S. HRG. 107–570

CLEAN POWER ACT

HEARINGS

BEFORE THE

SUBCOMMITTEE ON CLEAN AIR, WETLANDS, AND CLIMATE CHANGE

AND THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED SEVENTH CONGRESS

FIRST AND SECOND SESSIONS

ON

S. 556

A BILL TO AMEND THE CLEAN AIR ACT, TO REDUCE EMISSIONS FROM ELECTRIC POWERPLANTS, AND FOR OTHER PURPOSES

JULY 26, 2001
NOVEMBER 1, 2001
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[1]NOTE: During the 107th Congress, Senator Ben Nighthorse Campbell of Colorado resigned from the full committee and the Subcommittee on Clean Air, Wetlands, and Climate Change, and, on April 23, 2002, was replaced by Senator Pete V. Domenici of New Mexico.

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CLEAN POWER ACT

THURSDAY, JULY 26, 2001

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 9:36 a.m. in room 406, Senate Dirksen Building, Hon. James M. Jeffords (chairman of the committee) presiding.

ENVIRONMENTAL EFFECTS OF ELECTRIC POWER PLANT EMISSIONS

Present: Senators Jeffords, Campbell, Carper, Chafee, Clinton, Corzine, Crapo, Inhofe, Reid, Smith, Specter, and Voinovich.

Senator JEFFORDS. The committee will come to order.

I am pleased to welcome to the committee Senator Collins, who is a cosponsor of this bill which we will be considering, and I understand you have a tight schedule and I would like you to proceed.

STATEMENT OF HON. SUSAN COLLINS, U.S. SENATOR FROM THE STATE OF MAINE

Senator COLLINS. Thank you very much, Mr. Chairman, for your courtesy.

Good morning Senator Jeffords, members of the committee.

I would first like to start by thanking Senator Jeffords and Senator Smith for convening today's hearing on the Jeffords-Lieberman-Collins-Schumer Clean Power Act. Both Senators have shown great leadership in addressing our nations air pollution problems. Senator Smith, who has not joined us yet, but when he was chairman of the committee placed our nation's air pollution concerns at the top of the committee's agenda. Improving the quality of our nation's air remains at the top of the committee's agenda under the leadership of Senator Jeffords, with whom I have worked very closely on this issue and many others. I am confident that this committee will report legislation that will reduce emissions from our nation's dirtiest power plants and help restore the quality of our country's air.

I particularly want to acknowledge all the members of the committee who are cosponsors of the Clean Power Act. Senators Jeffords, Lieberman, Schumer and I began developing this legislation last fall. They have a long history of working on behalf of clean air and their leadership was extremely valuable in devising a bill that sets the framework for returning our nation to the era of blue skies and smog-free days.

I also want to acknowledge the role played by Conrad Schneider of Brunswick, Maine, who helped us in drafting the Clean Power Act. It is my understanding that Conrad will be testifying before the committee later today. He provided invaluable assistance in targeting the loophole in the Clean Air Act that has allowed the dirtiest, most polluting power plants in the nation to escape significant pollution controls for more than 30 years.

Mr. Chairman, coal-fired power plants are the single largest source of air pollution, mercury contamination and greenhouse gas emissions in the nation. They are truly horrific polluters. Just one coal-fired power plant can emit five times more of all the pollutants that cause smog and acid rain than all of the industrial sources in the State of Maine combined. In fact, Mr. Chairman, members of this committee, if you took every car off the road in Maine and shut down every factory, we would still have an air pollution problem because of emissions from power plants from out of State. As the easternmost State in the nation, Maine is downwind of almost all power plants in the country. Most of the pollutants emitted by these power plants—mercury, sulfur dioxide, nitrogen oxide and carbon dioxide end up in or over Maine. Airborne mercury falls into our lakes and streams, contaminating freshwater fish and threatening the health of our people. Carbon dioxide is causing climate change that threatens to alter Maine's delicate ecological balance. Sulphur dioxide and nitrogen oxides come to Maine in the form of acid rain and smog that damages the health of our people, creates asthma and other problems for our children, and also hurts our environment.

Mr. Chairman, Maine is tired of serving as the last stop for the nation's dirtiest power plant emissions. As I said when we joined together to introduce this legislation last fall, it is time to end the dirty air express. All power plants, wherever they are located in this country, should meet the same standards, and those standards must be sufficient to protect people's health and the health of our environment. I am very pleased that the hearing you have convened today moves us one step closer to ending the free ride for our nation's dirtiest power plants.

This bill will also level the playing field between upwind and downwind States. Inexpensive electricity in other States has come at the expense of the health of the people in Maine, Vermont, New Hampshire and other downwind States. At the same time, power-intensive industries in our States—manufacturers in particular—have been forced into a competitive disadvantage with their competitors in States with lower-cost, dirty power.

After causing some of the nation's worst pollution problems for decades on end, the time has come for power plants to stop using loopholes to evade emissions reductions. This bill demonstrates strong bipartisan, tripartisan support for clean air.

I thank you, Mr. Chairman, for convening this hearing. I know that this is an issue of great importance to you and it has been a privilege to work with you and many other members of this distinguished committee toward this goal.

Thank you, Mr. Chairman.

Senator JEFFORDS. Thank you for an excellent statement. I have visited Maine many times. My sister lives there. I have been to

Cadillac Mountain, which I believe is the point where the sun first reaches the country, and also where the pollution last reaches.

Senator COLLINS. Mainers take a great deal of pride in making their own contributions to cleaning up the air and the water, but there is very little that we can do about air pollution that is blown in from other States, and that is what this bill is intended to target.

Senator JEFFORDS. How urgent is this as far as Maine is concerned?

Senator COLLINS. It is very important to the people of Maine, and it is something that is strongly supported by Maine's State Government as well. Our Governor and the Department of Environmental Protection in Maine have joined with other States to try to negotiate with and to work with EPA to try to reduce the emissions that are coming to our State. We know that increasingly we can tie the increase in children's asthma, for example, to increased levels of air pollution. It is also just something that is so important to our way of life in Maine. The outdoors is very much a part of the heritage of the people of Maine. We take great pride in having a wonderful environment that attracts thousands of tourists in the summer and the fall—throughout the year, actually. We want to make sure that we can control the quality of our air. But one State alone cannot do it. We have to have a national approach.

Senator JEFFORDS. Any questions from my colleagues?

Senator CAMPBELL. I don't really have any questions, Mr. Chairman, but I have a few comments I would like to make. Are we going to do any form of opening statements or not?

Senator JEFFORDS. We will have the opening statements. I just want to make sure that you had an opportunity to visit with Susan if you so desire.

Senator CAMPBELL. I wanted to make the comments while she is here.

Senator COLLINS. I would be happy to stay and listen to your comments, and I thank you, Mr. Chairman, for the opportunity to testify.

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. Thank you very much.

Now, I will make my opening statement, and then we will turn to you all for your opening statements.

Today, the committee will hear from witnesses about the public health and environmental impact of power plant emissions. I am very interested about the power plant emissions. I look forward to hearing from the witnesses with regard to that, and listen to them describe these impacts of what levels of reductions are necessary to impact them. This is the first in a series of three or more hearings that will explore how air pollution from energy affects public health and the environment.

First, however, I will make a short statement, and then turn to my colleagues for their remarks.

This morning, I turned on the lights in my kitchen, and like a growing number of Americans, I thought about where the electricity came from. I wondered how many pounds of pollution and waste were created so I could make myself a cup of coffee. Then I opened my newspaper to the weather page like so many of us do every day, but the people I was thinking about are not farmers or ranchers or golf pros or construction workers. I was thinking about the tens of millions of people with asthma or who had children with asthma, and the people with emphysema, bronchitis, lung cancer and other illnesses related to air pollution. These people must check the weather page to see the air quality forecast. Will it be a code red day? Will they have to be careful about their outdoor activities? That is no way to live. We can do better in the way we use our energy.

This morning also reminded me of a sultry summer morning in Vermont some 15 years ago. Yes, we really do have sultry summer mornings in Vermont on occasion, once or twice a year. I was hiking in the Green Mountains. I could barely see across Lake Champlain. The haze from fine particles were terrible. My friends in the area tell me that the fishing permits came with an advisory about mercury in fish. They are concerned that sugar maples are being affected by acid rain and global warming. Christmas tree growers are concerned and worried about the acid rain's impact on tree health and vitality. These are important businesses, and these are big concerns for Vermonters.

I know the electric utility industry and its people have worked hard to provide our nation with the power to run our homes, schools and hospitals. The industry has done a good job of improving on the goals that Congress set in the Clean Air Act Amendments of 1990. But it is becoming increasingly clear that we should have asked for more, and we will.

We made great progress in 1990 on reducing pollution. Today, we begin the next phase of those actions. Our task together on this committee is to find common ground on the issue so important to the entire nation. We must strive to improve the nation's air quality even further. We will also try to bring certainty to an industry facing an array of complicated rules. In the meantime, there are lots of Administration initiatives that could help us achieve greater reductions from power plants. Unfortunately, some of these seem stalled or tied up in the reviews of one kind or another. The President's energy policy supports a multi-pollutant approach, and I look forward to working with President Bush and Governor Whitman as they develop this proposal.

Unfortunately, the President's policy backs away from a commitment to address carbon dioxide emissions from power plants. I am disappointed about the Administration's position on the Kyoto Protocol. I am disappointed in the Administration's approach to climate change and specifically the refusal to constructively engage the world in the solution.

The Administration can refuse to commit the United States to the Kyoto Treaty. It can withhold offering its own alternative to the framework outlined in the Treaty, and it can reduce funding for implementing climate change reduction programs. That is their choice. But this Congress, this Senate, and especially this committee will not let our international partners down. We plan to take steps to reduce our nation's contribution to this growing problem by working with industry to reduce carbon emissions.

So we can sit here and bemoan the fact that the United States has been left out of an important international treaty, or we can take action now to improve air quality and protect the environment. In the coming weeks, we will hold a series of hearings to review the possibilities available to clean our air and cut greenhouse gases, while maintaining the strongest economy in the world. Next week, we will review the transportation sector and later we will cover the commercial and industrial sectors. We really have to drastically rethink how we approach energy use if we are going to keep up with the electricity demand in an environmentally responsible way.

I am neither a scientist nor a gloomy person, but I cannot help but wonder if the pollution generated by the electricity to make a cup of coffee is to blame for some of these problems.

I would like to thank Senator Smith for all he has done to advance a comprehensive approach to power plant emissions. He really got the ball rolling and I look forward to working with him on this important matter. I also look forward to hearing from the witnesses, particularly Governor Whitman, Mr. Johnstone of Vermont, and I know the Governor has a long and personal interest in protecting the public health as she did so well in the State of New Jersey.

Senator Smith?

Senator SMITH. Thank you, Mr. Chairman.

Mr. Chairman, I did come in late and I am going to defer to my colleagues here, and I will go last since I do not want to hold them up.

Senator INHOFE. Save the best until last?

[Laughter.]

Senator JEFFORDS. Senator Inhofe?

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman, and thank you for having this hearing.

I was listening to Senator Collins, and she did such an eloquent job of talking about her State of Maine that she is so proud of, and you, too, and your State of Vermont, Mr. Chairman. I think a lot of people forget there are other parts of the country, too. I have lived in Oklahoma virtually all my life. My wife and I built a place actually on a lake 41 years ago, and I live there. I mean, I can serve my State—I have a little runway there—and come back and run my trout-line at night. Not many people realize Oklahoma actually has more miles of freshwater shoreline than any of the other States. It is a real garden spot. People do not understand that. They think of the Northeast and some of the other places, perhaps, Senator Campbell, of Colorado, but there are a lot of other beautiful places and there is no one with my four kids and nine grandkids who enjoy a more beautiful environment than we have in Oklahoma. I think that is one thing we all have in common in this room. I think everyone does want to preserve and to develop an environment that is going to be cleaner for the future.

I think we have done a lot. Air pollution is down. In almost every category, the amounts of pollutants have decreased substantially.

People are breathing healthier air today than they were 10 years ago, than they were 20 years ago. A lot of people do not know that. A lot of people get information that is misinformation, but that is actually true.

I look forward to working with all the members of this committee, Mr. Chairman, and with President Bush in developing a streamlined regulatory process that will significantly reduce mercury, NOx, SOx. These are types of initiatives that we need to examine if we as a nation are going to provide an affordable energy supply and make significant advances in the protection of human health and the environment.

I believe that objective and sound science must be the basis of reductions which Congress adopts as a part of legislation. It will prevent our society from chasing after pennies of benefits for dollars of cost. It is called cost-benefit analysis. A lot of people do not like that term, but there is a cost to all of these things that we are doing.

I think that we need to understand that it is not companies that ultimately pay for a lot of the environmental regulations that I believe are not based on sound science and have not considered cost-benefit analysis. It is the people of the middle and lower incomes, as the price of energy increases, that really are hurt the most. We hear from school after school about the problems out there with their heating bills and how it has depleted the funds that normally would go to supplies and books.

We as a nation need to rethink the manner in which we approach regulation. We need to keep an open mind. During the debates on various regulatory reform initiatives, I was very disheartened to hear that these were sneak attacks on the environment. In fact, it is just the opposite. If we rethink regulation, we can better position ourselves for the future. We could find ourselves in a place where we can have far greater environmental protection and more reliable and diverse energy sources.

Finally, on the issue of carbon, as the chairman has stated, the President will take meaningful steps to address this issue as appropriate, but at the same time consider the effect on our energy supply and the economy. You talked about the Kyoto Treaty. You know, I think it is smoke and mirrors. Besides that, we passed a resolution 95–0 prior to the Kyoto Convention, that if they came back with something that treats developing nations differently than developed nations, that we would reject it. That is 95 to 0. Unlike his predecessor, I think that President Bush cannot continue to place layer after layer of regulation without any consideration for the energy implications. There is a community that does not have to answer to the American people when energy crises go through the roof, or to worry about the national security ramifications of becoming dependent upon foreign sources for our ability to fight a war, but our President does.

Thank you, Mr. Chairman.

Senator JEFFORDS. Thank you. I am going to have to go to a map and take another look at Oklahoma.

Senator INHOFE. I would love to invite you to come out there.

Senator JEFFORDS. I think I would like to do that.

Senator Clinton?

OPENING STATEMENT OF HON. HILLARY RODHAM CLINTON, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator CLINTON. Mr. Chairman, I am fortunate because I know a lot about Oklahoma, and I can validate what Senator Inhofe is saying.

Senator INHOFE. And I should have put you on that list, too, because there is nothing more beautiful than the environment in Arkansas.

Senator CLINTON. Arkansas, New York—beautiful States.

[Laughter.]

Senator INHOFE. Right.

Senator SMITH. Which one is better?

[Laughter.]

Senator CLINTON. I was just about to say, not only am I glad to greet our new chairman, but I was going to say something very nice about our former chairman, but I will reconsider.

[Laughter.]

Senator CLINTON. It is a great pleasure to be here at Chairman Jeffords's first hearing, but I also want to acknowledge the role that Senator Smith played in getting us to this point. He really started the ball rolling on a lot of the issues that I think are critical to our environment and to our country.

I want to thank Senator Collins for her eloquent statement, which could have been given word for word by either Senator Schumer or myself on behalf of the damage that New York suffers from pollution.

I am delighted to welcome Governor Whitman and the other witnesses, particularly Dr. George Thurston, who will be testifying. He is the director of the Community Outreach and Education Program at the New York University School of Medicine, which is a National Institute of Environmental Health Sciences Center of Excellence. Dr. Thurston and the other panelists, I am very grateful that you are here to talk about pollution from power plants, which is a hidden health hazard. The unnatural things in our world, namely what we put into it, are posing a threat to our human life and well being.

I know that this has been a great concern to many of us on this committee, and it has become one for me as well—I spoke about it at the National Press Club last week—because chronic diseases like asthma and heart and lung diseases are caused by a combination of genetics, behavior and environment. Now, there may not be much we can do about our genetic predisposition to disease, there are things we can do about our behavior, and we of course should. But there are even more things that we can and should be doing about our environment than we have done up until now. I am pleased that we are going to be discussing how we can effectively reduce pollution from power plants in order not only to protect our environment, but to protect public health as well.

Poor air quality, and in particular emissions of nitrogen oxide and sulfur dioxide lead to increases in ground-level ozone or smog, as well as increases in particulate air pollution. There have been at least 27 ozone action days so far in New York just this year. Like Chairman Jeffords, I wake up every morning and hear whether there is a red alert in Washington and what should be done about it, and people are told, "Park your cars and try to stay indoors." It is a rather sad commentary on the state of our environment when those are the kinds of alarms that we have to hear on our radio and television weather reports.

As we will hear from today's witnesses, we know that this poor air quality can cause, and is causing in many parts of our country, significant costs that have to be factored into the kind of cost-benefit analysis that Senator Inhofe was talking about. We are seeing increasing evidence that not only are there many hospital admissions, particularly connected to asthma attacks, but heart attacks, birth defects and outcomes and even premature death are now being more closely linked as we learn more from sound science.

We are clearly in the midst of an asthma epidemic, with rates having increased 75 percent between 1980 and 1994, and New York State has the second-highest number of asthma sufferers. It is the highest cause of school absenteeism, which then has effects for parents having to take children to emergency rooms, and we obviously are going to have to address this growing problem.

Mercury pollution poses other health concerns. We know it is highly toxic. It has been associated with both neurological and developmental effects in humans. Earlier this year, the U.S. Food and Drug Administration had to issue a consumer advisory on mercury in fish, cautioning pregnant women, women of childbearing age, nursing mothers and young children not to eat certain types of fish containing high levels of mercury. It may be hard at this point to put a cost on that, but we know that there are costs associated with it. According to the EPA, the number of States issuing mercury fish consumption advisories has risen steadily from 27 States in 1993 to 41 in 1999. Because of mercury pollution, the State of New York has advised against consuming fish from over 16,000 acres of its lakes. Unfortunately, that does not always stop people who find fishing to be a good source for food and often on limited incomes, are still compelled to eat the fish even despite the advisories.

We know that acid rain, as we heard from Senator Collins, continues to plague our environment. We see that clearly and with devastating impact in the Adirondacks. Because of acid rain, which is caused by emissions of sulfur dioxide and nitrogen oxide, 41 percent of the lakes in the Adirondacks are now in some way acidic. I have been those lakes. They are beautiful. If you were just to drop in and maybe fly out, you might wonder what the issue was. But there are no fish left. The loons do not come to Loon Lake anymore. It is a great loss to the environment. In 40 years, if we do not act, more than half the lakes of the Adirondacks will be dead.

The Hubbard Brook study released earlier this year is an alarm bell warning us of what we already know. We cannot afford inaction. The emissions reductions mandated by the 1990 Clean Air Act are not adequately protecting our natural resources or our public health. The facts are so clear that some States are having to act on their own. Massachusetts recently instituted new regulations to require significant reductions in mercury, NOx, SOx, and carbon dioxide from power plants. In New York State, the Assembly passed legislation by a vote of 143–1 to control emissions of mercury, SOx, NOx, and carbon dioxide, and allowed for the establishment of an emissions credit trading mechanism for trading carbon dioxide. Suffolk County on Long Island, one of the most beautiful places in our State, recently passed legislation to establish a rate of allowable carbon dioxide emissions from power plants.

We are going to start seeing this kind of local and State regulation that will cause enormous amount of problems for the utilities in our country that need to have a secure base of regulatory enforcement that they can count on when making plants for power plants. I would hate to see us go the direction of New York, Massachusetts, Suffolk County, California—other people creating a patchwork of regulation. Because pollution knows no boundaries. The same is certainly true of the global effort to reduce greenhouse gas emissions. I applaud the chairman's remarks today, because we know we have to reduce CO_2 emissions, and certainly the United States must be a leader in this effort. We are the largest producer of greenhouse gases, and our participation is absolutely vital. Other countries have apparently reached an agreement on the Kyoto Protocol without U.S. participation. We need to demonstrate that we are serious about reducing our own emissions, and it is time that we address the power plant emissions that we are talking about today.

I would like to say that we can consider a lot of different alternatives that I think are economically feasible and environmentally necessary. I hope that this committee will continue the work that was begun before by so many in the previous Congresses.

We have heard testimony before this committee that in coming years there is going to be a global multi-trillion dollar market for energy-efficient technologies and products, which will help us achieve reductions in CO_2 emissions. We have a number of plants and businesses in New York that are pursuing this, such as a company in Buffalo working on the development of emission reduction and testing equipment, including a mobile air emissions monitor. I know that the trading floors on Wall Street would be very interested in trading greenhouse gas emissions. I have a certified and transferrable greenhouse gas offset title worth one metric ton of carbon dioxide, or about $3 in today's market. Shares of NOx and SOx are more expensive because there is currently a market for them under the Acid Rain Program under the Clean Air Act. If we created a market, we could sell these emissions as well. That would be one clear step that would use market incentives that would be effective and also clearly warranted since there is a market that needs to be encouraged.

So I hope that despite some of the differences that we bring to this committee, that we find common cause in working together and that we provide incentives for those plants in States like Senator Voinovich's that need the incentives to be able to do all that is required to cut their emissions, and I look forward to working with the chairman in achieving those kinds of objectives.

[The prepared statement of Senator Clinton follows:]

STATEMENT OF HON. HILLARY RODHAM CLINTON, U.S. SENATOR FROM THE STATE OF NEW YORK

Thank you, Mr. Chairman. Thank you for holding today's hearing to assess the impact that pollution from transportation sources has on public health and the environment.

Before I continue, I just want to say how pleased I am by the press reports this morning that Governor Whitman has decided to move forward with the full cleanup plan for the Hudson River that was originally proposed this past December. We don't have all of the details yet, but this appears to be a significant environmental victory, not just for New York and New Jersey, but for communities around the country that are plagued by contaminated sediments. I know that this is not a final decision—that this is still in a review process and that the decision won't be officially announced until September—but this is welcome news.

Having said that, I would like to welcome all of today's witnesses. In particular, I am pleased to welcome Mr. Omar Freilla from the New York City Environmental Justice Alliance. Omar, thank you for being with us today. Thank you for everything you do to improve air quality for New York City residents, and to address environmental justice issues in general in New York City.

I understand that you are working on a very exciting project at the Hunts Point Market. Unfortunately, due to business in the HELP Committee that requires my attendance, I may not be able to be here for your testimony, but I will review your statement, and I urge all of my colleagues on the committee to review it as well.

You know, we are a culture that is constantly on the move. We travel to and from work, to and from school, to and from the store. When we go to the store, we expect to find the products we want—products that are transported from near and far—by truck, by rail, by container ship, by plane. We are building buildings, and farming farms.

Yet we often don't think about how all of these activities can have an impact on our ability to breath clean air—which you could say is probably one of our most important activities of all.

In 1970, Congress amended the Clean Air Act to address pollution from the transportation sector, and we have benefited from the results. We have cleaner fuels. Removing lead from gasoline has reduced lead levels in the atmosphere—and in our children's blood—dramatically. We have cleaner cars. Cars are up to 95 percent cleaner than they were 30 years ago, and there are rules on the books to make cars, trucks and buses even cleaner in the years to come. It is critical that we resist any efforts to delay or rollback these new standards.

Yet even with these improvements, transportation activities still account for more than three-fourths of the nation's carbon monoxide emissions, more than half of the nation's nitrogen oxides emissions, and more than two-fifths of the nation's emissions of volatile organic compounds—or VOCs.

Both nitrogen oxides and VOCs contribute to the formation of ground-level ozone or smog, which can aggravate asthma and other respiratory illnesses, and has even been shown to contribute to heart attacks. So far this year, we have had 27 bad air quality days in New York State caused by high ozone levels.

We all know how it feels to get caught in that thick cloud of smoke that comes out of the back of many buses and trucks. I know my reaction is to close my mouth and try not to breathe. What many people don't know is that this diesel exhaust is classified as a likely carcinogen by the EPA.

Earlier this year, the Natural Resources Defense Council released a report showing that children who ride to school in a diesel school bus are exposed to excess exhaust on the bus at levels 23 to 46 times higher than those levels already considered to be a significant cancer risk by EPA. I know that many of these same school buses sit and idle outside of schools, further exposing our children and the surrounding community to these harmful emissions.

Overall, the transportation sector emitted approximately 2.3 million tons of air toxics in 1996, including benzene, toluene, benzopyrene, and 18 other compounds known or suspected to cause cancer, birth and developmental defects, and other adverse health effects.

What all of this tells me is that while we may be making progress, there is still more to be done. Omar's project at the Hunts Point Market is one example of how we can make further progress—and we will here more about that later.

Another example of how we can make progress is the Central New York Regional Transportation Authority (CNYRTA), which is in the midst of an aggressive campaign to replace its aging bus fleet with a fleet largely comprised of clean, compressed natural gas buses. By converting to these cleaner buses, CNYRTA will significantly improve the metropolitan Syracuse area's air quality.

I am pleased that in the transportation appropriations bill that is currently pending on the Senate floor, Senator Schumer and I were able to get another $4 million to help with this effort. With this appropriation, CNYRTA will be able to achieve an 84 percent conversion of its fleet to compressed natural gas.

But even as we move to cleaner cars, trucks and buses, the shear number of vehicles on the road continues to grow—which counteracts the progress we are making.

The overall number of cars on the road has more than doubled since 1970. In New York State today, there are over 10 million cars, trucks, and buses on the road according to DMV estimates.

We need to recognize that our efforts to improve our air quality and protect public health and the environment will be met with constant challenges.

Fortunately, new technologies will help us meet these challenges. In New York, we are home to companies that are on the cutting-edge of technology—companies such as Corning Incorporated in Corning, NY, and Air Flow Catalyst Systems in Rochester. These companies are manufacturing emission control equipment—equipment that can be used to retrofit existing vehicles and make them dramatically cleaner.

Companies like these are leading the way and demonstrating that investments in cleaner, more efficient technologies can help our economy, as well as our environment. But, it is the responsibility of government to foster the development of these cutting-edge technologies. We can accomplish this by providing regulatory certainty for industry, combined with appropriate incentives.

Another reason that it is so important that we continue to make progress in this area is the issue of global warming. The transportation sector currently contributes one-third of all carbon dioxide emissions—a number that will continue to grow unless we take action.

Just this week, the National Academy of Sciences reported that automobile manufacturers have the technology to make sport-utility vehicles and light trucks more fuel efficient, and therefore less polluting. According to the NAS, "There are . . . other reasons for the nation to consider policy interventions of some sort to increase fuel economy. The most important of these, the committee believes, is concern about the accumulation in the atmosphere of so-called greenhouse gases, principally carbon dioxide. Continued increases in carbon dioxide emissions are likely to further global warming."

So we have a lot of ground to cover. I hope that this hearing will help lay the ground work for future committee efforts, whether it's addressing the MTBE issue, or issues that we may want to try and address in the Transportation bill.

Again, I would like to thank the chairman for holding this hearing. I look forward to continuing to work with him and my other colleagues on the committee to find ways to improve our nation's air quality and protect human health in a common sense and cost-effective manner. Thank you.

Senator JEFFORDS. Thank you, Senator.

Senator Campbell?

OPENING STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

Senator CAMPBELL. Thank you, Mr. Chairman.

I was in the back room about 15 minutes early kind of dozing in a chair before you were here, and a kind staffer gave me a cup of coffee to wake up with. After hearing your comments on how much energy it took to make that coffee and some of these depressing opening statements, I think I am going to quit drinking coffee.

[Laughter.]

Senator CAMPBELL. Air emissions from electrical generating plants, indeed all energy-producing plants, are going to continue to be very controversial. I am on the Energy Committee, as are several other members. We we have had over 50 hearings on the production of energy and over 160 witnesses in the last couple of years trying to deal with how we find the balance between the needs of people, and having strict environmental concerns.

Certainly we have to take many things into consideration. When we deal with alternatives and renewables and fuel blends and conservation—all of the other things—I think it is important to recognize that we need to be careful in jeopardizing our electricity system by over-regulating from a Federal standpoint. We need, in my view, to come up with a solution that is fair, balanced, and takes everyone's needs into consideration, including the electricity generating plants. If California has taught us anything so far, it is that you cannot go for 30 years with increased needs going up every year and not building any generating plants.

Now, of course, they're on a pell-mell rush. They are opening one a week, and I assume by opening one a week, there is going to be some pollutants in the air from opening those new generating plants. But everyone in this room, including everyone on this panel, is part of the problem. We are the demand. We are the ones that are demanding more energy. As long as we demand more energy, whether it is electricity or oil, we are going to have to open new plants to comply with that demand, or we are going to have to get more and more dependent on Saddam Hussein as we are now, because we have also had the same problem with developing domestic oil fields and domestic production of our oil refineries. I do not think Americans want that.

One issue we have to preserve, I believe, though, is flexibility to comply with the standards. That will ensure that the smaller facilities, predominantly co-ops that are owned and all other generating plants can have the ability to attain compliance with air and environmental records. We must not throw regions of this country into a crisis by trying to implement stringent regulations that are impossible for small communities to achieve.

Another issue that is being discussed is the new energy review. The New Source Review seems to be hindering new energy exploration, citing expansion and rejuvenating of generating facilities. We all know the intent, and I think the intent is good. I know of no one that supports the destruction of the environment or wants to jeopardize the public health. But as a nation, I think we have come a long way to improving our environment, the quality of our air. I know we have to keep working on that, but I really worry about the full weight of the Federal Government in their regulatory agenda what it will do to small communities. I certainly commend the Chair, for the way, for doing some of these hearings that somewhat parallel the ones we are doing in the Energy Committee, but I would hope as we move along we do not sort of throw the baby out with the bath water by coming up with a list of regulations that are impossible for small communities to comply with.

Thank you.

[The prepared statement of Senator Campbell follows:]

STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

Thank you, Mr. Chairman. I would like to welcome all of the witnesses before the committee today and I am looking forward to the testimony that they will be providing us shortly on the impacts of air emissions from electricity generating plants on public health and the environment.

Air emissions from electricity generating plants and their potential impacts will continue to be controversial. Different regions of this country have different environmental regulations, and the role and scope of the Federal Government in this process is still being discussed. We have to take many things into consideration before we set a course of action.

What we cannot do is to jeopardize our electricity system by over regulating this industry. But, we do need to come up with a solution that is fair, balanced and takes everyone's needs into consideration, including the electricity generating plants.

One issue we must preserve is flexibility to comply with emission standards. This will ensure that smaller facilities' predominantly cooperative owned, and all other generating plants can have the ability to attain compliance with air and environmental regulations. We must not throw regions of this country into an energy crisis by trying to implement stringent regulations that are impossible to achieve.

Another issue that needs to be discussed is New Source Review. New source review seems to be hindering new energy exploration, siting, expansion and rejuvenation of generating facilities. We all know the intent of new source review is needed, but the last set of rules and regulations is too stringent and will hurt us in the long run. No one I know supports the destruction of our environment and wants to jeopardize the public health. As a nation we have come a long way to improving our air and environment. Most of the electricity generating facilities comply with the law, and I don't feel the full weight of protecting and preserving our nation's air and environment should fall solely on the backs of the electricity industry.

I am approaching the emissions debate very carefully because there are many interests that need to be addressed. have some questions for the witnesses that I would like them to answer so that we can further explore these issues during the time for questions.

Thank you Mr. Chairman.

Senator JEFFORDS. Thank you, Senator.

Senator Voinovich?

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. Thank you, Mr. Chairman.

I would like to welcome the Administrator. The Administrator and I have known each other a long time, and I have to say it is deja vu all over again.

[Laughter.]

Senator VOINOVICH. And the chairman will know as I continue my comments this morning.

I thank you for calling this hearing. Discussion on the health and environmental impacts of utility emissions is very useful, and I think we all need to better understand the impact of emissions.

As the past chairman of the Clean Air Subcommittee, I chaired four hearings on the harmonization of our environmental regulations with our nation's energy policy, and I think everyone would agree that those hearings were a success. We had some very helpful testimony and I encourage the chairman and his staff to review the hearing records.

Over the last 10 years, Ohio has spent more on emission reductions than New York, New Jersey, Massachusetts, Connecticut, Vermont, Rhode Island, Maine, New Hampshire, Maryland, Delaware and Washington, DC combined. We reduced our air toxins from approximately 381 million pounds in 1987 to 144 million pounds in 1996. When I began my term as Governor, eight of our largest cities—and we have large cities in Ohio—were not in attainment for the current ambient air standards. Currently, all 88 Ohio counties are in attainment for the national ambient air standards. No single State has done more to improve air quality in the last 10 years than Ohio. Admitted, we have real problems because we have utilities and we are one of the highest manufacturing States in the United States.

I do believe Ohio and other States can do more, and improvement is needed. This is why I started working with Senator Smith on his multi-emissions legislation. Also after I became Chairman of the Air Subcommittee, I met with Senator Lieberman and Clinton and other members of the committee to begin a dialogue in order to reach a consensus on a emissions bill. I remain optimistic that we can reach a bipartisan compromise to continue to improve the environment and public health, reduce utility emissions, create greater regulatory certainty—and I am glad, in your remarks, Mr. Chairman, you talked about that—and ensure that American consumers will have safe, reliable and cost-effective electricity.

I have a great deal of respect for the chairman of this committee, and I respectfully request that if we are going to have a bipartisan bill, one that is regionally supported and has the support of the Administration, then we must in addition to holding hearings examining the environmental and health impacts of emissions, hold hearings on the available control technologies for mercury and CO_2. That is a major issue of disagreement in terms of CO_2—the whole issue. We had hearing after hearing on global climate and the impact, and there are differences of opinion. How do we somehow bridge that gap and come up with something where we can get a consensus and get it through the Congress? Senator Lieberman and I agreed earlier this year to have hearings on those two topics.

For example, I am told by experts that control technologies to reduce the reduction levels in the Jeffords bill for mercury are not available. In addition, the only way to reach the reduction levels for CO_2 without increasing the emissions of other pollutants is to switch away from fossil fuels such as coal. Do we want to do away with coal? If we do want to do away with coal, what is going to take its place? I hear from everyone that we can try solar energy, or that we can build windmills, or we can try other technologies. If we look at the amount of energy that we are getting from those sources, it is relatively small. Let's be realistic. We are going to have coal.

Looking at the chart, we see that this is where we are getting our energy, and you can see that nuclear, non-hydro-power renewables and others—this is what we are getting now from petroleum, this is what we are getting from coal and this is what we are getting from natural gas. Now, if the purpose is to put coal out of business, I ask the question, then where do we get the source of energy to go forward? That is a question.

I think from a realistic point of view, we need to deal with coal. How do we do a better job? Senator Byrd and I have a bill in on clean coal technology. In our State of Ohio, we use about 85 percent coal. Nationally, it is about 55 percent. How do come up with a solution by which we can continue to improve the environment, improve public health, and at the same time provide low-cost, reliable energy for the citizens of my State and this country?

I have chaired hearings, Mr. Chairman, in my State. I started out with the Salvation Army and with the Catholic Charities, Lutheran Housing, to look at the impact of heating costs on the people in our State. They were devastating, devastating, at the least, upon our people. I think that when we are talking about prescriptions to try and deal with the environment, we need to also think about the cost to our brothers and sisters who have to pay for the bills. I know your heating costs from oil are very high in your State. We have people that are giving up food, not being able to pay their bills because of high energy costs.

Somehow we have got to reconcile these factors. We have got to stop throwing darts at each other. When I was Governor of Ohio, Christy and I had differences of opinion. It was Ohio causing the Northeast problem; we were polluting the lakes and streams; and the acid rain, and all the rest of it.

I think the time has come when we ought to sit down to make some real decisions about these issues. I am not going to take the time of the committee to finish the rest of my statement, and will put it in the record.

I really think it is time that we do reconcile these differences. People here representing environmental groups and people representing the industries, and those of us representing the citizenry—we all are worried about their health, aren't we? We all are worried about the environment. We all are also worried about the fact that these people have to have food on their table.

In our State because of the fact that we have backed away from coal, we now are using natural gas. Natural gas use is skyrocketing in this country. If we do not have a balanced source of energy, Mr. Chairman, we are going to see an absolutely negative impact on the economy of this country. If you talk to Alan Greenspan and most of the experts, my State is in recession today. One of the reasons that it is because of the energy crisis.

So somehow, we have to harmonize our environmental and our energy needs and come together and stop throwing stones at each other. Right now in our State, the utilities are kind of in limbo. We have this New Source Review thing. It is up in arms. They would like to spend a lot more money. They would like to take care of mercury. They would like to do more with NOx and SOx. They would like to figure out some alternative in terms of how to deal with this carbon problem in a way that is realistic and technologically feasible. They would like to have some certainty.

I think we can do that, Mr. Chairman, but I do not think that just each group sitting in another room talking to each other is going to get the job done.

Thank you for the opportunity.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Mr. Chairman, thank you for calling today's hearing on this important topic. A discussion on the health and environmental impacts of utility emissions is very useful. We all need to better understand the impact of emissions.

As the past chairman of the Clean Air Subcommittee, I chaired four hearings on the harmonization of our environmental regulations with our nation's energy policy. I think everyone would agree that the hearings were a success. We had some very helpful testimony and I would encourage the chairman to review the hearing records.

Over the last 10 years Ohio has spent more on emissions reductions than New York, New Jersey, Massachusetts, Connecticut, Vermont, Rhode Island, Maine, New Hampshire Maryland, Delaware, and Washington DC combined. We reduced air toxins from approximately 381 million pounds in 1987 to 144 million pounds in 1996. When I began my term as Governor, eight of our cities were in nonattainment for ozone. Currently, all 88 Ohio countries are in attainment for the national Ambient Air Standards. No single State has done more to improve air quality in the last 10 years than Ohio.

However, I believe Ohio and other States can still do more and more improvement is needed. This is why I started working with Senator Smith on his multi emissions legislation. Also, after I became Chairman of the Air Subcommittee I met with Senator Lieberman and Clinton and other members of the committee to begin a dialogue in order to reach a consensus on a utility emissions bill.

I remain optimistic that we can reach a bipartisan compromise to continue to improve the environment and public health, reduce utility emissions, create greater regulatory certainty, and ensure that American consumers will have safe, reliable, and cost effective electricity.

I have a great deal of respect for the chairman and respectfully request that if we are to have a bipartisan bill, one that is regionally supported and has the support of the Administration, then we must in addition to holding hearings examining the environmental and health impacts of emissions hold hearings on the available control technologies for mercury and CO_2. Senator Lieberman and I agreed to this earlier this year and I believe this topic needs to be addressed before this committee considers any legislation.

For example, I am told by experts that control technologies to reach the reduction levels in the Jeffords' bill for mercury are not available. In addition, the only way to reach the reduction levels for CO_2, without increasing the emissions of the other pollutants, is to switch away from fossil fuels such as coal.

Coal is our most abundant and cheapest source of energy, we have a 250 year supply and whatever we do in this committee needs to take into account the fact that we will continue to be a fossil-fueled based economy for the conceivable future. This is why I support clean coal technologies and why I joined Senator Byrd in cosponsoring his Clean Coal Technology legislation.

We all agree that we need to reduce emissions. We need to have hearings on how to reduce the emissions and the kind of time, flexibility, and regulatory environment that will result in reducing emissions and continue to allow the use of fossil fuels. Otherwise we will enter into a mark-up without all of the data.

The finger pointing between the Northeastern States and the Midwestern States has gone on far too long. Currently nothing is happening to improve the environment and produce low cost energy. New generation facilities are being built using only natural gas. As a result the cost for natural gas has risen astronomically. This has resulted in high heating costs for consumers across Ohio and the entire country.

Mr. Chairman, I do look forward to working with you on this issue and others, but if we are going to work together on this we need to collectively define what all of the issues are and then more forward to work out the solutions.

Senator JEFFORDS. Thank you, Senator.

Senator Crapo?

OPENING STATEMENT OF HON. MICHAEL D. CRAPO, U.S. SENATOR FROM THE STATE OF IDAHO

Senator CRAPO. Thank you very much, Mr. Chairman, and I, too, appreciate your holding this hearing.

These issues are very critical. I chaired the committee that deals with the water pollution issues and the infrastructure needs we have in water. If you look at the water needs and the air quality needs that we face in this country, they are significant.

I am not going to take long because I know we want to get on with the testimony, and Senator Voinovich basically laid the groundwork for what I was going to say, and so I will simply associate myself with his comments and amplify them in only one area. That is, if you look at that first chart that Senator Voinovich put up there, the nuclear capacity that we have in this country is providing about 20 percent of our national energy power. Is that the blue line there? Well, that does not show it on a percentage basis, but I believe that the nuclear line, and when you look at it in terms of the percentage of electric energy production in this country, is about 20 percent of our electricity production.

We have a tremendous capacity in the arena of nuclear power to address the needs that we will be talking about in this hearing. It turns out that when you talk about air quality emissions, nuclear power is one of those sources of power that this country has a tremendous opportunity to explore. It can significantly decrease our dependence on foreign oil, decrease our dependence on the fossil fuels that Senator Voinovich has talked about that are creating a number of our air quality concerns in this nation, and increase not only our economic stability, but our national security as a result of the United States following what I believe would be a much better nuclear policy.

There is not a single silver bullet that is going to solve this problem, but if you look at the role that we are now looking to nuclear power to play in this country and its potential for what it could mean to our country, it is dramatic and significant. Admittedly, there are problems with the wastestream of nuclear power that we are dealing with politically, and everybody in the Senate knows that we have had and will continue to have some difficult votes on those issues. But we are now getting to the point where the safety issues, the resolution of the wastestream issues, and the questions of technology with regard to how to reprocess the fuel are getting close to being answered. I would hope that this committee can help to address those issues as it moves forward in addressing the overall issue of air quality in this country.

Thank you.

Senator JEFFORDS. Thank you, Senator.

Senator Chafee?

OPENING STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator CHAFEE. Thank you, Mr. Chairman, for calling this hearing. I look forward to working with you and former Chairman Smith who is very interested in this subject. I look forward to hearing from the distinguished panelists.

Thank you.

[The prepared statement of Senator Chafee follows:]

STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator Jeffords, thank you for holding today's hearing on the public health and environmental impacts associated with emissions from electric utility power plants. I commend you on placing clean air at the helm of your priority list for the committee's agenda. I must also thank Senator Smith for his work on holding several hearings earlier this year on the Clean Air Act, global climate change and a multi-pollutant approach to addressing the nation's clean air concerns.

I look forward to working with both Chairman Jeffords and Senator Smith as the committee proceeds with studying the effectiveness of our clean air laws and the public health concerns associated with emissions from the electric utility sector. Congress should address power plant emissions through legislation. Most agree that the Clean Air Act should be amended to provide reductions of nitrogen oxides (NOx), sulfur dioxide (SOx), and mercury. I believe that we must take carbon dioxide (CO_2) into consideration. Science has indicated that the continued overproduction of carbon dioxide increasingly threatens the long term health of our planet. I firmly believe that the United States, as the world's leading industrial nation, must take the lead in curbing the disastrous effects of carbon dioxide overproduction.

While opinions clearly vary on the best way to address these issues carbon dioxide in particular it is critical that the committee take a bipartisan approach in seeking to move multi-pollutant legislation, and carefully balance environmental protection with economic security. As we have seen on so many issues, Congress does its best work when we reach across the aisle. I have confidence that Senators Jeffords and Smith have the determination and the experience to craft a solution to the problems which will be addressed in today's hearing. I look forward to continuing a constructive dialogue and doing my part to reach a sensible solution.

Senator JEFFORDS. Thank you.

Senator Specter?

OPENING STATEMENT OF HON. ARLEN SPECTER, U.S. SENATOR FROM THE STATE OF PENNSYLVANIA

Senator SPECTER. Thank you, Mr. Chairman.

I join my colleagues, Administrator Whitman, in welcoming you here. I think people came to hear you and the panelists, and quite enough has been said by way of opening statements, so I shall be very, very brief.

One observation is the Senators present seem to be tilted very heavily on the Republican side. If I could have the attention of the chairman, I was commenting, Mr. Chairman, that the weight seems to be tilted very heavily on the Republican side, and some of us still count you, so that makes it an even heavier tilt in this direction.

My sole substantive comment, beyond the obvious necessity to have balance, is to determine where we are going to find the energy. I believe that when we find that it is coal and gas and oil, gas and oil are in very short supply, and we do not want to obligate ourselves any further to the stranglehold of OPEC, which is driving up prices with the cartel. There is an enormous supply of coal. I have joined Senator Byrd and Senator Voinovich and others on clean coal technology and have legislation in on tax credits. The Clean Air Act of 1990, which was very hotly debated in the Senate and in the House, has done a good bit to provide a balance, but the coal resources really provide an enormous opportunity. I believe we can, with clean coal technology and the scrubbers, protect the environment and provide the necessary balance.

Thank you very much, Mr. Chairman.

Senator JEFFORDS. Thank you.

Senator Smith?

OPENING STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator SMITH. Thank you very much, Mr. Chairman, and apologies to the Administrator—just a couple more minutes of comments.

This is the first opportunity I have had to address publicly this issue since Senator Jeffords has taken over the chairmanship. I want to thank him for convening this hearing, but also encourage the chairman to partake of nearly 18 months of research and work that some of us—certainly Senator Voinovich and others—that worked with me and others on the other side of the aisle as well. For the last 18 months, we have worked on this multi-emissions strategy, a cap-and-trade system. We have held a number of hearings, numerous stakeholder meetings. I know Senator Voinovich and I attended several of those together. It has been ongoing deliberative process. We wanted to do it right. We wanted to take the time to see that it was done right, to hear all points of view. Many have embraced the multi-emissions strategy, but as you use a trite expression, the devil is in the details. We do not know what the details are yet. Industry does not know. The Senate does not know. Until we know those details, it is going to be very difficult to come to any conclusions.

If we are going to pass successful legislation, as Senator Voinovich said, it has got to be an inclusive process. It has to involve both sides of the aisle. If you look at the Everglades legislation, the brownfields legislation, clean beaches legislation and so forth that we passed over the last year or so, it was all on a bipartisan basis working together. If we do that, there really is not any reason why we cannot have a strong economy with energy security and a clean environment. I believe we can do both. I think there is interest in doing both by industry, as well as those of us in politics.

The question before us today is really the consequence of emissions from the fleet of power generators. But I would also caution you as we go through this to know that the Clean Air Act does have two separate and distinct areas regarding mobile sources, as well as stationary sources, and I would also remind us to all be considerate of the fact that only half of the sources of the dirty air is coming from stationary sources. The other half is coming from automobiles, trucks, cars, buses et cetera. The technology that is moving in that area, with hybrid automobiles and ultimately hydrogen vehicles, should we get there in the next decade or two, we are going to see perhaps as much as 50 percent of the problem taken right off the table immediately. Then we would look at the question as, well, if we get there, then how much does that reduce the seriousness of the remaining 50 percent? We can talk about that.

We are not taking full advantage of the most modern, most efficient power generation that is available to us. Our most effective zero-emissions power source, as already has been stated, is nuclear. We have to have the courage to look at that and make a statement so that coal understands, nuclear understands, oil—all the other sources—renewables—what is the energy policy of the United States of America? Are we going to go back to nuclear or not?

In the field of fossil fuel, we are not making those technologies that are available to us. We're not using them for more power with less pollution. We have had so many opportunities with new technologies, and I have seen these technologies. I have gone to witness those technologies. I have heard testimony on those technologies and the innovative means to satisfy our energy needs and meet our environmental goals.

These technologies will produce energy and they will make us good environmental stewards. We have got to give the technologies a chance. We are not doing that. We are still relying on power plants from the 1950's and 1960's and punishing people to operate those plants without giving them any other alternative. Ironically, unfortunately the Clean Air Act in many respects is the obstacle, and we have got to change that. We have to have the guts to change it. The status quo for power plants under the Clean Air Act is basically a regulatory maze that neither is effective nor efficient—a combative regulatory relationship that does little to increase any environmental protection, and does too much to increase litigation, delay and uncertainty which gets nobody any clean air. It does not make any sense.

The current mandates discourage innovation. I promise you, they discourage innovation—absolutely discourage it. The fight over New Source Review is stifling investment that existing plants could be more clean and more efficient. It is stifling the opportunity to do that. I have spent the last year and a half looking at this directly. The uncertainty over the vast array of these rules has essentially stopped all Wall Street investment in newer and cleaner coal.

Now, Senator Voinovich made the case. I do not need to repeat it. But the question is, if we are not going to do nuclear, you want to close down the coal industry—250 to 300 years of coal—OK. That will take 75 percent of the energy produced in this country clean off the table. What are we going to do for it? What are we going to replace it with? Even if you get financing, siting such a facility under current law is almost inconceivable. We need to change this. We need to fix the Clean Air Act and we need to do it soon. We have to stop politicking and get it done.

Now let me speak specifically for just a moment on coal. I live in New Hampshire, and it would be easy for me to go out and bash the coal industry. But coal is a part of our past, and it is going to be a part of our future. It is going to be part of the energy that we produce. So why not move toward clean coal, which is what industry wants to do and it is what we want to do. I know that many would like to end coal combustion, but again it is not politically feasible. It is not achievable. It is that simple. It is not wise. More than half of this nation's electricity comes from coal.

I have maintained and advocated we can get more power with less pollution, but not for 1 minute am I going to suggest that we can do it and meet the energy needs of this country, as Senator Voinovich said, without coal. You cannot do it unless you want to go out and build a 100 more nuclear power plants. Sixty percent of the power in New Hampshire comes from nuclear power, and we had to fight to get that plant on line, and if we did not have it, we would probably have no power right now. Every region of the nation could economic consequences if we are irresponsible and too aggressive on our timeframes for reduction, or unrealistic about the levels of that reduction.

Now, let me speak quickly. The chairman's bill is a very important contribution. It is quite different than mine, but it gives us the opportunity to work together, and I look forward to doing that with you, Mr. Chairman, to debate on this. It is not a complete package, though. The Jeffords bill does address the notion that we can use cap-and-trade, and I support that notion. I think most of us do here on this panel. But it overlooks the need for regulatory certainty. You have to have regulatory certainty, and that is where we need to work together.

We want to unleash the innovative forces of the American market. We can do it. We can make a profit cleaning up the environment and producing energy. That is a win-win. Investment will not come as long as this uncertainty, Mr. Chairman, continues to hang out there. The scores of regulatory hurdles in the Clean Air Act, they make new investments in new clean technology, especially coal, all speculative. As long as it is speculative, no one is going to do it. We simply cannot afford to turn our backs on an industry that can help us. It is neither practical or in our national interest to do so.

Truthfully, coal is a dirty fuel. So if we are to make significant gains in air quality and have efficient affordable power, then we must encourage investment in clean and efficient coal combustion, and we can do it. We will hear a great deal about the concerns raised by air pollution from the power. I take these concerns seriously. We can address them by calling for a specific limit on the level of emissions. At that point, the Federal Government should take a giant step back and let American ingenuity do it. Let American ingenuity do it.

One company in New Hampshire called Powerspan—I brag a little bit about New Hampshire. This is a pilot project in Ohio—two States working together, reducing NOx and SOx as much as 45 to 75 percent, mercury 80 percent. Mercury is not even regulated and we are reducing under these initial pilot project returns 80 percent mercury reduction. No government regulation, and these people are doing this on their own, at their own cost, on their own initiatives. It is the role of the government to set environmental thresholds. It is not the role of the government to tell us how to get there. If you want to get there and say, here is where we want to be, then let's set that standard, let us set that threshold and then let it happen. If it does not happen, get the hammer our, but give them a chance to make it happen, and I promise you it will happen.

I do not think any of us, regardless of where we are on the political spectrum, believes that the Federal Government is more innovative, more efficient and technically competent than the private sector. If somebody believes that, then I think the evidence is to the contrary. So let's not stifle, let's not punish. Let's work together. Let's work in a cooperative partnership with those people in the free market who can get this done.

Just a final note, Mr. Chairman, in this cap-and-trade in the carbon issue, and I know it has been a source of frustration for Governor Whitman and the Administration and all of us, let me just say when we talk about three emissions, four emissions, the truth is carbon reduction will occur. We can provide the exchanges, the credits that Senator Clinton was just talking about for reducing carbon, without regulating it. If we do not need to regulate it, then let's not regulate it. Let's reduce it. That is more important than regulating it. We can do that by sealing natural gas pipes. We can give credits to companies for doing that. We can do that by producing more nuclear power plants if we want to give credit, or more renewables if we want to give credit to the companies to do that. We can buy rain forests or we can plant trees or we can create coral reefs. There are all kinds of things we can do to reduce carbon dramatically.

Finally, we can sell this technology out there, instead of worrying about Kyoto, sell this technology out there to the rest of the world and let them skip the industrial revolution and bring in this new innovative technology that we have, and get this job done, not only on a national scale, but a global scale.

So Mr. Chairman, I look forward to working with you to do just that, with the Administration, and I hope we will lay the politics at the door and work together to get it done.

Thank you.

[The prepared statement of Senator Smith follows:]

STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Good morning everyone. I want to thank the chairman for convening this important hearing. Nearly 18 months ago, I announced my intention to begin a multi-emissions strategy. Since that announcement, I have held hearings and numerous stakeholder meetings. This had been an ongoing, deliberative process—I wanted to ensure that we took the time so that it was done right.

Many have embraced the multi-emissions strategy. Of course the devil will be in the details and changing the Clean Air Act in any way is a challenging task. But if we are to ever see successful legislation, it must be an inclusive process. We proved last year with Everglades, and this year with brownfields, that only through a cooperative, bipartisan approach can we get anything done. If we work together, there is no reason we cannot be successful in achieving a clean environment in concert with a strong economy and energy security.

The question before us today is the consequence of emissions from our nation's fleet of power generators. As long as we have been producing electricity, we have been creating air pollution. But today, we generate a great deal more power per pound of pollution than ever before. But we can do better, and everyone in this room knows that.

We are not currently taking full advantage of the most modern, most efficient power generation available to us. Clearly our most effective zero-emissions power source is nuclear. But even in the field of fossil fuel-based generation we are not making full use of the technologies that allow for more power with less pollution.

We have so many opportunities with new technologies and innovative means to satisfy our energy needs and meet our environmental goals. Technologies that produce energy and make us good environmental stewards.

We still rely on power plants from the 1950's and 1960's. Ironically, the biggest obstacle to utilizing these clean technologies is the Clean Air Act. The Status quo for power plants under the Clean Air Act is a regulatory maze that is neither effective nor efficient plus a combative regulatory relationship that does little to increase environmental protection and does too much to increase litigation, delay, and uncertainty. The current mandates actually discourage innovation. The fight over New Source Review (NSR) is stifling investments that would existing plants more clean and efficient.

The uncertainty over the vast array of rules has essentially stopped all Wall Street investment in newer and cleaner coal technologies. Even if you could get financing, siting such a facility under current law is almost inconceivable. We need to change this. We need to fix the Clean Air Act. However, we must also proceed carefully.

Coal is a part of our past and will be a part of our future. I know that many would like to end coal combustion in this country. I would caution them that is not only politically unachievable, but also it is unwise. More than half of this nation's electricity is derived from coal.

I have steadfastly maintained and advocated that we can get more power with less pollution. But not for 1 minute would I entertain the notion that we can do it, and meet the nation's energy needs, without coal. Nor can we achieve the desired results overnight.

This map indicates that coal use is spread evenly throughout the country. Every region of the nation could face economic consequences if we are irresponsible and too aggressive on our time-frames for reduction, or unrealistic about the levels of reduction.

The chairman's bill is an important contribution to the debate on the future of the Clean Air Act. But it is not a complete package in my view. While the Jeffords bill addresses the notion of using a cap-and-trade system, it overlooks the need for regulatory certainty. If we are to unleash the innovative forces of the American market in the quest of better performance, then we must encourage investment. Investment will not come if the uncertainty is too high. The scores of regulatory hurdles in the Clean Air Act make investments in new, clean technology—especially for coal—highly speculative.

We simply cannot afford to turn our backs on coal—it is neither practical or in our national interest to do so. But the fact remains that coal is one of our dirtiest fuels. If we are to make significant gains in air quality and have efficient, affordable power we absolutely must encourage investment in clean and efficient coal combustion.

We will hear a great deal about the concerns raised by air pollution from the power that we all use. These are concerns that I take seriously and must be addressed. We can address them by calling for a specific limit on the level of emissions we will allow. At that point, the Federal Government should take a giant step back and let American ingenuity take over.

While it is the role of the government to set environmental thresholds, it shouldn't mandate how to get there. I don't think that any of us, regardless of where we are on the political spectrum, believe that the Federal Government is more innovative, efficient, or technically competent than the private sector. Instead of stifling, even punishing innovation, as is current practice, I want to provide incentives to be innovative, not only reach the cap, but to do better. This is about using the free-market process to reduce emissions. If we allow the flexibility for innovation, then technology that has already proven itself effective can find its way into the mainstream.

Finally, on Monday the Wall Street Journal weighed in on the question of using a market-based system for emissions reduction. I would ask that a copy of this editorial be included in the record along with my statement.

Thank you Mr. Chairman and I look forward to hearing from our witnesses.

Senator JEFFORDS. Thank you, Senator, for a very forceful statement.

Senator Corzine?

OPENING STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator CORZINE. I am not going to preempt with a lengthy statement. Just let me say, Mr. Chairman, I appreciate you holding this hearing and a series of hearings on controlling emissions. I welcome my former Governor, as always, and I am anxious to hear what she has to say. She knows and I know in the most densely populated State in the nation, the issue of air pollution is absolutely essential for us to deal with. We have roughly 1,100 premature deaths that are identifiable with regard to a lot of these environmental issues that come about in New Jersey. We need to move on this. God knows I believe in the free market, but without some pressure to see some of these changes come in to place, I do not think we will address these issues directly, squarely and mean the kind of progress that I think the people of New Jersey want to see. I hope we can have a good, balanced discussion about how we deal with these things, but I think it is a partnership of our Federal Government and our States and the private sector to get to long-term solutions on this. I am very, very pleased we are having this hearing so that we can get on with this debate on these four pollutants.

[The prepared statement of Senator Corzine follows:]

STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Thank you, Mr. Chairman. I want to thank you for holding this hearing, which is the first in a series of hearings on controlling emissions of SOx, NOx, mercury and carbon dioxide. Today's focus is on power plant emissions, and I understand that we will soon have hearings on emissions from the transportation and industrial sectors.

Mr. Chairman, air pollution is one of the most pressing environmental health issues that we face. By some estimates, power plant emissions cause as many as 1,100 premature deaths in New Jersey each year. My State has extremely high smog-caused by NOx emissions-which exacerbates asthma and other respiratory ailments. SOx emissions are responsible for both ecological damage from acid rain and health impacts from fine particles. As a coastal State, we have many anglers, and I know they are concerned about high levels of mercury in fish.

Finally, carbon dioxide emissions from power plants are major contributors to global warming. The events of the last couple weeks have underscored the need for U.S. action on climate change. Power plant emissions seems like a good place for us to start looking for solutions.

Mr. Chairman, power plants are certainly not the only sources of these pollutants. But they are major sources, and I look forward to working with you to find market-based means of reducing their emissions of these four pollutants.

Senator JEFFORDS. Thank you very much, Senator. Without objection the statements of Senators Baucus, Reid, and Lieberman will be placed in the record.

[The statements of Senators Baucus, Reid, and Lieberman follow:]

STATEMENT OF HON. MAX BAUCUS SENATE, U.S. SENATOR FROM THE STATE OF MONTANA

Thank you, Mr. Chairman for calling us here today to discuss such an important issue. I appreciate your efforts, and the efforts of Ranking Minority Member Smith, to move the debate forward on how best to achieve realistic reductions in power plant emissions. I would also like to give my sincere thanks to our distinguished panel of experts for testifying here today.

When I go home to my ranch in Helena, MT, it is easy for me to forget some of the air pollution problems plaguing other parts of the country. In Montana, we are blessed with a small population and plenty of space. But, even in Montana, this is an issue we cannot ignore. For example, acid rain continues to be a significant problem in the Rocky Mountain region. But, I don't think anyone, on any side of this issue, is advocating that we do nothing. For instance, the Administration has directed the EPA to develop a proposal to reduce SOx, NOx, and mercury emissions from power plants. The problem is that as we in Congress try to fashion an appropriate response to the continuing problem of power plant emissions, there remain significant differences over the best way to achieve cleaner power. But as long as retain our common goal—cleaner and more efficient power—I am confident that we will find a way to reach a bi-partisan solution to this problem.

We have already gone a long way toward reducing amount of pollutants we release into the atmosphere and in cleaning up our lakes, streams and oceans. The Clean Air Act has resulted in significant reductions in emissions of SOx and NOx from power plants. We are on target to achieve even more reductions in the near future, and emissions control technologies continue to advance. We of course want to make sure that industry has every incentive to invest in these new technologies. Hopefully as we continue to hold hearings and discuss this issue, we can find the best combination of carrot and stick—government regulation and market-based incentives—to ensure we are on track to produce the cleanest power we can.

As for addressing emissions of greenhouse gases, I have stated before that I believe that we need to take action to address the consequences of climate change. Whether we like it or not, on this issue, the world still looks to the United States to take the lead, although that attitude may be changing, which is unfortunate. However, the proposed regulation of carbon emissions in the United States is controversial. Some argue that currently, there are no cost-effective control technologies for greenhouse gas emissions. However, I don't think anyone would argue that global emissions of greenhouse gases is something we can choose to ignore. The questions becomes, again, what is the best way to address the problem, and achieve realistic emissions reductions.

I look forward to hearing the testimony of today's witnesses. My colleagues and I appreciate your insight and knowledge on this issue.

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman, I want to begin by thanking you for holding this important hearing. You have been a strong advocate for protecting the environment and human health throughout your distinguished tenure in Congress and I hope you will use this committee to continue this important work.

This is a very important and timely hearing Mr. Chairman, because as you know, we are learning more every day about the linkage between polluted air and diseases such as asthma and lung cancer. We are also coming to realize the very real damage that air pollution does to the environment, both regionally, as in the case of acid rain, and globally, as in the case of climate change.

I appreciate your determination to better understand and address the impacts that powerplants have on people and the environment and look forward to working with you on your four-pollutant bill. As you know Mr. Chairman, President Bush supported a four-pollutant approach to controlling emissions of sulfur dioxide, nitrous oxides, mercury and carbon during the Presidential campaign last year. Unfortunately, the Administration changed course on this issue after taking office.

Electric utilities account for approximately: one-third of all emissions of mercury and particulate matter in America, one-third of all emissions of nitrogen oxides and carbon dioxide, and three-quarters of all U.S. emissions of sulfur dioxide. Electric powerplants are major contributors to global warming. Climate change will, in turn, have significant impacts on public and environmental health. Predicted impacts range from changes in temperature and precipitation patterns, which impact water resources, to the spread of diseases.

Mr. Chairman, some would prefer that the Senate address only 3 pollutants and ignore carbon dioxide. This would be a mistake. It would be like driving a car with one flat tire. Eventually we will have to fix that tire and it will cost us much more to fix it down the road. In addition, utilities need to have some business certainty regarding the regulatory environment.

Mr. Chairman, I look forward to hearing from the witnesses and working with you as this committee develops 4-pollutant legislation dealing with reducing air emissions including carbon dioxide from electric power plants.

STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Mr. Chairman, thank you for calling this hearing today on this critical issue. We have long worked together on our nation's air pollution concerns, and I look forward to continuing that cooperation as we undertake our new roles in this committee. I regret that I will be unable to attend this hearing due to a request from the President for a meeting on an unrelated matter, but I look forward to reviewing the testimony of the panel of witnesses.

Mr. Chairman, I am pleased to join with you and Senator Collins as the primary cosponsors of the tripartisan Clean Power Act, legislation that will set practical limits on the power plant emissions of sulfur dioxide, nitrogen oxide, mercury and carbon dioxide. This bill will provide the utility industry with the flexibility and certainty they need to make business decisions while avoiding adverse environmental and public health impacts, which we will hear about today. If we can enact such multi-pollutant legislation, more Americans will be able to enjoy fishing in our rivers, swimming in our streams, and breathing cleaner air, all goals embodied in the Clean Water and Clean Air Acts. I look forward to working with you, Senator Smith, and Senator Voinovich to craft a multi-pollutant bill that can be signed into law.

Unfortunately, I have been troubled by indications that the Bush Administration will propose legislation in the coming months that will resemble the Clean Power Act, but with one significant omission: a requirement to reduce carbon dioxide emissions. While I applaud the Administration's attention to critical air quality issues, I cannot support legislation that fails to address carbon dioxide emissions, the most abundant greenhouse gas that contributes to global warming.

As the Bonn conference on the Kyoto Treaty reminds us, global warming is one of the most serious and pressing environmental challenges faced by the United States, and the world. The Earth's temperature is anticipated to rise between 3 and 10 degrees Fahrenheit in the next century, with a host of adverse environmental impacts, if we do not act to address this problem. While close to 200 nations agreed on a strategy for combating global warming, one did not. We are the one. Because the Kyoto agreement has set rules that were drafted without consideration of the interests of American industry or our environment—I am afraid that we will pay a big price for our isolationism. As a leader of the industrialized world and the world's largest emitter of carbon dioxide, we have a responsibility to do better.

If we do not include carbon dioxide in a multi-pollutant bill, our industry will most certainly suffer as a result. To cite one example, a number of major utilities have expressed the concern that if they go forward with large capital investments now, relying on legislation that is inconsistent with addressing global warming, they may be faced with another round of regulation when this country eventually decides to join the rest of the world in controlling greenhouse gas emissions. Because of the real risk that today's investments would be rendered obsolete, they are reluctant to modernize.

James Rogers, Chief Executive Officer and President of Cinergy, recently testified before our committee. This is what he had to say on this subject: "My company seeks comprehensive multi-emission power plant legislation because we want long-term clarity and certainty built into our environmental compliance planning process . . . Without some sense of what our carbon commitment might be over the next

10, 15 or 20 years, how can I or any other utility CEO think we have the complete picture of what major requirements our plants may face?"

We would like to avoid that circumstance and provide utilities with the certainty they desire and their customers with the clean air they deserve.

Indeed, the U.S. utility sector, which is responsible for 40 percent of domestic and 10 percent of international carbon dioxide emissions, must be part of the solution. In fact, many of the most cost-effective measures to reduce emissions are available in the utility sector.

Finally, when all of the various ramifications of multi-pollutant legislation are considered comprehensively, as was done in five recent studies, the net economic impact of the legislation is modest. Just recently, the International Project for Sustainable Energy Paths released a report finding that the United States could meet the national carbon emissions reduction targets set forth in the Kyoto Protocol while still increasing economic growth from baseline projections.

We have a very real opportunity to work in a bipartisan, or should I say tripartisan, manner to pass meaningful clean air legislation in this Congress. I look forward to working with all members of this committee to draft comprehensive legislation to address emissions of nitrogen oxides, sulfur dioxide, mercury and carbon dioxide from power plants. We have the opportunity to provide certainty and flexibility to our nation's utilities while at the same time protecting our environment and public health, and we must seize it.

Senator JEFFORDS. Governor, please proceed.

STATEMENT OF HON. CHRISTINE TODD WHITMAN, ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY

Administrator WHITMAN. Mr. Chairman and members of the committee, I appreciate the invitation to be with you today.

I would like to start, though, by thanking the chairman for a different set of hearings, and that was on four of our nominees yesterday, and thank you for your commitment to trying to move them through before the August recess.

Senator JEFFORDS. We are going to get them through just as fast as we can.

Administrator WHITMAN. I appreciate that—get them in place.

I truly am pleased to have a chance to discuss this opportunity that we have to achieve significant improvement in the air quality in America. Consolidating many of the programs that regulate emissions from electric generation plants into one innovative and cost-efficient approach can significantly further the progress made since Congress passed the Clean Air Act 30 years ago.

Under that landmark law, the United States has reduced emissions of six important air pollutants by more than 30 percent, as the chart there will show you. The important thing to remember is that these reductions have been achieved while our economy has grown by nearly 150 percent, energy consumption has increased more than 40 percent, and coal consumption has increased more than 75 percent. Economic prosperity and environmental protection can go hand in hand.

Despite these noteworthy statistics, however, we still face serious public health and environmental problems caused or made worse by air pollution. This Administration is prepared to take the next step toward achieving attainment of our air quality standards across the nation. President Bush promised this during the campaign and has directed me to fulfill that promise by modernizing our regulatory system. To address these concerns, this Administration is developing legislation that will significantly reduce emissions of sulfur dioxide, nitrogen oxide, and mercury, while also eliminating administrative burdens on both industry and government.

As the American public has become more aware of the environmental and public health problems associated with pollution over the years, Congress, EPA and the States have responded by developing separate regulatory programs to address individual problems one at a time. Each program uses its own approach to serve its own purpose. The results for the power generation industry is a complex web of regulations and a great deal of uncertainty about future requirements.

It is time to simplify the existing regulatory structure. We can replace many of these individual programs with a single cost-effective system that will achieve greater emission reductions than all of the current programs combined. Again, this chart will show you some of that. Such a system would use market-based incentives such as emissions caps, while allowing trading, to keep compliance costs low, provide industry with certainty about future obligations, and ensure that we meet and maintain our environmental goals.

Congress established a wonderful model for such a system in 1990 when you passed the Clean Air Act and created the Acid Rain Program. This revolutionary program—the 1990 Acid Rain Program—focused on reducing the SO_2 emissions that cause acid rain by setting a nationwide cap on emission from electric generating facilities. It also created a tool to help achieve this reduction—an innovative, market-based allowance trading program. This cap-and-trade approach assured the American public that pollution reduction would be achieved and sustained.

At the same time, the program allowed industry unprecedented flexibility in choosing how to meet the emissions reduction goals by using methods that were best suited to their needs. Now in its sixth year, the Acid Rain Program has been a resounding success. SOx and NOx emissions have dropped dramatically and acid rain levels have fallen by up to 30 percent in certain areas of the country. These dramatic reductions cost nearly 75 percent less than initially predicted.

We can build on the success of this program to reduce NOx and SOx and mercury emissions from power plants. Addressing these emissions will provide the country with a variety of environmental and public health benefits. Reducing SOx and NOx in the atmosphere would help us avoid thousands of premature deaths each year, improve the visibility at some of our most treasured national parks and wilderness areas, avoid conditions that aggravate asthma and other respiratory conditions, and prevent damage to sensitive waterways and ecosystems.

I hope to be able to discuss with you soon the details of the legislative proposal to reduce power plant emissions of these three pollutants. I realize that some of you are disappointed that the President has decided not to include mandatory carbon dioxide reduction in his multi-pollutant approach. Chairman Jeffords, while I respect your decision to introduce legislation with different priorities, I want to explain to you why I believe it makes sense to move forward with a three-pollutant bill immediately.

The public health and environmental gains that this bill would bring are too great to delay. One of the things that has surprised me since I became Administrator of the Environmental Protection Agency is how close we are to consensus on appropriate and feasible reductions in SOx and NOx. Though mercury has proven more difficult, I believe we can come to agreement in a relatively short period on that emission. CO_2 stands in sharp contrast to these pollutants. Even if everyone decided today that power generators should reduce CO_2 emissions, it would take considerable time to agree on the appropriate levels, as well as on a number of other issues including the extent to which power generators could trade with other industries. It would be a shame to delay achieving important public health protection while we await consensus on CO_2 legislation.

The President's National Energy Plan includes a number of recommendations to conserve energy, increase energy efficiency and spur advances in technology. Whether fuel cells for automobiles or combined heat and power facilities, these advances will be critical to reducing the damaging effects of greenhouse gas emissions. A three-pollutant bill may not solve every environmental problem associated with power generation, but it can help us address very significant public health problems—serious problems that we need to face today.

We can make significant cuts in SOx, NOx, and mercury emissions with a program that is both effective and cost effective. The American public needs us to act now, and I look forward to working with you as you move forward in discussing this bill.

Thank you.

Senator JEFFORDS. Thank you very much. We appreciate your being here and as I said earlier, I am going to try to make sure you get your staff together very, very quickly.

I know you are in the middle of responding to the White House direction to develop a three-pollutant bill, which you have just been discussing. What levels of reduction should we be aiming for?

Administrator WHITMAN. I am not prepared to talk about specific levels of reduction. What our goal has to be is to ensure that we achieve at least as great, and hopefully—and we believe we can—much better reductions than we are getting today. The object has to be to improve our clean air.

Senator JEFFORDS. Would you elaborate on the kinds of benefits that could be achieved by significant reductions in the pollutants of NOx and SOx and mercury? What are you looking for?

Administrator WHITMAN. Well, certainly. SO_2, SOx, has environmental effects. It helps produce fine particulate matter, and Senator Clinton went into some detail about the impact that has on human health. It aggravates asthma, chronic bronchitis, acute respiratory problems, hospital admissions, asthma among children, acidification in lakes. It helps cause acid rain, which obviously affects our lakes and our streams; soil acidification and soil nutrient depletion. It damages trees.

NOx, again, has the same kind of human health implications—particulate matter, premature death, aggravated asthma and chronic bronchitis, acute respiratory problems. It also decreases visibility and is a major contributor to regional haze. It has an impact on coastal eutrophication over fertilization, which causes dead zones, as we have seen, and problems again in our coastal areas;

soil acidification and soil nutrient depletion. It damages trees and crops, global warming and stratospheric ozone depletion.

Mercury—the primary source of the problem is derived through eating fish that contain high levels of methyl-mercury. That is a neuro-toxicity producer that includes things such as mental retardation, cerebral palsy, difficulty speaking and hearing. Other impacts appear to include impaired reproductive systems—those are things that we are seeing some signs of; impaired immune system functioning and cardiovascular problems.

Senator JEFFORDS. When will you be able to tell us what levels will adequately protect human health in the environment?

Administrator WHITMAN. Well, we are working toward a bill, as you indicated, which would set some standards, and it is our hope to be able to do that early in the fall.

Senator JEFFORDS. What kind of benefits could we get if we simultaneously cut carbon dioxide? It seems that the efficiency improvements that help cut carbon would also cut these other pollutants.

Administrator WHITMAN. Well, really, I would approach it from the other way at this point, which says that the actions that we take to reduce SO_2 and SOx and NOx—SO_2 and NOx—actually help reduce carbon. We are doing a number of things now, as you may know, through voluntary programs that also achieve carbon reduction. The Energy Star Program, in and of itself, which is a voluntary program, last year alone reduced the equivalent in carbon emission of 10 million cars—as if we had removed 10 million cars from the road, which is a significant amount of that. It is also one of our best programs, and as I indicated before, is a totally voluntary one. Last year, and I can read you the actual statistics, Energy Star products and practices saved almost 10,000 megawatts of peak summer demand. The figures show that Energy Star commitments have prevented 864 billion pounds of carbon dioxide and will provide cumulative energy bill savings for consumers and businesses of $60 billion through 2010.

Senator JEFFORDS. Generally, doesn't it make more economic sense to invest in cutting all four pollutants at once, instead of cutting back at the sources——

Administrator WHITMAN. I do not believe, Senator, that even if you were to do all four pollutants that that would necessarily provide the kind of certainty that you are looking for the utilities, because there is still so much of an international discussion that is going on on carbon. What we are finding statistically as we are doing our studies would mean that there may well be the need for further refinement of that sometime in the future. An appropriate cap-and-trade system for SOx and NOx, and we are looking at what we can do with that with mercury, would allow flexibility for the utilities to make some determinations to buy some allowance against any kind of future carbon cap.

Senator JEFFORDS. Senator Smith, I would alert everyone that we are on a time basis, and I am trying to make sure that there should be available to you something which tells you how much time you have and have used.

Senator SMITH. Five minutes?

Senator JEFFORDS. Right. My 5 minutes are now up.

Senator SMITH. Thank you, Mr. Chairman.

Administrator Whitman, during the Acid Rain Program, isn't it true that the earliest reductions under that program came from the so-called dirtiest plants?

Administrator WHITMAN. Yes, that is true.

Senator SMITH. And isn't it also true that under that acid rain trade and exchange cap-and-trade and exchange, that the majority of the reductions actually came earlier than we had expected and greater than we expected?

Administrator WHITMAN. They did. Yes.

Senator SMITH. Let me ask you a question on the issue of regulatory relief. If we are going to go to a trade and exchange cap-and-trade and exchange of credits, and obviously I think that is where we are all headed, what would you suggest in terms of regulatory relief that should be put on the table in order to make some of those exchanges and credits work? On behalf of industry, what would you consider from the Administration's point of view putting on the table for regulatory relief?

Administrator WHITMAN. We believe that, depending on what levels are set—I mean, obviously, the target levels are going to be important in determining the extent of regulatory relief, but we believe that there is significant regulatory relief to be achieved for the utilities. We have the 126 reg, the NOx SIP Call, BART. There are New Source Review. There are a number of these very time consuming and costly regulations that would no longer be necessary if the appropriate target levels were set in the bill. Acid rain, NOx controls, as you know, the utilities are subject to a huge host of different regulations that are attacking each one of the issues separately. What we are talking about here are overarching standards that would mean that we no longer needed to have the individual regulations.

Senator SMITH. Also, I would point out in my conversations with some of the industry folks, there was certainly interest in voluntarily reducing carbon dramatically, and I believe, and I would ask you just to comment on this, I believe that in the trade and exchanges that we do, there could be credits given for carbon reduction using such things as sinks.

Administrator WHITMAN. Certainly sinks are certainly a way to address the issue of carbon and there has certainly been a lot of discussion about credits.

Senator SMITH. There also could be credits used in investment in renewables as credits, investment in perhaps other sources of power as credits as well—even solar, which could also be interesting in the sense that you would have perhaps the coal industry investing in solar power in terms of for credits on perhaps New Source Review.

Administrator WHITMAN. Well, the President in the energy proposal that he has put forward has called for a number of different incentives to help promote new technology and to help promote clean coal technology, as well as alternate fuels and conservation, and all of those goals. You know, when we talk about conservation, to the extent that we can reduce the demand for a kilowatt, that is a kilowatt we do not have to produce. That is obviously perforce going to be cleaner.

Senator SMITH. I am ready to roll up my sleeves and work with you. I look forward to doing that. Thank you very much.

I apologize for having to leave. I have another appointment.

Senator JEFFORDS. Senator Clinton?

Senator CLINTON. Thank you, Mr. Chairman.

I would endorse Senator Inhofe's request for a clean technology hearing, including clean coal technologies, because there is a lot of talk about it, but I think we need to have an in depth look at what does work, what the state of the technology is, and how we would proceed.

I was pleased to hear your endorsement of the Energy Star Program because I think that your statistics certainly tell the story that is one that needs to be widely known. But I am concerned that the budget for the Energy Star Program is flat, so that it does not appear as though the Administration is supporting a proven program that has encouraged people to take the steps necessary to reduce their own energy usage, and thereby reduce the emissions. I hope that we will be able to look for a revision of that in the weeks ahead as we move toward appropriating the funds necessary to support an effective program.

Administrator Whitman, Chairman Jeffords actually asked all my questions on pollution and emission, including the issue concerning the three-pollutant versus four-pollutant approach. I guess it was Senator Voinovich. I was giving you credit, Jim., for the clean technologies hearing, but I have just been told that it was Senator Voinovich. But it was a good idea, so we ought to followup on that.

[Laughter.]

Senator JEFFORDS. I approved of it.

Senator CLINTON. Good, excellent.

I hope that we will start the kind of conversations that will lead us to figure out what we can do to move forward on CO_2 controls, even if it is part of a four-pollutant strategy that does not have everything some of us would want with respect to carbon dioxide, because I think we need to establish the kind of certainty that the industry certainly has talked to me about.

Governor Whitman, I cannot let an opportunity go by with you here without asking about an important environmental issue in New York and New Jersey, namely the cleanup of PCB contamination in the Hudson River. Today, a New York Times editorial states that rumors have been flying all week that Mrs. Whitman would shortly announce her own dredging plan that would reduce the Clinton Administration's plan to a mere pilot project, followed by years of additional study and analysis. The reports, none confirmed by Mrs. Whitman herself, have emerged from various Members of Congress with whom she has been conferring, and from lower echelon sources at her agency.

Now, Governor, I know that the agency is still officially in a formal review process, but I would like to give you the opportunity now to confirm or clarify these rumors. First, is it true that you will be making, not necessarily announcing, but making a final decision by the end of this week?

Administrator WHITMAN. I certainly hope to get it done as quickly as possible. I would like to get it done by the end of this week if I can.

Senator CLINTON. Second, is there any factual basis to the concern that you are considering a pilot project, followed by years of additional study and analysis?

Administrator WHITMAN. Senator, as over the 10-year tortuous history of this case, there have been a lot of proposals put forward. Until the record is closed, it is my obligation to listen to all of them. I have made no decision. I have nothing in my hip pocket that I am preparing to spring on anyone at this time.

Senator CLINTON. I also understand that your decision, when it is made, will be followed by a 30-day period for the Governor of New York to review the decision. Is that how the process works? And what role will the Governor be able to play with respect to the final decision?

Administrator WHITMAN. Well actually what happens is that since the—the record of decision, if that is the way we go, comes from the region. That has to come back to headquarters. It has to be reviewed by the people in headquarters. Then it goes—and this is after I have made a decision of go or no-go with that—then it has to go to the State of New York and they have a month's period in which to make additional comments or suggest additional changes if they feel they are necessary.

Senator CLINTON. And so at that point, then, the State's response will be taken into account before you issue a final decision?

Administrator WHITMAN. Yes.

Senator CLINTON. Can you provide us with any additional information about the decisionmaking process or anything else regarding the timing? Are we just going to wait and see what happens in the next week or two?

Administrator WHITMAN. It is safe to say that I am giving it attention. That there are lots of very deeply held opinions on this issue, and I am going to do what I think is in the best interest of the environment and for the public in all the States impacted by it.

Senator CLINTON. And will you also consider carefully the previous position of Governor Whitman of New Jersey?

Administrator WHITMAN. Governor Whitman of New Jersey never endorsed the dredging plan. But Governor Whitman of New Jersey, as Administrator Whitman of the Environmental Protection Agency, is absolutely committed to cleaning up toxins where we find them.

Senator CLINTON. Thank you.

Senator JEFFORDS. Thank you, Senator.

Senator Inhofe?

Senator INHOFE. Thank you, Mr. Chairman.

Madam Administrator, I am not asking this critically, but I am just kind of curious. Senator Specter and I requested some information on New Source Review some time ago. We had a deadline of July 13. I know this came about the time that you are trying to get people confirmed, and you were kind of alone at that time, but can you give us a status on that, when we might get this report back?

Administrator WHITMAN. Senator, we are moving to provide you with all the answers to questions that you have asked. As you know, in the President's energy plan, he required of us a report by the middle of August on New Source Review. We are on-target to reach that, to be able to provide him with that review that he required of us on New Source Review. But we will continue to do everything we can to answer the questions that you have as we reach them.

Senator INHOFE. OK, I think that is important. When I chaired the Clean Air Committee, we had hearings on this—one was in the State of Ohio—and found some things that really need to be looked at. So we are anxious to get that report.

I would just like for a minute to address this NAS study that was out, where the report concludes that global warming may be happening, and then, I'm quoting, "emphasize that more systematic research is needed to reduce current uncertainties in climate change science." We recently had a hearing where we had a number of qualified witnesses, and I was shocked to find out how primitive even the best models which predict climate change are. It was Dr. Linzer, a renowned climatologist from MIT who stated in our hearing that the models we use have not been improved for 20 years and cannot be the basis for any conclusions. Then the recent NAS study agrees, and I will quote now, "a thorough understanding of the uncertainties is essential to the development of good policy decisions, and without understanding the sources and degree of uncertainty, decisionmakers could fail to define the best ways to deal with the serious issues of global warming."

This concerned me at that time. Is the Administration going to be looking at updating these models so that we can have something a little better to work with than we have had in the past?

Administrator WHITMAN. Yes, Senator. As you may know, when the President gave his June 11 speech on climate change, one of the things that he emphasized was the fact that he wanted to see additional dollars. Even though the United States far and away makes the largest commitment in research dollars of any nation on Earth, he intends and desires to increase that, as well as looking for our international partners, particularly the European Union, to step up their contribution to the scientific effort that is still needed to determine where the impacts are coming from, how much of this is naturally occurring, how much is manmade, and if so, what parts of man's activities are having the biggest impact, and therefore how can we best target our resources to address it if we are going to.

Senator INHOFE. When I heard his speech where he said essentially what you just said, I was hoping that he was specifically referring, among other things, to those models. Because we spent a whole hearing listening to how deficient they were and how outdated they are, and yet it seems as if there is nothing newer, and so we are basing our conclusions on models that are antiquated. So I am glad to hear that that was one of them.

Your chart—the second one you showed up there—I thought was very revealing. In my opening statement, I talked about the improvements that we have made over the years, but the public is not aware of that. I think the public is getting misinformation and is led to believe that things are really worse then they are. Your chart, which I looked through the material and I did not get a copy of—yes, it is that one right there—it showed that since 1970 that while the energy consumption went up 42 percent, emissions went down 31 percent. I think that is really astounding. I would hope that as you articulate this matter and the months go by, that you remind people that this is really a success story—that good things have happened. I know you have been trying to do that, but this is a good way of doing it and I applaud you for that and I hope you will continue to do that.

Administrator WHITMAN. Senator, if I might just update on your initial question, because I got a more definitive answer for you, that we hope to have your letter—it is in final review, and we hope to have the letter completed by Friday, tomorrow.

Senator INHOFE. That is great. All right.

Administrator WHITMAN. Just to give you a—it is at OMB.

Senator INHOFE. On this question, I think you have a good pulpit for this for the nation to say, you know, this is a success story. We are going to build on this success story. But let them know that it is not this dismal picture that we so often get.

Administrator WHITMAN. What is important to me and the lesson there is that it is not an either/or. You do not have to have either a healthy economy or a clean environment; that if we are smart, if we use modern technology wisely, if we approach things in a systematic way, we can in fact do both.

Senator INHOFE. I believe that is right. I think we can harmonize our efforts also with the energy problem. We cannot act like it is not there, and I hope that we will continue to do that, and the Administration will also.

Thank you very much.

Senator JEFFORDS. Senator Corzine?

Senator CORZINE. Thank you, Mr. Chairman.

I will identify with the remarks of my colleague from New York, that a lot of the questions I might have wanted to ask have been asked, but I might even repeat some of them. I want to particularly identify with the questioning with regard to the judgment about the GE issues that are so important to the citizens of New Jersey and New York, and all those that touch up against the Hudson River. I would throw back to one of the reasons that there was such strong support for your participation is a belief, as the Administrator, was the people's belief of your commitment to a clean environment, and to some extent interpretation of your leadership with regard to this issue, which is very vital to a lot of folks. So while maybe the junior Senator from New Jersey is not reading the history and your words correctly, we felt very strongly that you were on the side of making sure that this was addressed in a very environmentally friendly format. So I will anxiously await seeing the results of your decision. I hope that we do not have to go back and argue over what the words meant and said, because I admired your leadership with regard to these things in days past.

You can comment or not.

Administrator WHITMAN. You do not need to worry, Senator. Those words—I meant it. I am committed to cleaning up the environment.

Senator CORZINE. On another note, one of the reasons this carbon dioxide issue, in my view, should be addressed now really gets at some of the things that I hear others talk about with regard to bringing free market or market issues to bear on how we deal with the environment. I am going to quote, and I think I have been here and done this in the private sector, but I am going to quote James Rogers who as the chief executive officer and president of Cinergy recently testified before the committee and said, "My company seeks comprehensive multi-emission power plant legislation because we want long-term clarity and certainty built into our environmental compliance planning process. Without some sense of what our carbon dioxide commitment might be over the next 10, 15 or 20 years, how can I or my board or any other utility CEO think we have a complete picture of what major requirements our plants will face?" You cannot make these type of long-term decisions—25- or 30-year decisions—without having the kind of information. So if we do not put something definitive or relatively defined on the table, it becomes very difficult for the business community to make the kinds of decisions that we need to see environmentally take place. So I identify with Mr. Rogers' comments on this issue, and I think it is one of the strongest reasons why we need to address this now.

I would just add, I hear all this conversation about cap-and-trade work, which I think is a great idea. It certainly is with some of the ones where there is a greater degree of consensus. It is very hard to conceive of how one would put together a legitimate program about capping and trading with carbon dioxide if you did not have something definitive to work against. So I am troubled that we will not get those benefits that so many people want to talk about with regard to market-based initiatives if we do not do something that defines what cap-and-trade will be working against. So I am really interested in the GE issue, really interested in these other two market-based concepts.

Administrator WHITMAN. Well, Senator, if I might again on the carbon issue, because I understand exactly what you are saying and we have certainly heard a lot of it, but even if the bill were to address carbon, I am not sure it would give the utilities the certainty they are seeking, because the whole issue of climate change is still one that is very much under discussion. There is still a lot of uncertainty, and it would not necessarily. We are a long way from knowing how to solve the problem, so it would not necessarily give them the kind of certainty that there would not be future reductions required that we can actually move forward with on SOx, NOx, and mercury. It is going to be easier to set those standards with some level of certainty and with a consensus than it will be on carbon. So that even if we did do it, it would still be open.

Senator CORZINE. Excuse me, Madam Administrator. I am not hearing you say that the scientific evidence on global warming is not coming to a conclusion.

Administrator WHITMAN. There are conclusions being drawn, but I think that there still is a level of uncertainty as to what the carbon targets need to be and how to achieve them, and that there would not be further reductions required down the line. That is, of course, the bottom concern here, is what kind of credits you get up front if you move early, if you make a big investment and all of a sudden the rules change on you, what the impact is going to be. All I am saying is that there is more uncertainty with what are appropriate targets for carbon than there are for SOx, NOx and mercury.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. The Administration is working on a three-pollutant emissions bill?

Administrator WHITMAN. Yes, Senator.

Senator VOINOVICH. Do you know if that is going to be looking at the issue of New Source Review, which has got the utilities and many other people kind of in a state of limbo?

Administrator WHITMAN. Well, it is our feeling that right now that depending on where you set the targets, that New Source Review is certainly one of those regulatory aspects that would no longer be necessary—the regional haze, the BART, as I mentioned before, the MACT standards, the NOx SIP Call, the 126 Rule, acid rain—all of those could be eliminated and combined into one regulatory process under a new piece of legislation that would be vastly simplified. It depends where you go on those for utilities—we are talking for utilities now—as far as most of those are concerned. But where you go depends on what level is set in the final legislation, how far you can go to eliminating the additional regulations that we have in place now.

Senator VOINOVICH. I think that the point that Senator Corzine made is a good one. I think from a realistic point of view, I agree with you and I agree with the Administration, but the fact of the matter is that we need to deal with the carbon issue—substantively or politically—if we are going to get any kind of consensus and get something through here. I would suggest that somebody really start to brainstorm on some method that will kind of respond to what Senator Corzine was saying with his comments.

Administrator WHITMAN. I think it is important to know that when we look at the efforts that are underway or that are called for in the President's energy plan on energy conservation, we look at the efforts undertaken with Energy Star. I am happy to tell the Senator that we are going to in fact expand Energy Star—the number of buildings, the types of businesses to which it would be applied, and the number of appliances. We are going to be undertaking a consumer—a big effort starting in October to educate consumers on how to buy smart and what Energy Star means for them. Those things have had immeasurable impact on reducing carbon, on taking carbon out of the atmosphere. So they do work, and it is just important to recognize them as part of the equation.

Senator VOINOVICH. We hear a lot about asthma, and we look at the chart and we see that pollution is down, energy is up. I spent a lot of time on that issue when we were talking about the ambient air standards. If you have anything authoritative on the issue of asthma and its causes—certainly, ozone does not help the situation, but I think so often what we do is we concentrate on one area, and are there some other things that we ought to be dealing with, because that problem is getting worse in this country, and if you have any information on it, I would be grateful if you would share it with me.

The last issue is, we had a hearing at the Governmental Affairs Committee on Tuesday in regard to making science a cabinet position, and there is bipartisan support of a provision that would amend the bill that would create an assistant in the science area. Have you folks looked at that at all?

Administrator WHITMAN. Yes we have, Senator, and as I testified on Monday, my only concern is, and Senator Thompson captured it well when he said this often happens here. Windows of opportunity are short and important to capture when you have the opportunity, and that keeping it a clean bill—this is our opportunity to get something through. While I believe science has got to be at the basis of every decision we make, it underlies our credibility for any regulation, and as I have indicated to you, I have already taken some steps internally to ensure that we are applying science at the beginning of any rulemaking process, that it is integral to the rulemaking process. My concern is that if we were to add that, that that would cause someone else to want to add something else.

This has been the history since 1988, when a cabinet-level bill has been introduced, every time it has gone down. It has gone down under the weight of ideas, important issues that need to be discussed, but added on to that bill and it fell from its own weight. That is not to say, as I indicated, that we should not have that discussion and do it perhaps afterwards or take it up in another way. But my concern was simply that I think our window of opportunity is there for the elevation, but only if the bill is kept relatively clean.

Senator VOINOVICH. I would say to you that the credibility of the agency is in question in terms of the issue of good science, and there have been some reports that some of the people that were on advisory committees were not objective in their decisionmaking because of boards that they served on and so on. What happens is if you have an agency that does not have good science, then one group attacks it because it is not good science, the other groups attacks it. It seems to me that when you have that kind of expertise aboard that people respect and know if objective, that it gives the agency a lot more credibility. I will tell you, it would eliminate a lot of lawsuits that are based on the fact they made this decision and it was not on good science, but it was made because of a bias either one way or the other way.

Administrator WHITMAN. I agree, and the need to ensure that we are using the very best science, subject more of our decisionmaking to peer review, and we are taking a very serious look at the allegations that have been leveled about the composition of some of the boards, and we take that one very seriously.

I did want to respond to your concerns about asthma, to say that we would be happy to share with you any of the data we have, and in fact we have started now—we are undertaking for the first time for the agency a public awareness campaign to help people understand what they can do themselves to reduce the likelihood of severe asthma attacks, what you can do—indoor air, not subject children to second-hand smoke, look for those indicators—pets, dust, other things that exist within the home to try to control the home environment and indoor environments. We are trying to give people some tools on that. But we do have additional information I would be happy to share with you.

Senator JEFFORDS. Senator Chafee?

Senator CHAFEE. Thank you, Mr. Chairman.

Welcome, Governor. I know this is not a hearing on the Jeffords bill, but has the Administration or have you started to analyze that bill and taken a position?

Administrator WHITMAN. We have not taken a position. We are still in the process of working on the Administration's three emission proposal.

Senator CHAFEE. And obviously as we go forward, carbon dioxide is going to be the sticking point, and how are you going to approach reducing these emissions?

Administrator WHITMAN. Well, as I had mentioned before, the President has called for a significant investment in conservation technology which obviously impacts on carbon. We have seen significant measurable reductions through programs that we already have through the Energy Star program being the lead one on that, which is a voluntary program. As we look at the kind of clean technologies or the standards that we set for SOx and NOx, that will have an impact on carbon. Those things are interrelated. So there are a number of initiatives being undertaken right now as part of the energy plan to address emissions in general that will have an impact on that. But the President is not looking for, at this point in time, a mandatory cap on carbon.

Senator CHAFEE. Thank you.

Senator JEFFORDS. Thank you, Governor. You have been very forthright and we deeply appreciate your answers. We, of course, reserve the right to submit to you additional questions to respond in writing.

Administrator WHITMAN. Absolutely.

Senator JEFFORDS. But for now, thank you very much, and we look forward to working with you.

Administrator WHITMAN. Thank you.

Senator JEFFORDS. While the next panel is getting assembled, I want to just take a moment to make a couple of housekeeping announcements. Senator Smith and I are going to direct our staff to pull together a group of stakeholders that have an interest in passing comprehensive legislation to address power plant emissions. The first meeting is likely to be in September. Members of the committee and their staff are obviously welcome to have input on these meetings.

I am also hopeful that the committee will hold a legislative hearing on S. 556 not too long after the process concludes.

One more additional matter. I would like to remind the witnesses that their verbal statement should be limited to 5 minutes, and a little red light will come on when it is time to wrap up. No serious things will happen to you if you go a little bit beyond that, but I will just ask your help. Your written statements and any additional material will be included in the record, and members of the committee may be sending you all followup questions as well.

Let us now proceed to Mr. Johnstone. It is good to see a Vermonter at the table, and I deeply appreciate your being here, and please proceed.

STATEMENT OF SCOTT JOHNSTONE, ENVIRONMENTAL SECRETARY, STATE OF VERMONT AGENCY OF NATURAL RESOURCES

Mr. JOHNSTONE. Thank you, Senator Jeffords, and members of the committee.

It is my pleasure to appear before you today to offer testimony in support of comprehensive efforts to reduce power plant emissions, and in particular S. 556.

We in the Northeast live down wind from virtually the rest of the nation. In fact, a quick look at a map showing air flows will tell you that we are, in effect, the tailpipe of the nation. In addition to the harm caused by pollution emitted within our region, pollutants from many of our nation's most industrialized regions find their way to our corner of the country. Every year brings more and more evidence that air pollutants of all types harm the health of our children, our seniors, those who suffer from respiratory diseases and our natural environment.

Despite the Clean Air Act's original intent and subsequent amendments to the law, recent reports document many serious problems related to poor air quality, including ongoing acidification of lakes and ponds, increasing levels of carbon dioxide and other greenhouse gases in our atmosphere, and health advisories in many States recommending limited consumption of fish due to widespread mercury contamination. I believe the kind of comprehensive four-pollutant bill before your committee, focusing specifically on emissions from existing utilities, must be a critical component of any new clean air legislation.

While protecting public health and the environment must be our goal, I recognize that promoting cost-effective approaches that inspire innovation is critical to achieving this goal. The key to comprehensive and cost-effective public health and environmental protection is the establishment of firm tonnage emissions caps for all pollutants of concern.

The necessity for legislation such as S. 556 is apparent partly because of the unanticipated weakness in the existing Clean Air Act, and also because of new scientific evidence. In crafting the original Clean Air Act, Congress reasonably assumed that many of the largest, and arguably dirtiest, electric power plants—typically coal-fired—were nearing the end of their useful economic life, and therefore exempted them. Unfortunately, our nation's air quality continues to be adversely affected by these old power plants. There is no compelling reason to continue exempting high-emitting power plants from applying proven technology such as flue gas emission control devices.

While we have made considerable progress reducing sulfur dioxide and nitrogen oxide emissions since 1990, recent findings demonstrate that much work remains. Because of acid deposition, 346 Adirondack lakes—one quarter of all surveyed—no longer support fish. In Vermont, we have identified 35 lakes as sensitive or impaired by acidification. In addition, on Camel's Hump—Vermont's fourth tallest peak—the red spruce canopy has been extensively damaged and new growth red spruce is showing signs of acidic damage.

New air pollution concerns have also emerged in the past three decades. These are issues with perhaps even more significant adverse implications for the health and well being of our citizens and our environment. First, research clearly documents that the Earth's atmosphere has heated up during the past half century due to human-made air pollutants such as carbon dioxide, which is produced during the combustion of fossil fuels. The likely results of global climate change include widespread coastal flooding, immense changes in habitat for plants and animals, an increase in weather-related natural disasters, and in Vermont, possible crippling impacts on our ski areas and our maple sugar industry—potential devastating blows to our State's economy and to our State's culture.

Furthermore, we know that the Kyoto Protocol, while the starting point which this country should embrace, falls well short of reducing emissions to a level that even stabilizes, much less reverses, global climate change.

Second, mercury emitted in trace amounts by burning coal and other fossil fuels has found its way into fish throughout the Northeast. All six New England States, New York and New Jersey have issued fish consumption advisories. Fully 30 percent or more of the mercury deposited in the Northeast originates from sources outside of the region.

As a first step in addressing these many problems, I urge you to correct the faulty assumptions of 25 years ago and remove the exemptions that have allowed large plants to emit massive amounts of pollution into the atmosphere, and ultimately into the lungs of our citizens. Furthermore, power plants emit significant amounts of other toxic compounds in fine particulate matter. In order to avoid potentially conflicting requirements between existing and new power plant regulation, a truly comprehensive approach in new legislation should define requirements for utility power plants specific to all air pollutants emitted.

I encourage the committee members to craft a national policy that recognizes that for every measure of pollution reduction, there is a benefit to society. This notion is embodied in the Binational Toxics Strategy which our government has entered into with Canada. This agreement states that for some pollutants, the goal must be the virtual elimination of the contaminant. Power plant emissions contribute to many of the major environmental issues before us—mercury, fine particulate matter, global climate change and airborne toxins. To address these threats to our environment and health, we must have a sound goal and a sound policy direction. Virtual elimination is the right goal. It is a long-term goal, and new technologies and renewable sources of energy will provide the solutions for achieving this goal.

I urge you to adopt legislation that first imposes mandatory output-based emissions reductions for all currently grandfathered power plants as expeditiously as possible, and second, incorporates the concept of progressive reduction beyond currently identified achievable limits. We have learned from experience that thresholds for individual components of air pollution all too often need to be revised as we learn more about health effects of various pollutants, particularly toxics, which argues for the goal of virtual elimination.

While the Northeast States in our region have been successful in collaborating on partial solutions to many of these environmental challenges, State and regional approaches are no substitute for sound, comprehensive national policy, which is why I am here today speaking in favor of the legislation.

In closing, I want to thank you, Senator Jeffords and committee members, for this opportunity to testify. As you know far better than I do, Senator Jeffords, Vermont is a special place of outstanding natural beauty, and with a citizenry imbued with a strong environmental ethic. While nature dictates that winds blow from west to east across the North American continent, it is within the control of this Congress to decide if our corner of the country will remain the tailpipe of the nation.

Thank you.

Senator JEFFORDS. Thank you very much. In fact, I was going to have you repeat that, but I think I'll let it be.

[Laughter.]

Senator JEFFORDS. Dr. Thurston. I am going to go right down the line, and then we will have questions after everyone has had a chance to make their statement. As always, we reserve the right to pester you with questions in writing.

So Dr. Thurston, please proceed.

STATEMENT OF DR. GEORGE D. THURSTON, ASSOCIATE PROFESSOR OF ENVIRONMENTAL MEDICINE, NEW YORK UNIVERSITY SCHOOL OF MEDICINE

Dr. THURSTON. Thank you. Good morning, Senator Jeffords and members of the committee.

I am George Thurston. I am a tenured Associate Professor of Environmental Medicine at the NYU School of Medicine. My scientific research involves investigations of the human health effects of air pollution.

Despite progress over the last decade, Americans are still suffering from the adverse health effects of air pollution. The health consequences of breathing air pollution caused by emissions from utility power plants are severe and well documented. Over the past few decades, medical researchers examining air pollution and public health, including myself, have shown that air pollution is associated with a host of serious adverse human health effects, including asthma attacks, heart attacks, hospital admissions, adverse birth outcomes and premature death. Moreover, long-term exposure to air pollution has been estimated to take years from the life expectancy of Americans living in the most polluted cities relative to those living in cleaner cities.

One of the air pollutants most carefully studied in the 1990's is particulate matter or PM. Particulate matter is composed of two major components, primary particles including soot and ash emitted directly into the atmosphere by pollution sources; and secondary particles formed in the atmosphere from gaseous pollutants such as sulfur dioxide, SO_2, and nitrogen oxides. Fine particles such as those that result from power plant emissions can bypass the defensive mechanisms of the lung and become lodged deep in the lung where they can cause a variety of health problems.

Since the $PM_{2.5}$ standard was set in 1997, many dozens of newly published in 1997, many dozens of newly published studies have collectively confirmed the relationship between $PM_{2.5}$ fine particle pollution and severe adverse human health effects. In addition, this new research has eliminated many of the concerns that were raised in the past regarding the causality of the PM/health effects relationship, and has provided in addition plausible mechanisms for the severe health effects that have been associated with PM in past epidemiologic studies.

Sulphur dioxide emissions from coal plants contribute the most to secondary particle formation. Sulphur dioxide is chemically converted in the atmosphere after it is released from the smokestack to become a sulfate particle. Sulfates include sulfuric acid particles. In the East and Midwest U.S., sulfates make up the largest proportion of the particles in our air—in many regions, well over half of the fine particles. Moreover, power plants currently emit two-thirds of the sulfur dioxide in the U.S. Older, pre-1980 coal-fired power plants contribute about half of all electricity generation in the U.S., but produce nearly all of the sulfur dioxide and nitrogen oxide emissions from the national power industry.

Therefore, to reduce particulate matter in the eastern U.S., major reductions in pollution emissions from older fossil fuel power plants are needed. As documented in my written testimony, the risk of particulate matter from power plants in particular have become clear in the past decade's research. Power plant PM is composed of very small and especially damaging particles that bypass the natural defenses of the body, and therefore can penetrate deep in the lung where they are not easily cleared and reside for long periods of time.

Recent epidemiologic and toxicologic evidence indicates that the metals and acids contained in these particles make them especially toxic. This indicates an urgency to the need for reductions in the amounts of power plant pollution emitted into our air. Recent policy analyses have quantified some of the potential health benefits of cleaning up SO_2 and NO_2 and NOx emissions from presently uncontrolled grandfathered power plants. For example, Levy and Spengler in the April, 2001 issue of Risks and Perspective recently estimated that reducing SO_2 and NOx emissions at only nine of these plants would annually avoid some 300 deaths, 2,000 respiratory and cardiac hospital admissions, 10,000 asthma attacks and 400,000 person-days of respiratory symptoms. Using a similar approach, a study by Abt Associates last year found that if all the uncontrolled power plants across the United States applied SO_2 and NOx emission controls, some 18,000 premature deaths per year might be prevented.

Thus, the evidence is clear and it has been confirmed independently. Fine particle air pollution, especially those particles emitted by fossil fuel combustion, are adversely affecting the lives and health of Americans.

Finally, I would like to emphasize the importance of controlling carbon dioxide from such power plants, along with the precursor gases for PM and ozone. We now know that CO_2 concentrations in the atmosphere can adversely affect our climate, and utility power plants are a major source of that problem. If we are going to continue to use coal as a major source of electrical energy, while at the same time addressing our growing CO_2 emission problem, controls for CO_2 will also need to be developed and applied to coal-fire power plants. Considering the magnitude of the health and climate risks posed by power plant emissions, the Congress should take action now to provide relief to Americans from the burden of air pollution presently resulting from fossil fuel power plant emissions.

In summary, let me emphasize three points. Recent epidemiologic and toxicologic research has largely supported the toxicity of fine particles to human health and provided plausible biological mechanisms for the adverse health effects associations that we have found. Second, of the particles in the ambient atmosphere, evidence suggests that particles produced by fossil fuel combustion and by coal-fired power plants in particular are among the more toxic particles that we are exposed to in the ambient air. Last, controlling the grandfathered utility power plants is needed if we are to make significant further progress in meeting the new ozone and $PM_{2.5}$ air quality standards and in protecting the public's health.

Thank you.

Senator JEFFORDS. Thank you very much, Doctor.

Mr. Boyden, pleased to see you again. It is about 20 years ago, I guess, when we started having a working relationship, so it is a pleasure to have you here.

STATEMENT OF C. BOYDEN GRAY, PARTNER—WILMER, CUTLER AND PICKERING, ON BEHALF OF THE ELECTRIC RELIABILITY COORDINATING COUNCIL

Mr. GRAY. Thank you very much, Mr. Chairman.

I want to point out that I have a summer house near Acadia National Park. I have climbed Cadillac Mountain many, many times. It is one of the hot spots for ozone readings, so I am familiar with these issues from a personal point of view, as well as a professional.

I do not think I need to say much about the Clean Air Act record. Governor Whitman went over that. I think it is a very, very good record, given the economic growth that our country has experienced in the last two or three decades. The power plant record is especially good, and in terms of the Title IV acid rain reductions, dramatic—spectacular reductions which the New Republic recently referred to as "spectacular." If this is a loophole or a grandfather, then I say let's have another one to get another set of such spectacular reductions.

As I will say toward the end, the fact that the Clean Air Act Amendments of 1990 produced the 50 percent reduction in acid rain does not mean that that is the end of the issue, that you should not consider another 50 percent reduction, but as I will emphasize, please do it with market incentives, not with such things as the New Source Review.

There are really three outstanding problems—two that are public health, which this hearing has addressed, and one that is not. The public health problems are ozone and fine particulates. As for ozone, I believe that is primarily now a mobile source problem of cars, trucks. There was a problem with diesel during the test and leaving 12 million tons on the table in the 1990's. Power plants do contribute some, but after the NOx SIP Call, it really do think it is primarily a mobile source problem. Ozone is improving, but we still have a way to go. Here in Washington, The Washington Post just recently referred to SUVs and the mobile source problem. There was no reference to power plants, and I think that is an accurate portrayal.

On $PM_{2.5}$, most people do not know this I think, but these pollutants have been coming down even as there has been a struggle over the new NAAQS—down 17 percent in the 1990's. They will continue to come down because they are covered by the PM_{10} standard, the ozone standard, the Title IV acid rain reductions, the SIP Call and now the new visibility regulations. There are five programs that are going to keep driving fine particulates down regardless of what you do, although I am not saying you should not do more.

Then, of course, there is the NSR Program, which is highly controversial. One could spend an hour or two or three talking about it. It is, in a sense, a retroactive administrative repeal of Title IV because what EPA is asking is, if you look at the past settlements, a 95 percent scrub of 70 percent of the output, notwithstanding the fact that you repealed the 95 percent scrubber requirement in the 1990 amendments. We have heard discussion earlier here of possibilities for creative technologies to control all these pollutants in varying ways. An example I heard from one of the Senators talked about a 70 percent removal. Well, that is not 95 percent, so you could not use it. But it is a very rigid, permitting nightmare. It is illicit, in my opinion, and I hope that if the goal is to get a 50 percent cut, which is what a 95 percent scrub of 70 percent of the output would amount to, or a little bit more, if the goal is to get a 50 percent cut in these pollutants, then I would say do it with a cap-and-trade system. Extend the cap-and-trade system in. The current Title IV—extend it more clearly to NOx; have it include, as Governor Whitman suggested, the NOx SIP Call and the visibility regulations. Do it that way, rather than this piecemeal, piece by piece by piece command and control permitting nightmare that is good for lawyers like me, but not necessarily good for the economy.

I remember growing up in the South—God bless the man who sues my client—and NSR is a dream come true for lawyers, but it is a very, very debilitating thing for the businessman who actually has to comply with your regulations.

As for carbon, I just want to make one comment about that. People tend to forget that carbon is only one of four or five major manmade greenhouse gases. Ozone is one of them. Soot is another one. Methane, which contributes to ozone, is a third. Burning rain forests, of course, is a major fourth—a mixed bag of all kinds of problems, particulate matter and ozone and soot. We need to bear in mind that to take care of these other problems would buy us time on carbon, but at least they ought to be integrated in any kind of trading regime that you look at or that the world looks at. We are ahead, for example, of Europe in ozone. They do not want to try to comply with the existing World Health Organization standard, which is more relaxed than ours. I think we have to bear in mind that there are other issues other than just CO_2 when you are talking about greenhouse gases.

Thank you very much.

Senator JEFFORDS. Thank you, Mr. Gray.

Mr. Heydlauff?

STATEMENT OF DALE E. HEYDLAUFF, SENIOR VICE PRESIDENT-ENVIRONMENTAL AFFAIRS, AMERICAN ELECTRIC POWER COMPANY

Mr. HEYDLAUFF. Thank you very much, Mr. Chairman, members of the committee. It is a privilege to be here before you today.

I am the Senior Vice President for Environmental Affairs at American Electric Power Company headquartered in Columbus, Ohio. We are one of the largest generators of electric power in the nation. We are the largest consumer of coal in the western hemisphere. We are also the third largest consumer of natural gas in the United States. So we are a large energy producer, predominantly with fossil fuels. I am here today testifying on behalf of the Edison Electric Institute, which is the association for most of the industrial and electric utility community.

Let me just start by telling you that I have the unhappy task on occasion of having to address my senior management and talk to them about the issues that we are debating here today. They look at me somewhat puzzled, and believe me I am not a popular man when I do it many times, and I recount the testimony of those who have preceded me and those who will follow, I suspect. They shake their head and they say, "Well gosh, Dale, you know, perhaps we do not understand what the Clean Air Act really does."

It is partly my own fault because as I have explained it to them, the heart and soul of the Clean Air Act is a system of national ambient air quality standards which is explicitly designed to protect public health with an extra margin for safety. The country, by and large across the board, with some notable exceptions, has attained those standards, the presumption therefore being, what is the debate about?

We have done it, I might add, in part through substantial reductions in emissions from our own sector, as well as those from the rest of industrial America. As this chart depicts, the electric utility industry by this year will have reduced its sulfur dioxide emissions by 50 percent. By the time we have fully implemented the NOx SIP Call that has been previously reported on, we will have reduced our nitrogen oxide emissions by 50 percent. We virtually eliminated particulate matter emissions by installing in the 1970's electrostatic precipitators that remove 99.8 percent on average of all particulate matter.

This has come at a significant cost of $40 billion in capital costs, approximately $100 billion total in all end-costs. It has come at the same time, as Governor Whitman testified earlier, as we have seen a dramatic increase in electricity consumption. Just taking that electricity that comes from coal, we have generated 243 percent more electricity from coal in the last 30 years. At the same time, we are reducing these emissions. Coal consumption overall has gone up 270 percent.

Let me give you a case in point to underscore how these requirements have dramatically affected our industry. Senator Voinovich recently joined me on a tour of one of the largest generating plants in the country—the General James Gavin Plant, Cheshire, Ohio. He saw there a plant that when it was originally built cost us approximately $650 million—two 1,300 megawatt coal-fired boilers, the largest of their kind ever built at the time. You can set the Statue of Liberty inside the boiler. It is enormous.

We then showed him a advanced flue-gas to sulfurization system—essentially a chemical plant that removes sulfur dioxide. It cost us $650 million—roughly the same cost as the plant itself, to remove sulfur dioxide and essentially transform pollutant from one media to another. Then we showed him our latest retrofit at the plant, a $200 million selective keltic reduction system, which I unfortunately have to report we are having our growing pains in the operations of this technology, which is not uncommon when you retrofit an advance technology on a plant, the first of its kind, on a plant of this size with this type of coal.

My point being there have been dramatic reductions in power plant emissions. I am not here to tell you that we do not need to continue to reduce. Frankly, what I am here to suggest to you is we want to take your overture, Mr. Chairman—that expressed by Senator Voinovich and other Senators. Let us sit down. Let us work this out. Let us find a rationale and reasonable path to addressing the myriad environmental concerns that have been testified to, first by Governor Whitman and those by my fellow panelists. Let us do it in a way that does not substantially disrupt the fuel diversity upon which we generate electricity, which has provided tremendous benefits to this country. Competition among fuel supplies is enormously important, particularly in an increasingly global marketplace. Let us do it in a way that provides us with enough time so that we can do it in a rationale way, so we can both install conventional pollution controls and those innovative pollution reduction technologies such as the technology being pioneered by Powerspan in New Hampshire that Senator Smith talked about. But let us do it being mindful that the nation does have a diversity of energy supplies, and we go about addressing and providing energy in this nation in different ways in different regions. I know coal is not a big player in New England, Mr. Chairman, I understand that. It is a huge issue to Senator Voinovich. It is what powers the industrial heartland of America and it literally has since the day we first started generating electrons in this country.

So as we look at finding that right balance, and I understand it will not be easy. It will be difficult. We are going to have debates about the science and we should. We as an industry have spent tens of millions of dollars, literally, for the last decade studying these same issues. Probably not surprising to you, we reach different conclusion. But we do not differ with the understanding that additional emission reductions need to occur, and we look forward to working with you on the development of it and a greater emissions reduction strategy.

Thank you, Mr. Chairman.

Senator JEFFORDS. Mr. Schneider, please proceed.

STATEMENT OF CONRAD SCHNEIDER, ADVOCACY DIRECTOR, CLEAN AIR TASK FORCE

Mr. SCHNEIDER. Thank you, Mr. Chairman. Good morning.

My name is Conrad Schneider. I am the Advocacy Director for the Clean Air Task Force, a national environmental organization whose mission includes working to reduce power plant emissions.

I appreciate the opportunity to speak to you today. I am testifying on behalf of Clear the Air: The National Campaign Against Dirty Power, a joint effort of the Task Force, the National Environmental Trust and the U.S. Public Interest Research Group. It is a campaign that involves over 120 organizations in 40 States and represents hundreds of thousands of environmentally aware Americans.

Now, I look forward in future hearings we can address the issues that were raised by Senator Voinovich and some of the panelists about the future of coal, the feasibility of technology and so forth. But it is important not to jump over the problem statement as you consider the bills before you. My Governor likes to say, from the State of Maine, that we should not engage in ready, fire aim. So it is important that we know what we are shooting for when designing a bill to address the problems.

The adverse impacts from power plant pollution on public health and the environment are so numerous and so profound that it is scarcely time in 5 minutes to do more than list them. My first poster, which you have in the handout before you if you cannot see over here, graphically illustrates the variety of ways in which power plant pollution affects our lives and the natural world around us, including acid rain, reduced life expectancy from fine particle inhalation, asthma attacks triggered by ozone smog, shrouds of haze that blanket our national parks, mercury contamination in fish, and the contribution to the problem of global climate change.

If you leave here with only three points today, I want you to remember that one, power plant pollution is the single biggest contributor to each of these problems; two, that feasible solutions exist; and three, that nothing short of the levels of reduction prescribed in the Clean Power Act of 2001, that is S. 556, will be sufficient to protect public health and the environment.

Let us examine each in turn. First, acid rain. Data gathered and analyzed by the nation's top acid rain researchers over the last years demonstrates that the acid rain problem has not been solved, nor will it be solved by the current Acid Rain Program in the Clean Air Act. The map here from 1999 illustrates the continuing problem of high acidity of deposition in areas downwind of the nation's coal-fired power plant fleet. Over two-thirds of the sulfur dioxide that causes acid rain comes from these plants.

Now, Dr. Charles Driscoll from Syracuse University and Dr. Gene Likens of New Hampshire's Hubbard Brook Research Foundation, the discoverers of acid rain in this country, appear this week on CNN with Administrator Whitman to discuss their research. Their work, which you have summarized before you in the report Acid Rain Revisited demonstrates that nothing short of a 75 percent cut beyond that required in the Clean Air Act of 1990 will allow recovery of sensitive ecosystems in the Northeast to begin by mid-century. That is, the Adirondacks, the Green Mountains, the White Mountains—those that have been damaged by acid rain will not get the relief they need without the level of reductions called for in the Jeffords bill.

Now, turning to public health, fine particles from power plants are tied to a host of respiratory and cardiac problems, from triggering asthma attacks to reduced life expectancy. Legions of studies, literally, most of which have been published since the passage of 1990 Act, link particulate matter to these effects. Third-party reviewers from the Health Effects Institute have gone over that science with a fine-tooth comb and confirmed the results. Looking at the particulate matter filters on this poster, you will see an exposed filter from Portland, Maine which had been exposed only 24 hours at levels far below the current Federal health standard. Seeing it makes it more plausible the notion that breathing these particles 24 hours a day, day in and day out, could shave years off your life. As Dr. Thurston testified, studies indicate that power plants produce fine particles that are among the most toxic types of particles we breathe.

Now, Abt Associates, a consulting firm that EPA uses to quantify the benefits of its air regulations, using methodology approved by EPA Science Advisory Board last year, found that power plant pollution cut short the lives of 30,000 people each year and that more than 18,000 of these lives could be saved by passing the Clean Power Act—more lives than are saved each year by safety belts. Using EPA's methodology for assessing benefits, Abt Associates calculated the benefits of this at $111 billion per year. Now, this map which was prepared by Abt Associates illustrates that the greatest risk of death from power plant pollution falls in the Midwest and the Southeast, and that should not be surprising because that is where the greatest concentration of plants are located. We often hear about the Northeast being the primary recipient of this air pollution. Well, the pollution falls most heavily where the plants are. Of course, the greatest benefits would occur there, too, as the next map indicates.

Now, we know from scientific studies that the relationship between pollution and disease is linear. That means that for every ton we reduce, we can help save more lives. An analysis of several of the power plant bills that were introduced in the last Congress, and you have that before you in your packet, shows that the greater benefits are associated with the greater pollution reductions. Here are the differentials, and I think you can see more clearly in your packet, of what the lives saved would be for each of the different bills and the levels of cuts, particularly in sulfur. Greater reductions yield greater benefits, greater numbers of prevented deaths.

Now, as the earlier map showed, particle pollution is not evenly distributed across the country. In fact, it is most intense near the plants themselves. The Spengler and Levy analysis, which appears in Risk in Perspective—that is John Graham's newsletter from the Harvard Center for Risk Analysis—indicates that people living in the vicinity of power plants face the greatest risk from power plant pollution. This work supports the birthday provision in the Jeffords bill that requires cleanup on the plant's thirtieth birthday, because the national cap-and-trade system that allows certain plants to avoid cleanup through purchase of emission credits created elsewhere may not protect the people living in the shadow of the smokestacks.

Now, turning to ozone smog, we are in the middle of smog season right now. Earlier this week, ozone alerts were issued even in my home State of Maine. We were advised that our children should not go outside to play. Well, my kids are in summer camp this week, and I am frankly at a loss, even as a clean air expert, as to what to tell them to do. Power plant emissions contribute over one-quarter of the emissions that cause this problem in the East. If you pass this bill, ozone alerts could become as much of a curiosity to my kid's kids as civil defense alerts are to my kids.

Now, another mark of air pollution is the shroud of haze that blankets our national parks—areas that are supposed to offer us pristine views, pristine air quality and majestic vistas. But all too often, we arrive at these destinations to find the view that we came to see obscured in haze. A 75 percent cut in sulfur dioxide from power plants will be necessary to regain these vistas. I would like to just offer a brief demonstration. You really have to get to the last increment of pollution to see the benefit in these parks. This is a bottle of water and this is some food coloring. I am going to put one drop in, and you can see that the water which was previously clear is now green. Now, I can put more drops of food coloring into this and the water is a little darker green, but it is still green. If I wanted to clean up this problem, like I want to clean up the national parks, if I took a drop out, you would not see that much improvement. If I took three drops out, you would not see that much improvement. You have to get down to the last increment of pollution control in order to really see the difference when you are talking about cleaning up these parks. That is what the Jeffords bill requires.

Now, another problem associated we have heard about today is mercury from power plants. I will not go into the details of that because time is limited here, but coal-fired power plants are the largest unregulated emitters of mercury in the nation. They account for 33 percent of the emissions. I think the most important thing to understand is what the impact is on children who have been exposed in utero to mercury contamination because their mothers ate fish. These children are likely, according to the National Academy of Sciences, to struggle to keep up in school and might even require remedial classes or special education because of the subtle effects of mercury. A recent CDC report found that 10 percent of women of childbearing age were above EPA's safe level for mercury exposure. Nationally, this translates into six million women who are at risk and 400,000 newborns at risk from neurological effects of mercury.

Now last, let me just touch on the issue of climate change. The buildup of carbon dioxide and other heat-trapping gases in the atmosphere is primarily responsible for the unprecedented global warming seen over the last 50 years, according to the National Research Council. The White House, as part of its review on climate change policy, requested that NRC review and the NRC found the major threats are frequency of transmission of infectious diseases, an influence on air quality and water quality, sea level rise and increased storm activity, and changed drop distributions that would disproportionately affect small farmers.

Senator JEFFORDS. Bring your statement to a conclusion.

Mr. SCHNEIDER. I would be happy to close, Mr. Chairman. Thank you.

I would just point out that in this month's Science Magazine, the latest science on climate, suggests that there is a 50–50 chance that there will be a five degree increase in climate temperature by the end of the century, and a 90 percent chance between three and nine degrees. This is very significant and I would be happy to go into the details of that.

In conclusion, you should understand that power plant pollution is the dominant industrial contributor to each of the problems that I have discussed today. Traditionally, we have dealt with those problems one pollutant at a time. However, the natural world, including our lungs, experiences them simultaneously. They interact in the environment synergistically. For regulatory certainty, for the environment and for industry alike, it makes sense to deal with them comprehensively and as soon as possible. Nothing short of the comprehensive cuts required by the Clean Power Act will be sufficient to do that. We urge its speedy enactment.

I would be happy to answer your questions.

Senator JEFFORDS. Thank you.

Now, let me go back to the beginning of our line here and—Mr. Johnstone, if we do not move Federal legislation to cut power plant pollution soon, and electricity demand continues to grow, what will be the impact on Vermont and other States like Vermont that do not have major air quality problems now?

Mr. JOHNSTONE. Well, I think they will be numerous. First of all, while we are in attainment, we are always getting closer and closer as the impacts both of the way we live our lives in Vermont and the issues we have spoken about today continue to surround us. So it will mean that it will have much greater impact on our forests and our habitat, deeply impacting our natural resource base, which we are so proud of and so much is a part of our culture. We will have more Vermonters become ill from the effects of the pollutants increasing in our air, and them coming and going from our lungs.

It will put more pressure on us to try to accomplish the goals through only State actions and only regional actions. Now, we have had some success at doing that, both with our New England State partners and with the Eastern Canadian Provinces in terms of putting together regional pacts. We will continue to do that, but I think it is a poor substitute to address the issues as compared with really creating a national policy that guides us and gets us to work at implementing the programs through the State level, which is how we usually do this.

Senator JEFFORDS. Thank you for your support of the bill. We seem to be saying the same things about cutting mercury emissions. What other sources of mercury do we need to worry about and how can we control them?

Mr. JOHNSTONE. Well, I think we need to be looking at all sources of mercury that we as humans are enabling. In Vermont, we are looking at the use of mercury in classrooms and in labs, and we have done a successful school lab cleanup program. We have done thermometer exchanges where fully 40,000 households out of a total population of 600,000 came and exchanged their mercury thermometers. We are getting into our farms and pulling the mercury out of the farms and manometers that they use in our dairy farms.

So we are actively trying to withdraw mercury from every source where it is. This is a great example of a source that over the long-haul I think the goal needs to be virtual elimination from sources that we can deal with, not from the naturally occurring sources. But we need to be able to achieve that goal if we are really going to positively impact our environment and the health of our citizens.

Senator JEFFORDS. I gave a little preference to my Vermonter. I will ask a general question and ask each of you for your response.

What do you think will be the economic and environmental effects if we proceed with a three-pollutant bill and address carbon 5 years later?

Mr. Schneider—let us start at the other end.

Mr. SCHNEIDER. I think probably one of the most articulate statements on that point has been made by industry so far, which is that it is a simple notion that we should not throw good money after bad. Different economic decisions will be made if industry needs to comply with a three-pollutant versus a four-pollutant approach. From the environmental perspective, it only makes sense because as I have said, these pollutants interact with each other and you can have some unintended consequences if you tradeoff among them. But from an economic perspective, we are not going to solve the problem and we are going to compound the problem of uncertainty that industry is complaining about. So that would be my response.

Senator JEFFORDS. Mr. Heydlauff?

Mr. HEYDLAUFF. Mine, Mr. Chairman, would be it depends entirely on where you set the levels for the 3-P, certainly, to be able to give you some idea of the economic impacts of that. You know, carbon is a difficult topic. Yes, if I knew today what my mission reduction requirements were on a 4-P basis, it may very well change how I go about addressing my emission reduction obligations. But it depends entirely on what kind of compliance regime you put in place. I would point out to you, in the previous Administration the Council of Economic Advisers was asked by the President to do an assessment of the economic costs of complying with Kyoto, and they came up with an interesting conclusion, and that is that if we truly had complete flexibility in how we achieved our emission reduction obligations under the Treaty—this is the nation as a whole—87 percent of our emission reductions would be achieved through actions taken outside our borders. Now, I would submit to you there is enormous low-hanging fruit around the world. There are ways in which we can help developing countries electrify their economies either in places where they do not have access to electricity—and about a third of the people alive on the planet today, two billion people, do not have access to electricity—or we could transform their current electrical supply system from very inefficient dirty diesel generators to renewable energy systems, transfer that credit back. There has been a lot of discussion about sink enhancement projects. We are doing a lot of that ourselves as a company, and our industry as well.

There are lots of opportunities to reduce carbon dioxide, and I would submit to you in the near-term we would go an harvest those before we started to reduce emissions on-system in a significant way, in a significant way. Now, looking at pollution controls holistically, it may make economic sense just to make a decision to retire a plant and replace it with something that is less emitting for all the pollutants of concern here today. But it is not certain.

So it all will depend, quite honestly, on how you fashion that compliance program.

Senator JEFFORDS. Mr. Gray?

Mr. GRAY. I do not know that I can add much, except to say that the rational way to look at it is, what is the cost per ton? And the cost per ton of carbon removal in other countries and through other methods is so much lower than it is on a plant site today in the United States that it would not make any sense to do it. One way to handle this, of course, is to say that anything you do onsite here, in concert with any other pollution reduction measures you take, whether it is retiring a plant or putting new technology on an existing plant, is to assure in this legislation, if you pass it, what the baseline would be so that any reductions could be counted against any later obligations.

I would second the cost per ton here, it does not make sense to do it here. You would do it abroad. That would have the added advantage, of course, of transferring technology abroad, but that is still very much up in the air and that is one of the reasons why I think Governor Whitman is reluctant to endorse flat targets and flat requirements in current legislation.

Senator JEFFORDS. Dr. Thurston?

Dr. THURSTON. Well, in regard to the delay of 5 years for CO_2, I would just say that with global warming, what we are talking about here is a real buildup of momentum, and the sooner we start working on the problem, the easier it will be to deal with the problem. I think Mr. Gray and others have made the point that we have had a very successful run with air pollution, and that success is largely due to command and control technology. Deadlines were set. When we set a goal, we meet it. That has been the history of the Clean Air Act. When we have set specific goals and deadlines, I mean, yes, we have discussions. Like with SO_2, originally the people were saying, well, it is going to cost us $1,500 a ton to clean up SO_2. Then EPA said $500. Well, it turned out now it is less than $100 a ton that it is trading at for cleanup of SO_2.

So you know, I think the history has been that when specific goals were set, specific deadlines, that our businesses have been able to meet that, and that is really the success of the Clean Air Act.

Senator JEFFORDS. Mr. Johnstone?

Mr. JOHNSTONE. I would say that I think it is very important that all of the pollutants be included now, for many of the reasons that you have already heard. I think the real trick is, what are the targets in the short term, medium term, and what is long-term success? And I think that in those dialogues you can work toward finding the type of common ground that I have heard many people here talk about today. I think to proceed without one or the other just defers the question and certainly does not get to the issue of surety. Then it is all going to be a question of timing and how you blend and mix the issues.

So I would certainly argue that they all ought to be included, and what is as important as the short-term goals I think is finally defining what success is in the real long term. Beyond the first sets of caps that you might want to talk about and might want to target, what do we really think that leads us to? Because I think that gets us to the issues of really how far and how hard do we have to innovate and is the current fuel mix the exact right fuel mix for 50 and 70 years from now? Or should we spur our innovation not only toward cleaning up existing fuels, but driving much further into the future about what it takes to actually have a healthy environment and healthy people.

Senator JEFFORDS. Senator Voinovich, 10 minutes.

Senator VOINOVICH. First of all, I congratulate you on putting this panel together.

In my opening statement, I indicated that—and it is tough. I am the Senator from the culprit that is the bad guy. But I did mention that over the years, our utilities have spent more money to reduce their pollution than all of the utilities in your respective States. There has been a dramatic reduction in pollution. Obviously, it is still not good enough, and more needs to be done.

In my opening statement, I also said that I have been told by the experts that the control technologies to reach the reduction levels in the chairman's bill for mercury are not available, and I have also been told to reach the reduction levels for CO_2 without increasing emissions of the other pollutants means that you have to switch away from fossil fuels like coal.

I would like Mr. Heydlauff and Boyden Gray to comment on that. I want to say, Mr. Heydlauff, I was very impressed when I visited your facility—$650 million to build it; $650 million to put on the scrubber, which we encouraged you to do while I was Governor, and now another $200 million to do something about the NOx problem that you have. But I would like your comments about that. If there is time, is there any way that we can get everybody in the room and come up with something that works?

Mr. HEYDLAUFF. Let me answer your question about technology first. We have gotten pretty good at building scrubbers. To be honest with you, we do not like building them. They are an ugly process. In Southern Ohio, we are transforming a valley into what will probably someday be the new ski slope in Southern Ohio with scrubber sludge. So there really does need to be a better way, and I think that is the promise of clean coal technologies. With NOx controls, we are building SCRs. We are building them rapidly. We are making some mistakes, but we will work them out. It will be a proven technology. It will consistently deliver 90 percent removal. Scrubbers I think should get you 95 percent—wet scrubbers.

Mercury is the one that mystifies us. Quite honestly, it scares us the most. We do not know of a commercially available control technology for mercury. The industry is working hard on that. We do know that we capture mercury when we have a scrubber on a power plant. EPA believes, but we have seen no evidence to verify this, we hope that we will enhance mercury capture once we operate the selective keltic reduction for mercury control. We will know that soon. We are going to do a test this summer, Senator, at Gavin Plant to try to see whether or not mercury is enhanced. We had done a preliminary test and we saw some variability in mercury capture. It ranged from 40 to 60 percent. We will see if it is enhanced as a result of the operation of the SCR system.

Carbon dioxide is the interesting one. I already addressed it. Do we have technology today to remove carbon dioxide from coal-fired power plants? No. We are hopeful that someday in the future 20 years from now we can scrub out CO_2, and safely and permanently dispose it in geologic formations deep under the earth. But we do not have that today. Certainly, if you forced me on a unilateral basis to reduce carbon dioxide and you did not give me that flexibility I just talked about, there is no question it would lead to widespread forced premature retirement of existing coal-fired power plants and their replacement with new, efficient natural gas generation in the near term. That is what it would do, no question about it.

Mercury could quite honestly have the same effect if we do not come up with a cost-effective control technology to reach the emission reductions that the chairman's bill would require. We simply do not know how to do it.

Mr. GRAY. I am not an engineer, so I cannot—except to say that this is enormously complicated—speak to the CO_2 question. Without a global regime where you are trading between greenhouse gases and between all countries, and you are taking sinks into account, it is really to imagine what a utility should do. You have to remember that, I do not know what the fraction is, but the mobile source side of this is very, very important and it does not make any sense to regulate CO_2 just on power plants, and not do it vis-a-vis the mobile source sector. I would not make any sense, and how to trade between the two would be very, very important.

As I said earlier, the CO_2 costs are so much higher here than they would be in a developing country, that it just would not make any sense currently to do it here. You do it abroad.

Senator VOINOVICH. So what you are basically saying is that the technology for mercury is still questionable, and in terms of the CO_2, you have some real problems with that, and in all likelihood if that were mandatory, you would switch from coal to burning natural gas. Is that——

Mr. HEYDLAUFF. If you do not give me the flexibility. We are running, and this kind of goes to the chairman's earlier question, we have been running economic analyses of this, and just to put the cost in perspective of the mercury controls, because they actually exceed those of carbon dioxide significantly. A 90 percent mercury reduction requirement, according to recent economic analysis performed by the industry, which we would be happy to make available to the committee—may have already done so, I do not know—has found that the cost to the industry would be $226,000 per pound of mercury reduced. Staggering figures. Dr. Thurston's comments about CO_2 were not quite correct. It is $200 a ton what sulfur dioxide is trading for today. But you put that—that's per ton, you know. With mercury, you are looking at pounds.

Mercury is an interesting element. You could put all of the mercury we emit in the industry on this conference table. It certainly would collapse the table, but you are talking about trace amounts from any individual power plant. The science, despite what you heard here, is not as clear about the causal relationship between mercury emissions and methyl mercury concentrations in fish, which is the only pathway to human exposure. We do not have a population that eats a great deal of freshwater fish, so that population exposure is relatively limited.

I do not say this to argue that we should not control mercury. We are going to control mercury. I think there is no question about that. EPA is on a path to do that. We are going to work with them on it. But I think it goes to the broader issue of balance that Senator Voinovich talked about. There will be profound energy policy implications and enormous economic costs associated with mercury controls on the level that you have proposed, Senator, based on the best knowledge to date. That knowledge will improve, will get better. We will develop the technologies probably in the future, but they do not exist today.

Senator VOINOVICH. If you used natural gas, the mercury problem is eliminated?

Mr. HEYDLAUFF. Correct, but you still have a carbon dioxide emission issue. You would significantly reduce it in the near term. In the longer term, you are going to have to reduce carbon dioxide from natural gas plants as well.

Just to echo Boyden Gray's comment, though, when you are looking at carbon dioxide, please put it in its proper context. It is a common global problem and it is also a century-scale threat. We have the time to develop the replacement technologies that are going to be necessary to stabilize greenhouse gas concentrations around the world in the atmosphere. We do not need a rush program that significantly distorts energy markets.

Senator VOINOVICH. I would just make another comment or two, and one is that it was reported by the ISO in New England—the nonprofit operator of the power grid—and they found that the use of natural gas will increase from 16 percent in 1999 to a projected 45 percent in the year 2005. So there is going to be an enormous increase in natural gas. All of the new power plants in Ohio are all natural gas fired. The cost of that being passed on to people that live in your communities and in our community is going to be astronomic. It gets back to the issue of somehow we have got to figure out how we can continue to burn coal, and also nuclear energy. I would be interested in your comments about nuclear energy. How do you feel about nuclear energy? Any of the witnesses.

Mr. SCHNEIDER. We generally oppose nuclear energy, as you can imagine, Senator. Nuclear power plants do not have air emissions very often, but when they do, they are real doozies. There is always the question of the waste. But I would take issue with your assumption that reliance on gas—I do not think that that is necessarily the best source of all of our new power. Energy efficiency, other renewables and so forth can play a role to keep natural gas prices low. But you made the assertion that increased reliance on gas would mean astronomic increases. I would be interested in your basis for that. We would be happy to address that issue more thoroughly, but there we are right now dependent 52 percent on coal and it strikes us that that may be a little bit out of balance; that being able to bring it more into line would be a bit more prudent and not necessarily mean huge cost increases. There is a lot of gas out there on limits to be drilled and brought to market. Certainly the markets are aware right now of the number of gas plants that have been proposed—400,000 megawatts of new gas. We believe probably about half of that is real, based on analysis that NorthBridge Group has done for us. I think it calls into question the issue of whether we are in an energy crunch or whether we are going to be awash in new power over the next few years. Right now, gas forward prices, which is where you look to see whether gas prices are going to be a problem, are going down. By the middle of next summer, they are approaching $3 a gain.

So I am not sure that it is correct to assume that increased reliance on gas will necessarily——

Senator VOINOVICH. OK, I would just like to say that basically, coal is not something that you are excited about. Nuclear, you are not excited about it, and you are saying that gas prices, if we have more available, will be something that we can look at. But I just put this chart up again because there are a lot of people in this country that feel that the renewables, solar, air are going to be able to take care of the demand for energy in the future. The fact of the matter is that they are just contributing a very small amount today. Ultimately with technology 20 years from now, that is going to go up quite a bit, but for the near term, we need to look at what is available today.

I would just like to make one other point, Mr. Chairman, and it gets back to the ISO in your area. The ISO also said that the new gas-fired plant should develop the ability to burn oil as a backup; that the regional pipeline system must be expanded; and new compressors need to be added to existing pipelines to increase delivery capacity. The point they finished up with, Mr. Chairman, is one that I think this committee should be looking at in terms of national legislation, is the long and complicated Federal permitting process for building new interstate pipelines is a greater obstacle than the technical construction work. So that if you are talking about getting gas and these things happening, we need to be realistic today about the fact that if we are going to—whatever way we go, we going to have to do a much better job of getting this energy into the places where it is needed.

Senator JEFFORDS. Thank you, Senator. You have made an excellent contribution to our morning hearing and deeply appreciate the time you have spent with us.

We reserve the right to pester you with written questions. But I want to commend you for giving us a very realistic and very helpful look at the problems that we have and we face as we move forward on this legislation, and deeply appreciate your participation.

Senator JEFFORDS. Is there any further business?

[No response.]

Senator JEFFORDS. Hearing none, thank you profusely for your very helpful testimony, and we wish you well.

[Whereupon, at 12:17 p.m. the committee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF HON. SUSAN M. COLLINS, U.S. SENATOR FROM THE STATE OF MAINE

I would like to thank Senator Jeffords and Senator Smith for convening today's hearing on the Jeffords-Lieberman-Collins-Schumer Clean Power Act. Both Senator Jeffords and Senator Smith have shown great leadership in addressing our nation's air pollution problems. Senator Smith, when he was chairman of the committee, placed our nation's air pollution concerns at the top of the committee's agenda. Improving the quality of our nation's air remains at the top of the committee's agenda under Senator Jeffords. I am confident that, under the leadership of these two Senators, the committee will report legislation that will reduce emissions from the nation's dirtiest power plants and restore the quality of our nation's air.

I particularly want to thank Senator Jeffords, Senator Lieberman, and the other members of the committee who are cosponsors of the Clean Power Act. Senators Jeffords, Lieberman, Schumer and I began developing this legislation last fall. I note that both Senators Jeffords and Lieberman have a long history of working on behalf of clean air, and their leadership was extremely valuable in devising a bill that sets the framework for returning our nation to an era of blue skies and smog-free days.

I would also like to thank Conrad Schneider of Brunswick, Maine, for his input into the Clean Power Act. Conrad, who will be testifying before the committee later today, provided valuable assistance in targeting the loophole in the Clean Air Act that has allowed the dirtiest, most polluting power plants in the nation to escape significant pollution controls for more than 30 years.

Coal-fired power plants are the single largest source of air pollution, mercury contamination, and greenhouse gas emissions in the nation. They are truly horrific polluters. Just one coal fired power plant can emit 5 times more of the pollutants that cause smog and acid rain than all industrial sources in Maine combined.

As the easternmost state in the nation, Maine is downwind of almost all power plants in the United States. Many of the pollutants emitted by these power plants mercury, sulfur dioxide, nitrogen oxides, and carbon dioxide end up in or over Maine. Airborne mercury falls into our lakes and streams, contaminating freshwater fish and threatening our people's health. Carbon dioxide is causing climate change that threatens to alter Maine's delicate ecological balance. Sulfur dioxide and nitrogen oxides come to Maine in the form of acid rain and smog that damage the health of our people and of our environment.

Mr. Chairman, Maine is tired of serving as the last stop for the nation's dirtiest power plant emissions. As I said when we introduced the Clean Power Act, it is time to end the "dirty air express." All power plants should meet the same standards, and those standards must protect people's health and the health of the environment. I am pleased that today's hearing moves us one step closer to ending the free ride for the nation's dirtiest power plants.

This bill will also level the playing field between upwind and downwind states. Inexpensive electricity in other States has come at the expense of the health of people in Maine, Vermont, New Hampshire, and other downwind States. At the same time, power-intensive industries in our States have been forced into a competitive disadvantage with competitors in States with dirty power.

After causing some of the nation's worst pollution problems for decades on end, the time has come for power plants to stop using loopholes to evade emissions reductions. This bill demonstrates strong bipartisan support for clean air. I thank you, Mr. Chairman, for convening this hearing on our legislation, and I look forward to working with you to help ensure that this legislation becomes law.

STATEMENT OF HON. CHRISTINE TODD WHITMAN, ADMINISTRATOR, U.S. ENVIRONMENTAL PROTECTION AGENCY

Thank you, Mr. Chairman and Members of the committee, for the invitation to appear here today. The Administration and the Environmental Protection Agency (EPA) welcome the opportunity to address you on the need for a new approach to reducing emissions from power generation. The United States should take great pride in the progress we have made reducing pollution at the same time that we have had impressive economic growth. Over the last 30 years, we have reduced emissions of six key air pollutants by over 30 percent, at the same time that the gross domestic product has increased almost 150 percent, coal consumption has increased 77 percent and energy consumption has increased over 40 percent. This success story was made possible by American ingenuity spurred in large part by legislation that recognized the importance of a clean environment. We now have an opportunity to consolidate and replace several regulatory programs with an innovative, more cost-effective program that will achieve significant public health and environmental benefits. Our goal is to make significant strides toward attaining national air quality standards. Next generation thinking built on the successes of the past.

The Administration proposal to limit emissions from power generation will be the centerpiece of the President's promise to deal with emissions from old power plants. During the campaign, the President said:

> "As President, I will be firmly committed to providing a clean and healthy environment so that every American breathes clean air. That's why I believe old power plants should be held to higher emissions standards. The fact that different environmental standards apply to 'old' and 'new' power plants is a good example of how our environmental laws are too complex. The key to reducing emissions from older power plants on the Federal level is to cap emissions on a level that makes sense whether it be national, regional or local. Harness the power of the market place and provide economic incentives to produce better environmental results. I would want to make sure that any program we pursue does not result in excessive and unnecessary increases in electric bills."

In concert with this promise, the President's National Energy Plan recognizes that one of our principal energy challenges is increasing our energy supplies in ways that protect and improve the environment. This is a challenge we can meet through a careful blend of conservation, advances in technology, voluntary programs and improved regulatory programs. One of the keys to success will be new legislation significantly reducing emissions from power generators.

In the near future, I hope I will have the opportunity to discuss with you the details of such a legislative approach. Today, I will describe the approach we will propose—which builds on the Acid Rain Program a successful model for future efforts. I will also discuss the programs to which the utility industry is currently subject—many of which could be replaced with a bill that provided significant reductions of NOx, SO_2 and mercury. Finally, I will describe the types of public health and environmental benefits we can achieve from conserving energy and reducing NOx, SO_2 and mercury emissions.

I. The President's Approach Building on Success

The President's Energy Plan includes a number of conservation, advanced research and development, and other efforts that will reduce electricity usage. Reducing the amount of electricity we use and the amount of fuel needed to produce it are part of the answers to the challenge of providing energy in an environmentally responsible way.

The President's Energy Plan goes even further. The President has directed me to develop proposed legislation that would significantly reduce and cap NOx, SO_2 and mercury emissions from power generation. Such a program (with appropriate measures to address local concerns) would provide significant health benefits even as we increase electricity supplies. The proposed legislation will:

- establish reduction targets for emissions of SO_2, NOx and mercury,
- phase in reductions over a reasonable time period, similar to the successful Acid Rain Program established by the 1990 amendments to the Clean Air Act and to State programs,
- provide regulatory certainty to allow utilities to make modifications to their plants without fear of new litigation, and
- provide market-based incentives, such as emissions trading, to help achieve the required reductions.

Nationwide reductions of the three emissions, SO_2, NOx and mercury, in an integrated approach would result in key benefits including thousands of avoided premature deaths and aggravation of respiratory and cardiovascular illness due to fine particles, reduced hospitalization and emergency room visits due to fine particles and continued exposure to ground-level ozone. It would also address interstate transport issues as they relate to meeting the new particulate matter and ozone air quality standards. Visibility improvement would be anticipated over large areas including national parks and wilderness areas and recovery of many freshwater and coastal ecosystems would be likely. Public health risks associated with mercury, particularly those posed to children and women of child bearing age, may be reduced. This includes risks of neurotoxic effects such as mental retardation, cerebral palsy, difficulty speaking and hearing others, and other learning disabilities. Currently, current forty plus States have fish advisories; that number would be reduced.

The President's approach builds on the Acid Rain Program, which provides a wonderful model for future programs. It has not only met expectations, but exceeded them. Administering the Acid Rain Program has been a cost-effective experience. The program will achieve about 40 percent of the total emission reductions required under the 1990 Clean Air Act Amendments at a low cost to industry and to the government. The program is administered with a relatively small staff relying on strong and state-of-the-art data tracking and reporting capabilities.

When President George H.W. Bush signed the Clean Air Act Amendments of 1990, it revolutionized clean air policy regarding regional and national air pollution issues and drove environmental protection in new directions. First, the President and Congress designed the Acid Rain Program to focus on reducing the SO_2 emissions that cause acid deposition and translated the emission reduction goal into a nationwide cap on emissions from electric generating sources. Second, Congress provided EPA with a tool to achieve this reduction—an innovative market-based allowance trading program. This "cap-and-trade" approach provided greater certainty that the emissions reductions would be achieved and sustained while at the same time allowing industry unprecedented flexibility in how to achieve the needed emission reductions. In return for this flexibility, sources were to provide a full accounting of their emissions through continuous monitoring and reporting, and there would be consequences for failing to comply. The objective was for sources to find the most cost-effective means for limiting SO_2 emissions and to be responsible for achieving those emission reductions. There would be no government second guessing and lengthy permit reviews.

Compliance with the Acid Rain Program began in 1995 and is now in its seventh year. It has been a resounding success, with SO_2 emissions from power generation dropping 4.5 million tons from 1990 levels and NOx emissions down 1.5 million tons from 1990 levels (about 3 million tons lower than projected growth). In addition, during the first Phase of the program (1995–1999), SO_2 emissions were between 20 to 30 percent below their allowable levels. Furthermore, environmental monitoring networks tracked important environmental improvements—acid deposition was reduced by up to 30 percent in certain areas of the country.

And, these environmental improvements cost less than predicted because of the built-in market based incentives. In 1990, EPA projected the cost of full implementation of the SO_2ssions reduction with trading at $5.7 billion per year (1997 dollars). In 1994, GAO projected the cost at $2.3 billion per year (1997 dollars). Recent estimates of annualized cost of compliance are in the range of $1 to $1.5 billion per year at full implementation.

President Bush has not only promised to take the SO_2 trading program to the next level but he has experience to lend to the matter. In 1999, then-Governor Bush signed legislation that permanently caps NOx and SO_2 emissions from older power plants in Texas starting in 2003 and requires utilities to install a certain quantity of renewable and clean energy capacity by 2009. Environmental Defense hailed this legislation as a model for the country. The Emission Banking and Trading of Allowances Program is expected to achieve substantial reductions when it is fully phased in by 2003. It is estimated that this program will reduce NOx by 75,000 tons per year and SO_2 by 35,000 tons per year. It is designed to give the utilities flexibility in determining how and where to achieve the reductions. Allowances are allocated to each power plant based on 1997 emissions using a formula that does not penalize the "clean" plants that already have a low NOx or SO_2 emission rate. Permitted power generating plants may opt into the trading program.

II. Regulating Emissions from Power Generation

The President's legislative approach stands in sharp contrast to the complex web of existing regulations which currently confront the industry. Over the years, Congress, EPA and the States have responded to specific environmental and public health problems by developing separate regulatory programs for utilities to address the specific problems. Each individual program uses its own approach to serve its own purpose. As I describe the different regulatory programs, I think you will understand why we believe it is time to simplify. If we have a new legislation that significantly reduces emissions of SO_2, NOx and mercury, we can eliminate many of the individual programs that apply to the power generation sector and replace them with a system that will reduce the administrative burden on industry and governments, use market-based incentives to keep compliance costs low, and provide the industry with more certainty about its future regulatory obligations.

There are many regulatory initiatives in place that will lead to reductions in air emissions from electric power generation. These regulations include both Federal and State requirements that address a variety of emissions including SO_2, NOx, CO, PM_{10}, and a number of hazardous air pollutants. The requirements also vary depending on the characteristics of the generating facility, including its boiler type, size, age and location. These programs include the National Ambient Air Quality Standards for particulate matter and ozone, the section 126 and the NOx SIP Call rules, new source review and new source performance standards, the regional haze rule and mercury regulation as a hazardous air pollutant, among others.

EPA has set national ambient air quality standards (NAAQS) for six pollutants: ozone, carbon monoxide (CO); particulate matter (PM); SO_2; NO_2; and lead (Pb). The Clean Air Act calls upon States to adopt emissions control requirements in the form of State Implementation Plans ("SIPs") to bring nonattainment areas into compliance with the NAAQS. Historically, most States' strategies to attain the SO_2 and PM NAAQS included power plant controls.

EPA has taken two actions to address the contribution of interstate transport of NOx emissions to downwind ozone nonattainment problems, and both of these actions affect the power sector. In 1998, EPA finalized the NOx SIP call, which now requires 19 States and the District of Columbia (whose emissions significantly contribute to downwind ozone nonattainment problems) to revise their SIPs to control summertime NOx emissions. In response, all of these States are choosing control strategies that focus on reducing power plant emissions. In a separate action aimed at the same interstate NOx transport problem, in January 2000, EPA finalized a rule which was issued in response to petitions from several northeastern States under section 126 of the CAA. In this rule, EPA found that emissions from large electric generating units and large industrial boilers and turbines in 12 States and the District of Columbia are significantly contributing to downwind States' ozone nonattainment problems. The rule requires these sources to control their summertime NOx emissions under the Federal NOx Budget Trading Program beginning May 1, 2003.

The electric power generation sector is also regulated through a variety of traditional and innovative programs. Consistent with the Clean Air Act, many States have adopted NOx reasonably available control technology requirements for combustion facilities. In addition, several States have adopted market-based approaches. The South Coast Air Quality Management District in Southern California, for example, adopted a NOx and SO_2 emissions trading program (called RECLAIM). The Northeast and mid-Atlantic States that comprise the Ozone Transport Region have developed a region-wide NOx emissions trading program (the Ozone Transport Commission NOx Budget Program). The revised ozone NAAQS and new $PM_{2.5}$ NAAQS could lead to further regulation of power plant SO_2 emissions (a precursor to ambient $PM_{2.5}$) and NOx emissions (both for $PM_{2.5}$ and ozone attainment strategies).

The Act also requires State Implementation Plans to include a preconstruction permit program for new or modified major stationary sources, referred to as new source review ("NSR"). This program ensures that when large, new facilities are built—or major modifications to existing facilities are made that result in a net emissions increase—they include state-of-the-art air pollution control equipment. It also assures citizens who live near new major sources of air pollution that the facilities will be as clean as possible. The requirements are different for (1) the part of the program called the Prevention of Significant Deterioration program that applies to construction projects in areas where the air is already clean, and (2) the part of the program called the non-attainment NSR program that applies to construction projects in areas where the air is unhealthy to breathe. For attainment areas, to prevent significant deterioration of our nation's air quality, new major sources and major modifications to existing sources must apply the best available control technology (BACT) and ensure that the new pollution introduced into the environment does not adversely impact the air quality, such as in pristine areas like national parks. For nonattainment areas, in addition to applying control technology that represents the lowest achievable emission rates, new major sources and major modifications must offset their emissions increases. This can be done by getting reductions from other sources in the general area to compensate for the increases resulting from the new air pollution sources.

The Act also requires EPA to establish new source performance standards ("NSPS") that all new or modified sources must meet regardless of their location. The NSPS are technology-based numerical performance standards that apply to all sources in a particular source category, such as electric utility steam generating units or stationary gas turbines. These standards are intended to "level the playing field" so that all new facilities install a minimum amount of air pollution control equipment.

The recently finalized regional haze rule will also require power generators to reduce SO_2 and NOx emissions either through the implementation of best available retrofit technology (BART) or a trading program yet to be developed. States must show "reasonable progress" in their State Implementation Plans toward the congressionally mandated goal of returning to natural conditions in national parks and wilderness areas.

EPA is developing a rule to limit mercury emissions from utilities. The 1990 CAA Amendments required EPA to study and prepare a report to Congress on the hazards to human health that can reasonably be expected to occur as a result of emissions of hazardous air pollutants (air toxics or HAPs) from fossil fuel-fired electric power plants. Based on the Report to Congress and on other available information, EPA found in December 2000 that air toxics control is appropriate for coal-fired and oil-fired utility boilers. As a result of that regulatory determination, EPA is scheduled to propose “Maximum Achievable Control Technology” (MACT) standards for these source categories by 2003. Given the conclusions of the Report, the regulation is likely to focus on mercury emissions.

The utility industry is also required to reduce SO_2 emissions through the Acid Rain Trading Program described above. In addition, to address acid rain, the Clean Air Act requires utilities to reduce their emissions through emissions limits, which EPA established based on unit type.

III. Health and Environmental Benefits of the President’s Energy Plan

The President’s Energy Plan recognizes that by conserving energy and limiting NOx, SO_2 and mercury emissions, we can provide the country with significant public health and environmental benefits. The problems we would address include: fine particle pollution, visibility degradation, ozone pollution, mercury deposition, acid rain, nitrate deposition and climate change. In turn, this will avoid incidences of premature mortality, aggravation of respiratory and cardiopulmonary illnesses, and diminished lung function which results in lost work days, school absences and increased hospitalizations and emergency room visits, and will also avoid damage to ecosystems, fish and other wildlife. To understand the tremendous benefits of the President’s plan, we need to understand the public health and environmental issues.

Emissions from Power Generation

Power generators are a significant source of three key emissions: sulfur dioxide (SO_2), nitrogen oxide (NOx), and mercury (Hg). The Clean Air Act has been, and will continue to be, a successful tool in reducing these emissions. However, while we are observing significant environmental improvement, power generation still contributes 67 percent of SO_2, 25 percent of NOx, and 37 percent of man-made mercury. (Power generation has other emissions, such as carbon monoxide and coarse particles, but the level of these emissions poses smaller risks for public health and the environment.)

One of the reasons power generation accounts for such a large share of these key emissions is that significant emissions reductions have already been required from other sources. For example, a new car today is more than 90 percent cleaner than it was before Federal laws limiting emissions of CO, NOx and volatile organic compounds and they are subject to further reductions starting in 2004, as are heavy duty trucks in 2007. In contrast, some older power plants, built before certain Federal performance standards were put into place, are still operating without modern pollution control equipment for some emissions.

Air Quality Effects

Fine Particle Pollution

The President’s Energy Plan will reduce fine particle pollution. SO_2 and NOx emissions from power generation react in the atmosphere to form nitrates and sulfates, which are a substantial fraction of fine particle ($PM_{2.5}$) pollution. (Some $PM_{2.5}$ comes from direct emissions from a variety of sources.) A source emitting NOx and SO_2 can cause $PM_{2.5}$ many miles away. A substantial body of published scientific literature recognizes a correlation between elevated fine particulate matter and increased incidence of illness and premature mortality. The health impacts include aggravation of chronic bronchitis, hospitalizations due to cardio-respiratory symptoms, emergency room visits due to aggravated asthma symptoms, and acute respiratory symptoms. Based on these findings, EPA and others estimate that attaining the fine particle standards would avoid thousands, and up to tens of thousands, of premature deaths annually.

The significant expansion in scientific research in recent years has enhanced our understanding of the effects of particles on health. EPA is summarizing all new information in the ongoing review of the particulate matter standard in a “criteria document” that will undergo extensive peer and public review.

Visibility and Regional Haze Impacts

The President’s Energy Plan will improve visibility by reducing SO_2 and NOx emissions. Sulfates and nitrates that form in the atmosphere from SO_2 and NOx emissions are significant contributors to visibility impairment in many national parks and wilderness areas, as well as urban areas across the country. Sulfates are a key factor in all areas of the United States, particularly in the East, where high humidity increases the light extinction efficiency of sulfates. Sulfates are responsible for 60–80 percent of total light extinction in the East, based on data collected during the 1990's in eastern national parks such as Acadia, Everglades, Great Smoky Mountains, Shenandoah, and in Washington, DC.

In the West, sulfates account for approximately 25–50 percent of visibility impairment. Nitrates can play a larger role in visibility problems in some portions of the West than in the East. For example, nitrates account for 20–40 percent of visibility impairment in national parks and wilderness areas in Southern California. In many urban areas, NOx emissions from cars, trucks, and power plants contribute to winter time "brown cloud" situations.

Ozone

The President's Energy Plan will reduce ozone by reducing NOx, a key contributor to the formation of ground-level ozone. In the presence of sunlight, NOx and volatile organic compounds react photochemically to produce ozone. NOx can be transported long distances and contribute to ozone many hundreds of miles from its source. More than 97 million people live in areas that do not yet meet the health-based 1-hour ozone standard (based on 1997–1999 data). The number would be even higher for the new 8-hour ozone standard. Reducing ozone levels will result in fewer hospitalizations, emergency room and doctors visits for asthmatics, significantly fewer incidents of lung inflammation for at-risk populations, and significantly fewer incidents of moderate to severe respiratory symptoms in children.

Not only will reducing ozone provide public health benefits, but it will avoid damage to ecosystems and vegetation. Ozone causes decreased agricultural and commercial forest yields, increased mortality and reduced growth of tree seedlings, and increased plant susceptibility to disease, pests, and environmental stresses (e.g., harsh weather). Since NOx emissions result in formation of ground-level ozone, reducing NOx emissions will reduce ozone levels and thus reduce the deleterious effects of ozone on human health and ecosystems.

Deposition Effects

Mercury

The President's Energy Plan will benefit public health by reducing mercury air emissions. Mercury is highly toxic in small quantities and Americans with diets with high levels of mercury are at risk for adverse health effects. Mercury is a naturally occurring element, but human activity mobilizes mercury in the environment, making it more bioavailable. After mercury is emitted to the air, it can be transported through the atmosphere for days to years before being deposited into water bodies.

Once mercury is deposited in lakes, rivers, and oceans, it bioaccumulates in the food chain, resulting in high concentrations in predatory fish. In the United States, most human exposure to mercury is the result of consumption of fish contaminated with methylmercury. A recent report of the National Academy of Sciences (NAS) concluded that while most Americans face a very low risk from methylmercury, children of women who consume large amounts of fish during pregnancy face a much higher risk. Fetuses are particularly vulnerable to methylmercury because of their rapidly developing nervous systems. These effects include cognitive, sensory, and motor deficits. The NAS study estimates as many as 60,000 children annually may develop neurological problems because of low-level methylmercury exposure through their mother prior to birth. Forty-one States have advisories warning the public to restrict eating fish from local waters due to methylmercury. EPA estimates that 5.6 million acres of lakes, estuaries and wetlands and 43,500 miles of streams, rivers and coasts are impaired by mercury emissions.

Acid Rain

The President's Energy Plan will reduce acid rain by reducing SO_2 and NOx. Acidic deposition or "acid rain" occurs when SO_2 and NOx in the atmosphere react with water, oxygen, and oxidants to form acidic compounds. These compounds fall to the Earth in either dry form (gas and particles) or wet form (rain, snow, and fog). Some are carried by the wind, sometimes hundreds of miles, across State and national borders. In the United States, about 67 percent of annual SO_2 emissions and 25 percent of NOx emissions are produced by electric utility plants that burn fossil fuels.

Although we have made progress as a result of the 1990 Acid Rain Program, we have not fully addressed the problem. Indicators of recovery of lakes and streams do not show consistent change in response to reduced SO_2 emissions. In sensitive areas such as the Adirondacks, for example, the majority of lakes have remained fairly constant in terms of acidification levels, while the most sensitive lakes continue to acidify. Overall, acid deposition continues to impair the water quality of lakes and streams in the Northeast: 41 percent of lakes in the Adirondack region of New York and 15 percent of lakes in New England exhibit signs of chronic and/or episodic acidification. Although sulfur deposition has declined, nitrogen emissions have not changed substantially region-wide. Moreover, recent findings also suggest that nitrogen is quantitatively as important or, in some areas, possibly more important than sulfur as a cause of episodic acidification because of short-term acidic pulses occurring during the most biologically sensitive time of the year, when fish reproduce. Reductions of NOx, particularly during winter and spring, are critical for addressing these concerns.

Nitrogen Deposition

The President's Energy Plan will improve ecosystems and water bodies by reducing NOx emissions. Some air emissions of NOx from power generation result in deposition of nitrogen in soils and water. While nitrogen is an essential nutrient, its availability is naturally limited, making it an important factor in regulating the structure and functioning of both terrestrial and aquatic ecological systems. Human activity has greatly altered the terrestrial and atmospheric nitrogen cycle, doubling the annual amount of nitrogen available in forms that are useful to living organisms. Nitrogen saturation of watersheds contributes to environmental problems such as reduced drinking water quality, nitrate-induced toxic effects on freshwater organisms, increased soil acidification and aluminum mobility, increased emissions from soil of nitrogenous greenhouse trace gases, reduction of methane consumption in soil, and forest decline and reduced productivity.

Coastal water and marine environment are also impacted by atmospheric deposition of nitrogen. Depending upon the location, from 10 to more than 40 percent of new nitrogen inputs to coastal waters along the East Coast and Gulf Coast of the United States come from air pollution. One of the best documented and understood impacts of increased nitrogen is the eutrophication of estuaries and coastal waters. Eutrophication refers to the increase in the rate of supply of organic matter to an ecosystem and its many undesirable consequences. Symptoms of eutrophication are found in many of our nation's coastal ecosystems. They include algal blooms that are potentially hazardous to human health, low dissolved oxygen concentrations, declines in the health of fish and shellfish populations, loss of seagrass beds and coral reefs, and ecological changes in food webs.

Summary of Health and Environmental Effects

Adopting a unified approach to reduce SO_2, NOx and mercury is better than looking at each pollutant separately because of synergistic effects. Beyond their impacts as separate emissions, SO_2, NOx, and mercury together contribute to many air pollution-related problems affecting human health and the environment. In certain cases, synergies exist between emissions and among the various reduction approaches available, making it imperative that efforts to reduce risk address all three emissions accommodate these synergies. In the case of fine particles, atmospheric chemical relationships suggest that when only reducing sulfate for example, it is replaced in the atmosphere by nitrate. Thus, simultaneous NOx and SO_2 emission reductions are critical. In the case of acid rain, significant reductions in sulfur dioxide have not corresponded to ecological changes due to continuing high levels of nitrogen. Continuing levels of sulfur deposition, albeit smaller than before, also work to prevent recovery due to extremely large sulfur loadings over the years. Both emissions count in achieving the goal of recovery. Additionally, some synergies have been observed between methylmercury and lake acidity—the more acidic, the greater the mercury concentration.

As more environmental data become available and science improves, we are observing some environmental improvement accompanying the downward trend in emissions. However, there are persistent and growing concerns regarding recovery of ecosystems and the risks that air pollution pose to human health. For instance, nitrate levels in surface waters are not significantly improving, and at best are constant. Logically, if emissions continue at the same level, or increase, pollution problems will mirror that trend. Visibility impairment in national parks, wilderness areas and urban areas also continues to be a problem. Many people continue to be exposed to unacceptable levels of smog. Of particular significance—the American public has become acutely aware of the hazards to their health, including the risk of mortality, posed by inhalation of fine particles and exposure to mercury through fish consumption.

IV. Climate Change

The President's Energy Plan, and the climate change strategy that is under development, will provide benefits by addressing climate change. Energy-related activities are the primary source of U.S. man-made greenhouse gas emissions. Power generators, which emit CO_2, contribute abut 29 percent of the total emissions of all U.S. man-made greenhouse gases. Scientists continue to learn more about global climate change, its causes, potential impacts, and possible solution. We recently held Cabinet-level working group meetings to review the most recent, most accurate and most comprehensive science. During those meetings, we heard from scientists offering a wide spectrum of views. We have reviewed the facts and listened to many theories and suppositions. The working group asked the highly respected National Academy of Sciences to provide us the most up-to-date information about what is known and about what is not known on the science of climate change.

We know the surface temperature of the Earth is warming. It has risen by 0.6 degrees Celsius over the past 100 years. There was a warming trend from the 1890's to the 1940's, cooling from the 1940's to the 1970's, and then sharply rising temperatures from the 1970's to today. There is a natural greenhouse effect that contributes to warming. Greenhouse gases trap heat and thus warm the Earth because they prevent a significant portion of infrared radiation from escaping into space. Concentration of greenhouse gases, especially CO_2, have increased substantially since the beginning of the industrial revolution. The National Academy of Sciences indicates that the increase is due in large part to human activity. The Academy's report also tells us that there are many unanswered questions about climate change, which makes it difficult to determine what levels of greenhouse gas emissions need to be avoided.

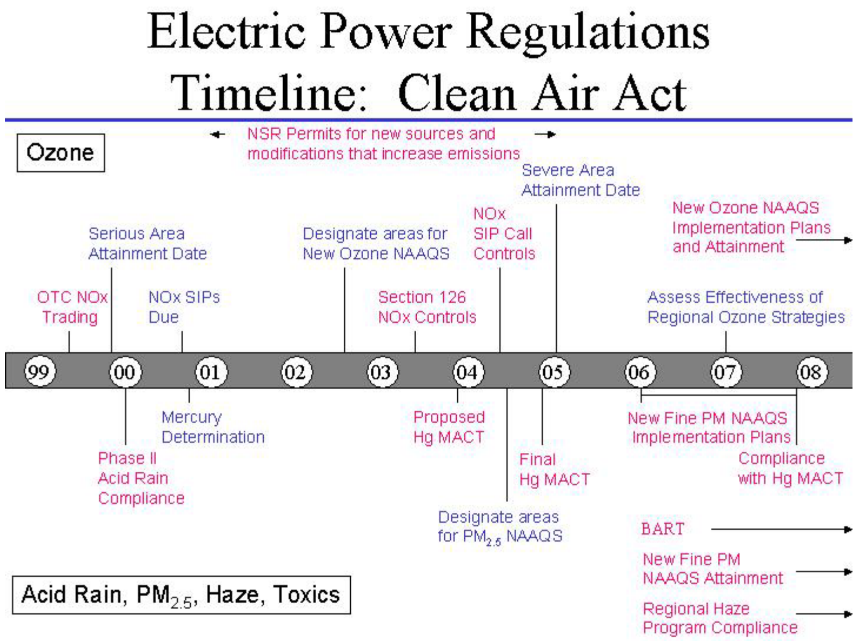
To address global climate change and greenhouse gas emissions, we are pursuing a broad array of conservation and energy efficiency goals under the Administration's National Energy Policy as well as the development of a comprehensive policy under the ongoing cabinet-level review for this issue. On June 11, President Bush announced the establishment of two major initiatives to address the major scientific and technological challenges presented by this serious, long-term issue: the U.S. Climate Research Initiative and the National Climate Change Technology Initiative. In addition, he committed the United States to increasing cooperative efforts in the Western Hemisphere, and with our allies globally, to aggressively pursue joint research and actions. These efforts have recently borne fruit, particularly recent agreements with Japan and Italy to collaborate on climate modeling efforts and with El Salvador in a "forest for debt" swap that will preserve tropical forests there that sequester carbon. The complex challenge of global climate change requires a global response that will draw on the power of global markets and the promise of technology to achieve emissions reductions most flexibly and cost-effectively in the coming century. The Administration intends to address this challenge in that context, and will leverage our national resources to enhance our scientific understanding of global climate change, and develop the advanced energy technologies that the world will need in coming decades to meet its energy and environmental needs.

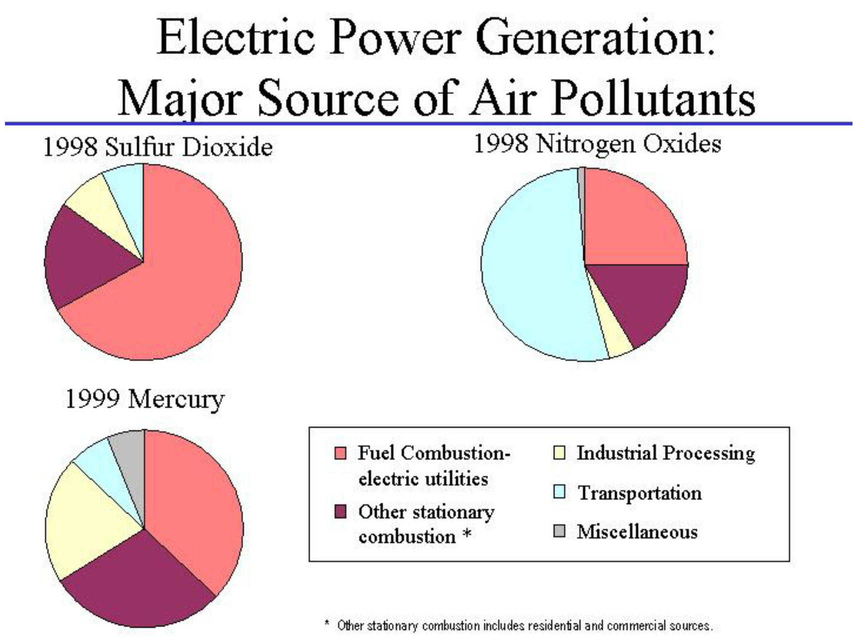
V. Conclusion

Our country has made great progress in reducing air pollution over the last several decades, but pollution from power generation needs to be further controlled. We can draw no other conclusion given the significant contribution that power generation makes to the emissions that cause such serious public health and environmental problems.

But our current regulatory programs are not the most efficient way to achieve the goal of ensuring a reliable energy supply in an environmentally responsible manner. Rather than take a pollutant-by-pollutant, problem-by-problem approach, we have the opportunity to examine the sector as a whole. Doing so provides us with the opportunity for cost-effective reductions and significant public health and environmental gains. That is why this Administration supports the development of new legislation that builds on the success of the market-based Acid Rain Program to reduce significantly the SO_2, NOx and mercury emissions from power generation. Mandatory controls are not the only way to solve public health and environmental problems. President Bush's National Energy Plan also includes measures to increase conservation of energy, increase energy efficiency, and encourage technological advances such as clean coal technology, fuel cells, and combined heat and power facilities—all of which will contribute to addressing the energy and environmental challenges of this industry.

I have already spent time with representatives of the power generation sector and have heard from a number of them who are interested in legislation that will provide the public health and environmental benefits we discussed today. I applaud their concern and their willingness to help craft a workable solution. I have also heard from environmentalists who are interested in these same issues. I know that many of you are interested in addressing these issues through legislation. I hope that our common interests will lead us to a consensus one that will provide the country with significant benefits. I look forward to working with you on these issues.





Pollutants and Concerns

- Sulfur Dioxide
  - Human Health
    - fine particles
  - Acidification
  - Regional Haze
- Nitrogen Oxides
  - Human Health
    - fine particles
    - ozone
  - Acidification
  - Eutrophication
  - Regional Haze
- Mercury
  - Human Health
    - bioaccumulative toxic

RESPONSES BY HON. CHRISTINE TODD WHITMAN TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. During testimony, you indicated that requiring simultaneous emissions reductions in sulfur dioxide (SOx), nitrogen oxides (NOx), and mercury (Hg) from power plants would produce reductions in carbon dioxide. Please explain how that would occur and any technology assumptions made in your response.

Response. EPA analysis estimates that there could be a decrease in the emission of uncapped pollutants and stack gases such as carbon dioxide (CO_2), depending upon the levels at which the caps are set under a multi-pollutant approach for sulfur dioxide (SO_2), NOx and mercury. This can be attributed to two factors. First, the program encourages more efficient generation by existing coal-fired boilers. Second, depending on the levels of the caps, a small percentage of sources may convert to different fuel sources in order to comply with the requirements to reduce emissions of the capped pollutants. Switching to cleaner burning fuels, such as natural gas, would reduce CO_2 emissions. However, some SOx and NOx controls, such as scrubbers and selective catalytic reduction, have energy, consumption penalties that would increase carbon emissions.

Question 2. Please provide the committee with the Agency's estimate of the carbon dioxide reductions that would result from the level of emissions reduction required for three-pollutants, SOx, NOx, Hg, in S. 556, the Clean Power Act. Also, please include an estimate of the carbon dioxide reductions that would occur as a result of the Agency's three-pollutant bill, when and if it is transmitted to the Congress.

Response. The estimated impact on CO_2 emissions of a three-pollutant bill depends on what emission limits are set for various pollutants. The Administration is currently determining the most appropriate methodologies for analyzing various multi-pollutant approaches. When the Administration announces its multi-pollutant bill to reduce emissions from power plants, EPA will provide estimates of the effect on CO_2 emissions of its bill and others.

Question 3. In response to a comment from Senator Corzine about utility industry expressions of a need for certainty on all four pollutants, you said ". . . that there is still a level of uncertainty as to what the carbon targets need to be and how to achieve them, and that there would not be further reductions required down the line." Were you implying that we may not need also to make further reductions in the future in sulfur dioxide, nitrogen oxides, or mercury emissions from power plants, beyond whatever agreement the 107th Congress and the Administration might reach on reductions of those three pollutants? If not, please explain.

Response. Although future Congresses can always enact new legislation, one of the goals for multi-pollutant power plant legislation is to provide regulatory certainty and predictability for covered emissions from covered sources for a set time period. My statement was not meant to imply anything about future regulation or reductions of SO_2, NOx or mercury after that time period.

Question 4. Can you please provide the committee with the approximate contribution of each major energy using sector—power generation, transportation, and industrial/commercial—to nonattainment of the ozone standard in each of the country's ozone nonattainment areas, in a graphic format?

Response. EPA staff are working with Senate staff to clarify details necessary to prepare the requested analysis. From what we understand, the information requested is not routinely prepared and a special analysis will be required to respond. If details of the analysis were resolved soon, we expect to deliver the requested materials in April 2002.

Question 5. Several EPA studies suggest that carbon emission reductions can be achieved at a net positive economic benefit. How does the Administration reconcile its current views on the costs and timing of carbon reduction with those studies? Specifically, please reference at least the study entitled, "Technology and Greenhouse Gas Emissions: An integrated Scenario Analysis Using the LBLN-NEMS Model," by Jonathan G. Koomey, R. Cooper Richey, Skip Laitner, Robert J. Markel, and Chris Marnay.

Response. The Administration bases its climate change policy on a thorough review of all available scientific evidence. The study referenced above is only one of many on the subject of the cost of reductions in carbon emissions from the U.S. economy. A broad range of estimates of impacts arise from the many modeling exercises that have examined greenhouse gas emissions reductions, which are heavily reliant upon input assumptions. For example, two studies from the Western Economics Association's International Conference in July 1999, which relied on price-driven policies, showed negative economic impacts. They Administration is concerned with the realities of turnover in energy sector capital stock (which is long-lived) and changes in domestic employment patterns to meet an immediate emissions reduction target. To the extent that immediate reductions are required without the time necessary for technology development and deployment in both demand- and supply side energy efficiency improvements, the costs of emission reductions are likely to be higher.

Question 6. In response to question from Senator Voinovich on whether the Administration's 3-pollutant proposal would look at the issue of relief from New Source Review, you suggested that a variety of Clean Air Act requirements might no longer be necessary and could be eliminated or combined into one regulatory process in that proposal. You listed New Source. Review, the regional haze rule, the BART guidance, the section 126 rule, the MACT standards, acid rain [Title IV], the NOx SIP Call, as regulatory aspects that could go or be combined. Given that those rules and programs were promulgated by the Agency or required by Congress to obtain significant public health and environmental benefits, it is logical that Congress would want to be assured that any substitute program would have equal or greater benefits. Please provide the committee with a consolidated estimate of the public health and environmental benefits, including the tons of pollution avoided, through full implementation of all of the programs that you listed and any others relevant that may affect power plants, such as the revised NAAQS for ozone and fine particulate matter.

Response. This will give the committee a baseline by which we can evaluate the Administration's 3-pollutant proposal and in preparing to move legislation.

The Administration believes that any multi-pollutant legislation must provide environmental and public health benefits at least equal to the current regulatory approach. To ensure this, the Administration is working on developing a baseline based on current and future emissions regulations. After it is complete, the Administration will provide it to the Congress.

Question 7. What would be the approximate percentage increase in power plant compliance costs if a three-pollutant bill were enacted with the levels and compliance deadlines for SOx, NOx, and mercury this year and a 30 percent reduction in carbon were required to be achieved 5 years later?

Response. Compliance costs for any regulatory program depend upon the levels of emissions reductions, the timing of those reductions and the scope of sources covered by the program. Without those specific numbers, we cannot determine costs or compare the costs of different scenarios. As part of the development of the Administration's multi-pollutant strategy, we are conducting modeling runs based on different emissions reduction scenarios. Once those modeling runs are complete, they will be provided to the Congress.

Question 8. Mr. Gray seemed to state that ozone is primarily a mobile source problem. Please comment.

Response. In deciding how to attain our health-based air quality goal for ozone, we need to consider what sources contribute to the problem and where reductions can be made cost-effectively. On both fronts, reductions from the power generation sector emerge as part o 'the solution. Power plants are a major contributor to NOx emissions, which react with volatile; organic compounds (VOCs) to form ozone. On average, power plants contribute 23 percent of man-made NOx emissions. The relative contributions, however, can vary widely from one region to the next.

To reduce ozone, Federal, State and local governments need to implement balanced programs that identify the most cost effective control measures for both stationary and mobile sources. EPA recently issued rules requiring significant reductions in mobile source NOx emissions. A new car today is more than 90 percent cleaner for NOx, carbon monoxide and VOCs than a new car in the 1960's. EPA's Tier 2 rule (limiting emissions from cars and certain trucks) and Heavy Duty Diesel rule will require additional reductions in NOx. After these new rules are in place, cars, trucks and buses will be as much as 95 percent cleaner than vehicles on the road today. NOx emission reductions from power plants are achievable at a cost per ton comparable to (or lower than) the cost per ton EPA estimated for these recent mobile source rules.

Finally, Mr. Gray's comments primarily addressed ozone—only one of the public health and environmental reasons for limiting emissions from power plants. Reducing power plant NOx emissions will reduce fine particle pollution. Also, mobile sources do not emit large amounts of SO_2 or mercury, which also contribute to public health and environmental problems.

Statement of Scott Johnstone, Secretary of the Vermont Agency of Natural Resources

Senator Jeffords and members of the committee, it is my pleasure to appear before you today to offer testimony in support of comprehensive efforts to reduce power plant emissions and in particular S. 556.

We in the Northeast live downwind from virtually the rest of the nation. In fact, a quick look at a map showing airflows will tell you that we are, in effect, the tailpipe of the nation. In addition to the harm caused by pollution emitted within our region, pollutants from many of our nation's most industrialized regions find their way to our corner of the country. Every year brings more and more evidence that air pollutants of all types harm the health of our children, our seniors, those who suffer from respiratory diseases, and our natural environment.

The 1977 Clean Air Act Amendments that you and your congressional colleagues crafted a quarter century ago was a landmark piece of environmental legislation. The amendments required installation of state-of-the-art pollution control equipment on all new sources and included provisions intended to reduce pollution concentrations in all areas of the nation to levels where adverse human health effects would be eliminated.

Despite the Clean Air Act's original intent and subsequent amendments to the law, recent reports document many serious problems related to poor air quality, including:

- Ongoing acidification of lakes and ponds;
- Increasing levels of carbon dioxide and other greenhouse gasses in our atmosphere; and
- Health advisories in many States recommending limited consumption of fish due to widespread mercury contamination.

I believe the kind of comprehensive four-pollutant bill before your committee, focusing specifically on emissions from existing electric utilities, must be a critical component of any new Clean Air legislation. While protecting public health and the environment must be our singular goal, we recognize that promoting cost-effective approaches that inspire innovation is critical to achieving this goal. The key to comprehensive and cost-effective public health and environmental protection is the establishment of firm tonnage emission caps for all pollutants of concern.

As we enter the 21st Century, the necessity for legislation such as S. 556 is apparent partly because of an unanticipated weakness in the existing Clean Air Act and also because of new scientific evidence. The admirable goals expressed in the original Clean Air Act were believed to be completely achievable within a timeframe of several years. Congress reasonably assumed that many of the largest and arguably dirtiest electric power plants, typically coal-fired, were nearing the end of their useful economic life, and therefore exempted them. Unfortunately, our nation's air quality continues to be adversely affected by these old power plants.

Electric utilities account for approximately one-third of all human-made emissions of mercury and particulate matter in our nation, one-third of all emissions of nitrogen oxides and carbon dioxide, and nearly three-quarters of all U.S. emissions of sulfur dioxide. These grandfathered power plants account for more than two-thirds of the carbon dioxide, three-quarters of the nitrogen oxides and mercury, and 80 percent of the sulfur dioxide emitted by all fossil fuel-burning utilities in the United States today.

There is no compelling reason to continue exempting high-emitting power plants from applying proven technology such as flue-gas emission control devices.

Although I am secretary of a natural resources agency, I want to note both human health problems and environmental damage caused by large power plants upwind from us. We know incidences of asthma in our nation have increased by more than 50 percent since 1980, and the Center for Disease Control now estimates that nearly 5 million American children suffer from asthma.

In terms of continuing environmental damage, while we have made considerable progress reducing sulfur dioxide and nitrogen oxide emissions since 1990, recent findings from the Hubbard Brook Research Forest demonstrate that much work remains. Fifteen percent of the lakes in New England and more than 40 percent of lakes in New York's Adirondacks are either chronically acidic or seasonally acidic. Because of acid deposition, 346 Adirondack lakes—one-quarter of all surveyed—no longer support fish. In Vermont, we have identified 35 lakes as sensitive or impaired by acidification.

In addition, on Camels Hump, Vermont's fourth tallest peak, where researchers have studied the impact of acid rain for decades, the red spruce canopy has been extensively damaged, and new growth red spruce is showing signs of acidic damage.

New air pollution concerns have also emerged in the past three decades, and they too are linked directly to electric power plants, particularly those grandfathered by the Clean air Act. These are issues with perhaps even more significant adverse implications for the health and well-being of our citizens and our environment. I'll mention two here.

First, research such as the analysis released this year by the Intergovernmental Panel on Climate Change clearly documents that the Earth's atmosphere has heated up during the past half century due to human-made air pollutants such as carbon dioxide, which is produced during the combustion of fossil fuels. The likely results of global climate change include widespread coastal flooding, immense changes in habitat for plants and animals, an increase in weather-related natural disasters, and, in Vermont, possible crippling impacts on our ski areas and maple sugar industry—potential devastating blows to our State's economy and culture. Furthermore, we know that the Kyoto Protocol, while a starting point which this country should embrace, falls well short of reducing emissions to a level that even stabilizes, much less reverses, global climate change.

Second, mercury emitted in trace amounts by burning coal and other fossil fuels has found its way into fish throughout the Northeast. Due to mercury's ability to accumulate through the food chain, all six New England States, New York, and New Jersey have issued fish consumption advisories of some kind. These advisories are designed to protect the general population and sensitive sub-populations, particularly pregnant women and children younger than six. Computer modeling conducted for the Northeast States and Eastern Canadian Provinces Mercury Study indicates that 30 percent or more of the mercury deposited in the Northeast originates from sources outside of the region.

As a first step in addressing these many problems, I urge you to correct the faulty assumptions of 25 years ago and remove the exemptions that have allowed large plants to emit massive amounts of pollutants into the atmosphere—and ultimately into the lungs of our citizens.

Furthermore, power plants emit significant amounts of other toxic compounds and fine particulate matter. In order to avoid potentially conflicting requirements between existing and new power plant regulation, a truly comprehensive approach in new legislation should define requirements for utility power plants specific to all air pollutants emitted.

I encourage committee members to craft a national policy that recognizes that for every measure of pollution reduction there is a benefit to society. This notion is embodied in the Bi-National Toxic Strategy, which our government has entered into with Canada. This agreement states that for some pollutants the goal must be Athe virtual elimination of the contaminant. Power plant emissions contribute to many of the major environmental issues before us: mercury, fine particulate matter, global climate change, and airborne toxins. To address these threats to our environment and health, we must have a sound goal and sound policy direction. Virtual elimination is the right goal—a long-term goal—and new technologies and renewable sources of energy will provide the solutions for achieving this goal.

I urge you to adopt legislation that, first, imposes mandatory output-based emission reductions for all currently grandfathered power plants as expeditiously as possible and, second, incorporates the concept of progressive reduction beyond currently identified achievable limits. We have learned from experience that thresholds for individual components of air pollution all too often need to be revised as we learn more about the health effects of various pollutants, particularly toxics, which argues for adopting a goal of virtual elimination.

Several States in the Northeast are working independently and collectively to adopt multi-pollutant regulatory controls on the power sector. These efforts build upon the progress we have made to cap nitrogen oxide emissions. The New England Governors and Eastern Canadian Premiers recently conducted a workshop to begin a collaborative approach toward addressing global climate change. This association has already outlined a framework for developing regional approaches to reduce mercury deposition and regional haze. Our region is also working together through NESCAUM to develop detailed policy recommendations and implementation strategies for multi-pollutant legislation, and I look forward to sharing these with the committee later this summer.

State and regional approaches, however, are no substitute for a sound, comprehensive national policy, which is why I'm here today speaking in favor of this legislation. The written testimony which I have submitted contains additional information relevant to S. 556.

In closing, I want to thank Senator Jeffords and committee members for this opportunity to testify. As you know far better than I do, Senator Jeffords, Vermont is a special place of outstanding natural beauty and with a citizenry imbued with a strong environmental ethic. While nature dictates that winds blow from west to east across the North American continent, it is within the control of Congress to decide if our corner of the country will remain the tailpipe of the nation.

[From New England Governors/Eastern Canadian Premiers Action Plan, 1998]

MERCURY

Mercury levels in freshwater fish have been monitored in the northeastern U.S. region since the 1970's. The results of these monitoring programs indicate that levels of mercury significantly exceed acceptable values in fish species from certain water bodies in the region. This information has led public health officials in the northeastern United States to issue advisories recommending that people limit their consumption of potentially contaminated fish.

Pregnant women, women of childbearing age, and children are at particular risk because the developing nervous system of fetuses and children are very sensitive to the toxic effects of mercury. Wildlife in the region may also be adversely affected, as high levels of mercury have been measured in fish-eating birds, such as loons and eagles.

There are many sources of mercury in the environment. Although natural sources of mercury exist, recent research suggests that background concentrations of this metal in the atmosphere and sediments have increased by a factor of two to five since pre-industrial times. This suggests that anthropogenic sources have significantly increased mercury levels in the environment.

Much of the mercury entering the waters of the region settles from the air or is deposited in rain or other precipitation. The mercury in the air originates from many sources both within and outside of the region. In the ambient air, mercury levels are not dangerous; it is the cumulative amount of mercury deposited to water bodies and its subsequent chemical transformation to methyl-mercury, that creates problems. Fish absorb and retain methyl-mercury, causing it to bioaccumulate until it is concentrated up to millions of times above the level in the surrounding water, particularly in older, predatory fish. Ingestion of contaminated fish is the primary pathway of human exposure to methyl-mercury.

Rates of mercury deposition are estimated to be higher in the northeastern United States relative to most other parts of the country. This situation is in part due to the existence of significant sources of mercury within the region. There is also strong evidence showing that, similar to other pollutants, airborne mercury emitted by upwind sources is transported by prevailing winds into the region.

Two other factors also thought to exacerbate the mercury problem in the region include (1) the acidified condition of many waters of the region, brought on by excess acid deposition, is associated with higher levels of methyl-mercury in fish in impacted lakes; and (2) elevated summertime levels of tropospheric ozone exacerbate the conversion of elemental mercury in the atmosphere to chemical forms that are more susceptible to deposition.

Analyses suggest that a wide array of sources of mercury emissions contribute to overall deposition in the region. Municipal waste combustors are currently the largest emission source sector in the northeastern States; utility and industrial boilers are the largest source sector in the remainder of the United States, primarily from the combustion of coal; and non-ferrous metal production, (i.e., nickel, aluminum), is the major source of airborne mercury emissions in eastern Canada. Computer modeling conducted for the Northeast States and Eastern Canadian Provinces Mercury Study (NESCAUM/NEWMOA/NEIWPCC/EMAN 1998) indicates that 30 percent or more of the mercury deposited in the Northeast originates from sources outside of the region. Because of the transboundary nature of mercury pollution, no single State or province will be able to solve its mercury problem alone. Concerted and coordinated regional efforts are needed. Ultimately, national and international efforts will be required to address transboundary mercury emissions, particularly from the utility sector.

CO_2/GLOBAL WARMING

From the most recent Report of Working Group I of the Intergovernmental Panel on Climate Change (IPCC) which is the Third Assessment Report, 2001:

“Globally, it is very likely that the 1990’s was the warmest decade and 1998 the warmest year in the instrumental record, since 1861.”

“[T]he increase in temperature in the 20th Century is likely to have been the largest of any century during the past 1,000 years. It is also likely that, in the Northern Hemisphere, the 1990’s was the warmest decade and 1998 the warmest year.”

“On average, between 1950 and 1993, night-time daily minimum air temperatures over land increased by about 0.2 degrees Celsius per decade. This is about twice the rate of increase in daytime daily maximum air temperatures (0.1 degrees C per decade). This has lengthened the freeze-free season in many mid-and high-latitude regions.”

“It is very likely that precipitation has increased by 0.5 to 1.0 percent per decade in the 20th Century over most mid-and high latitudes of the Northern Hemisphere continents.”

“In the mid-and high latitudes of the Northern Hemisphere over the latter half of the 20th Century, it is likely that there has been a 2 to 4 percent increase in the frequency of heavy precipitation events.”

“It is likely that there has been a 2 percent increase in cloud cover over mid-to high latitude land areas during the 20th Century.”

“Since 1950, it is very likely that there has been a reduction in the frequency of extreme low temperatures, with a smaller increase in the frequency of extreme high temperatures.”

From EPA 236-F–98–007aa, *Climate Change and Vermont, 1998:* “Over the last century, the average temperature in Burlington, Vermont, has increased 0.4 degrees Fahrenheit and precipitation has increased by up to 5 percent in many parts of the State.”

“[B]ased on projections made by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre climate model (HadCM2), a model that accounts for both greenhouse gases and aerosols, by 2100 temperatures in Vermont could increase by 4 degrees Fahrenheit (with a range of 2 to 9 degrees Fahrenheit) in spring and 5 degrees Fahrenheit (with a range of 2 to 10 degrees Fahrenheit) in the other seasons. Precipitation is projected to show little change in spring, to increase by about 10 percent in summer and fall (with a range of 5 to 20 percent), and by 30 percent (with a range of 10 to 50 percent) in winter.”

“The amount of precipitation on extreme wet or snowy days in winter is likely to increase. The frequency of extreme hot days in summer would increase because of the general warming trend. Although it is not clear how the severity of storms might be affected, an increase in the frequency and intensity of winter storms is possible.”

Based on these modeled projections, EPA estimates the following possible effects:

Although Vermont is in compliance with current air quality standards, increased temperatures could make remaining in compliance more difficult (re: ozone).

Warmer temperatures could increase the incidence of Lyme disease and other tick-borne diseases in Vermont, because populations of ticks, and their rodent hosts, could increase under warmer temperatures and increased vegetation.

A warmer climate would lead to an earlier snowmelt, resulting in higher streamflows in winter and spring and lower streamflows in summer and fall. Warmer summer temperatures and longer summers could exacerbate water quality problems such as excessive growth of aquatic weeds in Lake Champlain and other lakes. Warmer water temperatures also reduce dissolved oxygen levels, adversely affecting fish habitat, and lower summer streamflows could reduce the ability of rivers to assimilate waste. Changes in timing and accumulation of snow could affect skiing in positive and negative ways, such as the timing and length of season and snow depth.

In Vermont, very few of the farmed acres are irrigated. The major crops in the State are silage and hay. Yields of these crops and pasture could fall by as much as 39 percent under severe conditions as temperatures rise beyond the tolerance levels of the crop and are combined with increased stress from decreased soil moisture.

Trees and forests are adapted to specific climate conditions, and as climate warms, forests will change. These changes could include changes in species composition, geographic range, and health and productivity. Although the extent of forested areas in Vermont could change little because of climate change, a warmer climate could change the character of those forests. Maple-dominated hardwood forests could give way to forests with more oaks and conifers, species more tolerant of higher temperatures.

Across the State, as much as 30 to 60 percent of the hardwood forests could be replaced by warmer-climate forests with a mix of pines and hardwoods. The extent and density of the spruce and fir forests at higher altitudes and in the North, which support a large variety of songbirds, also could be reduced. The change in temperature also could cause maple sap to run earlier and more quickly, thus shortening the length of the season for gathering sap.

From "Climate Change, New Directions for the Northeast, a report produced at a workshop sponsored by the Governors of the New England States and the Premiers of the Eastern Canadian Provinces:

Global climate change modeling projects a shifting of climate zones northward in the Northern Hemisphere. The temperature projections for the 21st century include greater warming in nighttime temperatures and in seasonal minimum temperatures. These variations could be moderated in coastal areas of the Northeast Region, by the influence of the ocean. A key issue for the Northeast Region could be changes in the timing of seasonal changes, such as earlier onset of spring snowmelt or later frosts.

Animals need to adapt to the effects of climate change even if the forest remains intact. Changes in winter precipitation can have significant consequences for population balances of species like deer and their predators. If forest habitat for wildlife is lost, regional biodiversity will likely be reduced as well.

The National Assessment Synthesis Report states for the Northeast that climate change is likely to decrease the number of some types of weather extremes, while increasing others. Over the coming century, winter snowfall and periods of extreme cold are projected to decrease. In contrast, heavy precipitation events have been increasing and warming would continue this trend. Heat waves and associated drought conditions may be both very much more frequent and more intense in the summer months.

STATEMENT OF DR. GEORGE D. THURSTON, SC.D., PROFESSOR OF ENVIRONMENTAL SCIENCE, NEW YORK UNIVERSITY SCHOOL OF MEDICINE

I am George D. Thurston, a tenured Associate Professor of Environmental Medicine at the New York University (NYU) School of Medicine. My scientific research involves investigations of the human health effects of air pollution.

I am also the Director of the National Institute, of Environmental Health Sciences' (NIEHS) Community Outreach and Education Program at NYU. A goal of this program is to provide an impartial scientific resource on environmental health. issues to decisionmakers, and that is my purpose in testifying to you here today.

Despite progress over the last decade, Americans are still suffering from the adverse health effects of air pollution. Now, with calls for more electrical energy from fossil-fuel combustion sources, such as coal-fired power plants, we may face a greater health burden on our children, older adults, and even healthy Americans.

The adverse health consequences of breathing air pollution caused by emissions from utility power plants are severe and well documented in the published medical and scientific literature. Over the past few decades, medical researchers examining air pollution and public health, including myself, have shown that air pollution is associated with a host of serious adverse human health effects, including: asthma attacks, heart attacks, hospital admissions, adverse birth outcomes, and premature death. Ozone (03) and Particulate Matter (PM) are among the key air pollutants resulting from power plant emissions that have been found to adversely affect human health.

One of the air pollutants most carefully studied in the 1990's is particulate matter. Fine particles, such as those that result from power plants emissions, can bypass the defensive mechanisms of the lung, and become lodged deep in the lung where they can cause a variety of health problems. Indeed, the latest evidence indicates that short-term exposures cannot only cause respiratory damage, but also cardiac effects, including heart attacks. Moreover, long-term exposure to fine particles increases the risk of death, and has been estimated to take years from the life expectancy of people living in the most polluted cities, relative to those living in cleaner cities (Brunekreef, 1997).

Ozone is another pollutant that can result from power plant emissions that adversely affects human health. Ozone is a highly irritating gas that is formed in our atmosphere in the presence of sunlight from other "precursor" air pollutants, including the nitrogen oxides that are emitted by fossil fuel combustion pollution sources such as power plants.

The state of the science on particulate matter and health was thoroughly reviewed in the recently released Draft 2001 U.S. EPA Criteria Document for Particulate Matter—of which I am a contributing author. Since the $PM_{2.5}$ standard was set, the many dozens of new published studies, taken together, collectively confirm the relationship between $PM_{2.5}$ pollution and severe adverse human health effects. In addition, the new research has eliminated many of the concerns that were raised in the past regarding the causality of the PM-health effects relationship, and has provided plausible biological mechanisms for the serious impacts associated with PM exposure.

PM air pollution is composed of two major components: primary particles, or "soot" and "ash", emitted directly into the atmosphere by pollution sources, and; "secondary particles" formed in the atmosphere from gaseous pollutants such as sulfur dioxide (SO_2), nitrogen oxides (NOx), and hydrocarbons.

Sulfur dioxide emissions from coal plants contribute the most to secondary particle formation. Sulfur dioxide is chemically converted in the atmosphere after it is released from a smokestack to become a "sulfate" particle. Sulfates include sulfuric acid particles that, when breathed, reach deep into the human lung.

In the East and Midwest United States, sulfates make up the largest proportion of the particles in our air-in many regions well over half of the fine particles. Moreover, power plants currently emit two thirds of the sulfur dioxide in the United States. Older, pre-1980 coal-fired power plants contribute about half of all electricity generation in the US, but produce nearly all the sulfur dioxide (SO_2) and nitrogen oxide (NOx) emissions from the entire national power industry. Therefore, to reduce particulate matter in the Eastern United States, major reductions in pollution emissions from older fossil-fuel power plants are needed.

The hazards of particulate matter have become particularly clear in the past decade's research. Two of the largest landmark studies on particulate matter and death, the Harvard Six Cities Study, published in 1993, followed by the American Cancer Society Study in 1995, demonstrated greater risk of premature death from particulate matter in more polluted cities, as compared to cities with cleaner air (Dockery et al, 1993; Pope et al, 1995). Fine particles, especially sulfates, were most strongly associated with excess mortality in polluted cities. The American Cancer Society study examined half a million people in over 150 metropolitan areas throughout the United States and found a 17 percent greater risk of mortality between the city with the least sulfate and particulate matter and the city with the highest levels of this particulate pollution. The results of these studies were challenged by industry, resulting in an independent reanalysis by the Health Effects Institute (HEI)-funded by industry and EPA. HEI confirmed the associations found by the original investigators.

Recent epidemiologic and toxicologic evidence also suggests that the particles resulting from fossil-fuel utility power plant air emissions, and especially those from coal-fired power plants, are among the most toxic in our air. Many studies in the published literature have indicated that sulfate particles, which are predominantly formed from coal-fired power plant SO_2 emissions, are more strongly associated with human mortality than other components of PM. Also, my own published analysis of U.S. mortality and PM by source category found that coal combustion-related particles were more strongly associated with variations in annual mortality rates across U.S. cities than were other components of PM (Ozkaynak and Thurston, 1987). More recently, an analysis by Laden and co-authors (2000) at Harvard University of PM sources and daily pollution confirms that coal combustion particles, along with automobile pollution, were among the PM components that most affected daily variations in mortality. In addition, toxicological studies have indicated that particles resulting from fossil-fuel combustion that contain metals are very toxic to cells in the lung. Thus, both the toxicologic and epidemiologic evidence available indicate that pollution from fossil-fuel power plants are of great human health concern.

The conclusion that power plant particle pollution is one of the more toxic types of particles that we breathe is supported by the facts that combustion particles have different sizes, physiochemical characteristics, and deposit in different parts of the lung than other more "natural" particles, such as wind-blown soil. Therefore, these particles can defeat the body's natural defenses, and may have a far greater adverse effect on health. In particular, these power plant particles are enriched in toxic metals, such as arsenic and cadmium, as well as in transition metals, such as iron and vanadium, that can cause damaging oxidative stress in lung cells (e.g., Costa et al, 1997; Dreher et al, 1997, and; Lay et al, 1999). This may also be especially true in the case of power plant particles because of the co-presence of acidic sulfates, such as sulfuric acid, that can make these transition metals even more bio-available and potent to damage the lung (e.g., Chen et al. 1990, Gavett et al., 1997). Moreover, power plant PM is composed of very small particles that bypass the natural defenses of the lung, and therefore can penetrate deep into the lung where they are not easily cleared, and can therefore reside there for long times, potentially causing significant damage to the lung and to the human body. Thus, power plant air pollution is cause for special concern, and this indicates an urgency to the need for reductions in the amounts of this pollution emitted into our air.

Recent policy analyses have quantified some of the potential health benefits of cleaning-up SO_2 and NOx emissions from presently uncontrolled "grandfathered" power plants. For example, Levy and Spengler in the April, 2001 issue of Risks in Perspective recently estimated that reducing SO_2 and NOx emissions at only nine of these "grandfathered" plants would annually avoid some 300 deaths, 2000 respiratory and cardiac hospital admissions, 10,000 asthma attacks, and 400,000 person-days of respiratory symptoms. Using a similar approach, a study by Abt Associates (2000) recently found that if all such uncontrolled power plants across the United States applied SO_2 and NOx emissions controls, some 18,000 premature deaths per year might be prevented. It is notable that the Levy and Spengler article shows that most of the effects are estimated to occur within 100 miles of the plants studied, indicating that a national SO_2 cap-and-trade policy would likely fail to protect the health of all Americans, as it would not reduce the risks in "hotspots" near the plants.

Thus, the evidence is clear, and has been confirmed independently: Fine particle air pollution, and especially those particles emitted by fossil-fuel combustion, are adversely affecting the lives and health of Americans. The importance of these particulate matter-health effects relationships is made clear by the fact that virtually every American is directly impacted by this pollution.

Finally, I would like to emphasize the importance of controlling Carbon Dioxide (CO_2) from such power plants, along with the precursor gases for PM and O_3. We now know that CO_2 concentrations in the atmosphere can adversely affect our climate, and utility power plants are a major source of that CO_2. In addition, coal as an energy source emits far more CO_2 than other sources providing the same energy. Therefore, if we are to continue to use coal as a major source of electrical energy production, while at the same time addressing our growing CO_2 emission problem, technology for the removal and sequestering of CO_2 will also need to be developed and applied to these coal-fired power plants.

In conclusion, it is important for committee members to realize that the downside to not acting to control power plant pollution at this time is the fact that these pollutants' adverse effects will continue to occur unabated. This would result in the public unnecessarily continuing to bear the ongoing diminished quality of life and the health care costs we presently pay because of the adverse health effects of this air pollution from fossil-fuel power plants.

Technologies have existed for decades that can remove high percentages of the pollution from power plant smokestacks, so there is no reason to delay action. Considering the magnitude of the health and climate risks posed by this pollution, the

Congress should take action now to provide relief to Americans from the burden of the air pollution presently resulting from fossil-fuel power plant emissions.

Thank you for the opportunity to testify on this important issue

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RESPONSES OF GEORGE THURSTON TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. EPA is in the process of implementing the new air quality standard. for fine particles and the revised air quality standard for ozone. What impact will sources like power plants have on the ability of Northeastern States like New York to meet these new standards?

Response. It will be made very difficult, perhaps impossible in some cases, for Northeastern States to meet the new ozone and $PM_{2.5}$ standards if the air that is transported into these States remains as polluted as it is today. Virtually all of the primary and secondary particulate matter (PM) that results from pollution emissions from power plants is as fine particles less than 2.5 micrometers in diameter ($PM_{2.5}$). Therefore, these power plants are major contributors to the $PM_{2.5}$ problems in the downwind Northeastern States because they contribute greatly to the pollution that is transported into Northeastern States from the Midwest. They also emit large quantities of gaseous pollution, such as nitrogen oxides (NO) and sulfur dioxide (SO), that cause the downwind formation of secondary ozone and $PM_{2.5}$. In addition, this pollution is emitted from utilities at high temperatures from tall stacks, causing power plant pollution to be carried far downwind. That transported pollution alone pushes ozone and $PM_{2.5}$, levels in the Northeast near to the new standards even without the contribution of local source emissions. It will therefore likely be very difficult for these downwind States such as New York State to comply with the new law without mandates by legislation or litigation to clean up the pollution from upwind grand-fathered power plants, which are major sources of the pollution transported into the region. If the grand-fathered power plants are not controlled, then it seems likely that less effective and needlessly expensive emission controls may well end up being placed on Northeastern States' economies.

Question 2. At the hearing, Mr. Gray commented that ozone is largely a mobile sources problem. Do you agree with his assessment?

Response. Mr. Gray's assessment fails to consider the concentration of the grand-fathered utility pollution emissions in the Midwest, and the fact that they are emitted from tall stacks, which increases their transport and residence time in the atmosphere, relative to mobile emissions. While mobile sources are responsible for more emissions of the ozone precursor NOx than are utilities on a nationwide basis, this is not the case in the Midwest. In the Ohio Valley, power plant emissions of NOx have a major role in causing ozone concentrations: so much so that individual Eastern U.S. States will have a great deal of trouble meeting the new O_3 standard without controlling the grand-fathered coal-fired power plants operating upwind in Pennsylvania and the Midwest. For example, according to the EPA's Aerometric Information Retrieval System (AIRS) air pollution National Emissions Trends (NET) emissions data base, highway cars and trucks emitted 358,000 tons of NOx in the State of Ohio in 1999, versus 431,000 tons of NOx fossil-fueled power plants (USEPA, 2001). In West Virginia, power plant emissions play an even larger relative role, emitting some 286,000 tons of NOx in 1999, versus 74,000 tons by highway vehicles in that year (USEPA, 2001). Thus, mobile emissions do not play as large a role in the Eastern United States as the nationwide emissions would suggest, and the relative importance of power plant pollution in the Eastern United States is greater than in the nation as a whole.

Furthermore, such a simple comparison of tonnage of emissions underestimates the role played by power plant emissions in the problem of transported air pollution. Since power plant emissions are emitted from stacks at much higher heights above the ground than mobile sources, such as cars and trucks, power plant emissions will be carried further by the winds before being reacted or deposited out (e.g., as acid deposition). This gives the power plant pollution more time in the atmosphere to generate ozone and/or fine particles. As a result, power plant NO. pollution has a greater impact on downwind concentrations of ozone and $PM_{2.5}$ than similar amounts of NO, released at ground-level. Thus, power plants have a greater relative role in transported ozone and $PM_{2.5}$ than would be indicated by the tons of precursor pollutants (e.g., NOx) emitted from their stacks vs. the NOx emitted from mobile sources.

In the absence of new source controls over these plants, the emissions controls that will need to be placed on sources in the Northeast will likely be needlessly onerous, with little hope for complete success. Conversely, if these upwind gross-emitter power plant sources are in fact controlled using readily available control technology, and the air coming into the northeastern States is made cleaner to begin with, then the power of self determination to actually meet the new ozone and $PM_{2.5}$ standards will be returned to these downwind northeastern States.

Question 3. You say that children are especially affected by air pollution. In what ways, and why are children more affected?

Response. Child health effects of air pollution include decreased lung function growth and increased numbers of asthma attacks. Furthermore, recent evidence suggests that, among children, infants are especially affected by air pollution, including increased infant mortality. These greater effects among children are due to the facts that: children are more active outdoors than adults, often getting higher pollution exposures, children (and especially infants) breathe more air per pound of body weight; and, children have higher underlying rates of respiratory problems than other age groups, making them especially susceptible to air pollution effects. In addition, children's bodies and their immune systems are rapidly developing as they grow. Evidence suggests that air pollution can interfere with this development, and that their undeveloped immune system makes them more susceptible to air pollution effects. Thus, children are more exposed and more susceptible to the adverse effects of ambient air pollution than are most adults.

Question 4. Also, I understand that you have done extensive research on the impact that air pollution has on low-income families. Can you summarize the results of your research?

Response. Yes, the effects of air pollution are apparently more severe on the poor and working poor than on more affluent members of our society. My peer-reviewed research paper on this topic ("The Burden of Air Pollution: Impacts among Racial

Minorities") has just been published in the August, 2001 supplement to the journal Environmental Health Perspectives. This research indicates that the hospital admissions effects of elevated PM and ozone air pollution in New York City are greater among minorities than among non-Hispanic whites, but that socio-economic differences account for most of these differences. When we looked at those New York City residents who were on public assistance health coverage (Medicaid) or who have no health insurance (the working poor) admitted to the hospital, we found greater pollution effects than among those financially better-off individuals (i.e., those who had private health insurance); both among non-Hispanic whites and among minorities Thus, the acute effects of air pollution appear to affect those who are among the poor and working poor, irrespective of race. Moreover, this indicates that those who are least able to afford the adverse health effects of air pollution are the most severely affected.

The results of this study suggest that the financial savings that the lower energy costs of coal-fired power plants that Senator Voinovich alluded to in his opening statement may be false savings for the poor and working poor. Since it is the poor and working poor that are made the most severely ill by air pollution, the savings they get in terms of lower electricity costs would likely be more than offset by their increased risk of illness from the pollution caused by those coal-fired power plants. Lower energy costs of coal power will do the poor and the working poor little good if they are made sick in the process.

Question 5. Over the years, EPA and States have implemented impressive pollution reduction programs. Have the health benefits of these programs been documented and quantified?

Response. Yes, the EPA has evaluated the progress and health and net financial benefits that have resulted from the implementation of air pollution controls under the Clean Air Act. Indeed, the U.S. Environmental Protection Agency (USEPA) has estimated that air pollution reductions achieved by the Clean Air Act avoided some 200,000 premature deaths, 300,000 hospital admissions, 22,000 cases of coronary heart disease, 850,000 asthma attacks, and 22 million lost work days in the year 1990 alone. During the 1970 to 1990 period, the valuation of such health benefits came to 22 trillion dollars, versus a cleanup cost of only 0.5 trillion dollars (USEPA, Benefits And Cost Of The Clean Air Act 1970–1990, Doe. EPA–410-R–97–002, Office of Air and Radiation, RTP, NC, 1997). Thus, the health and monetary benefits of cleaning the environment have been extremely large, and their monetary valuations have greatly outweighed the clean-up costs of achieving those air quality gains.

Similarly, the EPA issued the second in this series of reports entitled, "The Benefits and Costs of the Clean Air Act, 1990 to 2010" (USEPA, Doc. EPA–401-R–99001, Office of Air and Radiation, RTP, NC, 1999). This report was issued after a 6-year process of study development and outside expert review. This prospective study also found that the benefits of the programs and standards required by the 1990 Clean Air Act Amendments significantly exceed costs. This EPA study estimated that, in the year 2010, the CAA Amendments of 1990 will prevent some 23,000 Americans from dying prematurely, and avert over 1,700,000 incidences of asthma attacks and aggravation of chronic asthma. In addition, in 2010 they will also prevent 67,000 incidences of chronic and acute bronchitis, 91,000 occurrences of shortness of breath, 4,100,000 lost work days, and 31,000,000 days in which Americans would have had to restrict activity due to air pollution related illness. Moreover, some 22,000 respiratory-related hospital admissions are expected to be averted, as well as 42,000 cardiovascular (heart and blood) hospital admissions, and 4,800 emergency room visits for asthma. For those health and ecological benefits that could be quantified and converted to dollar values, the EPA's best estimate was that, in 2010, the benefits. of Clean Air Act programs will total about $110 billion. This estimate represents the value of avoiding increases in illness and premature death that would have prevailed without the clean air standards and provisions required by the Amendments. By contrast, the detailed cost analysis conducted for this new study indicates that the costs of achieving these health and ecological benefits are likely to be only about $27 billion. This indicates that the health benefits of the Clean Air Act Amendments of 1990 outweigh the cleanup costs by at least a factor of 4. Similarly, given the ready availability of emission control technologies, the health and welfare benefits of reducing the air emissions from the grand-fathered utility power plants can be expected to greatly outweigh the costs of the needed emissions controls.

Question 6. Any time we require reduction in air pollution, there are costs associated with achieving these reductions. In your opinion, do the health benefits of improved air quality balance the costs of reducing air pollution?

Response. Yes, at present levels of air pollution, and given the reasonable goals of the Clean Air Act standards to protect public health, the benefits to our nation, and to the world, of cleaner air far outweigh the costs of control. As discussed above, this has been shown time and time again through cost-benefit analysis, despite the fact that such analyses must, by their nature, underestimate the benefits of clean air. This inherent underestimation of clean air benefits occurs because these analyses, as conducted today, only consider a subset of the pollutants and health effects that are curbed by such measures.

One recent example of such an analysis of the health benefits of cleaner air that I have conducted in my research was recently presented in the Science Policy Forum entitled “The hidden health benefits of Greenhouse Gas Mitigation” that was recently published in the August 17, 2001 edition of the journal Science (Cifuentes, Borja-Aburto, Gouveia, Thurston, and Davis, Science, Vol 293, pp. 1257–1259, 2001). In that work, we analyzed the human health benefits that would be derived by going forward with readily available greenhouse gas (GHG) mitigation measures in four North and South American cities: Mexico City, Mexico; New York City, USA; Santiago, Chile, and; Sao Paulo, Brazil, which have a combined population of 45 million people. As displayed in the figure below, we found that the adoption of readily available technologies to promote efficiencies and clean technologies to abate GHG emissions would also reduce fossil fuel emissions over the next two decades enough to reduce particulate matter and ozone concentrations by approximately 10 percent of present levels. This would avoid some 64,000 premature deaths (including infant deaths), 65,000 chronic bronchitis cases, and 37 million person-days of work loss or other restricted activity. These findings illustrate that measures to mitigate GHG emissions of CO_2 can also provide considerable local air pollution-related public health benefits to both developed and developing countries that choose to abate GHG emissions by taking conservation and efficiency steps to reduce fossil fuel combustion.

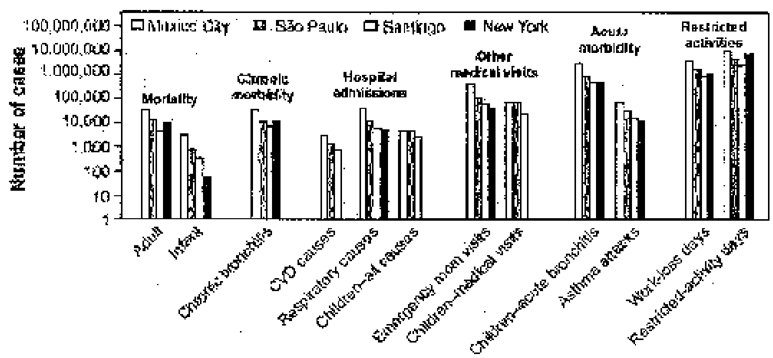


Figure 1. The human health benefits in four North and South American cities of implementing greenhouse gas mitigation measures during 2001-2020.(Cifuentes, Borja Aburto, Gouveia, Thurston, and Davis, Science, August 17, 2001, Vol. 293: 1257-1259).

STATEMENT OF DALE HEYDLAUFF, SENIOR VICE PRESIDENT FOR ENVIRONMENTAL AFFAIRS, AMERICAN ELECTRIC POWER

Good morning Chairman Jeffords, Senator Smith, and distinguished members of the Senate Committee on Environment and Public Works, and thank you for inviting me here today. My name is Dale Heydlauff, and I am the Senior Vice President for Environment at American Electric Power Company. AEP is a multi-national energy company based in Columbus, Ohio. AEP owns and operates more than 38,000 megawatts of generating capacity, making it America’s largest generator of electricity. AEP generates about 6 percent of the electricity in the United States, a figure comparable to the annual electric power consumption in Mexico and Australia. We are the largest consumer of coal and the third largest consumer of natural gas in the United States. AEP provides retail electricity to more than 6.8 million customers worldwide and has more than $55 billion in assets, primarily in the United States with holdings in select international markets.

I am grateful for this opportunity to address the committee on behalf of the Edison Electric Institute (EEI). EEI is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI’s

U.S. members serve over 90 percent of all customers served by the shareholder-owned segment of the industry, generate approximately three-quarters of all the electricity generated by electric companies in the country, and service about 70 percent of all ultimate customers in the nation.

In my testimony, I will provide the committee with a context in which to view the statements of my fellow panelists. The electric utility industry has had a great deal of success, especially over the past 20 years, in achieving emissions reductions goals set by Congress, and is on course to make significant additional reductions over the next 20 years (see chart A–1). These goals, which were set largely under Title IV of the Clean Air Act, have been met through a well-crafted process and a shared implementation between State and Federal Government, a process which sets air quality standards, including an adequate margin of safety, and allows the States to develop specific plans for attainment of those standards.

I hope to dispel some myths and misconceptions about electric utilities and environmental regulations, including the notion that some of our power plants have been "grandfathered," or exempted from regulation, to build the committee's appreciation of our industry's ability to respond to changing policies and priorities, to reinforce the need for reliable and affordable energy. The electric power industry neither supports nor recognizes a dichotomy between environmental and economic energy policies. A sound economy and national energy policy is inextricably linked to our country's environmental priorities, and the electric power industry supports the recognition of that linkage in the crafting and implementation of present and future environmental goals. Finally, I will share with you our industry's understanding of what types of policies work best to maintain environmental progress and promote the availability of reliable and affordable energy, along with the vital economic goods provided through the use of electric power.

Difficult choices have been made, and still others remain undecided regarding our national energy policies and priorities for improving the quality of the air, water, and land of the communities in which we all live. The-electric power industry supports and will continue to promote environmental policies based upon the best available science, an appreciation of the related energy policy challenges, and an understanding of the most effective types of policies and regulatory programs to accomplish environmental and energy policy goals.

I. Electric Power and Air Emissions: The Clean Air Act is Working

While our national energy needs continue to grow, so does our ability to produce electricity in an increasingly clean and efficient manner (See Appendix A–4). Comparisons of electric power production with emissions show that electric power produced in today's coal-fired electric power plants contributes far less sulfur dioxide ("SO_2"), nitrogen oxides (NOx), and particulate matter (PM) than just two decades ago (See Appendices A2—A3). Coal, which currently accounts for more than half of the electricity produced nation wide (See Appendix AI) is an increasingly clean and an exceptionally reliable energy source, and a fuel whose use has shown great progress in the reduction of emissions from electric power plants, in the implementation of Title IV of the Clean Air Act, and in achievement of the standards set under the Act to protect public health and the environment.

Electric utilities have implemented the first phase of this section of the Clean Air Act, including substantial reductions of NOx and SO_2, as well as the second phase of NOx reductions, as illustrated in the attached graphs (Appendices A–2—A–3). Additional reductions in SO_2 are currently underway, and requirements under the NOx State Implementation Plan ("SIP") Call will result in additional NOx reductions of nearly one million tons. Over a period of just 10 years, utilities will have reduced SO_2 emissions by about 50 percent compared to levels in 1980; national SO_2 emissions will be at their lowest level in one hundred years, largely due to utility reductions; and electric utility.

NOx emissions will account for about 20 percent of all man-made emissions. When you combine these emission reductions with the fact that coal use increased dramatically, emissions of SO_2 and NOx per ton of coal burned will be reduced by 75 percent compared to 1980 levels (See Appendix A–4). This is a tremendous record.

These advancements in the control and minimization of electric power emissions have resulted from significant capital investment in control technologies and a strong record of utility compliance. Over the past 25 years, the electric power industry has invested approximately $40 billion (capital) in technologies to reduce these air emissions. In addition, utilities spend $3 billion to $5 billion annually in operations and maintenance related to environmental performance. Conservative estimates assigning even half of these operational expenses to air-related activities indicates that total utility expenditures for the control of air emissions amount to $100 billion over the past 25 years.

II. New Source Performance Standards and the Myth of "Grandfathering"

Contrary to some claims that power plants were "grandfathered" under the Clean Air Act in 1970, Congress did not exempt any sources of pollution from emission controls, but did differentiate between existing sources and new sources. Existing sources were required to make whatever level of emission reductions were deemed necessary by the States in their implementation plans to attain National Ambient Air Quality Standards (NAAQS). New sources were required to install the best available control technology (BACT) to guard against deterioration in air quality once it had been achieved. There were no special deals for electric generating units under the Act. They were treated just like all other sources of industrial pollution (whether chemical manufacturers, steel mills, aluminum smelters, petroleum refiners, or automobile assembly plants). The industry has an impeccable compliance record in meeting these standards, often exceeding emission reduction requirements in order to provide an extra margin to protect public health and the environment.

While it is true that plants built before 1970 do not have to meet NSPS, this decision was a conscious one, made in full recognition of the following facts: First, Congress comprehensively regulates industry, including utilities, through enforceable State Implementation Plans (SIP'S) to meet NAAQS for NOx, SO_2, and PM ozone and others. These standards are set in light of the best available science, and require an adequate margin of safety to protect public health. For decades each State has evaluated what emission reductions need to be made by each electric utility plant to meet the NAAQS and then required any needed emission reductions through a permit process. Second, Congress deliberately chose in 1970 to target improved air quality rather than mandate across-the-board technological solutions, primarily due to the difficulty and great expense of retrofitting new controls on already constructed facilities. Finally, perhaps most importantly, the 1990 Clean Air Act Amendments included a cap on the total tons of SO_2 and NOx and required all facilities to address these pollutants to mitigate acid rain (through Title IV). Additional new regulatory initiatives since, have served to significantly reduce the gap between the emissions levels of new versus older units (See Appendices A–2 and A–3).

Simply put, in Title IV of the Clean Air Act, Congress crafted an environmental policy which maximized the effectiveness of environmental regulation while reducing the economic consequences. Strategies like these, which allow for flexibility and partnerships with State government to ensure effective and efficient compliance, do not ignore environmental challenges. Instead, they demonstrate what can be accomplished when policies integrate economic realities with environmental goals. Based upon the progress attained under Title IV, and the projected emissions reductions yet to come, as well as the rigorous State-level and other Federal environmental regulations which apply to all electric power plants, "grandfathering," and the underlying implication that many power plants are unregulated, is neither an accurate nor an appropriate term. Furthermore, we have been shown by this experience what can be accomplished through flexible regulatory programs.

III. Future Environmental Policy Challenges

Mercury

According to the Environmental Protection Agency ("EPA"), U.S. electric power companies are estimated to emit about 30 percent of manmade mercury emissions. Current research and information do not indicate that there is a direct link between electric utility mercury emissions and levels of mercury in fish that potentially affect public health. Even so, on December 14, 2000, EPA announced it would regulate mercury emissions from power plants. The agency likely will propose regulations by December 2003, promulgate a final rule by December 2004, and expect compliance by December 2007.

Exposure to mercury can be toxic and lethal at high levels. However, there continues to be scientific uncertainty and disagreement as to what level of mercury exposure is harmful to public health. In 1999, Congress instructed the National Academy of Sciences ("NAS") to assess the validity of the EPA's "reference dose" the amount of a substance that can be consumed safely over a lifetime—for mercury and to provide recommendations on what level of mercury exposure is "safe." The NAS panel, after actively reviewing existing mercury health studies, issued a final report in July 2000.

While significant uncertainty remains regarding the health effects of mercury emitted from powerplants, EEI intends to work cooperatively with EPA as it determines the extent to which mercury reductions from power plants may be needed and how those reductions should be achieved.

Climate

EEI's members have long supported voluntary, flexible, and cost-effective approaches to reducing greenhouse gases. For example, under the Climate Challenge program initiated in 1995, the electric utility industry was projected to reduce 174 million metric tons of CO_2-equivalent greenhouse gases in 2000.

The electric power industry is currently developing the framework for a voluntary climate initiative that would serve as an extension of the Climate Challenge, a partnership program developed by EEI and the Department of Energy (DOE). The industry expects to partner with the Federal Government—particularly DOE—and other industries to pursue approaches that further reduce greenhouse gases. This initiative will reduce greenhouse gases in the near term, and promote a technology research, development and deployment (R, D&D) program that will lead to the development over the longer term of cost-effective options to reduce greenhouse gases.

EEI supports continued scientific research to evaluate the extent to which human activity is adversely affecting the climate, to evaluate the causes, costs, policies and adaptation strategies to address possible solutions. EEI believes that any alternative to the Kyoto Protocol developed in the coming months should contain implementation rules for market mechanisms, forestry and compliance, that are cost-effective, flexible, inclusive and transparent.

EEI opposes regulation of CO_2 and other greenhouse gases as pollutants under the Clean Air Act or other legislation. Because there is currently no cost-effective control technology for greenhouse gas emissions, compliance with stringent, mandatory targets and timetables such as those contained in the Protocol would cause massive fuel switching in the electric utility industry from coal to natural gas,[1] which would be very expensive and increase electricity prices.[2] It also would further accentuate EEI's concerns, noted above, about fuel diversity.

In summary, EEI believes that a climate policy premised on a voluntary climate initiative would achieve both environmental and economic objectives, and would help maintain fuel diversity. Such a strategy would reduce greenhouse gases in the short term as technological responses are developed for long-term availability, all the while maintaining the viability of coal as a vital component of electric generation. In short, environmental policy would complement energy policy, which is consistent with EEI's goal ensuring that climate change issues are addressed synergistically with a national energy policy that protects our environment, consumers, and economy.

IV. Electricity: Powering Economic Growth

Perhaps no single index serves as a better indicator of the growth and productivity of the U.S. economy than the trends in electricity use. In fact, since 1970, electricity growth has closely tracked the rise in GDP (See Appendix A–4). The electronic economy, and all of the telecommunications services and computing technology which support it, currently accounts for 3 percent of electricity use at the national level, a significant statistic which has outpaced past projections and is expected to increase in the near future.[3] The Energy Information Administration (EIA) recently revised its estimates of future electricity demand growth from 1.3 to 1.8 percent per year between now and 2020. New electric generating capacity is needed in many areas of the country in order to avoid shortages and reliability problems. To meet increased demand and to offset retirements of existing power plants, EIA forecasts that 1,310 new power plants—with 393,000 megawatts of capacity—will be needed by 2020.[4] A sound national energy policy is needed to continue to

[1] See, e.g., the reference study that demonstrates that under a Kyoto Protocol-type scenario, coal would decline from 50 percent of electric generation to as low as 13 percent in 2010, while natural gas would rise from 25 percent to 50 percent in the same timeframe. Research Data International, Inc., U.S. Gas and Power Supply under the Kyoto Protocol, Vol. I at 1–9 (Sept. 1999).

[2] A recent EIA report (which actually understates costs because mercury had not yet been analyzed) found that reductions in sulfur dioxide, nitrogen oxides and CO_2 consistent with recent legislative proposals would increase electricity prices by 17–33 percent in 2005, and by 30–43 percent in. 2010. EIA, Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides and Carbon Dioxide xvii, 27 (Dec. 2000). The bulk of the cost increases are due to CO_2 restrictions.

[3] Koomey, Jonathan et. al. "Electricity Used by Office Equipment and Network Equipment in the United States," Lawrence Berkeley Lab, U.S. Department of Energy, February 9, 2001

[4] EIA, Annual Energy Outlook 2001, p.73.

assure the availability of affordable and reliable electricity supplies, and to meet future energy demands.

Even as it faces the new challenge of increasing demand, the electric power industry is well along the path toward the creation of a national retail energy market. Restructuring of the electric power industry is motivated by anticipation of the economic benefits these new markets will bring, but this change does not come without uncertainty. As our industry and our nation advances toward these new economic opportunities, we find ourselves at a point in history which brilliantly illustrates the need for sound and substantial coordination of energy needs and other national policy priorities. The role of policies concerning the development of retail energy markets is and should be focused on facilitating the necessary economic, organizational, and regulatory transitions within the industry, and on providing electricity producers and. service providers with the opportunity to conduct efficient market transactions with its customers. While EEI supports a balancing and coordination of energy and environmental policies, EEI does not support the incorporation of environmental policies in legislation or regulation concerning industry structure or retail energy competition.

New environmental policies can benefit from the changes taking place in the structure of the electric power industry. Policies which include flexible implementation mechanisms, avoid prescriptive technology standards, and adopt compliance schedules which take advantage of the ability of the market forces in a competitive industry will help assure our continued progress as a provider of increasingly clean energy to a growing economy.

EEI believes that fuel diversity—including the use of coal, natural gas, nuclear energy, oil, hydropower and other renewables, to generate electricity—must be maintained as a matter of national energy policy and national security (See Appendix A–1). An energy policy that maintains fuel diversity can appropriately balance continued utilization of coal, the most essential fuel for reliable and affordable electricity, with a sensitivity to the climate change and individual air quality issues that reflects both economic and environmental objectives. A diverse fuel mix helps protect companies and consumers from the impacts of fuel shortages and price fluctuations. Diverse fuel and technology options contribute to a stable, reliable and affordable energy supply over the long term.

We need a national energy policy that takes advantage of energy resources available within our country. One of the most plentiful energy resources is coal, and more than 90 percent of U.S. coal usage is the generation of electricity. This valuable but underutilized asset can meet the nation's energy needs for about 250 to 350 years.[5] Nuclear power can also be a plentiful resource with a virtually unlimited supply potential. On the other hand, the known supply of natural gas reserves looks adequate only for 40 years, based on current consumption. When you consider the multiple beneficial uses for natural gas, especially for heating, it is reasonable to question its use for generating substantial amounts of power, when electricity from coal is available to do the same work. Coal-based capacity additions, which already look attractive, will look even better as technology drives down their costs.

As the nation's electricity reserve margins continue to decrease—from a high of 26 percent to a low of 11 percent just in the past decade—we must now look at coal in a renewed role of prominence in the United States energy mix. The combination of this old source of energy and new technology is an important part of the solution to meeting America's energy needs, which are projected to grow 44 percent by 2020.[6]

New technology puts coal-based plants in position to clear today's environmental hurdles. Although Germany and Japan have built generating plants using clean coal technology in the past decade, none have yet been built in the United States—other than subsidized or demonstration projects.

Modern coal-based plants generate electricity with dramatically less environmental impact than traditional coal-based plants. The lower emissions and higher efficiency of new coal-based plants exceed current environmental requirements for sulfur dioxide (SO_2) and nitrogen oxides (NOx). Clean coal technology also addresses greenhouse gases. Because of increased efficiency, new technology coal plants produce significantly less carbon dioxide (CO_2) per megawatt hour than old plants. The units that we propose to build likely would result in a 30 percent reduction in the fuel needed to generate the same amount of electricity. In other words, the fuel once used to power three homes would power four. Consequently, the fourth home would be powered with virtually zero environmental impact, and the other homes would be served with less environmental impact than before.

[5]EIA, Annual Energy Review 1999, T.11.2, T.11.3.
[6]EIA, Annual Energy Review 1999, T.8.2 & T.8.3; Annual Energy Outlook 2001, T.A.8.

Certainty and Regulatory Flexibility

Coal-based power plants, which supply more than half of the nation's electricity, face a wide range of existing and proposed emission control requirements from Federal and State agencies, and even neighboring countries (See Appendix A–5). These requirements and proposed new programs are focused primarily on the reductions of four power plant emissions: SO_2, NOx mercury and CO_2.

Because these regulatory initiatives are largely uncoordinated and often conflicting, the electric power industry faces enormous uncertainty as it tries to develop appropriate plans to upgrade plants and add pollution control equipment. Utility planners are even more challenged by the need to ensure their customers continue to receive reliable and affordable energy. In essence, the unfortunate results of today's regulatory paradigm are higher costs for both shareholders and consumers, longer downtimes for our generating stations, and continued uncertainty in an industry that is critical to the U.S. economy (See Appendix A–5).

America's electricity prices are substantially lower than most of our international competitors, giving our businesses and industries a significant competitive advantage in the global marketplace. The United States has enjoyed low electricity prices, in part, because we rely on a variety of fuels to generate electricity. The resulting competition among these fuels keeps prices in check.

The combination of fuel sources used is referred to as the generation mix. Today, more than half of the nation's electricity supply is generated from coal. Nuclear energy produces nearly 20 percent of the supply, while natural gas provides 16 percent. Hydropower and, to a much lesser extent, other renewable sources—biomass, geothermal, solar, and wind—provide nearly 11 percent of the supply. Fuel oil provides nearly 3 percent of the generation mix. There are sharp regional differences in generation mix.

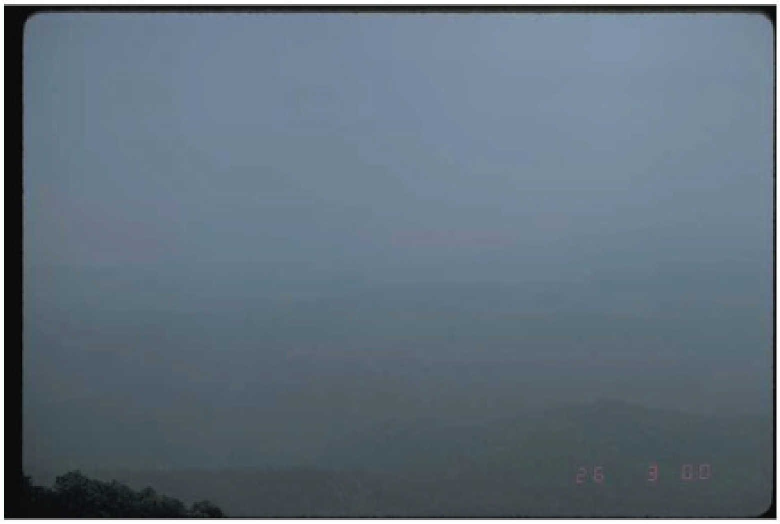
Summary

The electric utility industry is committed to working with the committee to help design multi-pollutant control legislation that is comprehensive, cost-effective, employs market-based instruments to achieve compliance, provides the industry with sufficient time to install conventional or innovative pollution control technologies, avoids forced premature plant retirements, preserves fuel diversity, and ultimately provides the industry with planning certainty.

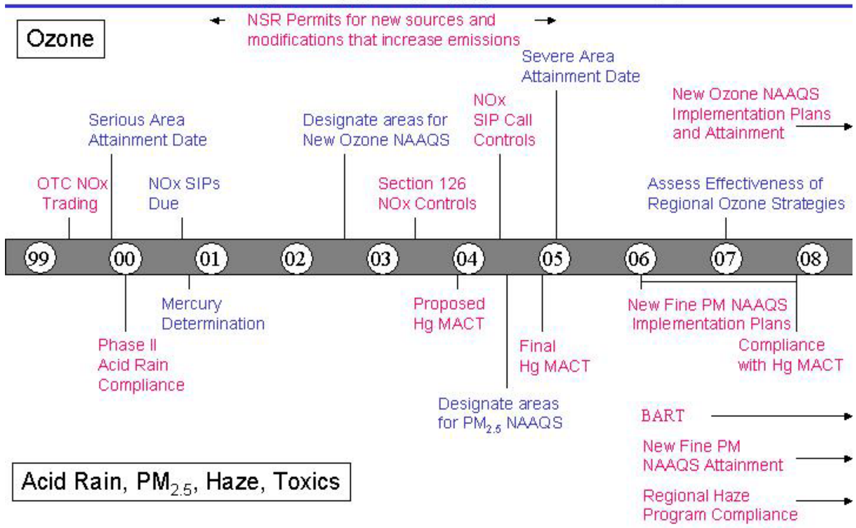
Our nation is building a legacy for taking firm steps to address environmental challenges, promoting sustainable use of our natural resources and improving public health. Based upon our record of compliance, improved efficiency, and increasing emissions reductions, as well as our future commitments, the electric power industry will continue to be a key partner in the accomplishment of these national priorities. This industry is certain that these priorities can be balanced with a national energy policy which protects consumers from fuel market volatility, keeps electric power affordable and reliable, and promotes continuing investment in technologies which will ensure increasingly clean power supplies in the future.

Great Smoky Mountains National Park

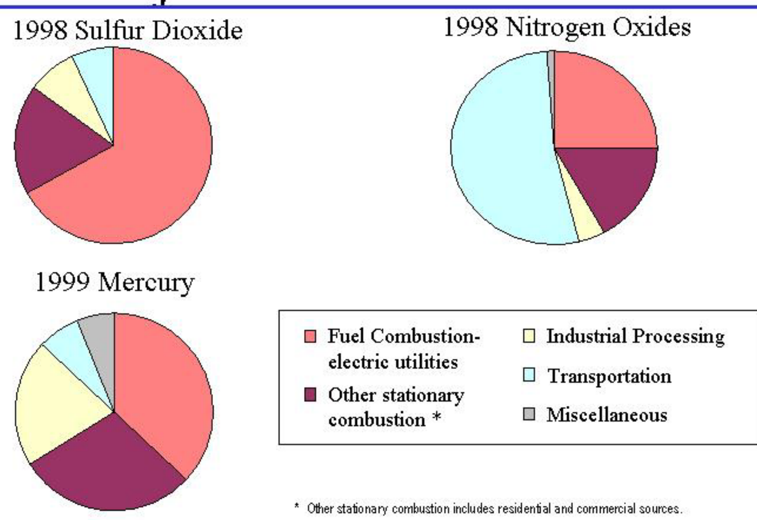
Examples of hazy and clear days. On the haziest days, sulfates account for over 80% of the visibility impairment (Photos: IMPROVE/NPS)



Electric Power Regulations Timeline: Clean Air Act



Electric Power Generation: Major Source of Air Pollutants



* Other stationary combustion includes residential and commercial sources.

Pollutants and Concerns

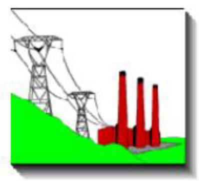
• Sulfur Dioxide	• Human Health • fine particles • Acidification • Regional Haze

• Nitrogen Oxides	• Human Health
	  • fine particles
	  • ozone
	• Acidification
	• Eutrophication
	• Regional Haze

• Mercury	• Human Health • bioaccumulative toxic

Attachment A

Discussion of Multi-Pollutant Strategy



Meeting with EEI

U.S. Environmental Protection Agency

September 18, 2001

STATEMENT OF C. BOYDEN GRAY, WILMER, CUTLER & PICKERING, ON BEHALF OF THE ELECTRIC RELIABILITY COORDINATING COUNCIL

Thank you very much for the opportunity to testify on the issue of air emissions from power plants. I am a lawyer and not a scientist or public health officer, but I have had two decades of experience with the Clean Air Act ("CAA"), both in formulating the 1990 Amendments ("1990 CAAA") and in implementing those Amendments as well as the other provisions of the Clean Air Act. What I can contribute is to provide some context for evaluating the role of utility emissions historically and as compared to mobile source emissions in the formation of pollution that is covered by the National Ambient Air Quality Standards ("NAAQS") designed to protect public health.

As a matter of background, I think it is important to stress that the United States has managed fairly successfully its overall public health responsibilities for air quality. The chart below reflects the overall reduction of pollution over the last three decades despite dramatic growth in GDP and population. As Peter Venturi, a California State Air Resources Board official stated at a recent EPA hearing in Sacramento, "The system is working," noting that smog-forming emissions from businesses in the State have declined by 50 percent in the past 20 years despite a 40 percent increase in population and commensurate industry growth. As a result of three successive CAA enactments (in 1970, 1977 and 1990), the United States has phased out lead and CFCs, achieved attainment of a number of health standards, including CO, NOx and, except for 19 counties with a population of 20 million, particulate matter (PM_{10}), and made deep cuts in acid rain, notably a 50 percent reduction mandated by the 1990 CAAA.

The acid rain reductions, contained in Title IV of the 1990 CAAA, are of special importance to these hearings because they involve the pollutants most directly associated with power plants. Title IV has, by all accounts, been highly successful. Gregg Easterbrook, a senior editor at the New Republic, wrote last week that the results have been "spectacular. Acid rain levels fell sharply during the 90's, even as coal combustion (its main cause) increased." The Wall Street Journal on Monday described the program as "fabulously successful," in part because the market-oriented emission trading aspect of the program has produced cost savings that "should be as much as \$2 billion a year—that's twice as much as originally estimated by

EPA"—and, I might add, as much as five to ten times cheaper on a cost-per-ton basis than command-and-control.

Notwithstanding these successes, there remain some difficult problems. Ozone levels, while improving, are still in violation of the NAAQS in substantial sections of the country. I think it's important to say here that while acid rain is primarily, though not exclusively, a power plant problem, ozone is primarily a mobile source problem today. Cars, trucks and buses account for twice the NOx produced by power plants, which in turn have no role in VOCs, the other smog precursor. Just Monday, The Washington Post noted that "Cleaner fuels and newer cars with more effective emission controls are improving Washington's air—just not fast enough to meet Federal ozone standards by a 2005 deadline." The article and a followup editorial yesterday focused exclusively on mobile sources (including the notorious SUVs) (although there is a long-range transport problem implicating Midwestern utilities, the District of Columbia Circuit has in the last 2 years affirmed two CAA programs, the NOx SIP Call and the Section 126 interstate transport petition referred to again below, to eliminate this problem).

The other major unresolved problem involves particulate matter. Thanks to a combination of the TSP and PM_{10} NAAQS, the ozone standard and the acid rain program, the United States has engineered a massive reduction of PM_{10}, which is now largely in attainment (achieving a 15 percent reduction from 1990 to 1999 and a 80 percent reduction from 1970). EPA has pending a NAAQS to control $PM_{2.5}$ which could, if implemented, call for further reductions of power plant emissions, along with other pollutants. In the meantime, existing EPA control programs are producing continuing reductions of what EPA describes as the "gaseous precursors of fine particles (e.g., SO_2, NOx and VOC), which are all components of the complex mixture of air pollution that has most generally been associated with mortality and morbidity effects" ($PM_{2.5}$ emissions declined 17 percent from 1990–1999).

More specifically, the acid rain and interstate NOx SIP Call rules alone are projected to reduce electric utility NOx by 3.6 million tons by 2010 from 1990 levels; 2.1 million tons have been achieved already. Further, as yet undetermined reductions are anticipated under the Regional Haze "visibility rules." A comparison of reductions required of mobile sources and electric utilities shows that the utilities are pulling their own weight. Mobile sources contribute 58 percent of annual NOx emissions, more than double the 25 percent generated by electric utilities, and consequently would seem to have much more scope for emissions reduction. However, utilities are projected to reduce their contribution by 54 percent by 2010 comparable to the mobile source reductions of 48 percent. Utilities are doing their fair share to reduce NOx under the law as it stands.

For SO_2, electric utilities represent 67 percent of SO_2 emissions, while mobile sources represent only 7 percent of emissions. Title IV of the Clean Air Act mandates a reduction by electric utilities of 6.4 million tons of SO_2 from 1990 to 2010, more than 5 million tons of which have already been reduced in the last decade. Mobile source reductions will remove a further 1.25 million tons of SO_2 between 2000 and 2010. Utilities make by far the greatest quantitative reduction, although qualitatively it is a reduction of 50 percent compared to an 80 percent reduction by mobile sources projected over the next decade.

Like the NOx reductions, SO_2 reductions also will be further reduced by the regulations implementing the Regional Haze rules. For example, the Grand Canyon Visibility Transport Commission has instituted a voluntary reduction-trading program, which complies with the Regional Haze rule that is estimated to reduce SO_2 emissions by approximately 25,000 tons by 2010 and by a further 185,000 tons by 2020. Although this number seems small, it is but the first of programs across the country that cumulatively will have a significant impact on SO_2 emissions, above and beyond what is already required under the 1990 Clean Air Act Amendments.

Given the pollution reduction initiatives outlines above that are still underway or just launched, and the $PM_{2.5}$ NAAQS currently pending before the District of Columbia Circuit, it is unclear what additional measures are actually necessary at the present time from a public health perspective. EPA is now also engaged in a New Source Review ("NSR") enforcement program that operates independently of all of the other initiatives described above and that is under review at EPA, the Department of Justice and the Department of Energy. The relevant question for this hearing is how many tons of pollution are at stake and at what cost, not the expected useful life of an average power plant. A review of a recent settlement agreement between EPA and a utility shows that EPA is attempting to require companies to install scrubbers for 95 percent removal on 70 percent of the MWs of energy produced by older plants—which really encompasses all plants over time that do not have scrubbers already. This will lead to over a 50 percent further cut in SO_2 above and beyond what is already required by Title IV and other requirements of the

CAA. Under existing law, utilities engaging in such massive overcontrol beyond Title IV would normally be able to recoup control costs by selling the allowances created by their overcontrol; but EPA is prohibiting allowance sales, thus confiscating those allowances and raising serious takings questions in the process.

There are many other questions raised by this new enforcement program. For example, it does not seem to be health-based—because it is not directed at attainment of the ozone standard (the object of the NOx SIP call) and does not appear to have any geographic focus. Rather, NSR seems to implicate some of the precursors of regional haze and $PM_{2.5}$ at a time when new visibility rules have just been issued and it is unclear whether the new $PM_{2.5}$ NAAQS will be implemented (and, if so, how any reductions required will relate, if at all, to NSR). In this context, the recent 9–0 Supreme Court decision in American Trucking is relevant, because it holds that EPA may not do more than "is necessary" to protect the public health. Further administrative reductions of $PM_{2.5}$ beyond those achieved by the PM_{10} standard, the ozone standard, Title IV, the NOx SIP Call and the visibility rules must therefore await resolution of the $PM_{2.5}$ NAAQS. Moreover, by identifying routine repair and maintenance activities of as much as two decades ago as having triggered a scrubbing requirement, EPA is saying that Congress' Title IV 50 percent reduction program of 1990 was totally unnecessary, its allowance trading system and its mandatory scrubbing repeal ineffectual, its resulting pollution control mechanism too cost-effective, and its focus misplaced to reduce pollution and increase efficiency rather than to promote litigation.

It may well be that a further 50 percent cut in acid rain precursors is called for as a matter of public health and environmental protection. However, if this is truly the case, EPA's retroactive and economically costly reading of NSR is not the way to achieve it. Such a reduction beyond the provisions of Title I and Title IV of the Clean Air Act requires EPA either to institute new NAAQS for SO_2 and NOx through a notice and comment rulemaking or to turn to Congress for new legislation to revise the 1990 Clean Air Act Amendments, pursuant to which Congress hopefully would not revert to the outmoded command-and-control approach for compliance which it rejected in 1990, but which EPA seems so eager now to reembrace. It is worth pointing out here that while the United States may be producing more than its share of CO_2 on a GDP basis, it is ahead of the rest of the world (including the EU) in reducing health-related pollutants, including the other major greenhouse gases (methane, soot and ozone).[1] Increasing environmental costs imposed here relative to those imposed abroad exacerbates trade tensions here, especially where unnecessary command-and-control costs are involved.

When we worked on the CAA Amendments in 1990, we never assumed that they would not be supplemented in 10–15 years just as previous amendments had been periodically revised—or that the next revision might not seek an additional 50 percent SO_2 cut. But, to repeat, it is imperative that if Congress is to seek any additional cuts, it do so not through the permitting nightmare and costly command-and-control methods of NSR, but rather through the highly successful and cost-effective cap-and-trade approach adopted in 1990. Failure to do so will abandon the market innovations of 1990, dramatically raise the cost and reduce the yield of air quality standards, and generally set back the efforts to curtail pollution by a decade or more.

APPENDIX

Electric Utility NOx Emissions (million tons/year)

APPLICABLE RULE	1990	1995	2000	2005	2010
Acid Rain program/CAAA 90[2]	6.7	6.1	4.6	4.3	4.2
Ozone Transport/NOx SIP Call further reductions[3]	....	....	....	−1.0	−1.142
TOTAL	6.7	6.1	4.6	3.3	3.058

[2] Source: Dept. of Energy, Annual Energy Outlook with Projections to 2020, December 2000 at 99.
[3] Source: Ozone Transport Rule.

[1] The current WHO ozone standard applicable in the EU is currently significantly less restrictive than the U.S. standard, and the EU Environmental Minister is resisting the European Parliament's efforts to tighten the WHO standard on the grounds that there is "insufficient scientific knowledge on ozone formation" and that total compliance might not be "efficient from an economic viewpoint."

Electric Utility NOx Emissions Compared to Mobile Source NOx Emissions (million tons/ year)

SOURCE	2000	2005	2010
Electric Utilities	4.6	3.3	3.058
Mobile Sources[4]	11.678	8.132	6.078

[4] Includes Heavy Gas Vehicles, Heavy Diesel Engines, Diesel Engines, and other vehicles regulated under Tier II, Highway Diesel Fuel Sulphur, and Regulation of Heavy Duty Engine Rules.

Electric Utility SO_2 Reductions (million tons/ year)

	1990	1995	2000	2005	2010
Electric Utilities	15.7	11.9	11.5	10.3	9.3
Mobile Sources	....	....	1.5	0.8	0.255

STATEMENT OF CONRAD G. SCHNEIDER, ADVOCACY DIRECTOR, CLEAN AIR TASK FORCE, U.S. PUBLIC INTEREST RESEARCH GROUP

Summary of Testimony

Mr. Chairman, members of the Senate Environment and Public Works Committee, Good morning, my name is Conrad Schneider, Advocacy Director of the Clean Air Task Force. I appreciate the opportunity to speak to you today. Based in Boston, the Clean Air Task Force is a national non-profit, environmental advocacy organization whose mission includes reducing the adverse environmental impacts of fossil-fuel electric generating plants. Our staff and consultants include scientists, attorneys, economists, and engineers. Today I am testifying on behalf of Clear the Air: The National Campaign Against Dirty Power, a joint effort of the Task Force, the National Environmental Trust, and the United States Public Interest Research Group Education Fund; a campaign that involves over 120 organizations in 40 States.

The adverse public health and ecological impacts from the nation's older coal-and oilfired fleet of power plants are so numerous and so significant that it is scarcely possible to do more than list them in 5 minutes of testimony. Electric power plants are by most measures the nation's largest industrial air polluter. Power plant emissions are the biggest contributor to the single largest environmental risk to public health: disease and premature death due to inhalation of fine particles. Power plant air emissions cut a broad swath of damage across human health, and the local, regional and global environment. Unhealthy levels of ozone smog that trigger millions of asthma attacks each summer; fine particles that shave years off peoples lives and damage lungs; the damage to forests, lakes, bays and crops due to acid rain; mercury contamination of fish and wildlife; shrouds of haze in our national parks; and contributions to greenhouse gasses; the damage from fuel extraction, and groundwater contamination from the lack of proper disposal of solid and liquid waste from power plant fuel combustion—these are just some of the major problems associated with the nation's fossil electric generating fleet. Attachment 1 illustrates the many different ways in which power plant pollution affects our lives and the natural world around us.

The best available scientific evidence demonstrates that very deep cuts are needed in all four major power plant pollutants: sulfur dioxide, nitrogen oxides, mercury and other air toxics, and carbon dioxide:

- Research from the nation's top acid rain scientists at Hubbard Brook Research Foundation indicates that nothing short of the 75 percent reductions in sulfur dioxide and nitrogen oxides called for in the Clean Power Act of 2001 (S. 556) will be sufficient to allow damaged ecosystems to begin to recover by mid-century.
- Analysis of power plant health impacts performed using methodology approved by U.S. EPA's Science Advisory Board found that fine particles from power plant sulfur dioxide and nitrogen oxide emissions shorten the lives of over 30,000 Americans each year, and that a 75 percent cut in these pollutants would avoid over 18,000 of these premature deaths. Lesser reductions will avoid fewer unnecessary deaths.
- Pristine vistas in our national parks and wilderness areas will be restored only with pollution reductions of this magnitude.

• Mercury from a variety of sources over the years has contaminated the food chain to the point that in over 40 States people are warned to limit or avoid consumption of fish for fear of neurotoxicological effects. Power sector reductions of mercury of up to 90 percent are feasible with current technology, and reductions of 90 percent or more appear commercially viable within the time horizon contemplated by the Clean Power Act of 2001. Technical means include coal cleaning, sulfur dioxide and nitrogen oxides scrubbing co-benefits, fabric filters, carbon sorbent injection, adoption of cleaner fuels, and a greater reliance on energy efficiency and clean renewable energy resources.

• The buildup of carbon dioxide and other heat-trapping gases in the atmosphere is primarily responsible for the unprecedented global warming seen over the last 50 years, according the National Research Council. As the Council recently concluded, the adverse health and environmental impacts of climate change are real. The largest source of carbon dioxide in the United States is the electric power industry, accounting for 40 percent of all U.S. emissions. Of that, more than 88 percent of power plant emissions come from older, less efficient coal-fired facilities. Any rational policy dealing with the U.S. contribution to climate change must include power sector carbon reductions. Capping power sector emissions of carbon dioxide at 1990 levels, in accord with the Rio Treaty, is technically feasible. This will require an expansion of the nation's use of energy efficiency, clean renewable, and gas-fired energy sources, and potentially the use of advanced coal technologies.

For a host of reasons, the time is right for action finally to reduce the devastating effects of power plant pollution. We commend Senator Jeffords and the members of this committee for advancing the issue and look forward to working with you as the process continues. There will be many points of agreement and disagreement among the affected parties around issues of implementation, costs, etc. However, public health and protection of the environment demand that emission reductions as prescribed by the Clean Power Act of 2001 must be achieved and achieved as quickly as possible. I would be happy to answer any questions.

Mr. Chairman, members of the Senate Environment and Public Works Committee, Good morning, My name is Conrad Schneider, Advocacy Director of the Clean Air Task Force. I appreciate the opportunity to speak to you today. Based in Boston, the Clean Air Task Force is a national non-profit, environmental advocacy organization whose mission includes reducing the adverse environmental impacts of fossil-fuel electric generating plants. Our staff and consultants include scientists, attorneys, economists, and engineers. Today I am testifying on behalf of Clear the Air: The National Campaign Against Dirty Power, a joint effort of the Task Force, the National Environmental Trust, and the United States Public Interest Research Group Education Fund; a campaign that involves over 120 organizations in 40 States.

Electric power plants are by most measures the nation's largest industrial air polluter. Power plant emissions are the biggest contributor to the single largest environmental risk to public health: death and disease due to inhalation of fine particles. Power plant air emissions cut a broad swath of damage across human health, and the local, regional and global environment. Unhealthy levels of ozone smog; fine particles that shave years off peoples lives and damage lungs; the damage to forests, lakes, bays and crops due to acid rain; mercury contamination of fish and wildlife; shrouds of haze blanketing our national parks; contributions to greenhouse gasses; and groundwater contamination from the lack of proper disposal of solid and liquid waste from power plant fuel combustion—these are just some of the major environmental problems associated with the nation's fossil electric generating fleet. Attachment 1 illustrates the many different ways in which power plant pollution affects our lives and the natural world around us.

Although to date the Clean Air Act has taken a pollutant-by-pollutant approach, the suite of pollutants from power plants: sulfur dioxide, nitrogen oxides, mercury and other air toxics, and carbon dioxide interact and operate synergistically to damage the environment. For example, global warming will likely increase the incidence and severity of summer smog episodes; acidification of water bodies mobilizes existing deposits of mercury meaning more mercury uptake into the food chain, etc. For these and other reasons (cost-effectiveness, planning certainty for industry, etc.) the problem of power plant pollution demands a comprehensive solution that includes all four major power plant pollutants.

Moreover, the best science available demonstrates that public health and ecosystem protection demand steep cuts in all four of these pollutants:

• Reductions in power plant emissions of sulfur dioxide and nitrogen oxides on the order of 75 percent beyond current law.
• Mercury emission reductions of 90 percent from current levels.
• Power plant carbon dioxide caps set at 1990 levels.

I will address the impacts from each of these pollutants in turn and discuss the science that supports these reduction targets:

Sulfur Dioxide

The problems associated with sulfur dioxide include: damage from acid rain, deadly fine particles, and the haze that obscures scenic vistas in national parks and our urban areas. Power plants emit about two-thirds of the sulfur dioxide emitted in the United States each year.

Sulfur Dioxide Reductions of 75 Percent or More are Necessary to Allow Ecosystem Recovery from Acid Rain by Mid-Century

It is increasingly well-documented that the problem of acid rain has not been solved and that the acid rain provisions of the 1990 Clean Air Act Amendments will not be sufficient to solve it. Over 150 years of deposition of sulfur has taken a serious toll on ecosystems. Although sulfur emissions have declined somewhat in recent years, they remain very high when compared to historic levels. See Attachment 2.

As a result of this legacy, lakes and streams and the aquatic life that live in them are experiencing the most widespread impact from high concentrations of acidity. The majority of sensitive waterbodies are those that are located atop soils with a limited ability to neutralize (or buffer) acidity. Sensitive areas in the United States include the Adirondack Mountains, Mid-Appalachians, southern Blue Ridge[1] and high-elevation western lakes.[2] Water bodies are affected not just by the chronic acidification that occurs from cumulative deposition but also by episodic acidification that occurs when pulses of highly acidic waters rush into lakes and streams during periods of snowmelt (acids have collected in the snow over the winter) and heavy downpours.

In some places, chronic and episodic acidification together have completely eradicated fish species. For example, acid-sensitive fish have disappeared and/or populations have been reduced in Pennsylvania streams where they formerly occurred in large numbers. Acidification, together with high levels of aluminum leaching, is blamed for the reduction in fish diversity that many Pennsylvania streams have experienced over the past 25–34 years.[3]

Acid rain also saps calcium from the needles of trees, weakening the cell membranes and making the trees susceptible to damage from freezing in the winter and more vulnerable to diseases and/or insect outbreaks.[4] Acid rain also depletes soil nutrients—largely calcium and magnesium—needed for healthy forest growth. The U.S. Geological Survey has shown that calcium in forest soils has decreased at locations in the northeastern and southeastern United States, forest soils, with acid rain being one of the major factors contributing to this depletion.[5]

Although most evidence shows that conifers tend to be more impacted than hardwood trees, acid rain is also hurting deciduous trees. Detection of patches of dead trees in northern hardwood forests of the Southern Appalachian National Forests has been attributed to the interactions of many stressors, including air quality.[6]

Some specific problems that are documented to be associated with acidic deposition are:

- Preliminary work suggests that episodic acid deposition has contributed to the decline of Atlantic salmon in Maine, with this periodic acidification having the greatest impact on smolts and fry.[7]
- Forty-one percent of lakes in the Adirondack region of New York and 15 percent of lakes in New England are either chronically or periodically acidic. Nearly 25 percent of surveyed lakes in the Adirondacks do not support any fish, and many

[1]US EPA 1995. Acid Deposition Standard Feasibility Study Report to Congress. EPA 430-R–95–001 a. http://www.epa.gov/acidrain/effects/execsum.html

[2]National Acid Precipitation Assessment Program (NAPAP). 1998. Biennial Report to Congress: an Integrated Assessment. http://www.nnic.noaa.gov/CENR/NAPAP/NAPAP 96.htm

[3]Heard, R.M., W.E. Sharpe, R.F. Carline and W.G. Kimmel. 1997. Episodic acidification and changes in fish diversity in Pennsylvania headwater streams, Transactions Am. Fisheries Soc. 126: 977–984.

[4]Dehayes, Donald H., P.G. Schaberg, G.J. Hawley, and G.R. Strimbeck. 1999. Acid Rain Impacts on Calcium Nutrition and Forest Health—Alteration of Membrane-Associated Calcium Leads to Membrane Destabilization and Foliar Injury in Red Spruce. BioScience: 49(10).

[5]USGS. 1999. Soil-Calcium Depletion Linked to Acid Rain and Forest Growth in the Eastern United States. http://bgs.usgs.gov/acidrain/

[6]U.S. Forest Service. 1997. Forest Service and Air Management. George Washington and Jefferson National Forests. http://svinet2.fs.fed.us:80/gwjnf/airpollution.html

[7]Haines, T.A., S.A. Norton, J.S. Kahl, C.W. Fay, and S.J. Pauwels. 1990. Intensive studies of stream fish populations in Maine. Ecological Research Series. U.S. Environmental Protection Agency. Washington, DC. 354 pp.

others have less aquatic life and reduced species diversity when compared to less acidic lakes.[8] Acid rain is the major cause of red spruce mortality in New York.[9]

- Reduction in fish diversity in northwest Pennsylvania is linked to aluminum leaching from acid rain. Comparison of fish data collected in the Allegheny Plateau and Ridge and Valley region 40 years ago to data collected in the mid–1990's found an overall decrease in species diversity, with the most dramatic declines occurring in five species of non-game, acid-sensitive fish. Streams that experienced a loss of species had greater increases in acidity and more episodic acidification than streams that either gained or had no change in species.[10] In the same area, acid rain has been associated with poor sugar maple and red oak regeneration as well as deterioration of tree health and excessive mortality in mature trees of both species.[11]
- The West Virginia Department of Natural Resources has identified hundreds of miles of streams that are chronically acidic and is currently liming 60 streams to offset the damage from acidic deposition.

Episodic acidification is "ubiquitous" in Shenandoah National Park streams, and chronic acidification of surface; water is also a serious concern. Values of pH as low as 5.0 (nearly as acidic as lemon juice) are common in these streams.[12] In spring, 2001, Paine Run River was placed on the American River's Most Endangered list because, without further cuts in air pollution, it will become too acidic to sustain populations of brook trout and other aquatic organisms. Thirty percent of trout streams in Virginia are either chronically (6 percent) or episodically (24 percent) acidic and therefore either marginal or unsuitable for acid-tolerant brook trout.[13] By the time acid-tolerant species are affected, there are many acid-sensitive species that are no longer productive.

- Great Smoky Mountains streams are very sensitive to acidic deposition. The sensitivity of these sites has emerged later than was observed in the Northeast, suggesting that it took longer to leach out agents that were able to buffer sensitive sites from acidity. Many high elevation streams are currently acidic.[14] Acidic deposition is also causing forest soils to experience chemical imbalances that are contributing to tree stress.[15] [16]
- Many soils in the Southeast are already nutrient-poor. Human intervention, and in particular the chronic loading of sulfate and nitrate from acidic deposition, has made already calcium-poor soils more calcium deficient. Analyses at forest sites in the southeastern United States suggest that within 80 to 150 years, soil calcium reserves will not be adequate to supply the nutrients needed to support the growth of merchantable timber. [17]
- Because pollutants cross borders, there is documented damage in Canada as well. Atlantic salmon habitat in Nova Scotia rivers has been seriously reduced by

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[8]Baker, J.P., J. Van Sickle, C.J. Gagen, D.R. DeWalle, W.E. Sharpe, R.F. Carline, B.P. Baldigo, P.S. Murdoch, D.W. Bath, W.A. Kretser, H.A. Simonin, and, P.J. Wigington. 1996. Episodic Acidification of Small Streams in the Northeastern United States: Effects on. Fish Populations. Ecological Applications 6(2): 422–437.

[9]Driscoll, C.T., Lawrence, G.B., Bulger, A.T., Butler, T.J., Cronan, C.S., Eagar, C., Lambert K.F., Likens, G.E., Stoddard, J.L. and Weathers K.C., 2001. Acidic deposition in the Northeastern United States: Sources, inputs, ecosystem effects and management strategies. Bioscience. 51(3).

[10]Heard, R.M., W.E. Sharpe, R.F. Carline and W.G. Kimmel. 1997. Episodic acidification and changes in fish diversity in Pennsylvania headwater streams. Transaction Am. Fisheries Soc. 126:977–984.

[11]Sharpe, William and Joy R. Drohan, eds. 1998, The Effects of Acidic Deposition on Pennsylvania's Forests. Proceedings of the 1998 PA Acidic Deposition Conference. Vol. 1. Environmental Resources Research Institute, University Park, PA.

[12]Bulger, A.J., B.J. Cosby, C.A. Dolloff, K.N. Eshleman, J.R. Webb, and J.N. Galloway. 2000. Shenandoah National Park. Fish in Sensitive Habitats Final Report. University of Virginia and Virginia Polytechnic Institute and State University. Report to the National Park Service, Coop Agreement CA–40002–1007.

[13]Bulger, A.J., B.J. Cosby, and J.R. Webb. 2000. Current, reconstructed past, and projected future status of brook trout (*Salvelinus fontinalis*) streams in Virginia. Canadian Journal of Fish and Aquatic. Sci 57: 15151523.

[14]Cook, R.B., J.W. Elwood, R.R. Turner, M.A.. Bogle, P.J. Mulholland, and A.V. Palumbo. 1994. Acidbase chemistry of high-elevation streams in the Great Smoky Mountains. Water, Air and Soil Pollution 72:331–356.

[15]DeFelice, T.P. 1997. Investigation of wet acidic deposition episodes capable of damaging Red Spruce in the Mt. Mitchell State Park. Atmospheric Research. 43: 325–344.

[16]McLaughlin, S, J. D. Joslin; W. Robarge, A. Stone, R. Wiimer and S. Wullschleger. 1998. The impacts of acidic deposition and global change on high elevation southern Appalachian spruce-fir forests. From The productivity and sustainability of southern forests ecosystems in a changing environment. Springer-Verlag, New York: 255–277.

[17]Huntington, Thomas. 2000. The Potential for Calcium Depletion in Forest Ecosystems of Southeastern United States: Review and Analysis. 14(2) 623–638.

increased acidity. A study of 49 rivers that historically supported salmon found populations to be extinct in 14 rivers and severely impacted in 20. Loss of salmon is correlated with increased acidity.[18] Sensitive watersheds, located primarily in central Ontario and Quebec, have not responded to reductions in sulfate deposition as well or as rapidly as those in less-sensitive regions. At the current sulfur deposition levels (20 kg wet sulfate/ha/yr.), roughly 95,000 lakes will continue to be damaged by acid deposition. Lakes continue to acidify despite reductions in sulfur deposition.[19] Modeling found that after full implementation of the acid rain program of the Clean Air Act Amendments of 1990 and Air Quality agreements that 76,000 lakes in SE Canada will remain damaged, that is have a pH below 6.[20]

• A continuing decline in soil nutrients, due to acidic deposition, is occurring in forest ecosystems in Ontario and Quebec. In Ontario, levels of acidic deposition are accelerating the loss of base cations and essential nutrients from soils that support sugar maple dominated hardwood forests. In Quebec, studies have shown the nutrient status of sugar maple seedlings declined as soil acidification levels and soil base saturation decreased. At current deposition levels, these effects will likely be sustained or increased. With sustained soil nutrient loss, not only will nutrient uptake by tree roots be reduced, but also forest ecosystem productivity will decline.[21]

Despite declines in power plant sulfur emissions due to acid rain provisions of the 1990 Clean Air Act amendments, the acidity of many waterbodies has not improved.[22] Scientists believe that cuts called for in the 1990 amendments to the Clean Air Act will not be adequate to protect surface water and forest soils of the northeastern United States.[23]

What will it take to reverse the impacts of nitrogen saturation, ozone and acid rain? Recent work by scientists with the Hubbard Brook Research Foundation found that an additional 80 percent reduction in sulfur from levels achieved by Phase II of the acid rain program of the Clean Air Act Amendments of 1990 would be needed to allow biological recovery to begin mid century in the Northeastern United States.[24] Model simulations in the Shenandoah project that greater than 1970 percent reduction in sulfate deposition (from 1991 levels) would be needed to change stream chemistry such that the number of streams suitable for brook trout viability would increase. A 70 percent reduction would simply prevent further increase in Virginia stream acidification.[25] In the Great Smoky Mountains National Park, two separate ecosystem models have concluded that sulfate reductions of 70 percent are necessary to prevent acidification impacts from increasing. Deposition reductions above and beyond these amounts are necessary to improve currently degraded aquatic and terrestrial ecosystems.[26] [27] To reverse and recover from acidic deposition impacts, Canadians in the Acidifying Emissions Task Group have recommended a 75 percent reduction in U.S. sulfur emissions, post Phase II of the acid rain program of the Clean Air Act Amendments of 1990.[28] Thus, nothing short of the overall

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[18]Watt, W.D., C.D. Scott, P.J. Zamora and W.J. White. 2000. Acid Toxicity Levels in Nova Scotian Rivers have not Declined in Synchrony with the Decline in Sulfate Levels. Water Air and Soil Pollution. 118(3–4): 203–229.

[19]Environment Canada, 1997. Canadian Acid Rain Assessment, Volume 3. The Effects on Canada's Lakes, Rivers and Wetlands.

[20]Jeffries, D.S., D.C.L. Lam, I. Wong, and M.D. Moran, 2000. Assessment of Changes in the Lake pH in Southeastern Canada Arising from Present Levels and Expected Reductions in Acidic Deposition. Can. J. Fish Aquat. Sci. 57(Suppl2): 40–49.

[21]Duchesne, D. Houle and P.A. Arp. 2000. Critical Loads and Exceedances of Acid Deposition and Associated Forest Growth in the Northern Hardwood and Boreal Coniferous Forests in Quebec, Canada. Water Air Soil Pollution

[22]Stoddard, J.L.; D.S. Jeffries; A. Lukewill; T.A. Clair; P.J. Dillon; C.T. Driscoll; M. Forsius; M. Johannessen; J.S. Kahl; J.H. Kellog; A. Kemp; J. Mannio; D.T. Montelth; P.S. Murdoch; S. Patrick; A. Rebsdorf, B.L. Skjelkvale; M.P. Stainton; T. T'raaen; H. van Dam; K.E. Webster; J. Wieting and A. Wilander. 1999. Regional Trends in Aquatic Recovery from Acidification in North America and Europe. Nature. 401: 575–579.

[23]"Acid Rain Revisited: Advances in Scientific Understanding Since the Passage of the 1970 and 1990 Clean Air Act Amendments, Hubbard Brook Research Foundation (2000); Driscoll, Charles T., et al., Acid Deposition in the Northeastern U.S.: Sources and Inputs, Ecosystems Effects, and Management Strategies. BioSience. Vol. 51, no. 3; Likens, G.E., C.T. Driscoll and D.C. Buso. 1996. Science. Long-Term Effects of Acid rain: Response and Recovery of a Forest Ecosystem. 272: 244–46.

[24]Driscoll, C.T, supra.

[25]Ibid.

[26]Cosby, B.J. and T.J. Sullivan. 1998. Final Report: Application of the MAGIC Model to Selected Catchments: Phase I, Southern Appalachian Mountain Initiative (SAMI).

[27]Munson, R.K. 1998. Application of the NuCM Model to Noland Divide, White Oak Run and Shaver Hollow for SAMI Phase I. Final Report.

[28]The Acidifying Emissions Task Group. 1997. Toward a National Acid Rain Strategy submitted to the National Air Issues Coordinating Committee.

75 percent reduction called for in the Clean Power Act of 2001 will finish the job of solving the acid rain problem. Tighter targeted cuts may be necessary for sources directly impacting sensitive areas. The longer we wait for the reductions to begin, the longer we will await recovery of these systems.

A 75 Percent Reductions in Power Plant Sulfur Dioxide Emissions will Avoid Over 18,000 Particulate-Related Premature Deaths Each Year

One of the air pollutants most carefully studied in the 1990's is particulate matter. Fine particles, such as those that result from power plants emissions, defeat the defensive mechanisms of the lung, and can become lodged deep in the lung where they can cause a variety of health problems. See Attachment 3. New evidence indicates that short-term exposures cannot only cause respiratory (e.g., triggering asthma attacks), but also cardiac effects, including heart attacks.[29] In addition, long-term exposure to fine particles increases the chances of death, and has been estimated to shave years off the life expectancy of people living in our most polluted cities, relative to those living in cleaner ones.[30]

Fine particulate matter may be emitted directly from tailpipes and smokestacks (known as "primary" particulate matter), but the largest proportion of fine particles come from gas emissions (called "secondary" particulate matter). Sulfur dioxide emissions from coal plants contribute the most to secondary particle formation. Sulfur dioxide is chemically altered in the atmosphere after it is released from a smokestack to become a "sulfate" particle. Sulfates include sulfuric acid particles that, when breathed, reach deep into the human lung. Indeed, analysis of the relative toxicity of particles indicates that sulfate particles are among the most toxic.[31] In the East and Midwest United States, sulfate makes up the largest proportion of the particles in our air-in many regions well over half of the fine particles. Moreover, power plants currently emit two-thirds of the sulfur dioxide in the United States. Therefore, to reduce particulate matter, major reductions in pollution emissions from fossil-fuel power plants are needed.

The hazards of particulate matter have become particularly clear in the past decade's research. Two of the largest landmark studies on particulate matter and death, the Harvard Six Cities Study, published in 1993, followed by the American Cancer Society Study in 1995, demonstrated greater risk of premature death from particulate matter in more polluted cities compared to cities with cleaner air. The Harvard Six Cities study monitored particulate matter and tracked mortality in Six U.S. cities and discovered a 25 percent higher risk between the cleanest city, Portage Wisconsin and the dirtiest, Steubenville Ohio. Fine particles, especially sulfates, were most strongly associated with excess mortality in polluted cities. The American Cancer Society study examined half a million people in over 150 metropolitan areas throughout the United States and found a 17 percent greater relative risk of mortality between the city with the least sulfate and particulate matter and the city with the highest levels of this particulate pollution. The results of these studies were challenged by industry resulting in an independent reanalysis by the Health Effects Institute (HEI)-funded by industry and EPA. HEI found the results to be robust and actually strengthened the associations found by the original investigators.[32]

Thus, the evidence is clear, and has been confirmed independently, fine particle air pollution, and especially those particles emitted primarily by fossil-fuel power plants, are adversely affecting the lives and health of Americans. The importance of these particulate matter-health effects relationships is made clear by the fact that virtually every American is directly impacted by this pollution. Indeed, a recent analyses by Abt Associates using the methodology approved by EPA's independent Science Advisory Board estimated that emissions from power plants alone are re-

[29] Gold, D. et al., "Ambient Pollution and Heart Rate Variability," Circulation, v. 101, 1267–1273, American Heart Association (March 21, 200); Peters, A. et al., "Increases in Heart Rate Variability During an Air Pollution Episode," 150 American Journal of Epidemiology, p. 1094–1098 (1999); Peters, A. et al., "Air Pollution and Incidence of Cardiac Arrhythmia," 11 Epidemiology, no. 1, p. 11–17 (2000); Schwartz, J., "Air Pollution and Hospital Admissions for Heart Disease in Eight U.S. Counties, 10 Epidemiology 1722 (1999).

[30] Pope, C.A., "Epidemiology of Fine Particulate Air Pollution and Human Health: Biologic Mechanisms and Who's at Risk?" 108 Env. Health Persp. (Supp 4) 713–723 (August 2000).

[31] Thurston, George, "Determining the Pollution Sources Associated with PM Health Effects," Air And Waste Management Association (January 1998); Laden F, Neas LM, Dockery DW, Schwartz J. Association of fine particulate matter from different sources with daily mortality in six U.S. cities. Environ. Health Perspect. 108: 941–947(2000).

[32] Krewski, D., Burnett, R.T. Goldberg, M.S., Hoover, K., Siemiatycki, J., Jerrett, M., Abrahamowicz, A. and White, W.H., "Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Matter and Mortality," Health Effects Institute, Cambridge, MA (2000).

sponsible for about 30,000 premature deaths per year—more than from drunk driving or homicides. That same study determined that a 75 percent reduction in power plant sulfur dioxide and nitrogen oxide emissions would result in reduced fine particle levels and avoid over 18,000 premature deaths per year—more lives than are saved by safety belts each year.[33] The greatest risk is faced by people living in the Midwest and Southeast where the greatest concentrations of coal-fired power plants are located. See Attachment 4.

In addition, recent work by researchers at the Harvard School of Public Health including that summarized in "Risk in Perspective",[34] the journal of the Harvard Center for Risk Analysis, found that the risk from power plant pollution is not evenly distributed geographically. The risk was found to be greatest in relatively close proximity to the power plants: people living within 30 miles of a plant were found to face a risk of mortality from the plant's emissions 2–3 times greater than people living beyond 30 miles do.[35] These "local" impacts suggest that a national "cap-and-trade" program that allows some plants to escape pollution controls through the purchase of emission credits will not reduce the specific risk posed by those emissions to the surrounding population. This work supports the need for the "birthday bill" provision of the Clean Power Act of 2001 that requires each facility to meet modern pollution standards by a date certain.

These scientific studies have found that the relationship between fine particles and premature mortality is linear—meaning that every additional ton of pollution we remove from the air will carry an additional, incremental benefit in saving more lives. The chart in Attachment 5 compares the benefits of several power plant bills introduced in the last Congress. With technology available today that can cost-effectively reduce power plant sulfur dioxide emissions by up to 90–95 percent,[36] public health demands that Congress adopt emissions cuts no less stringent than those called for in the Clean Power Act of 2001.

A 75 Percent Reduction in Power Plant Sulfur Dioxide will be Necessary to Regain Pristine Vistas in our National Parks and Wilderness Areas

In the last several decades, visibility—how far you can see on an average day—has declined dramatically, especially in the Eastern half of the United States. In the East, annual mean visibility is commonly one quarter of natural conditions and as little as oneeighth in the summer. One of the greatest casualties of this upsurge in regional haze has been the national parks. An example of the magnitude of visibility decline due to high air pollution levels are shown in the Great: Smoky Mountains National Park slide attached to this testimony. See Attachment 6.

There is no question that power plants are the major driver of this problem: visibility impairment has tracked closely in parallel with sulfate and electric power production for nearly half a century. Taken together, sulfur, carbon and nitrogen oxide emissions are responsible for about well over 80 percent of this visibility impairment. When these components are assessed for their contribution to the problem, electric power is accountable for about ⅔ of the emissions that lead to regional haze-related visibility impairment in the East, most of which is caused by sulfate.

Half-measures will not solve the problem of visibility impairment in our nation's parks. EPA has set a long-term goal of eliminating man-made haze by 2060. That goal will never be achieved without steeply cutting power plant emissions consistent with the reduction targets in the Clean Power Act of 2001. Indeed, the cuts in sulfur dioxide to date under the acid rain program have not led to perceptibly improved vistas. Research shows that visibility improves more rapidly with deeper cuts in sulfate. Thus, we will achieve pristine views in those areas shrouded in a sulfate haze only when the deepest cuts in sulfur dioxide emissions have been achieved.

There is concern about haze from other quarters as well. New research is showing that both haze and particulate matter are depressing optimal yields of crops.[37] Yield decreases in the northeastern United States are estimated to be occurring in

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[33] "Death, Disease, and Dirty Power," Clean Air Task Force (2000); "The Particulate-Related Benefits of Reducing Power Plant Emissions," Abt Associates (2000).

[34] Levy, J. and Spengler, J., "Health Benefits of Emissions Reductions From Older Power Plants," Risk in Perspective/Harvard Center for Risk Analysis Vol. 9, Issue 2 (April 2001).

[35] Levy, J., Spengler, J., Hlinka, D. and Sullivan, D., "Estimated Public Health Impacts of Criteria Pollutant Air Emissions from the Salem Harbor and Brayton Point Power Plants." Available online at www.hsph.harvard.edu.

[36] Srivastava, R.K. (2000) EPA ORD Control of SO_2 Emissions: An Analysis of Technologies. EPA/600R00/093.

[37] Chameides, W.L., H. Yu, M. Bergin, X. Zhou, L. Megarns, G. Wang, C.S. Kiang, R.D. Saylor, C. Luo, Y. Huang, A. Steiner and F. Giorgi. 1999. Case: Study of the Effects of Atmospheric Aerosols and Regional Haze on Agriculture: An Opportunity to Enhance Crop Yields in China through Emission Controls? PNAS. 96(24): 13626–13633.

the 5—10 percent range. In the Southeast the decrease in optimal yields for summertime crops is likely higher—about 10—15 percent.

Nitrogen Oxides

The problems associated with nitrogen oxides include the massive health and ecosystem damage due to ozone smog and nitrogen deposition. Power plants are responsible for about one-quarter of the nitrogen oxides emitted in the United States each year.

A 75 percent Reduction is Necessary to Reduce Ozone Smog and Help Attain the New Ozone Standard

Ground level ozone is a colorless, odorless pollutant that causes respiratory damage ranging from temporary discomfort to long-term lung damage. According to a recent study[38], in the Eastern half of the United States, ground level ozone sends an estimated 159,000 people to emergency rooms each summer; triggers 6.2 million asthma attacks, and results in 69,000 hospital admissions. Many more millions of Americans experience other respiratory discomfort. The year 2000 saw one of the worst ozone summers in recent history, with more than 7,000 violations of the Federal ozone health standard.

Although much of the controversy around ground level ozone in recent years has centered on ozone levels in the Northeast, and the impact of Midwest and Southern emissions on the Northeast, this misses an important part of the story. In fact, many Midwestern and Southeastern States suffer greater ozone exposures and per capita health impacts than many Northeast States. According to a recent study by the Ohio Environmental Council, in collaboration with the University of Michigan and Harvard University,[39] for example, people in Ohio River Valley communities such as Cincinnati and Marietta, Ohio are often exposed to dangerous levels of ground level ozone as much as 75 percent more than people in Boston and New York. Ohio River Valley ozone hospital admission rates also track this pattern—with admission rates higher in the Ohio Valley than in the East. Similarly, some of the nation's highest and most persistent ozone smog violations are outside of the cities, in places considered pristine—places like the Great Smokies (there were an astonishing 52 exceedance days of the 8 hour ozone standard in the Great Smoky Mountains National Park in 1999 where it is now unhealthy to breathe on about half of the days of summer), Door Country, Wisconsin, and the nation's seashore points.[40]

The reason is not hard to discern. There is a high correlation between elevated ground level ozone and proximity to power plants—especially in the Midwest and Southeast where roughly 60 percent of the nation's coal-fired generating capacity is located. In the Ohio Valley area studied, for example, emissions from coal-and oil-fired power plants contribute nearly fifty percent of elevated ozone levels in the Valley, enough by themselves to cause violations of the Federal health standard.[41]

Crop Losses Due to Ozone Smog

Human health is not smog's only victim. There is strong scientific evidence showing that current levels of ground level ozone are reducing yields, particularly in sensitive species—soybean, cotton, and peanuts from NCLAN studies. Annual crop loss from ozone for soybeans alone in Illinois, Indiana and Ohio has been calculated to fall between $198,628,000—345,578,000. Ozone-induced growth and yield losses for the seven major commodity crops in the Southeast (sorghum, cotton, wheat barley, corn, peanuts and soybeans) are costing southeastern farmers from $213–353 million annually.[42]

Year Round Reductions of Nitrogen Oxides will be Necessary to Minimize the Effects of Nitrogen Deposition

Power plant nitrogen emissions deposited on land and water—sometimes at great distances from their original sources—is an important contributor to declining water

[38]Abt Associates, "Out of Breath: Adverse Health Effects Associated with Ozone in the Eastern United States," Abt Associates (October 1999).

[39]"Ozone Alley," Ohio Environmental Council (2000).

[40]"No Escape: Can You Really Ever Get Away-'from the Smog?" Clean Air Network and Clean Air Task Force (August 1999).

[41]"Ozone Alley" supra.

[42]Production and yield figures come from 1997 United States Department of Agriculture, National Agricultural Statistics Service. Ozone impact data comes from EPA 1996. Office of Air Quality Planning and Standards Staff Paper. Review of National Ambient Air Quality Standards for Ozone. EPA–452/R–96007.

quality.[43] Estuarine and coastal systems are especially vulnerable. Too much nitrogen serves as a fertilizer, causing excessive growth of seaweed. The result is visual impairment and loss of oxygen. With the loss of oxygen, many estuarine and marine species—including fish—cannot survive.[44]

The contribution of nitrogen from atmospheric deposition varies by watershed. In the Chesapeake Bay, atmospheric nitrogen accounts for 27 percent of nitrogen entering the system.[45] Of that amount, power plants account for about a third.

Nitrogen is also being deposited on ocean surfaces many, many miles away from land. Atmospheric nitrogen accounts for 46 to 57 percent of the total externally supplied (or new nitrogen) deposited in the North Atlantic Ocean Basin.[46]

Mercury

A 90 Percent Reduction in Mercury and other Power Plant Toxic Emissions is Necessary to Minimize the Risk to Children

Mercury is another power plant pollutant that poses a threat to human health and the environment. Exposure to mercury in the United States primarily comes from the consumption of freshwater, estuarine, marine fish and shellfish. Across the United States, mercury contaminates freshwater and saltwater fish populations, poses health risks to the people and wildlife that consume these fish and threatens the multibillion-dollar recreational and commercial fishing industries. State health departments in over 40 States have issued advisories warning the public about consuming certain species of fish in certain water bodies, 11 States have advisories for every water body and 13 now issue consumption advice for certain marine species. Methylmercury (the form of mercury in fish) is a developmental toxin and poses the greatest hazard during prenatal development. EPA has estimated that 3 million children and 4 million women of childbearing age are exposed to Methylmercury at levels above what EPA considers safe.

Coal-fired power plants are the largest emitters of mercury in the nation—they account for 33 percent of air emissions and have been linked to contamination of the nation's fisheries.[47] (Forty-one States have mercury fish consumption advisories, 11 have statewide advisories.)[48]

People are exposed to mercury primarily through eating contaminated fish. Most at risk is the developing fetus because mercury interferes with the normal development of the nervous system.[49] The fetus is exposed to mercury when the mother eats fish. Infants appear normal during the first few months of life, but later display subtle effects such as poor performance on tests of attention, fine motor function, language, visual-spatial abilities (e.g., drawing), and memory. According to the National Academy of Sciences, these children will likely have to struggle to keep up in school and might require remedial classes or special education.[50]

A recent Centers for Disease Control survey of hair and blood samples found that 10 percent of the women of childbearing age that were tested were above the EPA's safe level for mercury exposure.[51] Nationally, this translates into 6 million women of childbearing age with elevated levels of mercury from eating contaminated fish, and approximately 390,000 newborns at risk of neurological effects from being exposed in utero to elevated levels of mercury.[52]

Mercury pollution has been linked to a number of industrial sources. EPA estimates, however, that about a third of the nation's airborne mercury emissions come

[43]USEPA 1999 Office of Water, Oceans and Coastal Protection Division, Air Pollution and Water Quality, Atmospheric Deposition Initiative http://www.epa.gov/owow/oceans/airdep/

[44]USEPA 1997. Deposition of Air Pollutants to the Great Waters. Second Report to Congress, Office of Air Quality Planning and Standards. http://www.epa.gov/oar/oagps/gr8water/2ndrpt/execsumm.html

[45]Valigura, Richard, Winston Luke, Richard Artz and Bruce; Hicks. 1996. Atmospheric Nutrient Input to Coastal Areas. Reducing the Uncertainties. National Oceanic and Atmospheric Administration Coastal Ocean Program.

[46]Paerl, Hans, 1999. Atmospheric Nitrogen in North Atlantic Ocean Basin. Ambio (Royal Swedish Academy of Sciences Journal) (June 1999). Summary online: http://www.seagrantnews.org/news/19990630 n.html

[47]"USEPA, 1997. Mercury Study Report to Congress: Volume I Executive Summary." December. EPA 452/R–97–003.

[48]http://www.epa.gov/ost/fish

[49]USEPA, 1997b. *Mercury Study Report to Congress, Volume VII: Characterization of Human and Wildlife Risks from Mercury Exposure in the United States*. EPA–452/R–97–009.

[50]*Toxicological Effects of Methylmercury*, National Academy Press, Washington, DC, 2000. http://www.nap.edu

[51]U.S. Centers for Disease Control and Prevention. Blood and hair mercury levels in young children and women of childbearing age—United States, 1999. Morbidity and Mortality Weekly, March 2, 2001.

[52]Derived from 1990 census data. http://www.census.gov

from power plant smokestacks; this assessment ignores the likely additional mercury flows coming from power plant solid waste streams. EPA recently determined to regulate mercury from power plants, but industry has challenged that decision in court. Until these regulations go forward, power plants will remain the only large industrial source of mercury that is unregulated.

Power plants emit many other (HAPs) air pollutants. In EPA tests, 67 different HAPs were detected in the flue gas.[53] Of these, 55 are known to be neurotoxic or developmental toxins (i.e., affect development of a child's brain, nervous system or body). Examples include cadmium, manganese and selenium.[54] In addition, 24 are also known, probable or possible human carcinogens.[55] Examples include arsenic, chromium, and beryllium. Power plants rank first in release of toxics to the air—842 million pounds of chemical releases to the air in 1999 (Toxics Release Inventory).[56] This accounts for 40 percent of the nation's total.

The Clean Power Act of 2001 requires a 90 percent reduction in mercury emissions from power plants by 2007. Can a 90 percent reduction be in this timeframe? Yes. Numerous bench-scale and pilot-scale field studies of sorbent injection technologies developed specifically to capture mercury have demonstrated that removal efficiencies in excess of 90 percent are achievable[57,58] Recent data collected by the EPA on the mercury capture efficiency of conventional pollution controls illustrates that for some coals and pollution control devices, more than 90 percent of the mercury is already being captured.[59] In particular, for some coals, a combination of nitrogen oxides and sulfur dioxide controls can result in mercury removals ranging from 50 to more than 90 percent.[60,61]

To optimize the mercury capture efficiency of existing technologies the Department of Energy has committed to full-scale demonstration projects that are underway right now. These demonstration projects will be completed between 2002 and 2005—a consistent timetable for achieving significant mercury reductions by 2007. Previous demonstration projects of emerging technologies have achieved mercury reductions in excess of 80 percent.[62,63] In addition, the EPA states that controlling mercury emissions with multi-pollutant control technologies can be a cost-effective method for collectively controlling multiple pollutants. We believe that mercury legislation is needed as a technology-forcing mechanism and to provide the certainty that regulatory agencies, research groups, industry and equipment vendors need to carry their work through to full-scale commercialization within a reasonable, period of time.

Carbon Dioxide

The Power Sector Must Reduce Its Share of Greenhouse Gas Emissions

Carbon dioxide (CO_2) is a byproduct of burning fossil fuels such as coal and oil. In a balanced system, carbon dioxide helps regulate the Earth's climate. However, too much carbon dioxide causes excess heat to be trapped in the atmosphere, forcing global temperatures upward, the process known as global warming.

The largest source of carbon dioxide in the United States is the electric power industry, accounting for about 40 percent of all U.S. emissions. Of that, more than 88 percent of power plant emissions come from older, dirtier coal fired facilities. As a result of excessive burning of fossil fuels, carbon dioxide in the atmosphere has

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[53] USEPA, 1998. Study of hazardous air pollutant emissions from electric utility steam generating units—final report to Congress. February. 453/R–98–004a.

[54] National Environmental Trust (NET), et al. 2000. Polluting Our Future: Chemical Pollution in the U.S. that Affects Child Development and Learning. September. www.environet.org.

[55] USEPA, 1998. Study of hazardous air pollutant emissions from electric utility steam generating units—final report to Congress. February. 453/R–98–004a.

[56] USEPA, 2001. 1999 Toxics Release Inventory—Public Data Release. www.epa.gov/tri

[57] USEPA, Mercury Study Report to Congress, Volume VIII, EPA—452/R–97–010, December, 1997.

[58] Northeast States for Coordinated Air Use Management. Environmental regulation and technology innovation: controlling mercury emissions from coal-fired boilers. September 2000.

[59] Kilgroe, J. D. and R. K. Srivastava. EPA studies on the control of toxic air pollution emissions form electric utility boilers. Environmental Management, January 2001.

[60] Gutberlet et. al. (1992). Measurement of the trace element mercury in bituminous coal furnaces with flue gas cleaning plants. As cited in Sloss, L. 1995. Mercury emissions and effects—the role of coal. IEA Coal Research, United Kingdom.

[61] Kilgroe, J.D. and R.K. Srivastava. EPA studies on the control of toxic air pollution emissions form electric utility boilers. Environmental Management, January 2001.

[62] Pavlish, J.H. and M.D. Mann, An economic basis for developing mercury control strategies. Energy and Environmental Research Center, University of North Dakota. Presented at Power-GEN International, Orlando, Florida, December 9–11, 1998.

[63] Powerspan Press Release, August 23, 2000. Powerspan Corp.'s ECO Technology Demonstrates Unmatched Reductions in Mercury and Fine Particulate Matter.

increased 30 percent since the start of the industrial revolution, and is expected to continue climbing unless emissions are steadily reduced. If current energy trends continue, our atmosphere will contain twice as much carbon dioxide by 2050 as it did before the industrial revolution.

The Intergovernmental Panel on Climate Change (IPCC) recently detailed the sensitivity, adaptive capacity, the vulnerability of natural and human systems and the potential consequences of climate change in its "Climate Change 2001: Impacts, Adaptation, and Vulnerability" report.[64] For example, the IPCC found that a 5-degree increase in global temperatures over the next century could result in the death or displacement of hundreds of millions of people.[65] The White House, as part of its review of U.S. climate change policy requested the National Research Council to conduct a review of the IPCC report.[66] Among other questions, the White House asked the NRC to assess the likely consequences for the United States of climate change. In responding, the NRC relied heavily on the U.S National Assessment of Climate Change Impacts.[67]

Health Effects Associated with Climate Change

The NRC found that climate change has the potential to influence the frequency and transmission of infectious disease, alter heat-and cold-related mortality and morbidity, and influence air and water quality. Changes in the agents that transport infectious diseases (e.g., mosquitoes, ticks, and rodents) were found likely to occur with any significant change in precipitation and temperature. The Assessment tied increases in adverse air quality to higher temperatures. Children, the elderly, and the poor were considered most vulnerable to these adverse health outcomes.[68]

Ecological Impacts Associated with Climate Change

The Assessment found that coastal regions are at greatest risk from sea level rise and to increases in the frequency and severity of storms. Significant climate change will cause disruption to many U.S. ecosystems, including wetlands, forests, grasslands, rivers, and lakes.[69]

Regarding effects on crops, the Assessment found: that many crop distributions would change, thus requiring significant adaptations. Such changes were found likely to be more costly to small farmers than large corporate farms. Hotter, drier scenarios increase the potential for declines in both agriculture and forestry.[70]

Two articles in the most recent edition of the journal Science mark the first time scientists have computed the likelihood of a specific temperature increase rather than simply offering a range of possibilities. An Intergovernmental Panel on Climate Change committee released a report earlier this year saying a 5-degree increase would make it hot enough to cause severe weather that could kill or displace hundreds of millions of people. According to this latest research, there is a 90 percent chance that global warming will increase the Earth's temperature from 3 to 9 degrees Fahrenheit by the year 2100, and a 50–50 chance that a 5-degree increase will occur.[71]

Climate change cannot be reversed without significant cuts in U.S. emissions that contribute to the greenhouse effect. Thus was the conclusion that formed the basis for the Framework Convention on Climate Change and the 1992 Rio de Janeiro Treaty. The U.S. Senate unanimously ratified the Rio Treaty on October 7, 1992, shortly after its submission by President Bush. The Rio Treaty committed the United States to achieving a "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous interference with the climate system." Specifically, the Rio Treaty aimed at reducing carbon dioxide emissions to their 1990 levels by 2000. Obviously, the United States has not met the levels set out in the Accord. Instead, carbon dioxide emissions have risen by more than 15

[64] International Panel on Climate Change, "Climate Change 2001: Impacts, Adaptations, and Vulnerability—Summary for Policymakers (February 2001).

[65] Ibid.

[66] "Climate Change Science: An Analysis of Some Key Questions," Committee on the Science of Climate Change, Division of Earth and Life Studies, National Research Council (National Academy Press 2001).

[67] U.S. National Assessment. U.S. Global Change Research Program, "Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change", 2001 Cambridge University Press.

[68] Ibid.

[69] Ibid.

[70] Ibid.

[71] Wigley, T.M.L, and Raper, S.C.B., "Interpretation of High Projections for Global-Mean Warming " Science (July 2001); Goldenberg, Stanley B., Christopher W. Landsea, Alberto M. Mestas-Nunez, and William M. Gray, "The Recent Increase in Atlantic Hurricane Activity: Causes and Implications," Science (July 2000).

percent since 1990 according to the Energy Information Administration. Any rational plan to curb global warming must include sharp reductions in power plant carbon dioxide emissions. Power system reductions consistent with the Rio targets are included in the Clean Power Act of 2001.

Reductions Appropriate In Federal Policy

In each of the above areas, the best scientific evidence calls for large reductions in emissions:

- In the case of sulfur, cuts of at least 75 percent are suggested by the imperatives of ecosystem recovery; huge health and environmental dividends in the form of fine particle reduction and reduced haze will result as well.
- In the case of nitrogen oxides, ozone smog health impacts are roughly linear, and 75 percent cuts in nitrogen oxides will dramatically reduce summer smog as well as year round nitrogen and acid rain impacts.
- Mercury is highly toxic in small amounts, and, as for other industries, maximum available control thresholds should be pursued.
- While reducing U.S. power plant emissions alone will not solve the world climate change problem, an important start can be made in this sector. Reductions consistent with the nation's Rio treaty commitments—a return to 1990 levels—are an appropriate starting point.

Fortunately, the technology is at hand to dramatically reduce these power plant emissions and their resultant impacts throughout the nation, at reasonable costs. For example:

- Power sector reductions of sulfur dioxide of 75 percent beyond current law are readily achievable through a combination of flue gas desulfurization (scrubbing), use of cleaner fuels, and greater commitment to energy efficiency and renewable resources.
- Year round nitrogen reductions of 1975 percent or more are achievable through selective catalytic and non-catalytic reduction technology, low NOx burners, overfire air, and use of cleaner fuels, and greater commitment to energy efficiency and renewable resources.
- Power sector reductions of mercury in the range of up to 90 percent are currently feasible with some coals, and reductions of 90 percent or more from all coals appear commercially viable within the time horizon contemplated by the Clean Power Act of 2001. Technical means include coal cleaning, sulfur dioxide and nitrogen oxides scrubbing co-benefits, fabric filters, carbon sorbent injection, and adoption of cleaner fuels.
- The buildup of carbon dioxide and other heat-trapping gases in the atmosphere is primarily responsible for the unprecedented global warming seen over the last 50 years, according the National Research Council. As the Council recently concluded, the adverse health and environmental impacts of climate change are real. The largest source of carbon dioxide in the United States is the electric power industry, accounting for 40 percent of all U.S. emissions. Of that, more than 88 percent of power plant emissions come from older, less efficient coal-fired facilities. Any rational policy dealing with the U.S. contribution to climate change must include power sector carbon reductions. Capping power sector emissions of carbon dioxide at 1990 levels, in accord with the Rio Treaty, is technically feasible. This will require an expansion of the nation's use of energy efficiency, clean renewable and gas-fired energy sources, and potentially the use of advanced coal technologies.

The Time For Action Is Here

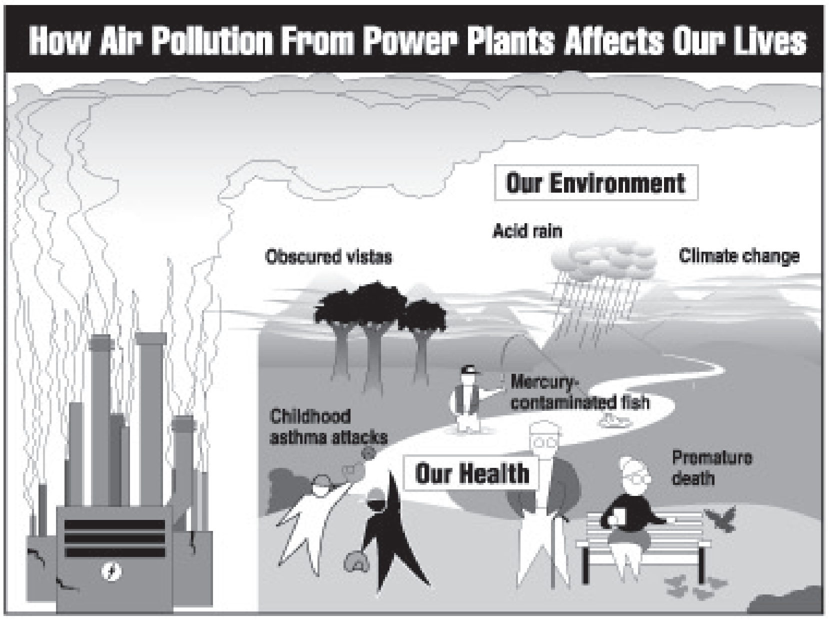
The discussion we are having today is hardly new. It goes back at least to 1995, when EPA initiated its "Clean Air Power Initiative" designed to bring stakeholders together around a comprehensive set of pollution reductions. For a variety of reasons, that initiative never came to a consensus conclusion.

However, much has changed in the last 5 years to change the landscape:

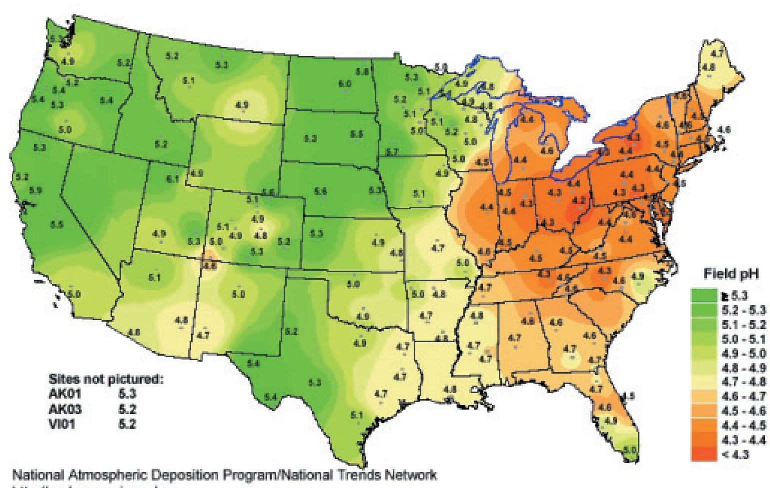
- The science underlying reduction targets for acid rain, fine particles, haze and mercury has become more compelling.
- Many States have moved ahead of the Federal Clean Air Act. Recently, for example, Massachusetts, Connecticut, and Texas have adopted regulations that will chop air pollution from grandfathered power plants by up to 75 percent. In Illinois, legislation has passed that will require promulgation of similar regulations by 2002. Such a measure has passed one house of the State legislatures in North Carolina and New York. While demonstrating leadership, however, the effectiveness of State action will be limited by transboundary impacts.
- Public opinion is increasingly supportive of steep power plant emission cutbacks. Opinion leaders throughout the Midwest and Southeast have voiced a con-

cern about current emission levels, as evidenced by many recent newspaper editorials.

• Many voices in industry are recognizing the value of a comprehensive multi-pollutant approach including carbon dioxide, rather than a balkanized approach—and the wisdom where possible of not throwing good money after bad.



Acidity of deposition, in pH



National Atmospheric Deposition Program/National Trends Network
http://nadp.sws.uiuc.edu

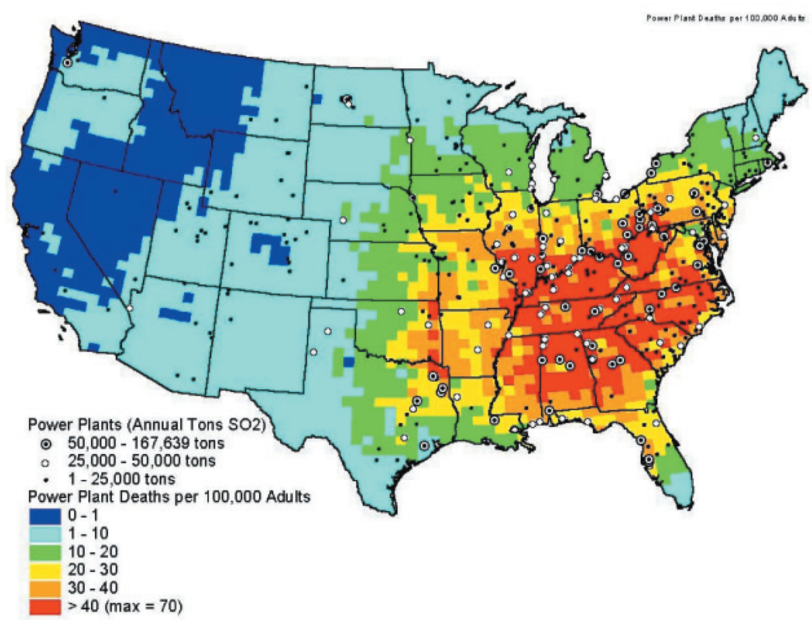
Particulate Matter Monitor Filters

Clean

Exposed 24 hours

Portland, Maine
1/7/93
48 ug/m3

Source: Maine DEP



Comparative Benefits

Avoided Health Endpoints	S 172 (Moynihan)	HR 2569 (Pallone)	S 1369 (Jeffords)
SO_2 Cap (million TPY)	4.50	4.00	3.24
Percent Below 1990 CAAA	50	55	64
Mortality	10,600	13,000	18,700
Total (all) Health Benefit	$60 billion	$75 billion	$111 billion
Visibility Benefits	$1 billion	$1 billion	$3 billion
Total Benefits	*$61 billion ($1997)*	*$76 billion ($1997)*	*114 billion ($1999)*

Greater Emissions Reductions Yield Greater Benefits

Clean Air Task Force
77 Summer Street, Boston, MA 02110
Tel: (617) 292-0234
Fax: (617) 292-4933

AIR RESOURCES BOARD,
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY,
Sacramento, CA, August 7, 2001.

The Honorable JAMES JEFFORDS, *Chairman,*
Senate Committee on Environment and Public Works,
Senate Office Building,
Washington, DC, 20510.

DEAR SENATOR JEFFORDS: The purpose of this letter is to provide clarification to the testimony of Mr. C. Boyden Gray presented on July 26, 2001, before the Senate Committee on Environment and Public Works. In his testimony Mr. Gray quoted excerpts of verbal testimony that Mr. Peter D. Venturini, Chief, Stationary Source Division, California Air Resources Board recently presented at a public meeting in Sacramento, California regarding the U.S. Environmental Protection Agency's draft New Source Review 90 Day Review Background Paper. The impetus for this letter is our concern that Mr. Gray's testimony (enclosed) mislead the committee to believe that since California has made considerable progress toward achieving clean air standards there is justification for relaxing or eliminating the New Source Review program.

On the contrary, in both verbal and written comments to the U.S. Environmental Protection Agency (enclosed) we shared our experience with the success of New Source Review in California. Because of the serious nature of California's air quality problem, our State has adopted New Source Review requirements that go beyond Federal requirements. The cornerstone of our success has been the advanced emission controls that our State requires for new and expanding sources and the fact that California law does not allow sources to "net out" of emission control requirements.

Peter Venturini, in verbal testimony presented July 12, 2001, stated that the New Source Review program in California is working and has played an integral role in California's long history of achieving environmental progress. It has also resulted in the construction of some of the cleanest power plants in the nation. The context of Mr. Gray's quote implied that Mr. Venturini was discussing the success of the Federal air quality program. In fact, Mr. Venturini was discussing the success of the more stringent California program, and was using the effectiveness of achieving emission reductions through stringent emission controls imposed through New Source Review as an example for the rest of the nation to follow.

Further, Mr. Gray misquoted the facts; the 50 percent reduction in overall statewide ozone exposures that has occurred in California over the past 20 years has been due to a combination of emission reductions from both stationary sources and mobile sources, not just from emission reductions from "businesses in the State."

New Source Review is based on the solid premise that new emissions should be minimized and mitigated so that industrial growth can continue without undermining progress toward achieving clean air mandates. It is also based on the fact that the most cost-effective time to control a source is at the time of its installation or when it undergoes a significant modification. We believe that any weakening of New Source Review control requirements will increase the need to achieve a greater proportion of emission reductions from existing sources and will likely result in a less effective pollution control program.

I appreciate this opportunity to clarify our comments. If you have any questions, please call me at (916) 445–4383.

Sincerely,

MICHAEL P. KENNY, *Executive Officer.*

CLEAN POWER ACT

THURSDAY, NOVEMBER 1, 2001

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 9:34 a.m. in room 406, Senate Dirksen Building, Hon. James Jeffords [chairman of the committee] presiding.

Present: Senators Jeffords, Bond, Boxer, Campbell, Carper, Chafee, Inhofe, Smith, and Voinovich.

FEDERAL AND STATE ROLES IN REDUCTION OF AIR POLLUTANTS

Senator JEFFORDS. The committee will come to order.

We have a number of meetings and hearings going on and members are being squeezed considerably. So I will start off by delaying my opening statement and turn to Senator Inhofe.

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman.

I do appreciate it. I explained to the chairman we have our defense conference meeting in 15 minutes, and that is required attendance. So I would like to get a statement in. I will not be able to stay for the meeting.

First of all, Mr. Chairman, I think those of us in our part of the country would be very much opposed to the provisions of S. 556. Quite frankly, I think it will pass the committee here, but will not pass on the floor.

First, I believe S. 556 to be inequitable to require an across-the-board reduction in pollutants when States such as Oklahoma, and I would suggest Colorado and several of the other States that are represented on this panel, already are in attainment with these standards, and we are talking about all the way across the board.

In the case of SOx, Oklahoma's coal-fired power plants had an average SO_2 emission rate which is approximately half of the United States national average coal-fired emission rate. As a result, Oklahoma already over-complies with its phase two Acid Rain Program allocation by 27 percent.

In the case of NOx, Oklahoma's coal-fired stations had an average NOx emission rate of roughly 20 percent below the national coal-fired emission and 10 percent below its 1995 average mercury emissions. According to the EPA, Oklahoma mercury emissions from coal-fired utility boilers are 1.8 percent of the nationwide total.

In carbon, the regulation of CO_2 would make the price and availability of energy a national crisis at a scale that our nation has never before experienced, even that just in recent months.

Oklahoma's environmental profile mirrors that of many of the western States. Oklahoma does not have the SOx, NOx, or mercury problems. Therefore, before we are asked to reduce our emissions even further, other States in other parts of the country where there is a problem should have to start lowering theirs. Second, by limiting fuel options for power generation, increasing the cost of electricity to Americans and stopping the construction of new generating facilities, S. 556 is the very antithesis of sound national energy policy.

You know, there has been a lot of talk about energy policy in this country, and I was severely criticized, Mr. Chairman, for trying to put H.R. 4 on the Senate authorization—Defense Authorization bill, and yet I see that as a national security policy. I mean, the fact that we are no 56 percent dependent on foreign countries for our ability to fight a war, and half of that is from the Middle East. The fastest-growing contributor to that deficit that we have is Iraq. So it is ironic that we would have to depend on Iraq for our ability to fight a war against Iraq, and that is kind of the situation that we are in.

So we in Oklahoma right now are complying, and I do not think this approach is going to be working, and quite frankly, I do not think it is going to—I think it will pass the conference, and there are a lot of people here in the room who would be very distressed for a period of time. But I cannot imagine that this will pass the floor. We will at that point be making some challenges, some amendments, and trying to come up with a compromise that is better, particularly for States like my State of Oklahoma.

[The prepared statement of Senator Inhofe follows:]

STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

I am afraid that our chairman has not come close to fully considering all the issues associated with his proposal. If such legislation is to ever be enacted into law, the compromise, unlike S. 556, must contemplate and balance our nation's existing environmental achievements and energy supply and security.

First, I believe S. 556 to be inequitable to require an across the board reduction in pollutants when states, such as Oklahoma, currently emit well below the national averages. According to EPA, Oklahoma is in attainment with ambient air quality standards for all six criteria air pollutants—carbon monoxide, nitrogen dioxide, lead, PM, ozone and sulfur dioxide. Let me specifically address SOx, NOx, Mercury, and Carbon emissions in Oklahoma:

SOx: Oklahoma coal fired power plants had an average SO_2 emission rate, which is approximately half of the U.S. national average coal fired emission rate. As a result, Oklahoma already over-complies with its Phase II Acid Rain program allocation by 27 percent.

NOx: Oklahoma's coal-fired stations had an average NOx emission rate of roughly 20 percent below the national coal-fired emission and 10 percent below its 1995 average rate.

Mercury: According to EPA Oklahoma mercury emissions from coal fired utility boilers are 1.8 percent of the nationwide total.

Carbon: The regulation of CO_2 would make the price and availability of energy a national crisis—at a scale that our nation has never before experienced.

Oklahoma's environmental profile mirrors that of many western States. Oklahoma does not have SOx, NOx, or Mercury problems. Therefore, before we are asked to reduce our emissions even further, other States in the Midwest and North East should be expected to get their emission levels down to the levels cleaner States are today. It is ridiculous to impose percentage reductions on us—at enormous marginal expense—before those regions who have significant air problems do their part.

Second, by limiting fuel options for power generation, increasing the cost of electricity to Americans, and stopping the construction of new generating facilities, S. 556 is the very antithesis of sound national energy policy. Coal-fired units provide 61.2 percent of the Oklahoma's electric generation. S. 556 would significantly change the source of energy in Oklahoma away from coal. Oklahoma utilities depend upon coal for power because of its much lower fuel cost versus natural gas and it's a clean source of energy. Since fuel costs account for the bulk of electric generating costs, Oklahoma's coal use has kept power rates lower than neighboring States of Arkansas, Kansas, Missouri and Texas.

According to the U.S. Department of Energy, Oklahoma utility rates averaged 5.37 cents per kilo Watt Hour. That is 19 percent less that the national average power rate. These utility rates are much lower than States that depend heavily upon natural gas (e.g., New York, New Jersey, California) or oil/renewables (e.g., Maine) for generation. When legislation is rushed into effect without adequate thought, it is likely to do more harm than good. Let's not forget. When the price of energy rises that means the less fortunate in our society must make a decision between keeping the heat and lights on or paying for other essential needs.

As a Senator and grandfather, I want to ensure the cleanest environment for our nation. The real challenge with dealing with this issue isn't getting just environmental protection or just affordable energy. The real challenge is getting both. S. 556 does not even come close to getting us both, and a compromise is a lot of hard work away. That is why, with so many enormous issues to tackle pertaining to S. 556 or other similar legislation, I think a markup in the near future would be a futile and divisive exercise. Rather than simply marking up a bill, which would be dead-on-arrival, a much more constructive exercise for the committee would be to work on a compromise with Energy, Interior, and EPA and all the other relevant agencies and stakeholders.

Senator JEFFORDS. Thank you very much, Senator.

Our first witness has now arrived. Congressman Boehlert would you mind coming forward?

Senator CAMPBELL. Mr. Chairman, are we going to have an opportunity for opening statements?

Senator JEFFORDS. Yes, after Sherwood Boehlert.

Welcome. I appreciate your cooperation and being with me in this endeavor. We've had many good times together and fought many battles, and we've got another big one on our hands. Please proceed.

STATEMENT OF HON. SHERWOOD BOEHLERT, U.S. REPRESENTATIVE FROM THE STATE OF NEW YORK

Representative BOEHLERT. Thank you, Mr. Chairman. I am glad to see some good friends up there—friends, Senators.

Thank you for allowing me to appear at this important hearing. My testimony will be brief. I am really here to make one simple, but significant point. The four-pollutant bill has bicameral and bipartisan, I guess I should say tripartisan, support. Congressman Waxman and I are as committed as ever to moving forward with the companion four-pollutant bill we introduced in the House.

Now, some may say, how can we talk about environmental legislation at a time like this? My response is that just as we are being urged to carry on with our daily lives despite terrorist threats, we must carry on with the full gamut of our legislative business in the face of these threats. We must do so because our environmental problems are just as real, just as significant, and just as solvable as they were before September 11.

The lakes in the Adirondacks are still acidifying. The ecological and economic consequences of that acidification are still serious. The obvious damage caused by terrorists does not make the insidious damage caused by pollution any less threatening. Indeed, the consequences of global climate change will still be with us long after the war in Afghanistan is a distant event students will have to learn about from history books.

Now, even those who accept this analysis may say, OK, but should we be passing laws now that could make us more dependent on imported sources of energy? My answer is that we ought to be attacking our dependence on foreign oil primarily by becoming more energy efficient and developing alternative fuels, not by blithely ignoring the long-term environmental and economic costs associated with our continuing dependence on coal. Moreover, coal would still be a significant fuel after the passage of a four-pollutant bill and substitutes for coal are readily available in North America.

So I think that if anything, the debate this committee is beginning to bring to a head is long overdue, and I hope this hearing will be a first step in bringing all the Federal, State and private sector players to the table for serious and relatively swift discussions about how to phase in a strict four-pollutant regime, a cost-effective regime that would give Americans cleaner air, while giving utilities greater regulatory certainty.

Let me emphasize, though, that regulatory certainty should come to be only as part of a new regime that will significantly reduce the emissions from power generation. I would strongly oppose making any changes in new source review unless they are implemented as part of and at the same time as a new pollution control regime.

Let me add with my own committee hat on that we are being pushed toward a new pollution control regime by science. The more we learn about air emissions, the more we understand the imperative to limit them.

For example, the new studies of acid rain that were released this past spring indicated clearly that without further cuts in both sulfur dioxide and nitrogen oxide, acid rain will continue to deplete soils, damage trees, acidify lakes and kill fish. The good news, though, is that the 1990 Clean Air Act Amendments are having a noticeable positive impact, demonstrating that we have the power to remedy the situation.

Similarly, the National Academy of Sciences review of climate change science issued this past spring at the request of the President clearly indicates that despite continuing uncertainties, climate change is a real and serious threat. But there, too, reviews such as the Department of Energy's Five Laboratories studies indicate that we have the wherewithal to attack the problem.

So Mr. Chairman and members of this committee, I want to congratulate you for having this hearing, and I urge you to move forward as swiftly as possible with a four-pollutant bill. On the other side of the Capitol and on both sides of the aisle, we're ready to work with you.

Thank you very much.

Senator JEFFORDS. Thank you for an excellent statement, and I deeply appreciate your cooperation and look forward to working with you. This is a most critical issue, as you know, in this nation, and I would like to ask you a couple of questions.

What are the obstacles in the House to moving forward with a 4-P legislation?

Representative BOEHLERT. Well, I think we are advancing. We have 112 cosponsors of our bill now, and I think it is one of prioritizing. Obviously first and foremost, we are all concerned about the aftermath of September 11 and we are dealing, for example, today somewhat belatedly with the airline security bill, but we are going to deal with it. We have dealt with antiterrorism legislation. We have dealt with a lot of other issues that directly relate to the horrific episode of September 11.

That does not mean we should stop all other activity. I would point out that we have a sizable and growing number of Republicans who are just as concerned as you and I are about this issue. I think when all is said and done, the likelihood of getting something done this year is diminished day by day, but next year I think we will do it.

Do you want to know what? It not only is good policy, but it is good politics. We've got an election coming next year, and the American people are going to ask us, what are you doing about this very important issue? And I think we are prepared to respond with some solid legislation.

Senator Smith, welcome. Good to see you.

Senator SMITH. Good to see you.

Senator JEFFORDS. The EPA and the EIA analysis we requested came back with a rather gloomy view of technology innovation. What are your thoughts on that?

Representative BOEHLERT. Well listen, we are going to promote technology innovation. I am privileged to chair the Committee on Science and we are doing a lot of things to get more investment within the Federal Government. But if the world out there sees that we are really serious about this, and I know you are and I am and others on this committee are, that innovation will come because there will be an incentive to invest. But the fact of the matter is, even using existing innovation, existing technology, we can do the job.

I can recall back in 1990 when President Bush signed the Clean Air Act Amendments, a lot of people thought that was a minor miracle, but it was achieved. I hate to think of where we would be today if that legislation were not in effect.

Senator JEFFORDS. Senator Smith?

Senator SMITH. I don't really have any questions of Congressman Boehlert. I do have a statement I would like to make, but if others have questions of the Congressman, I don't want to hold him up.

Senator JEFFORDS. What I want to do is to let Sherry go first, but I am going to have everyone have an opportunity to ask questions. I will make my statement, and then we will go back to regular order, but I want to take care of my good friend from the House.

Representative BOEHLERT. Thank you very much.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. I have looked at your legislation, and to be very frank with you, it would be a disaster for my State and for the manufacturing sector of the United States of America. Terrible. You have mentioned that there are alternative energy sources that could make up for perhaps coal. My statistics show that 0.1 of 1 percent of the energy in this country is being produced by renewables. If you look at the demand for energy in this country and look at our inability to provide for that energy demand that is going to be there, to not look at increasing gas, oil, coal, nuclear energy to meet that need puts us in a very, very bad position and a position where we will be relying too heavily on foreign sources of energy and not be competitive in that global marketplace in terms of this nation.

I would just like you to comment how you think that renewables are going to make up for legislation that I think we can prove will put coal out of business in the United States of America.

Representative BOEHLERT. Senator, I don't think it would put coal out of business by any stretch of the imagination. We get more than 50 percent of our energy needs from the coal industry, and as a matter of fact in my capacity as Chairman of the Science Committee, we worked very well with the coal industry on clean coal technology legislation.

It is inevitable that we are going to be using coal for a long, long time to come. Let's use cleaner coal. But your statement just gave me one of the best testimonies I have heard for supporting my effort to increase CAFE standards for automobiles, for trucks and suburbans. As a matter of fact, if we do that we will save a lot. We will lessen the demand. We should not always think about the supply side of the equation. I am just as interested as you are in making sure the dynamic manufacturing sector in America continues to be dynamic. I want to work with them in cooperation and make sure they thrive, but they also should work with me and you and all of us on the committee to make sure the American people are factored into the overall equation in terms of their health and welfare and daily well-being.

So I think we can do this in a responsible way that will not unduly burden any one sector of the economy; that will divert the attention from always focusing on the supply side of the equation and begin for all of us to think seriously about the demand side. We can address that.

Senator VOINOVICH. Well, my feeling is this, is that unless we sit down and really negotiate these numbers, that nothing is going to be done.

Representative BOEHLERT. I would agree with that, Senator.

Senator VOINOVICH. Because those of us from the Midwest that are getting clobbered today and are in recession are going to do everything we can because if we don't stop this, we feel it is going to kill our economy. So it seems to me that what we need to do is to sit down and try and rationalize these things together, looking at clean coal technology, looking at ways that we can get conservation.

The numbers that are in this bill are devastating, and it is really important that on a bipartisan, regional basis, we sit down and start to talk about this realistically, taking into consideration that we want to improve the air in this country and public health, but at the same time provide reasonable energy for the people in this nation, including our manufacturing sector, which is the backbone of the American economy.

Representative BOEHLERT. Senator, I couldn't agree more. I am a realist and I know from reviewing your very distinguished career, you are too. Nothing is set in concrete. You can't be all for or all against. You've got to sit down at the table and talk reason. But in the final analysis, we have to do a hell of a lot better than we are now doing to protect the health and well-being of the American people. I think you are as committed to the proposition as I am.

So there is room for discussion and compromise. But we should not come to this hearing or any hearing with a closed mind. So I am most anxious to work with you and other colleagues on the committee and the distinguished Chairman to do just that. In the final analysis, it does not serve us well if we cleanup the air and kill industry. I don't want to do that. My people work in industry just like your people do.

I will tell you this, my experience in working very hard for a long time on the Clean Air Act Amendments of 1990, I mean, I came to Congress in 1982, first elected, freshman in 1983, I came with the notion I was going to do something about acid rain because it was systematically destroying the lakes in the beautiful Adirondacks. Five hundred of those lakes are now dead.

I was an instant success. It only took me 8 years to do anything. But in the final analysis, when I was developing that Clean Air Act Amendment with my colleague from California, Congressman Waxman, I didn't spend all the time talking with my colleagues in the Green community. I proudly identify with them. I spent the vast majority of my time talking to the people in the utility industry from places like Ohio and Indiana, because I knew they were going to be most severely impacted, and it would be a heavy negative impact unless we did it right.

In the final analysis, we worked out some agreement, some adjustment, some compromises and we got a bill that President Bush signed on November 15, 1990. The utility industry in Ohio and Indiana didn't stand up and cheer when that passed because that made life a little more difficult for them. But they understood it was responsible legislation because we sort of worked it out together, and they did not try to put up roadblocks.

So I will work with you, Senator, or anyone else who is as committed as you are to doing the right thing for the right reasons. But I say if we come to this discussion with an open mind, we have a great opportunity ahead of us.

Thank you very much, Senator.

Senator VOINOVICH. Thank you.

Senator JEFFORDS. Senator Chafee?

Senator CHAFEE. Thank you, Mr. Chairman.

I know you have worked hard on this, and Senator Smith also. I commend you both for your hard work, and as we just heard in the exchange, this is going to take delicate compromise to come up with a good bill. I look forward to working with everybody on that.

[The prepared statement of Senator Chafee follows:]

STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator Jeffords, thank you for holding today's hearing on the Clean Power Act. I commend you on placing clean air on the top of your priority list. I must also thank Senator Smith for his work over the last 2 years on a multi-pollutant approach to addressing the nation's clean air concerns.

Let me start off by clearly stating that Congress must pass legislation that requires power plants to reduce emissions that contribute to acid rain, smog, respiratory disease, and global warming. Legislation should be enacted to provide reductions of nitrogen oxides (NOx), sulfur dioxide (SOx), mercury, and carbon dioxide (CO_2). As this committee has heard, there is significant disagreement over the inclusion or exclusion of carbon dioxide in any given proposal. However, science has indicated that the continued overproduction of carbon dioxide increasingly threatens the long-term health of our planet. I firmly believe that the United States, as the world's leading industrial nation, must take the lead in curbing the disastrous effects of carbon dioxide overproduction.

Senator JEFFORDS. Thank you.

Representative BOEHLERT. Mr. Chairman, it's good to come over here and see all my former colleagues.

Senator JEFFORDS. Yes, well, it is good to have you over here and straighten them out.

Representative BOEHLERT. Thank you very much.

[Laughter.]

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. We will now sort of go back to regular order. I am going to make my opening statement, and then Senator Smith and others can make their opening statements.

Today, the committee will hear testimony from Federal and State witnesses on S. 556, the Clean Power Act. We have asked them to tell us about the impact of this legislation on the environment, air quality goals, the economy and energy supply. We have also asked for their suggestions for any improvements or amendments to the bill.

Unfortunately, because of the transportation delays, my friend, Governor Howard Dean of Vermont, will be unable to testify as planned. I am hopeful that he might be able to make it to the next committee hearing on multi-pollutants, which is scheduled for Thursday, November 15. However, I am pleased to welcome Sherry Boehlert, and we have heard from him, and are certainly pleased that he could be here.

This is a busy day, so I will keep my remarks short and encourage everyone to do the same.

Since the horrific events of September 11 and the more recent terrorism in these very buildings and around Washington, our world seems increasingly uncertain. Places we thought were secure now appear unsafe. Even the air we breathe cannot be taken for granted, we have found. My brief trip into the Hart Building last Thursday showed me how hard it is to walk around while only exhaling. It's very hard to do. You ought to try that.

[Laughter.]

Senator JEFFORDS. I don't mean to make light of the anthrax threat. It has caused great dislocation, inconvenience and several deaths. This is a serious and acute threat to our nation's capital and its people. The response was a little disorganized at first, since who could envision or predict the evil insanity of terrorists willing to use such weapons? Now, however, Americans are rising to the challenge. They are using their ingenuity to combat the health threat and our vast scientific know-how is being employed to track down those dangerous people.

We are good at responding to short-term threats. Unfortunately, we don't do as well with long-term threats. That is why we are here today. That requires coordinated planning over the years, like global warming or acid rain. However, we know the world is warming, and that man-made emissions are primarily responsible for the warming. If we don't swiftly and radically change our behavior, Boston's weather will probably become more like Richmond's in the next 50 years.

We also know that power plant pollution contributes to acid rain, causes lung disease and premature mortality, and a host of other problems. These are sometimes hard to see, because they take longer to clearly manifest than the effects of biological weapons. However, like this current plague, once the symptoms are full-blown, a cure is costly and difficult at best. We would be better off to take actions now to avert catastrophic necessities in the future.

I am appreciate that the Energy Information Administration has provided the committee with the analysis we requested in a timely fashion. I thank them. Late yesterday, we finally received the EPA's analysis after much delay. Unfortunately, its late arrival gave us very little time to review it. If we are going to really meet the multi-pollutant challenge, I hope there will be more cooperation and openness than has occurred thus far.

It will also take a much healthier dose of optimism about our ability to engineer solutions to achieve ambitious goals. Unfortunately, both analyses failed to address perhaps the most fundamental matter: What are the costs of full implementation of the existing statutory and regulatory requirements, including the mercury rule and the fine particulate matter standard

Without that information, it is impossible to determine the true incremental costs of any additional control requirements. That is the same question that the committee asked the Administrator 2 months ago, with no response. I am a patient man, as my colleagues know. I am also respectful of the situation in which the White House, the Administration now face. But the time for delay is over and important work should resume. Climate change, in particular, must be addressed.

The industrialized nations of the world are meeting in Marrakesh right now to discuss self-imposed carbon limits. Yet the largest emitter, the United States, will sit idly by without a plan. That is just not wise, nor is it sensible to be disengaged from helping the Congress develop smart and constructive environmental policy.

I am hopeful that these things will change. I will continue to do my part, including the development of legislation to cap carbon emissions in other sectors, and other efforts to stimulate carbon reductions. We all need to work together a little harder to leave the next generation with a cleaner environment.

Despite these troubled times, we have a responsibility to plan for a future where the air is safe to breathe and the world is more predictable.

Senator Smith?

OPENING STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator SMITH. Thank you very much, Mr. Chairman.

I was interested to hear your talk on delays. As you know, the Senate passed a brownfields bill that we finally got unclogged after years and years and years of being held up. It passed at 99 to nothing. It is now being held up in the House over Davis-Bacon because a few Democrat members have decided that that needs to be attached to the bill so we can run the costs up more to do the brownfield cleanups. This is the kind of thing that happens around here that frustrates all of us, and so I guess we shouldn't be too upset with the delays, but it is frustrating, I tell you.

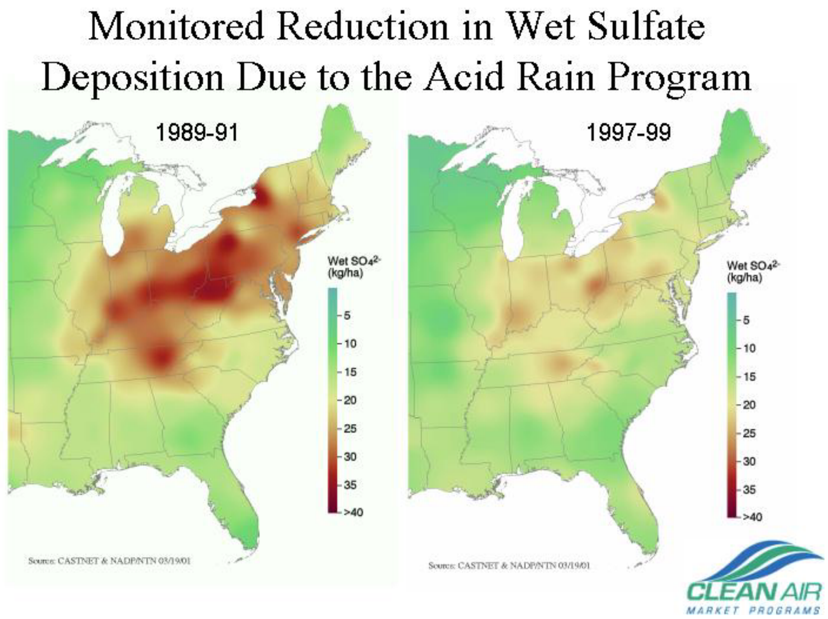
I want to thank all the witnesses, and a special welcome to Ken Colburn who came down from New Hampshire, who will be on one of the—I believe the third panel. He does a great job for the people in the State, and has been very helpful to me and my staff, and I appreciate it, Ken.

Mr. Chairman, I have long been a proponent of reducing utility emissions, as you know. But I have a little bit of a different perspective. We all seek the same goal here. But I believe unfortunately current law fosters a combative relationship that does too little to increase environmental protection, and too much to increase litigation, delay, uncertainty and so forth. In many ways, the law actually contributes as an obstacle to cleaning up the air.

Now, the bottom line is that we have a system that discourages new energy production, increases the cost for current production and delays environmental protection. This is just simply unacceptable. I would like to change it. I know many of my colleagues would like to change it. I began an inclusive process when I was the chairman 2 years ago, and I applaud you, Senator Jeffords, for continuing to have that kind of inclusive process and discussion. We have differences, but that's life and we will try to work them out.

It is vital, though, that we reduce our emissions, and at the same time separate ourselves from the current command and control system that really helps no one. The command and control system is not effective and not efficient. We need to embrace free market mechanisms that rely on innovation. Innovation and technology 1 day, and maybe not too far away, is going to make regulation a thing of the past. If innovation and technology move past regulation, then we don't need to worry about regulation. We will do more if we are ahead of the game with innovation and technology, then we can let regulation sit aside and not worry about it. Believe me, it is happening in other countries of the world.

We have a successful model to follow right here in the United States—Congressman Boehlert mentioned it—and that is the Acid Rain Program. I would like to, with the help of a couple of charts here, clearly we need further reductions in sulfur emissions, but no other environmental program compares with the efficiency and the effectiveness of the Acid Rain Program. It was criticized. We have seen compliance under this program exceed 99 percent. You tell me one environmental program that has been 99 percent successful. Many of the reductions were realized ahead of schedule, and this map proves it.



There was concern that the acid rain cap-and-trade program would create so called "hot spots," and EPA data has shown that is not occurring. On the contrary, if you look at this chart, it shows the monitored reductions in SO_2 deposition due to the Acid Rain Program. The map on the left shows deposition for 1989 through 1991, and the map on the right, for 1997 and 1999. Look at the difference. The red is the bad spots, and then in 1991, now in 1997 and 1999, you can see how much that has diminished. Where are the hot spots? There aren't any. The significant reduction in red and yellow areas on the map indicate that the most adversely affected areas have seen the greatest environmental benefit from the Acid Rain Program. The existing hot spots have cooled, and new ones have not occurred.

Finally, one last success of this program has been the steady decline in estimates of annual compliance costs. The next chart, everybody said this was going to cost $7 billion to $10 billion, maybe more—the sky is the limit. It has cost about $1 billion. Look at the effectiveness. This was cap-and-trade. This was trade. It worked. It was market-based. It was flexible. It was incentive-driven, and it has proven that the most effective and efficient environmental program on the books works. If you could do it on acid rain, we can do it on other emissions as well, and we have proven we can do it.

So let's move to innovation and replace regulation. I want to thank Chairman Jeffords for his leadership on this, but there is a lot of work to be done. With all due respect, S. 556 is not ready for markup yet. Discussions with members simply have not yet gotten to the point where we are ready for a vote on the bill, and I think if we could have that discussion, Senator Voinovich and I and others, we can make this a reality.

There is a lot to do to establish the broad support that we need, Mr. Chairman, in order to get legislation passed. If it is passed by a one-vote margin or up or down on Republicans one side, Democrats the other, it is not going to go anywhere. We need a consensus, otherwise we are not going to get progress. Even sometimes when you get a consensus and you pass a bill out of here, like brownfields, you still can't get it passed, which is the frustrating thing, as I said.

It is my hope that this will be the first in a long line of legislative hearings, which I know you are prepared to do, where members are able to discuss options. I don't think we are very far away from reaching that consensus. I worked on this for 2 years as the chairman. We had a lot of meetings, a lot of discussions, there are lot of people very interested, both in industry and in the environmental community, to make this happen. There are some great models out there—acid rain here; the nation of Holland, which Governor Whitman is very aware of in terms of what they are doing with pilot projects there to reduce emissions, as opposed to with true innovation and technology, and not with regulation.

If we do this right, with flexibility, market-based emissions trading, and clear limits, we will create a system that not only reduces air pollution, but costs less, while still enhancing fuel diversity. Both EIA and EPA have completed analysis of multiple pollutant reductions scenarios, and Senator Voinovich and I have requested those. Both indicate that we can make dramatic reductions for an annual cost that is below the original cost estimates for the Acid Rain Program—significant reductions in NOx, SOx, SO_2, mercury—EPA's analysis also includes CO_2—for less than the expected cost for partial reductions in just SO_2. What is more, coal consumption in the East increased in this analysis. This makes me optimistic that we can improve on the current system.

So I look forward to working with all my colleagues to make this happen.

Thank you, Mr. Chairman.

Senator JEFFORDS. Well, thank you, Senator Smith.

I want to give all Senators a chance to comment, but we have a long list of witnesses also, so I would appreciate it if you could be brief.

Senator Boxer?

OPENING STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. Mr. Chairman, I will summarize my statement and ask unanimous consent that it be included in the record in its entirety.

Senator JEFFORDS. That is granted.

Senator BOXER. Thank you.

Mr. Chairman, thanks for holding this hearing. As you probably know, I am a strong supporter of your legislation, and I was pleased to be an original cosponsor when you introduced the bill last November. I might say, Mr. Chairman, I hope we are as successful in this legislation as we were in getting the standard for arsenic reduced. As we all know today reading the paper, the Administration has gone from the 50 part per billion to 10, based on their own study. We were telling them all along that we had enough studies. This one even told them it ought to go lower than 10, because even at 10, the cancer risk is higher than what EPA puts forward as a goal.

The bottom line is, we were successful. We kept the light on this, if you will, and I hope that you will do the same with your bill, because by requiring power plants to reduce emissions of sulfur, nitrogen, mercury and carbon dioxide, the bill will lead to great improvements in air quality, which will greatly benefit public health. That's our mission, it seems to me, is to benefit public health.

I just want to flag three areas quickly that I will be watching that concern me. If we do move forward to a compromise, which Senator Smith I think rightly points out we might, I just want to let him know and others the areas I will be watching. First of all, as introduced, the bill is a supplement to existing Clean Air Act regulations, not a replacement. I think it must stay that way, and I will oppose efforts to use this bill as an excuse to weaken or eliminate existing protections found in Title I of the Clean Air Act.

Second, the bill covers four pollutants, and to my mind that must not change because the science overwhelmingly shows that climate change is a reality. We cannot credibly address that problem without reducing carbon dioxide emissions. "Some Like It Hot" might have been a great movie, but I don't think it should be the motto of our country's environmental policy. Global warming is an issue that must be addressed.

Let me say third, there may be some interest in attaching provisions which will allow power plants to avoid reducing carbon emissions if they create carbon sinks that literally store carbon in various forms. Forests, for example, serve as a natural repository of carbon. I am definitely intrigued by the possibility of a win-win situation, at least the protection of forests, and to reduction in the amount of carbon in the atmosphere, but I think it is very important we not leap to that solution unless we know it really will work.

Finally, I do not dismiss cost considerations at all, but I believe that we must always remember the costs associated with illness in the general public—respiratory illness, cancer and the like. It is hard for a person to put a price on a family member's health.

So I look forward to working with you. I am very excited about moving forward on this.

Thank you.

[The prepared statement of Senator Boxer follows:]

STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

I want to thank the chairman for holding this hearing. I am a strong supporter of your legislation and was pleased to be an original cosponsor when you introduced the bill last November.

By requiring power plants to reduce emissions of sulfur, nitrogen, mercury, and carbon dioxide, this bill will lead to important improvements in air quality that will provide great benefits to public health and environmental quality.

1As the debate and discussions about this bill move forward, there are three specific aspects of this bill that I will be watching carefully. First, as introduced, this bill is a supplement to existing Clean Air Act regulations, not a replacement for existing protections. It must stay that way.

I will strongly oppose efforts to use this bill as an excuse to weaken or eliminate existing protections found in Title 1 of the Clean Air Act.

Second, this bill covers four pollutants. This also must not change. A 3-pollutants bill—one that excludes carbon dioxide as the Administration has suggested—is not acceptable. Indeed, it is irresponsible. There is no way that we can credibly address power plant emissions without including standards for carbon dioxide. The science overwhelmingly shows that climate change is a reality, and we cannot credibly address that problem without reducing carbon dioxide emissions.

"Some Like It Hot" may have been a great movie, but it must not become the motto of this country's environmental policy. I would remind my colleagues that the carbon standard this bill sets is a standard that the first Bush Administration committed to meet—and that the Senate committed to meet when it ratified the United Nations Convention on Global Climate Change. We have done little to fulfill that commitment. This bill would help us to begin to remedy that.

Third, I understand that there may be some interest in attaching provisions to this bill that would allow power plants to avoid reducing carbon emissions if they create carbon "sinks."—that literally store carbon in various forms. Forests, for example, serve as a natural repository of carbon.

I am intrigued by the possibility of a win-win situation that leads to the protection of forests and to a reduction in the amount of carbon in the atmosphere. However, many questions remain about the long-term effectiveness of carbon sinks.

Until those issues can be resolved, I am skeptical that such a provision should be used to exempt utilities from real emission reductions. Instead, perhaps we should promote pilot projects that can test the benefits of so-called carbon sinks.

Let me make one final point, Mr. Chairman. I expect that we will hear concerns about the expense of these regulations. These are the same arguments that are raised any time a new environmental standard is proposed. While I don't dismiss cost considerations, I believe that the benefits these regulations will bring to human health and the environment are priceless. I look forward to working with the chairman to help move this bill forward as quickly as possible.

Senator JEFFORDS. Thank you, Senator.

Senator Campbell?

OPENING STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

Senator CAMPBELL. Thank you, Mr. Chairman.

I think Senate Bill 556 is probably a good vehicle for debate, but I am inclined to think, as Senator Inhofe stated earlier, that it will never become law. I would like to welcome my fellow Coloradan who seems to be the sole voice from the West testifying before this committee. Mr. Dave Ouimette, I have not met Dave, so I am not sure where he is sitting. Dave, nice to have you here, and I am pleased that you are here, but I have to express my disappointment that the West is not better represented. Perhaps that is fitting since Western States really have a single voice in this matter, and I think most of them would be opposed to S. 556.

I respectfully submit, Mr. Chairman, that this bill fails to acknowledge the inherent differences between air quality in the East versus the West in several says. First, this bill would impose significant reductions in nitrogen oxide emissions throughout the entire country. However, scientific data raises the issue whether in the West whether we even have a nitrogen oxide problem.

Second, the bill ignores ongoing regional initiatives and approaches dealing with the air issues, particularly in the West. For example, the Western Regional Air Partnership is in consultation with EPA to develop a Western Sulfur Dioxide Reduction Program on a reduction schedule that is far different from that proposed in this bill.

Also, the bill does not allow for flexible solutions for local air problems to be addressed through local partnerships. A few years ago, through legislation passed in the Colorado State Legislature, Excel Energy entered into an agreement with the State to dramatically reduce sulfur dioxide and nitrogen oxide emissions in the Denver metro area. That agreement represents an innovative partnership with industry and local residents to craft a realistic solution based on local needs. This bill threatens the future of these agreements and could undermine those that have already been reached.

The purpose of reducing carbon dioxide emissions is not pollution abatement, but combating greenhouse gases. President Bush took a very strong position in opposing the Kyoto Protocol, yet this bill would have us circumvent his position. I would remind my colleagues that we had a vote, as I remember it, 98 to nothing to oppose implementing that Kyoto Accord. Assuming that we were to include carbon dioxide as a pollutant and contradict our president, and what would implementing that Kyoto Accord give us, except a bigger deterioration in our manufacturing and a higher unemployment rate? A new book by the European statistics Professor Bjorn Lomborg found that implementing the Kyoto Protocol could cost the world's industrialized nations $80 billion to $350 billion per year, only to postpone the warming for 6 years. Even the former Clinton officials admitted that their projected cost to implement the Kyoto Accord at around $12 billion a year for the United States alone was unrealistically low.

In the West, more than 80 percent of our electricity, Mr. Chairman, is coal-fired. Coal-burning facilities are a major source of carbon dioxide, therefore dramatic reductions in carbon dioxide disproportionately affects the West and imposes additional costs on rate-payers who are already forced to deal with spikes and rolling blackouts.

In short, S. 556 amounts to an eastern fix to address largely eastern problems being forced on the West. I would like to say, Mr. Chairman, if we do not recognize that in the Bush energy plan, which had about 120 parts, there were sections dealing with renewable energy and alternative energy and conservation and increased CAFE standards. I think all of us support those sections.

There were really smaller areas that dealt with increasing our energy independence. If September 11 didn't teach us anything at all, it should have taught us that there is a connection between our energy dependence and our national security. I think one of my colleagues alluded to this already, but we are importing more oil from Iraq now than we did before the war, and we know that the money is being used to re-arm, I suppose with the intention of killing more Americans sooner or later, and yet it is our money being used against us.

We know that millions—one-third of our whole trade deficit deals with oil now—and some of that money, a good deal of it, goes to the Saudis who produce about 25 percent of the world's oil. We know, as a member of the extended royal family, some of that money one way or another ends up getting into the hands of Mr. bin Laden, and we all know what his objective is in this country, too.

So I have to tell you, Mr. Chairman, those ships, planes and tanks don't run on solar power, and we do not have any kind of a substitute for high BTU hydrocarbon energy at the present time. I would think that it would really be bad to further handicap ourselves by bad legislation that would make us more dependent on those very people who want to kill us.

Thank you, Mr. Chairman.

[The prepared statement of Senator Campbell follows:]

STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

I would like to take a moment to welcome a fellow Coloradan, and the sole voice from the West testifying before this committee, Mr. Dave Ouimette. Although I am pleased to see Mr. Ouimette, I must express my disappointment that this committee has not sought greater representation from those west of the Mississippi.

Perhaps, it is fitting that Western States have a singular voice here today since such under representation mirrors the lack of deference that this bill gives to Western interests. This bill fails to acknowledge the inherent differences between air quality in the East versus the West in several ways.

First, S. 556 would impose significant reductions in nitrogen oxide emissions throughout the entire country. However, data raises issue whether the West even has a NOx problem at all. Second, this bill ignores ongoing regional initiatives and approaches dealing with air issues particular to the West. For example, the Western Regional Air Partnership (WRAP) is in consultation with the EPA to develop a Western sulfur dioxide reduction program on a reduction schedule far different from that proposed in S. 556.

Also, this bill does not allow for flexible solutions to local air problems to be addressed through local partnerships. A few years ago, through legislation passed in the Colorado State legislature, Xcel Energy entered into an agreement with the State to dramatically reduce sulfur dioxide and nitrogen oxide emissions in the Denver metro area. That agreement represents an innovative partnership with industry and local residents to craft realistic solutions based on local preferences. This bill threatens the future of such agreements, and could undermine those already reached.

Furthermore, the inclusion of reductions in carbon dioxide emissions in a reform bill of the Clean Air Act necessarily assumes that carbon dioxide is a pollutant when it clearly is not. The purpose of reducing carbon dioxide emissions is not pollution abatement but combating green house gases. President Bush took a strong and brave position in opposing the Kyoto Protocol. Yet, this bill would have us circumvent our Commander-in-Chief and impose Kyoto-like reductions. Assuming that we were to include carbon dioxide as a pollutant and contradict our President, what would implementing the Kyoto reductions get us? A new book by a European statistics professor, Bjorn Lomborg, found that implementing the Kyoto Protocol would cost the world's industrialized nations $80 to $350 billion per year only to postpone warming by 6 years, from 2094 to 2100. Even former Clinton officials admitted that their projected costs to implement the Kyoto Protocol, at around $12 billion per year for the U.S. alone, were unrealistically low.

Where before this bill fails to account for air quality in the West, the carbon dioxide reduction provisions fail to acknowledge that more than 80 percent of electricity in Colorado is coal fired. Coal-burning facilities are major sources of carbon dioxide. Therefore, dramatic reductions in carbon dioxide disproportionately affects the West, and imposes additional costs on ratepayers who are already forced to deal with spikes and rolling blackouts.

If carbon dioxide is not a pollutant; if the dramatic reductions this bill calls for are unrealistic and costly; and if such reductions disproportionately disadvantage one region of the country that which is so under represented here today, then why are we addressing carbon dioxide in this bill? To be honest, I don't know. I hope that this is not an underhanded attempt to force our nation's consumers to choose one energy source over another. Such action would not only be wrong, but be coming at the worst of times.

In short, S. 556 amounts to an Eastern fix to address largely Eastern problems being forced on the West. I look forward to working with all of the members of this committee to achieve a balanced, realistic, and flexible solution to reforming the Clean Air Act.

Senator JEFFORDS. Thank you.

Senator Voinovich?

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. Thank you, Mr. Chairman, for holding this hearing today. I am glad we are moving forward with this important work of the committee. This multi-emissions issue is important for both the environment and the larger issue of our nation's energy policy.

Mr. Chairman, as I said at our hearing on July 26, I remain optimistic that we can reach a bipartisan compromise to continue to improve the environment and public health, reduce utility emissions, create greater regulatory certainty and ensure the American consumers will have safe, reliable and cost-effective electricity, particularly for the least of our brothers and sisters—the elderly and the low income.

I know today's hearing is a legislative hearing on the chairman's bill, but I would hope we use today's hearing to explore some of the broader issues surrounding multi-emissions because I do not believe that the chairman's bill is workable as drafted. In addition to today's hearing, I understand the chairman is planning on at least one more legislative hearing to receive testimony. I believe before the committee acts, several more hearings are in order, particularly one that I discussed with the chairman and Senator Lieberman on the availability of control technologies for mercury and CO_2.

I believe S. 556 as drafted would be disastrous for our energy supply, our economy and our competitiveness in the global marketplace. While I agree with the goals of the legislation to reduce emissions from utilities and provide certainty in terms of emission levels, the bill offers nothing in terms of providing regulatory flexibility.

The bill also sets emission levels which would lead to higher electricity prices for consumers, massive fuel switching and an overall reduction in our gross domestic product of $75 billion by the year 2010 and $150 billion by the year 2020, and the loss of over 600,000 jobs in 2010. These impacts would be felt the hardest in the Midwest and the Atlantic States, from Florida up to New York. The Midwest in particular would be hit hard because it is the manufacturing base of our country.

As you can see from this chart, 23 percent of our nation's GSP, gross State product for manufacturing, is concentrated in five States which comprise the Midwest—Ohio, Indiana, Michigan, Illinois and Wisconsin. One of the major reasons manufacturing is centered in the Midwest is the availability of reasonably priced and reliable energy and energy sources. This region and its border States of West Virginia, Pennsylvania, Virginia and Kentucky, are the source of low-cost, abundant coal and because of the iron ore coming in from the Great Lakes. This region is the heart of U.S. manufacturing, not only because of the low-cost energy, but because of our central location for transportation.

This chart contrasts data with six States of New England. For years now, the discussion on utility emissions has turned into a regional debate—a regional debate between the Northeast and Midwest. I have been involved in this debate since the early 1970's from my time when I was mayor of the city of Cleveland and we operated a 57-megawatt municipally owned utility called Cleveland Public Power.

I realize my colleagues in the Northeast will say that higher energy prices will impact on them as well. But the truth of the matter is that impacts on the Midwest will have a direct negative impact on the economy of the entire nation. The Midwest represents 23 percent of the U.S. total manufacturing GSP and almost three million manufacturing jobs, compared to New England's 5.6 percent of the U.S. total and 615,000 manufacturing jobs.

When energy prices go up, manufacturing declines and workers are laid off. I think we need to move past the regional differences and understand that what impacts on the Midwest manufacturing base has a direct impact on our nation's economy and our competitiveness in the global marketplace.

Right now, the Midwest and Ohio are in a recession that began last year, and I want everyone to understand he said that we are in a recession. We've been in recession in the Midwest. That recession accelerated when natural gas prices increased fivefold last winter. Ohio is the leading producer, for example, of polymers in this country. Natural gas is used as a raw material in their production. Higher prices earlier this year took away our international competitive edge, threatening our domestic industry. That just goes to reiterate why it is so important that this Congress before we go home pass an energy bill. It is very important to our economic well-being and our national security.

Over the last 10 years, Ohio has spent more on emission reductions than New York, New Jersey, Massachusetts, Connecticut, Vermont, Rhode Island, Maine, New Hampshire, Maryland, Delaware and Washington, DC combined. We reduced air toxins from approximately 381 million pounds in 1987 to 144 million pounds in 1996, and I think, Senator Smith, your chart up here showed the effort that is being made and its impact. When I was Governor, I convinced AEP to install scrubbers costing $616 million to reduce SO_2 emissions at the Gavin facility, which is the largest coal-powered facility in the United States of America. When I began my term as Governor, eight of our cities were in nonattainment for ozone and the current standards that we have now, Mr. Chairman. Today, all of them comply.

At the same time, our emissions are higher than most other States, yes, because we produce more manufactured goods than most other States. That is chart two. You can see from the chart while Ohio produces 4.6 percent of the total U.S. electricity generation, we also employ 5.8 percent of the nation's manufacturing workforce—733,000 jobs. We also produce 6.2 percent of the nation's manufacturing gross State product.

Let's look at chart three. When you compare Ohio's manufacturing production . . .

Senator JEFFORDS. Senator, speed up a bit.

Senator VOINOVICH. I'm going as fast as I can, Mr. Chairman. I want to say this to you. I know you want me to speed up. I am talking about the lifeblood of my State. My State is suffering today. We have had people laid off. I am supporting extending unemployment benefits and dealing with the health care problems of my people. But this legislation is a threat to my economy, and I would like an opportunity—it will take me a couple more minutes to share this with you.

Senator JEFFORDS. I appreciate that. The common practice is 5 minutes and you have gone 7, so please proceed.

Senator VOINOVICH. I am just going to finish up, and I will ask that this be put into the—I just want you to know, Mr. Chairman, you and I talked about this a long time. I want to have an energy policy here. I want to do something about multi-emissions. We've got a lot of people here from Buller's Place and out in your part of the country that want to do something about acid rain. We could very quickly deal with NOx and SOx and get it over with, but this legislation wants to drag in mercury; wants to drag in CO_2. The bottom line is, it ain't going to happen because we have large regional differences. The president says if you've got CO_2 in there, he is going to kill the bill. He will veto it.

So we have gone through hearing after hearing after hearing after hearing. I think we ought to sit down with this like we sat down with some other things, get a table, get the best people we can and work at this and come up with something that makes sense, that will improve the environment, that will improve public health, and at the same time provide an environment where we can continue to have reasonable energy costs, continue to burn coal with clean-coal technology, and look at some of the other energy sources that we have.

This is really serious. I want to say, this is not the same game we have had. Our country is in jeopardy today, and part of the reason is because we haven't got an energy policy.

Thank you.

Senator JEFFORDS. I agree with you on that.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

I would like to thank you, Mr. Chairman, for holding this hearing today. I am glad we are moving forward with the important work of this committee. The multi-emissions issue is important for both the environment and the larger issue of our nation's energy policy.

Mr. Chairman, as I said at our hearing on July 26, I remain optimistic that we can reach a bipartisan compromise to continue to improve the environment and public health, reduce utility emissions, create greater regulatory certainty, and ensure that American consumers will have safe, reliable, and cost effective electricity, particularly for the least of our brothers and sisters who are elderly and low income.

I know today's hearing is a legislative hearing on the chairman's bill, S. 556 but I hope we use today's hearing to explore some of the broader issues surrounding multi-emissions because I don't believe the chairman's bill is workable as drafted. I will outline some of my concerns with the bill in a few minutes.

In addition to today's hearing I understand the chairman is planning at least one more legislative hearing to receive testimony from some of the interest groups. I believe before this committee acts, several more hearings are in order, including the hearing I previously discussed with the chairman and Senator Lieberman on the availability of control technologies for mercury and CO_2.

I believe S. 556, as drafted, would be disastrous for our energy supply, our economy, and our competitiveness in the world marketplace. While I agree with the goals of the legislation, to reduce emissions from utilities and provide certainty in terms of emission levels; the bill offers nothing in terms of providing regulatory flexibility. The bill also sets emissions levels which would lead to higher electricity prices for consumers, massive fuel switching, an overall reduction in our Gross Domestic Product of $75 billion by the year 2010, and $150 billion in 2020, and a loss of over 600,000 jobs in 2010.

These impacts would be felt the hardest in the Midwest and the Atlantic States (from Florida up to New York). The Midwest in particular would be hit hard because it is the manufacturing base of our country.

[CHART I]

1999 Statistics obtained from Bureau of Economic Analysis, U.S. Department of Commerce, and Bureau of Labor Statistics, U.S. Department of Labor

As you can see by this chart, 23 percent of our nation's GSP for manufacturing is concentrated in the five States which comprise the Midwest; Ohio, Indiana, Michigan, Illinois, and Wisconsin.

One of the major reasons manufacturing is centered in the Midwest is the availability of reasonably priced and reliable energy and energy sources. This region, and its border States of West Virginia, Pennsylvania, Virginia, and Kentucky are the source of low cost and abundant coal and because of the iron ore in the Great Lakes. This region is the heart of U.S. manufacturing not only because of it's low cost energy but also because of its central location for transportation.

This chart contrasts the Midwest data with the six States of New England. For years now the discussion on utility emissions has turned into a regional debate between the Northeast and the Midwest, and I have been involved in this debate since the early seventies and from my time as mayor of Cleveland when I operated a 57-megawatt municipally owned utility, Cleveland Public Power.

I realize my colleagues in the Northeast will say that higher energy prices will impact them as well. But the truth of the matter is that the impacts on the Midwest will have a direct, negative impact on the economy of the entire nation. The Midwest represents 23 percent of the total U.S. manufacturing GSP (gross State product) and almost 3 million manufacturing jobs compared to New England's 5.6 percent of the U.S. total and 615,000 manufacturing jobs. When energy prices go up, manufacturing declines and workers are laid off.

I think we need to move past the regional differences and understand that what affects the Midwestern manufacturing base has a direct impact on our nation's economy and our competitiveness in the global marketplace.

Right now Ohio and the Midwest are in a deep recession and although it began last year, the recession accelerated when natural gas prices increased fivefold last winter. Ohio is the leading producer of polymers in this country and natural gas is used as a raw material in their production. The higher prices earlier this year took away our international competitive edge, threatening our domestic industry.

By the way, the effect on our economy is one of the reasons Congress needs to act on developing a national energy policy. What happened last winter underscores why Congress needs to adopt a national energy policy. The Administration has acted, the House of Representatives has acted, and it is time for the Senate to act.

Over the last 10 years Ohio has spent more on emissions reductions than New York, New Jersey, Massachusetts, Connecticut, Vermont, Rhode Island, Maine, New Hampshire Maryland, Delaware, and Washington DC combined. We reduced air toxins from approximately 381 million pounds in 1987 to 144 million pounds in 1996. While I was Governor I convinced AEP to install scrubbers costing $616 million to reduce SO_2 emissions on the Gavin facility, the largest coal-fired power plant in the country. When I began my term as Governor, eight of our cities were in nonattainment for ozone. Currently, all 88 Ohio countries are in attainment for the national ambient air standards. No single State has done more to improve air quality in the last 10 years than Ohio.

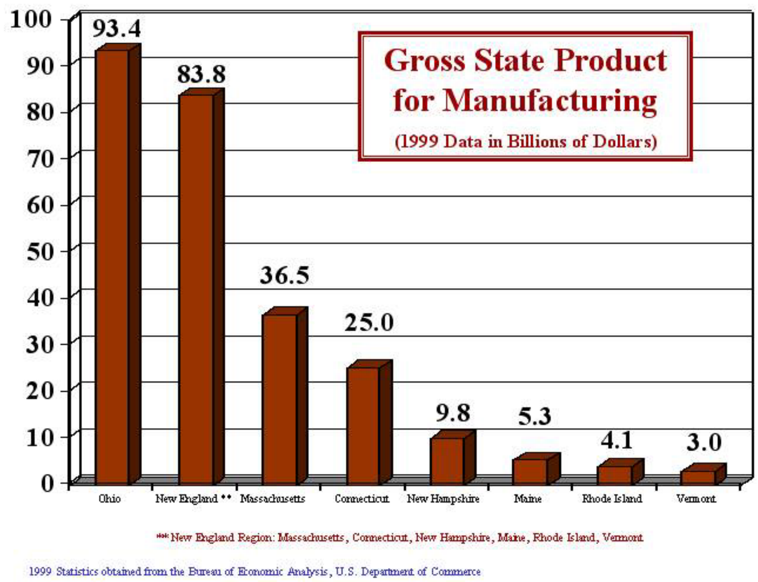
At the same time, our emissions are higher than other States, because we produce more manufactured goods than most other States.

[CHART II]

1999 Statistics obtained from Energy Information Administration, U.S. Department of Energy; Bureau of Economic Analysis, U.S. Department of Commerce; and Bureau of Labor Statistics, U.S. Department of Labor

As you can see by this chart, while Ohio produces 4.6 percent of the total U.S. electricity generation, we also employ 5.8 percent of the nation's manufacturing work force (733,610 jobs). We also produce 6.2 percent of the nation's manufacturing GSP (gross State product).

[CHART III]

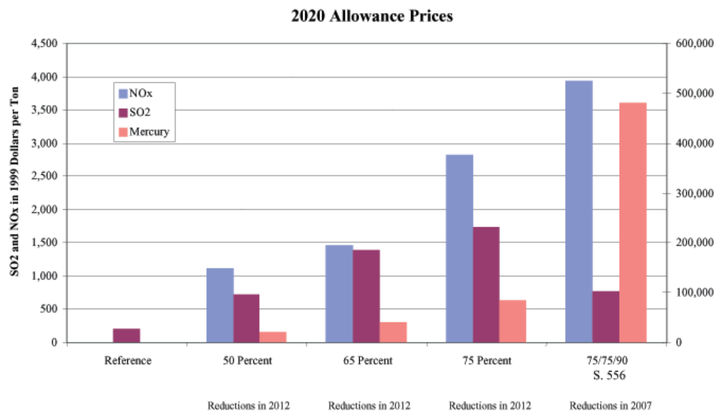


When you compare Ohio's manufacturing production with the New England States, as you can see on this chart, Ohio's GSP for manufacturing is higher than all six of the New England States combined. (93.4 billion for Ohio, compared to 83.8 billion for all of New England.)

Mr. Chairman, I use these charts only to point out that while our electricity generation is higher, we have also spent more on emissions reductions; and while our electricity generation is also higher, its because we produce more manufactured goods. Any legislation which jeopardizes our ability to produce manufactured goods will jeopardize our nation's economy.

I am afraid Mr. Chairman, that your proposal as currently drafted will jeopardize our nation's economy. I will set aside the CO_2 issue for a moment (which on its own would wreck the economy) and just concentrate on the other three pollutants as covered in your bill.

[CHART IV]



This chart shows the expected costs of four different proposals addressing NOx, SO_2, and mercury, according to EIA (Energy Information Administration). The first three scenarios show 50 percent, 65 percent, and 75 percent reductions in all three pollutants by 2012. This is contrasted with the reductions in S. 556, which are called for by 2007. As you can see for mercury alone, the costs increase five-fold, from $90,000 per pound to almost $500,000 per pound of reduction.

Although S. 556 calls for a 75 percent reduction level for NOx, the cost under S. 556 is $1,000 more per ton because of the change in the compliance dates, from 2007 to 2012. The SO_2 numbers are lower because the mercury reductions drive the technology for SO_2.

According to analysis provided to me from the Edison Electric Institute, this bill would decrease Ohio's Gross State Product by $3 billion dollars bt 2010 and $6 billion dollars by 2020. Overall Ohio would lose over 25,000 jobs by 2010 and over 37,000 jobs by 2020.

Ohio families would pay $494 million dollars more for electricity by 2010 and over $1.5 billion dollars for electricity by 2020.

nationwide, the Jeffords bill would decrease the national Gross Domestic Product by $75 billion in 2010 and $150 billion in 2020. The country will lose over 600,000 jobs in 2010 and 0ver 900,000 jobs in 2020. Earnings would decline by $300—$550 dollars per household.

This chart comparing the different plans, and the impacts on Ohio convinces me that we need to spend more time on this issue as a committee to better understand what the different reduction levels would mean for cost, fuel switching, and the effect on the economy. As well as what technologies are feasible and available for the reductions we need. The bill as drafted would be a disaster on the economy of Ohio and our nation's manufacturing industries.

This bill will be like a tornado sweeping across the country, leaving in its wake ruined manufacturing facilities.

I don't want to leave any doubt in anyone's mind, I do support a 3-pollutant strategy, and I am open to a voluntary CO_2 program, so long as it is cost-effective, makes real reductions in pollution, will not cause massive fuel switching away from coal, and will not harm our economy. However, I cannot support the reduction levels or dates that are found in S. 556 as drafted.

Mr. Chairman, I hope this is just the beginning of the process in this committee and that we will have true bipartisan negotiations to reach a compromise bill that we all can support. I look forward to hearing from the witnesses.

Senator Chafee?

OPENING STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator CHAFEE. Thank you, Mr. Chairman.

I think part of the process of crafting a bill is to get testimony from witnesses, and so I think it is important we move in that direction as swiftly as possible to hear the testimony of the people who have come such a long way.

I will say that, as Senator Smith said earlier, there is always a sense that the sky is falling every time we try and pass some legislation. When we tried to do it with DDT, we said it would ruin the United States agriculture industry. It just didn't happen. When we said we were going to have unleaded gasoline, they said that will ruin the American automobile industry. It just didn't happen. I think sometimes the sky isn't falling, and we have to move forward and address some of these important concerns—acid rain, smog, respiratory disease and global warming. Let's move forward with it.

Senator JEFFORDS. Thank you very much, Senator Chafee.

Senator Bond?

OPENING STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Senator BOND. Thank you very much, Mr. Chairman. I am sorry I was called out of the room briefly. I want to thank you for holding this hearing on the environmental effects of S. 556. I think it is vital we know the effects of this legislation as we consider how best to improve air quality.

I want to associate myself with the remarks that some of my colleagues have made—Senator Smith, Senator Campbell, Senator Voinovich. I particularly want to commend and thank Senator Smith for his comments about the acid rain emissions trading system.

Those of you who have not been around this place very long may know that we call that trading system, at least in Missouri, we call it the Bond-Byrd Compromise. I had the pleasure of doing the legwork for the coal-producing States, and of course having the leadership of Senator Byrd enabled us to get a lot more done than a freshman Senator would have. But I think he is correct. This does show the model on how we can improve the environment at much less cost than we would otherwise do if it was strictly a command and control economy.

In some ways, we will never recover from September 11. The attacks left indelible scars on thousands of families from New York, Washington and across the nation. Our nation is struggling in its recovery. We are a nation at war. A weak national economy shrunk last quarter and may very well be in recession. Companies are laying off tens of thousands of workers. Consumer confidence is at an all-time low. Our nation will and must recover from these trying times. We will come back.

However, we as policymakers must do all we can to help get the nation back on its feet, moving forward. I am very troubled by the negative effects S. 556 would have on families, consumers and the economy. I do not believe that now is the time to put the parking brake on an economy already at a stop. According to independent experts, consumers would face skyrocketing energy costs under S. 556. Families trying to heat their homes would face electricity prices 30 percent higher and natural gas wellhead prices 15 percent higher by 2007. American consumers and businesses would spend an extra $40 billion to $60 billion on electricity. Total U.S. economic activity, GDP, would be reduced by almost $100 billion in 2007 alone.

I am not an economist. I have two hands. But if the $75 billion to $100 billion we are talking about now is enough to stimulate the economy as we are talking about a stimulus package, then a $100 billion brake seems like it would bring the economy to a stop. These numbers are not just empty talk. Most directly, they mean jobs. Reduction in coal demand would cost thousands of American coalworkers their jobs. Shutting down access to our most abundant supply of fossil fuel coal makes no sense. We have enough coal to provide energy to this country. We don't yet have enough petroleum-based products. The American people cannot afford the cost of S. 556. American consumers and employers need predictable, reliable and affordable energy to heat their homes and power their businesses.

Earlier this week, I introduced a concurrent resolution which you, Mr. Chairman, joined, and Senators Crapo, Graham and Voinovich of this committee joined, commemorating the 30th anniversary of the Clean Water Act. Clean water in our nation's lakes and rivers is a national commitment and a national treasure. Clean air is also a national treasure. Every one of our families have treasures in the form of our children and grandchildren who are especially vulnerable to air pollution. We all depend on clean air and I believe everyone here supports improving air quality. We have a unique opportunity to reduce significantly air pollution from electric utilities.

The Administration, Congress, environmental and public health advocates all agree that we should significantly reduce air emissions of sulfur dioxide, nitrogen oxides and mercury from electric power generators. A comprehensive market-based approach that reduces emissions would provide significant public health and environmental benefits, and provide greater regulatory certainty, encourage plant-owners to install newer, cleaner and more efficient systems to produce power.

I believe that we need to achieve three clean air goals: meet health-based clean air goals out of reach today; provide regulatory certainty to industry, which will encourage innovation and keep our energy supply secure; keep energy costs stable. S. 556 does not meet these goals.

Let me say, I have been assured by Administrator Whitman of the EPA that they are working on developing a sound, market-based approach which will make significant reductions. It is not easy. It takes a lot of work, and we should be working with them to develop a plan that can bring everybody together to achieve our goal of far less pollution, without costing our country jobs.

To sum it up, the Jeffords-Lieberman bill is a recipe for recession. Total economic activity would be reduced somewhere between $82 billion to $97 billion in 2007 alone. Thousands of American workers would be out of work. Power plants would cut their use of coal by 40 to 50 percent, costing thousands of jobs. High energy costs would threat tens of thousands of jobs across the country.

I am willing to work hard to develop legislation that provides clean, affordable, reliable energy for American consumers and the economy. I know it is a lot of work. We spent many, many months developing the acid rain trading system, and we are willing to do that again. I look forward to moving forward on this effort, but S. 556 is the wrong solution for the problem we face.

[The prepared statement of Senator Bond follows:]

STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Mr. Chairman, thank you for holding this hearing on the environmental effects of S. 556, the Clean Power Act of 2001. I believe that it is vital that we know the effects of this legislation as we consider how best to improve air quality.

Later today, this committee will hold another hearing. The topic will be infrastructure security and economic recovery in the aftermath of the September 11 attacks. In some ways, we will never recover from September 11. The attacks left indelible scars on thousands of families from New York, Washington, and across the nation.

Our nation is also struggling in its recovery. We are a nation at war. A weak national economy shrunk last quarter and may very well be in recession. Companies are laying off tens of thousands of workers. Consumer confidence is at an all time low.

Our nation will recover from these trying times. We will come back better than ever. However, we as policymakers must do all we can to help get the nation back on its feet and moving forward.

I am very troubled by the negative effects S. 556 would have on families, consumers and the economy. I do not believe that now is the time to put the parking break on an economy already at a stop. According to independent experts, consumers would face skyrocketing energy costs under S. 556. Families trying to heat their homes would face electricity prices 30 percent higher and natural gas wellhead prices 15 percent higher by 2007. American consumers and businesses would spend an extra $40 to $60 billion on electricity. Total U.S. economic activity—or GDP—would be reduced by almost $100 billion in 2007 alone.

I'm not an economist, but if the $75 to $100 billion we are talking about now is enough to stimulate the economy, then a $100 billion brake seems like it would bring the economy to a stop. These numbers are not just empty talk, most directly they mean jobs. Reduction in coal demand would cost thousands of American coal workers their jobs. Expensive energy would threaten tens of thousands more jobs across the economy.

The American people cannot afford the costs of S. 556. American consumers, and America's employers, need reliable, predictable and affordable energy to heat their homes and power their businesses.

Earlier this week I introduced a Concurrent Resolution, with the support of Sens. Crapo, Graham, Voinovich and Jeffords, commemorating the 30th anniversary of the Clean Water Act next year. Clean water, in our nations lakes and rivers, is a national commitment and a national treasure.

Clean air is also a national treasure. Every one of our families have treasures, in the form of children, who are especially vulnerable to air pollution. We all depend on clean air and I believe everyone here supports improving air quality.

We have a unique opportunity to significantly reduce air pollution from electric utilities. The Administration, Congress, environmental and public health advocates all agree that we should significantly reduce air emissions of sulfur dioxide, nitrogen dioxides and mercury from electric power generators.

A comprehensive, market-based approach that reduces emissions would provide significant public health and environmental benefits. It would also provide greater regulatory certainty and encourage plant owners to install new, cleaner and more energy efficient systems to produce power.

I believe that we need to achieve three clean air goals: 1) meet health-based clean air goals out of reach today, 2) provide regulatory certainty to industry which will encourage innovation and keep our energy supply secure, and 3) keep energy costs stable. S. 556 does not meet these goals.

I am willing to work hard to develop legislation that provides clean, affordable, reliable energy for American consumers and the American economy. I look forward to moving on to this effort as soon as possible. Thank you.

DOE STUDY OF JEFFORDS' MULTI-POLLUTANT LEGISLATION

- Consumers would immediately face skyrocketing energy costs—Average electricity prices for consumers would increase between 27 and 32 percent in 2007, and would remain high (up 20 to 33 percent in 2020).
- America's Pocketbook would feel the hit—In 2007, consumers would be spending an extra $40 billion to $60 billion on electricity.
- The price of natural gas would rise dramatically—Average natural gas wellhead prices would increase 12 to 17 percent in 2007, and up to 20 percent in 2020.
- The Jeffords/Lieberman bill is a recipe for recession—Total U.S. economic activity—or GDP—would be reduced by $82 billion to $97 billion in 2007 alone.
- Thousands of America's workers would be out of work—Power plants would cut their use of coal by 40 to 45 percent, costing thousands of coal industry jobs. High energy costs would threaten tens of thousands of other jobs across the economy.

Senator JEFFORDS. Thank you, Senator.

Now we are ready to go to our witnesses.

Mr. Holmstead, if you would please come forward?

Mr. HOLMSTEAD. Mr. Chairman, I am very grateful to be here this morning.

Senator JEFFORDS. Ms. Hutzler—I am sorry—I should have the others come to the table at the same time, on the first panel.

Mr. HOLMSTEAD. Fine. We are all there now.

Senator JEFFORDS. Thank you.

STATEMENT OF JEFFREY HOLMSTEAD, ASSISTANT ADMINISTRATOR, OFFICE OF AIR AND RADIATION, U.S. ENVIRONMENTAL PROTECTION AGENCY

Mr. HOLMSTEAD. I thank you for the opportunity to be here this morning. I felt a little rude sitting in the back room and not having the chance to be out here in person, but it was a wonderful opportunity to hear all the opening statements and get a sense for the issues that we will be discussing further this morning.

Thank you for giving me the opportunity to testify about S. 556 and to discuss how we can create a better approach for reducing pollution from power generations. I believe that this hearing is an important step toward reaching a bipartisan agreement on this matter.

I would also just like to quickly address a concern that Senator Campbell raised about the lack of representation from the West. He may not be aware that I am actually from Colorado. I grew up in Boulder, and so I can assure you that the western perspective is also being understood and discussed within the Administration, and it is something that we do—we've appreciated the efforts of the western Governors and the WRAP, and we are trying to work with them as we move forward on something.

We are pleased as an Administration that Chairman Jeffords and many of you on this committee share our commitment to modernizing the Clean Air Act. The Act has been very successful in many ways, but over the last decade we have learned a lot about how we can make our regulatory programs more effective. Given what we have learned, I think it is now clear to everyone that we can make the Clean Air Act better.

As you know, the President has directed EPA to work with Congress to develop legislation that would establish a flexible, market-based approach to significantly reduce and cap emissions of NOx, SO_2 and mercury from the power generation sector. We are still working within the Administration to develop a proposal that we can discuss with you and your staffs, and I hope to have the opportunity to discuss the details of this proposal with you in the near future.

Over the years, Congress, EPA and the States have responded to a number of specific environmental and public health problems by developing separate regulatory programs with their own approaches and time lines. This chart over here gives you some sense for the complexity of that current program as it exists for public sectors, and I promise you I won't go over every word on that chart, but just a couple of highlights in terms of the timing.

I think everyone on this committee is quite familiar with the NOx SIP Call and the section 126 petitions. In addition to that, by statute, we are required to issue a MACT standard for this sector in 2003. Compliance would take place at the end of 2007. Farther out into the future, there is a visibility program that would also requires States to go out and impose source-specific controls on the power plant.

In addition to that, and probably most importantly, States and EPA will be working together over the next five to 10 years to address the need to come into attainment with the new $PM_{2.5}$ and 8-hour ozone standards. As a result of that, there will be individual States taking actions to reduce emissions from power plants in their own States. There are likely to be at least two rounds of additional 126 petitions for States that are concerned about up-wind sources. So as a result, there is this extremely complicated and uncoordinated set of regulatory requirements that will be coming into play over the next little while.

Let me point out, and this chart here gives you a sense for the current projections as to the number of areas that will be out of attainment with either the $PM_{2.5}$ standard, which I think everyone here is familiar with, or the ozone standard. The chart on the left shows the current conditions. The chart on the right shows what we project in 2020. You will see that because of a number of current programs, the problem actually begins to get better. But notwithstanding that fact, there are a number of areas that will be out of attainment with one or the other of those standards in 2020.

Now, in place of this uncoordinated set of complex regulatory programs, we believe that there is a better way, one that would cost American consumers and industries far less, while still protecting our air quality. The country would be far better served by legislation that builds on the successful Acid Rain Program by establishing a flexible, market-based approach to significantly reduce emissions of NOx, SO_2 and mercury. If the caps are protective enough, this legislation could replace many of the current regulatory requirements that apply to power generations. Such an approach would reduce the administrative burden on industry, reduce consumer costs, lower compliance costs and increase national energy security by providing the industry with more certainty about its future regulatory obligations.

For all of these reasons, we applaud Chairman Jeffords for tackling this important issue and for recognizing that a cap-and-trade program is the best way to achieve these reductions. However, EPA and the Administration would oppose S. 556 as drafted. Because of the tight timeframes and cap levels, our analysis to date suggests that it would increase consumers' electricity rates by from 32 percent to 50 percent or even more. The bill's timeframes for installation of controls could lead power plants to be taken off-line at important times, which could lead to electricity shortages.

In addition, our analysis found that it would force a substantial shift from coal to natural gas as an energy source, which would undermine the need to maintain fuel diversity and drive up natural gas prices for homeowners and others. We believe that these effects are not only unacceptable, but unnecessary.

Let me also reiterate that the Administration strongly opposes including CO_2 reductions in any multi-pollutant bill for power generators. The CO_2 provisions in S. 556 would be costly and endanger our energy security by causing fuel-switching from coal. We are also concerned that the health and environmental benefits of reducing NOx, SO_2 and mercury should not be delayed while we take the time to reach a broader consensus on CO_2.

Notwithstanding these concerns, the Administration wants to commend Chairman Jeffords and the other members of the committee for taking on this important issue. I realize that S. 556 was developed without the technical assistance that you would normally want to have from EPA and other expert agencies. As you move forward with your efforts, I hope to have the opportunity to work with you more closely. I look forward to working with the committee to develop legislation that we all, including the President, can support.

Thank you.

Senator JEFFORDS. Thank you.

Ms. Hutzler?

STATEMENT OF MARY HUTZLER, ACTING ADMINISTRATOR, ENERGY INFORMATION ADMINISTRATION

Ms. HUTZLER. Mr. Chairman and members of the committee, I appreciate the opportunity to appear before you today to discuss Senate bill 556.

While the Energy Information Administration has not prepared an analysis of the specific provisions of this bill, we did release on October 2 two service reports that examine the impacts of controlling multiple emissions at our nation's power plants. One of the requests from you and from Senator Lieberman specified power sector emission caps for nitrogen oxide, sulfur dioxide, mercury and carbon dioxide that are the same as those in S. 556, which are shown on this chart.

However, our analysis differs in that we did not assume that all the plants would be required to meet new source performance standards, and we assumed that mercury emission reductions could be traded, rather than requiring all plants to reduce their mercury emissions to a specified target.

Our analysis examined the impact of these limits under four scenarios, with different assumptions about technology costs and performance, energy policies and consumer behavior. The four scenarios are based on the annual energy outlook reference and high supply and demand technology scenarios, and the clean energy futures moderate and advanced scenarios. For each of these scenarios, two cases were prepared without and with the emission limits. This was done so that the impacts and costs of imposing the emission limits could be separated from the other changes in each scenario.

Today, I will concentrate on the impacts of the emission limits on the annual energy outlook reference case, both to simplify the discussion and because we believe it to be the more likely outcome for future technology trends. Our results indicate that fuel-switching is a key compliance strategy. Because a cap on CO_2 emissions is imposed, coal generation is reduced; natural gas, renewable and nuclear generation is increased; and electricity demand is lowered in response to higher prices.

By 2020, coal generation is projected to be 55 percent below the reference case. In contrast, natural gas generation is higher by 39 percent, renewable generation by 30 percent, and nuclear generation by 10 percent. Sales of electricity are 9 percent below the reference case.

Among the various technology scenarios, the smallest change is in the clean energy futures advance scenario, because the carbon tax was included in that case even before the imposition of the emission caps. As a result, coal generation was already significantly reduced from what would otherwise be expected. In other analyses that we prepared where a CO_2 emissions cap is not included, we have found that the primary emissions reduction strategy is adding control equipment, rather than switching fuels.

Increasing the use of natural gas, which is relatively more expensive than coal, and adding emission controls leads to higher electricity prices. The wide range in allowance prices shown in this chart occurs because of differences in emission levels and control costs for the various gases. The zero-allowance price for NOx is a result of sharply reduced coal use in order to comply with the CO_2 cap. Also, controls added to meet the 2004 State Implementation Plan call enable power suppliers to meet the new NOx limits in 2007.

The various emission caps and allowance prices are very interrelated. Often equipment added to remove one type of emission leads to reductions in others. Reducing coal use to lower CO_2 emissions often tends to lower other emission allowance prices because less controls are needed to comply.

My next chart shows the impact of the allowance prices on the operating costs of two types of coal plants—one that is relatively uncontrolled and one that is more controlled. In both cases, CO_2 represents the largest component—over two-thirds of the total for the uncontrolled plant and 90 percent of the total for the controlled plant.

As the power sector turns increasingly away from coal to natural gas, the price of natural gas increases as the higher natural gas demand results in drilling from increasingly smaller and less economical fields. By 2020, wellhead natural gas prices are 20 percent higher when the emission limits are imposed, as you can see from this chart.

The combination of higher fuel costs, increased investments in new plants to replace existing coal plants, and investments in control equipment cost electricity suppliers $177 billion over the 2001 to 2020 timeframe, an increase of about 9 percent from the case without controls. The higher resource costs, plus the costs of emission allowances, result in electricity prices that are 33 percent higher in 2020. Imposing these emission caps reduces GDP by $100 billion or .08 percent in 2007, and slightly over $50 billion, or .03 percent, 2020.

As one might expect, numerous uncertainties exist in any analysis this complex. First, while the reference case in our new energy outlook incorporates improvements in technology, cost and performance over time, based on trends in historical data and consumer purchase decisions, it is very difficult to assess how much these trends might change in response to increased R&D, information and voluntary participation programs.

Second, while technologies for controlling SO_2 are fairly mature, technologies for controlling NOx, mercury and CO_2 are not as far in their development cycle. We assume that new selective catalytic reduction equipment will remove between 75 percent and 80 percent of NOx emissions, but there is little data on actual operating facilities. Small changes in the cost and performance of emissions control technologies can have significant impacts.

Third, even among power plants with similar equipment, there is substantial variation in the amount of mercury removed by NOx and SOx control equipment.

Fourth, there are numerous policy instruments for reducing emissions, with different implications regarding the impacts of emissions reductions. A cap-and-trade program, which is what we assumed in this analysis, is expected to lead to the lowest resource cost of compliance. Other options could lead to lower electricity price impacts, but they would have higher resource costs.

Thank you, Mr. Chairman and members of the committee. I will be happy to answer any questions you may have.

Senator JEFFORDS. Could you please leave that last chart up for the moment?

It's a dangerous place in here.

[Laughter.]

Senator JEFFORDS. I want to more fully understand that chart. Now, as I look at the left, that is kilowatt hours—cost per kilowatt hour, or what is that?

Ms. HUTZLER. That is per kilowatt hour in 1999 real dollars.

Senator JEFFORDS. So if you go from 1990 to the year 2020, there would be somewhere around maybe 1.5 cent increase, or you can give it 2 cents?

Ms. HUTZLER. Well, in 2020, we see it as 2 cents because have declining prices in our reference case, so we are declining from about 7 cents per kilowatt hour today to about 6.1 cents in 2020. But the bill would in fact have the 2020 price be 8.1 cents per kilowatt hour.

Senator JEFFORDS. Does that assume or not assume any improvements in the production costs that could reduce that number?

Ms. HUTZLER. We have certain improvements in technology. For instance in clean coal technology, we have them improving over time. In terms of the controls for the specific—for controlling SOx, NOx and mercury, they do not improve over time. They are fairly constant, but we do feel those costs are fairly optimistic at their current levels that we have in the reference case.

Senator JEFFORDS. What part of the 2 cents is related to power plant compliance with the fine particulate matter standard that will go into effect in about 2008?

Ms. HUTZLER. We do not have that in our reference case, so it is not modeled directly and as such I cannot give you the specific amount that particular policy would introduce into the cost of electricity.

Senator JEFFORDS. Perhaps Mr. Holmstead can tell us what share of the $PM_{2.5}$ nonattainment problem comes from power plants.

Mr. HOLMSTEAD. I can tell you it is a significant share. I do not know that we have an exact number. What I can say is that the problem with high levels of $PM_{2.5}$ is primarily a problem in the eastern part of the United States. We think that the largest single contributor is SO_2 sulfates, and we know that about 70 percent of the SO_2 emissions in the East come from power plants. So there is no doubt that it is a significant share.

Senator JEFFORDS. The EPA staff believes based on significant data that there has been collected that the MACT rule for mercury will in the 85 percent to 95 percent reduction range, at least for eastern coal. That rule is on a court order scheduled to become effective in 2004. Approximately how much will electricity prices increase when that rule is in place?

Mr. HOLMSTEAD. First of all, let me just say I am not quite sure about your indication that the MACT levels would be 85 to 90 percent. That does not sound right to me. As you know, we are at the very beginning stages of figuring out what the MACT standard would be. There is no doubt that that will impose significant costs on the industry, beginning probably in about 2007, because that is when the compliance date first occurs. But I don't believe that we have specifically, in fact I know we haven't, because at this point we don't know enough about what the MACT standard will be to have a projection of the cost. But you are correct in suggesting that that will impose some additional compliance cost, probably a significant compliance cost on many utilities, and as a result probably increase electricity prices, but I can't tell you by how much.

Senator JEFFORDS. Ms. Hutzler?

Ms. HUTZLER. Yes, I would just like to comment that I showed you a chart that shows on a cent-per-kilowatt-hour basis what the different targets would mean in terms of the cost. And CO_2 outweighs all the other costs tremendously, depending on the coal plant. I mentioned it could be anywhere from two-thirds to 90 percent of it. If you are looking at controlling these other items that you have mentioned, if you also include a CO_2 emission target, that is going to dominate. We have looked at various situations where we only look at controlling SOx and NOx. They alone will only increase the electricity price 1 percent. If you only control mercury, you are only going to see the electricity price rise by 3 or 4 percent. But once you add on the CO_2, you are getting this greater increase of 33 percent.

So everything is relative. You have to realize that these different emissions and these different targets and the way to control them interacts, and you need to be very careful if you are talking about controlling three pollutants or controlling four pollutants in terms of how significant the cost is. I just wanted to mention that in terms of Mr. Holmstead's answer.

Senator JEFFORDS. In our request, Senator Lieberman and I asked EPA to analyze the costs and benefits of controlling emissions from power plants. What are the specific and quantifiable environmental and public health benefits of the emission reductions in S. 556?

Mr. HOLMSTEAD. As I think everyone on the committee is aware, actually quantifying benefits is a difficult thing to do, and in particular trying to quantify the benefits of mercury and CO_2, for which no one really has any methodologies. I will also tell you that the process of trying to quantify—and typically when people ask us for a benefits estimate, they are asking for a monetized estimate, meaning that we would try to give some indication of the monetary value of those estimates. That is something that we have not been able to do for S. 556.

I can tell you that qualitatively, there is no doubt that by reducing in particular SO_2 and NOx, which contribute to $PM_{2.5}$ levels, that there is no doubt that there would be significant environmental benefits from S. 556.

Senator JEFFORDS. Ms. Hutzler?

Ms. HUTZLER. We in EIA are an energy organization and we look at the impacts of what the energy situation is. We are not dealing with the environmental benefits and we have not actually analyzed what those might be, nor do we feel that we are expert in doing such.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. Ms. Hutzler, the charts that you have here, are they based on an analysis you did for Senators Jeffords and Lieberman?

Ms. HUTZLER. Yes, they are.

Senator VOINOVICH. In your analysis, you were asked to make a number of assumptions based on future technologies, and in your report you made a number of qualifying statements, such as, quote, "the scenarios are based on assumptions that EIA questions, including assumed changes in consumer behavior that are not consistent with historical behavior patterns," end of quote. The report also says R&D funding increases that have not occurred, voluntary and information programs from which there is no analytical basis for evaluating impacts; and last, legislative or regulatory actions that may not be enacted, even if enacted, may become effective at later dates than assumed, such as a $50 carbon tax.

It seems to me that any one of these qualifying statements could refute the entire analysis that you did for Senator Jeffords and Senator Lieberman. Could you go into a little more detail about the uncertainties regarding the policies and technology underlying the assumptions of the Jeffords bill?

Ms. HUTZLER. We looked at four different scenarios. The first scenario was based on our annual energy outlook reference case. That is the scenario that I briefed today to you; that scenario we do believe is a realistic way of looking at the future because it is based on consumer behavior in terms of their historical behavior patterns, and it is also based on historical rates of R&D.

There were three other scenarios that we were asked to look at. One of those scenarios was to combine all of the high-technology cases in our annual energy outlook, those cases being for each of the demand sectors, each of the conversion sectors and each of the supply sectors. Combining all those technology scenarios together we feel is highly unrealistic because we do not believe that technology in all those sectors could simultaneously come into effect.

That particular case was also similar to one of the clean energy future cases, the moderate case, in terms of its electricity demand in the future. We had trouble with the clean energy future scenarios for the reasons that you already mentioned, that not all of the costs were embedded within those scenarios; that many of the policies are based on voluntary or information programs that we don't feel necessarily have the impact that some people do and they're also very difficult to quantify because we have not seen in history that much improvement based on voluntary or information programs.

They also require legislative or regulatory changes such as the carbon fee that you mentioned, but others as well, such as the renewable portfolio standard, such as pay-at-the-pump insurance, such as tax credits for various technologies and also other appliance and efficiency standards. They also had cost reductions where advanced technology costs are to be reduced to where conventional technologies are today. We think R&D to get to that level of cost reduction is probably unlikely.

Also, they assumed that consumers would behave differently by modifying hurdle rates. We haven't seen consumers behave that differently.

Senator VOINOVICH. One of the things it seems to me, Mr. Chairman, that we need to do is to try and get the most honest, objective scenario when we're doing our projections about some of these things are going to do, and not make assumptions based on things that are not something that one could follow in terms of historical behavior by people, and look realistically at some of what is going to happen and not going to happen. We can play—we get different numbers based on what your scenarios are.

I would love to have just your best estimate based on the real world on what all of this is going to do in terms of energy costs. Have you calculated, or Mr. Holmstead have you ever looked at the impact of this if it went through the way it is written today would have on our gross domestic product, on the use of coal, and on fuel-switching that would go on?

Mr. HOLMSTEAD. We, like EIA, were asked to look at these four different technology scenarios, so what we have provided is a range of possible impact depending on which of the scenarios turns out to be accurate. What I can say is in terms of electricity prices, we believe that if it were to be enacted as it is drafted, S. 556 would increase electricity prices somewhere between about 30 percent and 50 percent or a little more than that. The reason I say it could be a little bit more is that like EIA, we assumed that the mercury cap would be fully tradeable, and as I understand S. 556 it would actually require source-specific controls to get to the five-ton cap, which would . . .

Senator VOINOVICH. So you are saying that your estimate would be between 30 and 50 percent for electricity?

Mr. HOLMSTEAD. For electricity prices.

Senator VOINOVICH. OK. But the question I would like to add on that is that if you have an increase in the cost of electricity, it probably means that you are burning more natural gas in order to provide the electricity. Have you given any consideration that that demand on natural gas would have on heating costs, which we went through this last winter? In other words, the demand for natural gas escalated. Spot prices were $8 whatever unit they put it on, and from our perspective in Ohio, is that our electrical costs would go up, but not only would our electricity costs go up, because of the increased demand on natural gas our heating cost would go up.

Mr. HOLMSTEAD. That is correct. We see in our analysis that you would get somewhere between a 25 and 30 percent decrease in the use of coal. Most of that is switched from coal to natural gas, which would also tend to drive up natural gas prices. I don't think we have quantified exactly what those increases would be. I think maybe EIA did do that, but we do believe that natural gas prices would also increase significantly.

Senator VOINOVICH. Did you comment on that?

Ms. HUTZLER. Yes, we get a 20 percent increase in natural gas prices in 2020. That is about 60 cents per thousand cubic feet at the wellhead. So of course that would result in higher heating fuel costs.

Senator JEFFORDS. Senator Boxer?

Senator BOXER. Thank you.

Mr. Chairman, let me just put on the record that no State had to face the kind of crunch that my State did, as I said to the good Governor recently. Everyone predicted blackouts and horror stories. The people rose to the occasion and without making one change in lifestyle, cut 12 percent of the energy use. So I think that energy efficiency when we talk about the kind of crunches that could come need to be the centerpiece of any energy policy. We do need an energy policy. We have agreement on that in this committee. I just think we see the policy playing out a different way.

I also feel I want to respond to the statement that Senator Bond made that the Jeffords-Lieberman bill is a recipe for recession. You know, Mr. Chairman, the last time I heard that was when most Republicans, not all, most said that the Clinton economic plan would lead to major recession. The fact is, we had the greatest economic growth that we have had in our history.

So I think those kind of predictions play to the worst prejudices, in a sense, because it is rhetoric. The fact is, and if you look at the facts, I agree with Senator Chafee's assessment here. The gloom and doom in every single environmental fight we have ever been in in the last 30 years never happened. I want to point to recent history, and I would ask to put into the record some pages here from an energy group. This is a private utility—their experience in Massachusetts, because they have a four-pollutants bill. Let's see what happened to the jobs surrounding this, and they reduced all these emissions we are talking about in your bill, Mr. Chairman.

Their 5-year environmental improvement plan, as they call it, 300 to 500 construction jobs created; much of the construction done by local people; $12 million spent on purchases of local goods and services; and they were able to have enough affordable electricity to power 1.5 million homes and businesses in southeastern New England.

So we see jobs. We see electricity. We see cleaner air. We see healthier people. The gloom and doom scenario just is not evident in our history here.

I wanted to ask you, Mr. Holmstead, because I so disagree with you on CO_2, but I will save that for a second round of questions because I disagree with you.

Mr. HOLMSTEAD. I appreciate the warning.

[Laughter.]

Senator BOXER. I disagree with your position on CO_2 as much as I disagree with you position on arsenic. It looks good. You moved in our direction, so I am ever hopeful we will move more together.

Let me talk to you about mercury. What is the position of the Administration on mercury in terms of a standard?

Mr. HOLMSTEAD. I believe that the only standard we have is something we call the reference dose, and that is something we refer to as the RFD, which actually—and it is based on body weight. So if someone consumes below the RFD, we believe that they are safe from having any difficulties.

Senator BOXER. I mean standard from a power plant. You said we should move on limiting the mercury emissions. What is the standard that you are supporting?

Mr. HOLMSTEAD. At this point, we are still—this is a very difficult issue as you will hear when you have the technology hearing, which I believe is scheduled to come up a little bit later on. The technology is . . .

Senator BOXER. Do you have a position at this time on how to deal with it?

Mr. HOLMSTEAD. No, we don't. This will be part of the proposal that we will be talking about soon.

Senator BOXER. Do you lean in favor of trading?

Mr. HOLMSTEAD. We do believe that some sort of mercury trading will allow us to dramatically reduce overall loadings at a much lower cost, yes.

Senator BOXER. So that would mean you would allow different plants to have different levels of mercury emissions in that case, if you allowed that type of trading.

Mr. HOLMSTEAD. That is correct. Let me just clarify why I think that that makes sense.

Senator BOXER. That's OK. I don't have time. I want to stick to the 5 minute rule. We will come back to it. But I want to establish that.

Mr. HOLMSTEAD. Right. But some plants right now emit perhaps less than half a pound of mercury. Other plants may emit several hundred pounds of mercury. So there is really quite a difference in terms of what plants are emitting now.

Senator BOXER. I do understand, but this is why I think the chairman's bill is so important, because he does not allow that to happen. Because if you are fortunate enough to live in an area that emits a little bit, you are OK. If you live in the other one, you are not OK. Do you know, Mr. Holmstead, what the impact is of mercury—too much mercury, microscopic amounts that stay in the body?

Mr. HOLMSTEAD. Yes, I have some sense of what those impacts are.

Senator BOXER. Would you lay that out for us?

Mr. HOLMSTEAD. Well, the impacts of mercury are very similar to the impacts of other heavy metals like lead, and I think the biggest concern is for children who were born to women who were exposed to high levels of mercury. There may be developmental effects. There may be IQ effects. So it is those sorts of effects that we are—and that is why, by the way, that the President is committed to having legislation that would cap mercury emissions. So that is something that we are very interested in pursuing, and we think that it makes sense to do it in a way that allows to achieve those in the most sensible way, and that is what we are planning on doing.

Senator BOXER. Well, Mr. Holmstead, if I may I will just finish because my time is up. I want to put in the record a letter that I have here to all of us on the committee from the National Wildlife Federation, U.S. Public Interest Research Group, National Environmental Trust, Clear the Air, Sierra Club, Natural Resources Defense Council, Environmental Defense, Clean Air Task Force, American Lung Association, National Parks Conservation Association, and the Earth Justice Legal Defense Fund. I want to put this in the record because these organizations are extremely concerned about the intent of the Administration to allow different levels of mercury at different plants, because what you say is true. We are talking about pregnant women who are exposed to these higher levels having children with lower IQ, even retardation. There will be abnormal growth patterns in some of the children, central nervous system disorders.

So how can we sit here and possibly even entertain the fact that some plants will give off higher levels. So I am just, as we work on the four-pollutant legislation as it deals with mercury should we have to go and do a mercury bill stands, and that we don't move toward this flexible approach which will put some of our people and children and women so on into harm's way.

Mr. HOLMSTEAD. Mr. Chairman if I could just comment, because I am concerned about the implication that somehow the Administration's bill will lead to these sorts of problems. First of all, as I think you understand, S. 556 would continue to allow different plants to have different amounts of emissions. There is nothing that anybody has ever entertained or suggested that would have every plant emitting the same amount, because plants use different amounts of coal. Some emit very little; some emit a great deal. I think under your proposal, what that would be is just a uniform percent reduction so that everybody would reduce by some certain percentage.

We think that a way that we could substantially reduce overall loadings of mercury is the most important thing to look at, because as I think Senator Boxer understands, the mercury that comes out of power plants is emitted in two different forms. Part of it is elemental mercury, which actually goes up into the global pool and could easily be deposited in China or Japan, and we think it is important to reduce the overall loadings of mercury. In addition, there is a part of the mercury that is known as non-elemental mercury that may deposit nearby, that may actually come to the ground in a closer area. We just think it is sensible to understand that the world is fairly complex, and so rather than simply requiring a specific percentage reduction from each plant, we can actually have a cap that allows some trading, that allows us to reduce the overall mercury loading in a much more efficient way, while at the same time making sure that there are mechanisms in place to address the kinds of local concerns that I know Senator Boxer and the rest of us are all concerned about.

Senator BOXER. Mr. Chairman, if I just might—30 seconds—rebut that. This letter talks about the practical effect of the Jeffords bill as a 90 percent reduction in emissions from each power plant and the prohibition of mercury trading, which is quite different than what you said. In addition, if you look at page three of the law—if you would let me finish; I didn't interrupt you—if you look at page three of the law it says, we shall prevent localized adverse effects on public health and the environment, so that each locality will be subjected to the tougher standards, making sure no one is harmed.

So I mean I'm glad that you think that we are close on this. I hope you are right, but it is not what I am getting and I hope we can put this letter from the environmental groups into the record at this time.

Senator JEFFORDS. We can do that.

Senator Chafee?

Senator CHAFEE. Yes, Mr. Holmstead, thank you very much for your testimony.

What is the timeframe for the Administration's multi-pollutant bill?

Mr. HOLMSTEAD. I am hoping, and I believe it will be in the relatively near future. As you can imagine, a lot of the senior level people who had been sort of refereeing these issues and working them through have now been spending much more of their time on other issues. I can tell you it still is receiving very senior level attention, not only at EPA, but within the White House. So again, I hope it will be relatively soon, but I cannot give you a specific date.

Senator CHAFEE. I can completely understand that relatively soon. Anything more specific on that?

[Laughter.]

Mr. HOLMSTEAD. No.

[Laughter.]

Senator CHAFEE. Do you envision when the Administration's bill is proposed that there will be an increase in energy costs associated with their bill?

Mr. HOLMSTEAD. I think the answer is anytime that you impose additional requirements on an industry, you are likely to increase the—and in particular on this industry—you are likely to increase energy costs. I think the important thing to remember, though, is what we are committed to doing is something that really rationalizes the current system. I would be happy to talk more about this at some other time, if people are interested, but we think it makes sense to replace a number of the current requirements that are imposing costs right now. So by putting in place a highly efficient cap-and-trade program that replaces some of these other things, we think we could actually achieve greater environmental benefits at lower cost.

So as a practical matter, we believe that we would actually be reducing, and again I cannot give you specific details until we have our proposal, but because of the inefficiencies in the current system, we think there is an opportunity to have greater environmental reductions at lower cost than we would otherwise have.

Senator CHAFEE. I hope that is true.

Thank you very much. Thank you.

Thank you, Mr. Chairman.

Senator JEFFORDS. I think we ought to take a look at the other side of the equation and the benefits that occur from these kind of reductions. The EPA's analysis of Senator Moynihan's bill from the last Congress said that smaller reductions than those in S. 556 would result in $59 billion in health benefits and $1 billion in visibility benefits. Do you agree that S. 556 would produce at least these level of benefits?

Mr. HOLMSTEAD. Again, we have not specifically quantified it, but I think that something like that is not out of the—I think that is certainly the right range that we would be thinking about. There is a methodology that EPA has used and that others within the Administration have used to monetize the benefits, and most of those benefits, as you have indicated, tend to be from reducing $PM_{2.5}$. So again, I think that that range is probably, at least that number is in the right range.

Senator JEFFORDS. I just want to keep this in perspective here, because sometimes we only look at one side of the equation. From the perspective of the national policy, it leads us to the wrong solutions.

How much will it cost consumers in cents per kilowatt hour if the power sector has to comply with all the numerous Clean Air Act regulations that you have identified?

Mr. HOLMSTEAD. Again, we have not done that analysis, and one of the reasons we have not is because so much of the future is uncertain, not only to the industry, but to EPA. We are in the process right now of, in fact the very beginning part of the process, of trying to figure out what the MACT standards would need to be. As you know, there is a very detailed statutory regime that gives us a methodology for doing that. We are in the process of doing that now, but we can't tell you exactly what MACT will be or how much it will cost the industry.

The same is true in particular with figuring out how much this industry will have to spend in order to help State come into attainment with the new MACT standards. So as I mentioned before, there is no doubt that they will face additional compliance costs and we believe that probably those compliance costs would be passed along to consumers in the form of higher energy prices. But at this point, we are just not able to estimate with any certainty what those will be.

Senator JEFFORDS. You praise the cap-and-trade approach of the acid rain title of the Clean Air Act Amendments of 1990. You also said that it is not wise to just layer additional reduction requirements on top of existing programs, but that is more or less what Congress did in setting up the title's caps, isn't it?

Mr. HOLMSTEAD. That is what Congress did back in 1990, but I think there are two points we need to keep in mind. The first and the most important point is what we have said and what Governor Whitman has said is that we would only be replacing existing programs assuming that the caps are stringent enough to warrant that. I don't think people believed back in 1990 that the nine million ton cap was sufficiently stringent to warrant the elimination of some of these other programs.

The other thing to keep in mind is, back in 1990 there was a great deal of skepticism about a cap-and-trade program. There were a number of people who were concerned about the impacts of that, but it has worked much better than I think anybody envisioned. I think the proof is in the pudding. I've been in Washington long enough to know how these things work, and since I have been at EPA I have met hundreds of outside consultants and lawyers who claim to have invented the acid rain trading program. Every day I run across somebody new who was the father or mother of that program.

So it has worked out better than I think people expected. One of the interesting things is that, you know, one of the concerns was that it would lead to this issue of local hot spots. We have just not seen that at all. We have very detailed analysis now that suggests that in fact by bringing down the total loading of emissions, that we have not caused any localized hot spot problems. But again, if I could just say I think the important thing is that we believe these programs could be eliminated provided that the caps are sufficiently stringent to warrant that kind of an action.

Senator JEFFORDS. As I remember, I was the father of that program.

[Laughter.]

Mr. HOLMSTEAD. Senator, I think that we can agree that you and I were the co-fathers of that program.

[Laughter.]

Senator JEFFORDS. Good answer.

Your testimony provides the committee with ideas about what the agency thinks is wrong with S. 556. The invitation letter asked for suggestions or amendments that should be made to the legislation. When will you and the Administration be prepared to provide the committee with constructive suggestions like that?

Mr. HOLMSTEAD. We look forward to working with you and with your staff, and I think now that we have the first round of the analysis that we provided to you, and I am sorry that we did not get that to you earlier, but we hope that that is the beginning of a relationship where we can provide you additional technical support that should be useful to you and your staff and the other members of the committee.

I know that everyone is eager to have the Administration come up with a more concrete proposal, and again I hope that is something we can do. It is something that we will do, and the timing of that is just still uncertain because of everything else that is going on within the Administration.

Senator JEFFORDS. I appreciate that answer, and we will be looking for it.

Senator Voinovich?

Senator VOINOVICH. Yes, Ms. Hutzler, I requested some information, and I will put this chart up from the Energy Information Administration and the Department of Energy. Are you familiar with this chart?

Ms. HUTZLER. Yes.

Senator VOINOVICH. According to the information that I have, the chart shows that the expected cost of four different proposals addressing NOx, SO_2 and mercury, that the first three scenarios show a 50 to 65 and 75 percent reduction of all three pollutants by the year 2012. This is contrasted with the reductions in S. 556 which are called for by 2007. Could you explain this chart to us?

Ms. HUTZLER. That chart shows different allowance costs under different scenarios of reductions, and we've added to it beyond what you had asked us to analyze. You asked us to analyze SOx, NOx, and mercury reductions of 50 percent, 65 percent, and 75 percent versus some baseline. But we also took a look at looking at mercury reductions that went further—90 percent below, rather than 75 percent below, which was the most stringent target you had requested us to analyze.

What happens in that case is your mercury allowance price really increases dramatically. The reason for that is that to control mercury, we find it to be very non-linear; that there is sort of a knee in the curve where the costs increase substantially. When you push it to 90 percent, you have hit that knee in the curve. So that is pretty much what that chart is indicating.

The point of it is that if you give more time in order to achieve the goals, that the costs are a lot less and less of an impact in terms of energy cost. Is that . . .

Ms. HUTZLER. That is another way of looking at it, because in your scenarios you also had it phased over a 5-year period—2007, half the targets had to be met; the full target in 2012. So you would also have lower costs, too, if you are giving the industry more time to comply.

Senator VOINOVICH. I think that is one of the things that is being debated right now in terms of this legislation is the time line. How fast are you going to ask people to come on board and what is the status of the technology, and the issue of mercury and what you can do to bring it down. I visited power plants and talked to people about mercury, and they are not just sure what they can do in order to bring mercury down. According to your chart, it seems that if you address the mercury issue that you should at the same time be able to deal with the NOx problem. But I know at Gavin in Ohio, they put on that new SCR technology to get rid of the NOx, and they are still not sure just what impact it is having on NOx yet. They are having some problems with it, and they really can't come back and tell me what impact they think it is having on mercury.

So there is a lot of uncertainty out there about whether or not you can deal with the mercury problem and how effective you can be with it.

Have you done any calculation either in the EPA or in the Department of Energy on the impact that this legislation, if it was passed just as it is, would have on the gross State product or the domestic product of the United States in any sense? I mean, we are talking 30 percent to 50 percent increase in electricity cost; 20 percent cost, say, in heating. What impact—have you done any calculations about the impact that it would have on this nation's economy and its competitive position in the global marketplace?

Ms. HUTZLER. In our reference case, we say that the bill would have about a .08 percent impact on GDP in the year 2007. That is about $100 billion in reduction to the gross domestic product in that particular year. What we analyzed, though, was not specifically S. 556 because we did not look at two provisions precisely, but the analysis we did do was fairly similar.

Senator VOINOVICH. And would you repeat that again? What is the date?

Ms. HUTZLER. In 2007, it would be a .08 percent reduction in GDP.

Senator VOINOVICH. So that is about $100 billion.

Ms. HUTZLER. $100 billion.

Senator VOINOVICH. We are trying to figure out $100 billion stimulus package right now to jack the economy up and get it going.

Has EPA ever done that kind of analysis, Mr. Holmstead, do you know?

Mr. HOLMSTEAD. As I think I mentioned, we have not analyzed S. 556 directly, and what we did was respond to the letter from Senators Jeffords and Lieberman. And S. 556 contains a couple of provisions that would make it more costly than what we have analyzed. What I can say is, and what we did analyze, in general our analysis was pretty consistent with EIA's. We did not see as big an effect on GDP, and in fact GDP was largely unchanged. But the reason for that is I think we agree with the EIA's analysis in terms of the increased cost in terms of the decline in consumer ability to purchase goods and services.

What you have to remember is the GDP is a total measure of—includes government spending, includes investment for government-required programs. So to some extent, the control technologies that you and I would be paying for in the form of higher energy prices, that money then gets reinvested into the economy in the form of SCRs and scrubbers and other things. So that is why we don't see a big impact on GDP. But as I mentioned, we have never done that sort of analysis on S. 556.

Senator BOXER. I am chairing this for the moment, just waiting for Senator Jeffords to come back.

Do you have any more questions, Senator? Your time has expired, but would you like to ask another?

Senator VOINOVICH. No, Madam Chairman.

Senator BOXER. OK. Thank you.

Mr. Holmstead, I am confused about something you said. You said that EPA has never done an analysis of S. 556, but I have it right here.

Mr. HOLMSTEAD. That is an analysis of the request that we got from Senators Jeffords and Lieberman back in, I think in May.

Senator BOXER. Yes.

Mr. HOLMSTEAD. There are two important aspects—there were two important things about that analysis that are different from S. 556. The first one is, S. 556 actually would require all power plants after a certain period of time to come up to conformance with so-called NSPS, new source performance standards. That is something that was not included in our analysis.

Senator BOXER. OK.

Mr. HOLMSTEAD. Probably the more significant thing, though, is that the only way our models work allow us to model mercury trading, and so we have not been able to analyze the cost of mercury-specific controls on each plant, though we do know that that would drive up the cost pretty significantly.

Senator BOXER. OK. Well, I am still confused because I have it here from the U.S. EPA, Office of Air and Radiation, Office of Atmospheric Programs, dated October 31, 2001.

Mr. HOLMSTEAD. Right. But does it say that it is an analysis of S. 556, or does it—it is a response to the request, and the request was not that we analyze S. 556. The request was that we analyze certain parameters.

Senator BOXER. OK.

Mr. HOLMSTEAD. But those parameters are not exactly the same as S. 556.

Senator BOXER. All right. Well, then I would suggest you let us know where this analysis falls short in its relation to S. 556. I would like to know because I would like you to then continue doing your analysis.

In this non-analysis analysis, you say here . . .

Mr. HOLMSTEAD. That is an analysis. It is the analysis for . . .

Senator BOXER. It is the analysis?

Mr. HOLMSTEAD. Yes, it is the analysis that we were asked to do by Senators Jeffords and Lieberman.

Senator BOXER. Very good.

Mr. HOLMSTEAD. They did not ask us to analyze S. 556.

Senator BOXER. But they did ask you to analyze what they do in S. 556.

Mr. HOLMSTEAD. No, they did not. They asked us to . . .

Senator BOXER. OK. Because here it says—well, you have to read this. It sure sounds that way to me. Let's go take a look at it.

Mr. HOLMSTEAD. Here is something that we could perhaps agree upon.

Senator BOXER. Let me just read this, OK?

Mr. HOLMSTEAD. Sure.

Senator BOXER. Yes. In response to a May 17, 2001 request from Senators Jeffords and Lieberman, this report describes the results of a modeling study done to evaluate the potential impacts of reducing nitrogen oxide, sulfur dioxide, mercury and carbon dioxide emissions from the U.S. electric power sector. As far as I am concerned, if this is not a complete report, it is a good first step of analyzing the bill.

So let me just say it clearly . . .

Mr. HOLMSTEAD. That is correct. We agree. That is absolutely right. Yes.

Senator BOXER. OK. It clearly says here that, and this is in response to Senator Voinovich's points about GDP, and I want to ask unanimous consent to place in the record page 24 here. There is little change in GDP under any of the policy scenarios, and they explain why—some of which you have explained.

Mr. HOLMSTEAD. Right.

Senator BOXER. So the macro impact on overall GDP, according to this first analysis, is that there isn't any impact in the macro picture of GDP for the reasons that you stated before.

I want to read into the record a part of this letter from the environmental groups that I mentioned before, Mr. Holmstead, for you to consider what they are saying; and not for you to respond to it, but just to think about what they are saying, and this is I think important.

Mercury exposure in the United States is real and widespread, and as a potent neurotoxin it persists in the environment and accumulates in the food chain. It demands an aggressive policy response. Most important, it demands that Congress not set a dangerous precedent by allowing trading of this toxic pollutant to meet a national reduction target.

Then they explain why—and what I like about this, they put it into a real situation here. It is not just some bureaucratic thinking. It is a real situation. They say, for example, children of fishermen in the eastern United States living within 1.5 miles of a power plant are potentially exposed to mercury five times above the level EPA considers safe. Power plants' mercury emissions also could be transported through the atmosphere and deposited hundreds of miles away. For both reasons, stringent timely controls on each coal-fired plant are essential, and any program that would allow local mercury burdens to increase would be unconscionable.

I just want you to think about that. I know you probably don't agree with what they are saying, but I think it is important to think about it, because I think the people in the country are going to agree with it, because it is common sense.

Now, I also want to respond to what Senator Voinovich said, and the I will stop and I will wait for another round. In terms of the technological capabilities of controlling mercury, my understanding is that data from EPA show that power plants can capture 40 to 98 percent of their mercury emissions using existing controls for other pollutants. Mercury control technology recently tested on power plants is capable of capturing 80 to 90 percent of mercury in flue gas. One of these technologies is very widely used by other industries and proven to routinely capture over 90 percent of mercury.

So this is a good news situation. I believe truly, you know, we will cerate jobs in moving these technologies forward. We will have healthier people and we will have no adversity on our GDP. That is the picture that I conclude, and as I say, it is from real-life experience seeing this in a western State called California, let me state, that has 34 million people and did elect Ronald Reagan, Richard Nixon and me.

[Laughter.]

Senator BOXER. So I think that it shows that our people are working together here, and we always have prized a clean and healthy environment.

So Senator Chafee, I believe it is your turn.

Senator CHAFEE. Thank you.

I would only like to add that as we talk about GDP, I think it is important to also remember that if we push the envelope on clean air that we are also pushing American ingenuity, and there is a vast wide world out there that can depend on American ingenuity, whether it is Latin America, Africa or China wrestling with these problems that as we push the envelope, we can export that technology and help our GDP.

So that is all I have to say.

Senator JEFFORDS. Senator Voinovich, I know you are very interested, and I would let this panel . . .

Senator VOINOVICH. I am going to let this panel go, but I would just like to ask one more question please.

Senator JEFFORDS. Yes. Please go right ahead.

Senator VOINOVICH. OK. And it deal with the same thing that Senator Chafee and others, and that is getting some information back as soon as possible, Mr. Holmstead, from the Environmental Protection Agency.

In your ongoing analysis of the multi-emission strategy, either for the Administration's proposal, which we are anxious to see, or the independent analysis you are conducting for this committee, are you considering the potential costs to different industries in additions to the impacts on utilities? For example, impacts on manufacturers—higher fuel prices, higher cost to goods, loss of competitiveness; impacts on users of natural gas; farmers; agriculture; polymer chemical industries; impacts on small business.

The Edison Electric Institute, which I am sure people would say is discredited, it represents the utility industry, estimates that the following industry sectors would be hit hard by this bill: the agriculture sector, loss of $2.27 billion gross output by 2010; manufacturing, loss $11.2 billion gross output by 2010; motor vehicles, loss of $1.6 billion, 2010; service sector, loss $57.2 billion gross input by 2010.

Those kinds of—and this is an industry group's statistics, and I am sure people would debate them—but we need the best information we can in terms of the impact that this legislation is having, and the sooner we can get something back from the Administration and the EPA on where you are, the better off I think all of us are going to be.

Senator JEFFORDS. Thank you.

Senator Boxer?

Senator BOXER. Thank you, Mr. Chairman.

I find this so interesting because Senator Voinovich raises these costs that will absolutely occur. I don't deny that there will be costs overall. The GDP, according to this report, will not change, but there are clearly going to be impacts. But we have to remember smog also impacts agriculture. We know that. We take heavy losses because of it. So there are benefits as well.

Because my Chairman wants to move on and because, Mr. Holmstead, I don't want to torture you anymore, I just would ask you to respond in writing to something. The Administration asked for a report from the National Academy of Sciences, said is there really global warming. The report came back and they said yes, there is global warming and it is happening and human actions are responsible.

Now, I understand you have said sort of over your vehement objections, we will not touch this issue of CO_2. We are going to fight you on it, and in terms of this—in this bill.

Mr. HOLMSTEAD. That's not—I'm sorry. Right. I think that is an important distinction.

Senator BOXER. I am making it. I am saying in this bill. All right? Even though 40 percent comes from the power plants. OK. So that leaves you just 60 percent to work on to improve. I want to know what you are going to do. I would be very interested to know what you are going to do. Obviously, staying away from the worldwide meetings on this is something that you have done, at least at the highest levels. So without getting into it today, I think it is extremely important for us to know what you are going to do. Because if you are not going to allow us to move forward with this, although I think we are going to try, and have our debate. In terms of these power plants, how are you going to get to those reductions? What is your plan? So if you could get that to me in writing, because it is way too long and my Chairman will not be happy with me, even though I am a strong supporter of his bill. He wants to move on.

I want to thank you for this debate that we had, and Mr. Chairman, we clearly have a fight ahead of us, but I think it is a good one, and I look forward to it.

Thank you.

Senator JEFFORDS. You look forward to every fight.

[Laughter.]

Senator BOXER. My name is Boxer for a reason, and that's the deal.

Senator JEFFORDS. That's right.

Thank you. I deeply appreciate your cooperation and being very forthright this morning, and we look forward to working with you.

I will now call the third and final panel for this morning. This is panel three—Kenneth Colburn, Director of Air Resources, Department of Environmental Services, Concord, New Hampshire; David Ouimette, Manager, Stationary Sources, Air Pollution Control Division, Colorado Department of Public Health and Environment, Denver, Colorado; Brock Nicholson, Chief, Air Quality Planning Division, North Carolina Department of Environmental Natural Resources, Raleigh, North Carolina; and Michael Callaghan, Secretary, Department of Environmental Protection, Charleston, West Virginia.

Thank you, gentlemen, for being with us today. I deeply appreciate your willingness to come and to cooperate and to provide us with some good testimony.

Our first witness is Mr. Ouimette, and if you will proceed.

STATEMENT OF DAVID OUIMETTE, MANAGER, STATIONARY SOURCES, AIR POLLUTION CONTROL DIVISION, COLORADO DEPARTMENT OF PUBLIC HEALTH AND THE ENVIRONMENT

Mr. OUIMETTE. Thank you, Mr. Chairman.

On behalf of the State of Colorado, thank you for the opportunity to present the State's views on S. 556, the Clean Power Act of 2001.

My name is Dave Ouimette and I direct the activities of the Stationary Sources Program for the State of Colorado, and I have worked in that area for the past 17 years. Colorado is in support of legislation to reduce the health and environmental impacts of air pollution, especially if this includes some streamlining of the Clean Air Act by replacing outmoded procedures with stringent standards reducing air pollution.

We examined the proposed legislation in relation to several broad principles, and I would like to tell you what those principles are and how they apply to the proposed legislation. The principles are, first, there cannot be any backsliding from the environmental protections found in current law. That is, there should be no less emissions reductions under a multi-pollutant control strategy than that under the current program. Also there should be no detrimental localized effects which would threaten the national ambient air quality standards.

Our second principle is any new legislation should not simply overlay the new standards or requirements on top of the existing Clean Air Act. New requirements need to be integrated into the Act to avoid redundancy. For example, elements of some programs such as major modification permitting under the New Source Review Program and regional haze as they pertain to power plants may no longer be necessary. More discussion will be needed to determine which existing elements should possibly be abandoned.

Our third principle is certainty—certainty for regulators and the regulated community, as well as the general public, is crucial. Certainty being clear program requirements that can be readily understood. Also, program requirements should be clearly identified in the law or in the regulations that implement them. I have noted in the past that policies, letters and written determinations from EPA have tended to confound the implementation of programs such as New Source Review and this needs to be addressed.

Our last principle is energy demands in the West and the ability to develop the resources to meet that demand must be considered with any new legislation. In that regard, we do not fully understand the implications of the carbon dioxide emission reduction provisions, and there may be unintended consequences for energy supplies in the West that may be difficult to cope with. For this reason, we believe we should closely examine whether CO_2 reduction targets are appropriate at this time.

Instead, we recommend that an intense study of the impact of CO_2 controls on power in the West, as well as perhaps future hearings on the topic, would be advisable to ensure that any reductions agreed upon do not have a secondary effect of causing power shortages or inflating the cost of power to consumers.

Please don't misconstrue our statement to mean that we are not concerned about CO_2 emissions. As you know, there are many dimensions to the CO_2 debate beyond just power plants, including increased energy efficiency and use of renewable energy sources in other sectors of our economy. These strategies can effectively reduce overall CO_2 emissions, and Colorado has robust, ongoing programs in these areas.

I would like to now walk through a few additional comments on the provisions of S. 556. First, the western part of the country differs from the East, as you have heard previously, with regard to the nature and extent of air pollution problems. So we recommend that the bill be amended to reflect these east versus west differences where they exist. Your staff heard about this at some length during the October 4 and 5 stakeholders meeting on this proposed legislation.

Next, the timeframe for making the requisite emissions reductions is impractical, especially if these reductions are going to occur with the assistance of an emissions trading program. A 5-year time line is insufficient to adopt legislation at the Federal level, develop and implement Federal regulations, adopt legislation at the State level, and then provide facilities time to comply. The establishment of an emissions trading program in the same timeframe is also very aggressive and may not be possible.

On the proposed nitrogen oxide reductions, with the exception of California, the West does not face ozone standard violations as do other areas of the country. Therefore, we believe that any reductions required of power plants be no greater than that which can be achieved by good combustion technology, as opposed to the use of add-on control devices. We also believe that this approach would still provide an environmental benefit in the West with respect to regional haze.

Last, Colorado supports reducing mercury emissions and the benefits this will have for both air and water. We do believe than an appropriate reduction number can be placed in legislation in the near future, but that the issue warrants further consideration before an emission target is set, the reason being that the proposed legislation requires a 90 percent reduction of mercury from 1999 levels without regard for the emissions reductions that may already be achieved as a co-benefit of operating existing non-mercury pollution control equipment. This may put State regulators in the untenable position of having to enforce a 90 percent reduction without having technology available to industry to achieve that goal.

Also, it is our understanding that there are subtle differences between eastern and western coal that make it difficult to reduce mercury emissions from the burning of western coal, and this needs to be addressed.

Finally, in the spirit of advancing the discussion on multi-pollutant legislation, we have a recommendation for the committee to consider. That is, in order for States and other stakeholders to more fully grasp the implications of the proposal, additional analyses would be helpful to flesh out various options as to how the multi-pollutant program would work.

Thank you again, Mr. Chairman, for seeking Colorado's views on this important legislation.

Senator JEFFORDS. Well, thank you, Mr. Ouimette.

Mr. Nicholson?

STATEMENT OF BROCK NICHOLSON, CHIEF, AIR QUALITY PLANNING DIVISION, NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL NATURAL RESOURCES

Mr. NICHOLSON. Good morning. My name is Brock Nicholson. I am chief of the planning function for the State of North Carolina's air program, and as such responsible for developing State Implementation Plans, regulation and working with the legislature on pieces of legislation.

I am pleased to be here today to share some insights regarding the current North Carolina experience with multi-pollutant legislation and how that experience might relate to S. 556 under consideration by this committee.

I will skip through some of the material on our bill that is contained in the handout, but simply I will say that it is approximately 70-plus percent reduction in both NOx and SO_2 from actual 1998 levels in North Carolina, and that is of course a key feature, being a State-only type program. For mercury and CO_2, it does not have specific limits, but it obligates the State to come forward to the legislature in future years. I will go into a little more detail on that in a moment, with recommendations.

What I would like to do now is comment on S. 556. Fundamentally, the Department does support the aggregate emissions reduction concept contained in this bill. This approach would presumably incorporate a cap for each pollutant. Caps can provide for an efficient and flexible program to obtain reductions. Both implementing agencies and emission sources will benefit.

This aggregate approach is one that, based on our consideration of and discussions about the North Carolina bill, gives the sources flexibility and certainty to make the business decisions that are in their best interest while they meet the requirements of the legislation. In our view, the aggregate emission reduction approach is a key feature—was a key feature in getting the utility industry to support our State bill.

However, caps must be meaningful from the standpoint of protecting public health and the environment. By that, I mean they must be sufficiently stringent to assure that air quality goals are actually met. Caps must not be set at levels that merely facilitate a robust trading system. Our view is that S. 556 appears to be sufficiently stringent to be meaningful, without commenting on exactly where it is the right level or not.

However, unlike the North Carolina bill, which requires all of the actual reductions to be in North Carolina, I would presume that S. 556 and the regulations that implement it would allow for a national trading program. Such a program must not only achieve the national aggregate emissions reduction goal, it must also allow local pollution problems to be addressed in a way that protects health and the environment. There must be a States rights provision or authority provision that allows for actual controls, no trading credits, to be applied to specific units or areas to address local air quality needs.

Since public health protection is an overall goal, States must be able to assure NAAQS attainment even if overall reductions exceed the national cap or such NAAQS controls conflict with the trading program. Such protections must apply not only to NOx and SO_2 emissions, but to the associated ozone and fine particle matter, but also to mercury emissions which can give rise to special local concerns about public health impacts.

Along with a strong Federal mobile program, the multi-pollutant approach such as this bill is critical for attainment of the 8-hour standard and the foreign particle standard. What I would like to do, I know my chart is a little smaller, maybe a little less lethal.

[Laughter.]

Senator JEFFORDS. We like small charts. Thank you.

Mr. NICHOLSON. It is in the handout I think that we have passed, but it is color and I would be glad to send it around or leave it here. What I really want to point out is, this contains both modeling results for 2007–2015 that reflect the full NOx SIP call, assuming no trading, that every unit is controlled, and assuming all the mobile programs are in place, and we still show some local areas not attaining the ozone standard. So I will leave that.

Regarding the compliance schedule in S. 556, we observe that in the discussions that led to the North Carolina bill that a consensus between the environmental groups and the two utilities produced a schedule which is longer than the one in S. 556, but nonetheless acceptable and would not adversely affect the economy or energy supply in North Carolina. These are 2009 to 2013 for final second phase of SO_2 control. However, I didn't say before, but is in the text here, most of the debate was on a cost recovery feature.

As it is in many other States, mercury is a big public health issue in North Carolina. However, considering the uncertainties regarding measuring mercury and the expected and perhaps relatively large co-benefits of mercury reduction when scrubber and SCR controls are placed on bituminous coal plants, the drafters of the North Carolina bill decided not to specify a control level for mercury. Instead, there is a requirement that the State study the issue of co-benefit, report annually to the legislature, and make recommendations to that body by March of 2005 on additional controls that would be needed for public health protection from mercury in our State.

With respect to carbon dioxide emissions, the North Carolina bill requires our Department to recommend action to the legislature by March, 2003. The 2003 date allows time to consider developments at the Federal level and in other States, and to understand the benefits of energy conservation, greater use of natural gas, and the developing clean coal technologies, including coal gasification.

Finally, I will just very briefly say North Carolina, along with Georgia, South Carolina and Tennessee have been charged by our Governors to come up with a multi-pollutant recommendation by this spring, March of 2002, and also to look at innovative energy and transportation approaches that will benefit the air quality.

While CO_2 is not specifically identified, we are looking at measures that also give CO_2 benefits in that effort.

In conclusion, thank you for this opportunity to speak on this very important issue. I will be glad to answer any questions.

Thank you.

Senator JEFFORDS. Thank you.

Mr. Colburn?

STATEMENT OF KEN COLBURN, DIRECTOR OF AIR RESOURCES, NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

Mr. COLBURN. Thank you, Mr. Chairman.

My name is Ken Colburn. I direct New Hampshire's air quality programs, and I appreciate this opportunity to discuss multi-pollutant strategies with the committee.

First, I applaud the chairman and the ranking member for tackling this issue, due to its importance not only to public health and the environment, but also to our nation's economic progress and the burdens States will face in wrestling with air pollution. I also applaud your staff, both personal and committee, for conducting groundbreaking stakeholder discussions on this issue in early October.

A reassessment at this time is appropriate because it is over a decade since the last major amendments to the Clean Air Act. We have made good progress. Overall, pollution from power plants is down, despite increased economic activity and nearly a doubling of coal use. Still, the Act and its implementation must improve in order to capture the benefits of our experience in the last decade. We must build on our successes, like the Acid Rain Program, which has shown that environmental and economic interests can be aligned, rather than at odds. We must rectify several shortcomings in the Act.

Most important, though, we need to improve its results. Many areas still violate health-based air quality standards. Forests and lakes throughout the Northeast continue to suffer acid rain damage, and growing scientific evidence points to the profound health effects of fine particulate matter, the long-term impacts of toxic metals, and the climate-altering effects of carbon dioxide.

Multi-pollutant approaches like S. 556 promise to address all of these needs. That is why the northeastern States strongly support the committee's efforts. Only a 4-P approach can give industry the investment and planning certainty it needs, ensure reliability, and prompt a smooth transition to the future technologies and resources that we will need.

A 3-P approach will not accomplish this goal. Scientifically and politically, climate change can no longer be ignored. We need to start decreasing our emissions of climate-forcing gases, and based on EIA's analysis, CO_2 prices could be as low as $10 a ton or even lower if sequestration is involved. This is an economic issue in New Hampshire because our economy is based on our quality of life, and our quality of life is clearly based on our climate.

In short, we cannot gain on the future by wedding ourselves to the policies and programs of the past. Ultimately, efficiency will win out in an economy over inefficiency. So it is just a question of how much competitive advantage and technology opportunity we will squander by delay. Action now on a multi-pollutant bill is economically, not just environmentally, superior to inaction.

States also seek Federal action now in order to deal with upcoming attainment dates and designations. States can do a lot of things better than the Federal Government, but adopting consistent regulations to equitably address the multi-State impacts of the interstate power industry probably isn't one of them. Reducing emissions from power plants through a nationally consistent output-based approach will take the smallest bite out of the economy and simultaneously enhance electric competition.

Any emission reductions not achieved through a Federal multi-pollutant approach will have to be secured by imposing additional burdens on States, which in turn will have to impose additional burdens on other smaller sources. Thus, failure to adopt an effective national 4-P legislation is a recipe for adding costs in pursuit of identical environmental and public health goals.

Further, since Federal preemption obstructs State controls on other major emissions sources like vehicles and fuels, small businesses will bear the brunt of making up for the missing reductions.

High-tech States like New Hampshire also welcome the benefits that a multi-pollutant path will push. For example, energy efficiency in distributed generation can provide better reliability, cost savings, and greater energy security than simply erecting vulnerable power plants and pipelines.

We would also like to solve transported pollution more constructively than the Act now allows. Though well-intended, sections 126 and 110 have divided the country into bitter upwind and downwind camps, and wasted scarce State resources on incessant litigation. Dramatically reducing power plant pollution is more cost-effective than burdening the States with solving interstate pollution transport through litigation.

Finally, we also need to look at New Source Review. Many grandfathered power plants have actually increased output in recent years, rather than retired as anticipated. In this context, NSR has accomplished two important things. It has enabled States to reduce pollution, albeit from new sources, more than they otherwise would have, and it gave rise to the development and application of new emission control technologies. NSR at existing sources is more contentious, as the enforcement actions now under way demonstrate. The fact that a law is violated, however, does not mean we don't need it. The northeast States unequivocally support the current enforcement actions against NSR violators, and feel strongly that new legislation must not impede those actions or create a pretext to let past violators off the hook.

Going forward, however, there should be opportunity for consensus on improving NSR. Progress is most likely if we take a systems approach to the interlocking provisions of the Act. The yardstick we will use to measure those new provisions will be whether they guarantee better health protection than the current statute. States will be willing to entertain greater regulatory relief if emission reduction commitments are larger, sooner, more certain and become progressively more protective over time. We will not support relief today in exchange for promises of future reductions.

In addition, the full suite of existing State authorities to go beyond Federal requirements when necessary must not be abridged.

In conclusion, several States are already moving ahead to create an energy future that is cheaper, cleaner, more secure and provides greater competitive advantage, job opportunity and quality of life. We urge the country as a whole to do so by adopting an aggressive national four-pollutant strategy reflecting the core concepts in S. 556. The northeast States have developed a general set of principles which was attached to my testimony, and I look forward to answering any questions. Thank you.

Senator JEFFORDS. Thank you.

Mr. Callaghan?

STATEMENT OF MICHAEL CALLAGHAN, SECRETARY, WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Mr. CALLAGHAN. Thank you, sir, and good morning. I am Mike Callaghan. I am head of the West Virginia Department of Environmental Protection. I have had that job since February. Prior to that I was a Federal prosecutor, and I will say it is a lot easier putting bad guys in jail than it is understanding the Clean Air Act.

[Laughter.]

Mr. CALLAGHAN. So, for what that is worth.

As most of you on this committee probably know, West Virginia, we are probably the largest supplier of coal of any State. I say that in this sense, Btu-wise, we surpass Wyoming and even the States out west. Quite simply, we supply high-tech States like New Hampshire with the power to run their computers and their Internet and things like that.

In my role, I spend a good bit of time working with environmental issues related to the digging of coal, and more and more we are working on environmental issues related to the burning of the coal.

This particular bill, and let me talk about the goals here. The 75 percent reduction of SO_2, 75 percent NOx reduction, 90 percent mercury reduction and a reduction of CO_2 to 1990 levels—looking at those things, and let me start with this premise. It may surprise many of you here to believe that I kind of support the concept of a multi-pollutant strategy. Many of our environmental programs that we have had, including the air program, have developed in a mix-matched fashion, and it has been a hodgepodge of complex regulations. The traditional command and control approach has often addressed only individual pollutants in a facility-specific manner. Control requirements or the lack thereof can vary widely across jurisdictional boundaries within the same air shed.

For those reasons, I think a national multi-pollutant strategy is a superior environmental solution that could address many of these issues and clear up some complex and very confusing things like the regional haze issue, the 8-hour ozone standards and the $PM_{2.5}$ standards. So that is the positive.

The negative, I have to say, our problem with it is simply the CO_2. We have severe reservations about including CO_2 national emissions caps. I love to refer to our senior Senator Robert Byrd when he supported the Climate Change Strategy and Technology Innovation Act of 2001, which is S. 1008. He stated the case far more eloquently than I am capable of doing. But the entire Senate adopted, as I understand it, Senate Resolution 98—an acknowledgement that climate change treaties, you must include commitments from all the developing nations, the heavy polluters, including the United States. We don't have that and we are not going to get there. So our recommendation is, let's not go there with the CO_2. We recommend removing the CO_2 cap from S. 556.

Now, I say that, but we also acknowledge that global warming is a concern. It needs to be addressed in a meaningful way, and I suggest a far better approach is to start with S. 1008 and move forward, and not put in the provisions in S. 55.

Let me briefly address NOx and SO_2 and mercury reductions. We have heard it today and you hear it all the time, anytime you talk about regulating industry you hear the same cry. First of all, they can't do it. Second if they could do it, it would cost us too much money and we would all go out of business. We are all hearing that on this particular issue.

Past experience has told us, I think, that industry overstates their case, but in this particular instance I want to say I think there is legitimacy to the concern of the restrictions in S. 556. I think the focus needs to be placed on the level of the caps, not on whether we need caps or not. So with respect to the three pollutants, we are supportive of some type of cap. I think they might be just a little too high.

When you put the caps on, I will sound this warning. Various levels, once the caps are determined, the next step is to ensure equity among the States. There needs to be some mechanism to ensure that legitimate issues concerning allocation under these caps are fairly resolved.

I will give you an example here that is site-specific with West Virginia. We are involved in an ongoing feud with EPA over a growth assumption that they placed on West Virginia. EPA basically told West Virginia from the period of 1996 to 2007 we would have zero new power facilities in the State of West Virginia. Well, that strikes me as rather odd because there are eight of them sitting on my desk today that want to move forward. So when I talk about fairness, we need to be fair to States like West Virginia and not have EPA putting unreasonable growth assumptions on our State.

Let me conclude, I see my time is out, we need to have a multipollutant strategy and eliminate things like the complexities of New Source Review, prevention of significant deterioration. We need to clarify enforcement issues under these programs. The strategy I think you should go in is to provide stability and certainty for the affected sources and limit liability for sources that demonstrate adequate compliance with the program provisions.

Thank you.

Senator JEFFORDS. Thank you all for very excellent statements. I deeply appreciate it. West Virginia, you certainly have Senators here that you can rely upon to take care of your interests, I can assure you of that.

We have a difference of opinion across this nation on what to do, what the levels ought to be and who ought to be helped and hurt, so this is going to be a very long and lengthy dissertation in the committee before we probably end up with a bill that we would be pleased with, but we intend to go forward.

I have questions which I will just take them in the same order that we spoke. The first question is, to achieve attainment with a new $PM_{2.5}$ standard, what kinds of emissions reductions will be necessary from power plants in your State?

Mr. Ouimette?

Mr. OUIMETTE. Mr. Chairman, we are not anticipating being out of compliance with the $PM_{2.5}$ standard. So we have no issues with that that I am aware of at this time.

Mr. NICHOLSON. In North Carolina, we are having considerable problems with the PM standard presently. We have a very large percentage of our monitors that are over the standard. We would anticipate a very significant cut in SO_2 emissions are necessary to obtain that standard. We don't have the number yet. We haven't finished that analysis. But we believe we need a very substantial cut, both in North Carolina, and certainly we need to reduce in North Carolina for North Carolina's benefit, but we also need it reduced in a broader region. These kinds of levels, I think, are probably—our gut sense is they are in the ballpark.

Senator JEFFORDS. Mr. Colburn?

Mr. COLBURN. Senator, a similar answer. We anticipate or hope that we will not be in nonattainment of the new $PM_{2.5}$ standards, but to the extent that we risk that, it is a function of regional sulfur emissions being transported to the State, and there is nothing I can do in my State to achieve that. However, we will ante up and do the same things required of other States to our own plants, and we believe that the sulfur and NOx requirements that you have outlined in S. 556 are about right.

Senator JEFFORDS. Mr. Callaghan?

Mr. CALLAGHAN. We think we are going to be in compliance. We don't have any issues on attainment.

Senator JEFFORDS. Next question—if the emission reductions in S. 556 don't take place, what steps will your State be required to take to ensure that the public health and environment are protected?

Mr. OUIMETTE. Mr. Chairman, fortunately in Colorado we have had tremendous success, perhaps more than most States have had, in redesignating from nonattainment status to attainment status. In fact in the next year, approximately a year or year and a half, we anticipate that we won't have any nonattainment areas remaining in Colorado. So we are keeping our fingers crossed and I think if that in fact is the outcome, there will be nothing further that we have to do.

Senator JEFFORDS. Mr. Nicholson?

Mr. NICHOLSON. In North Carolina, we, as I explained, we have this legislation that I didn't mention before, but has passed our Senate and is still in the House. That is one step that the people in North Carolina believe is necessary. The other is to work collectively with our other regional States in an effort come forward with our own regional program. I think it is much more difficult, obviously, on a single-State basis or a regional basis, so it would be much tougher for us without a national program.

Senator JEFFORDS. There is a vote going on now. I intend to get through, and it looks like I can make it in about another minute and I will be—you can use your own judgment, I guess, with what you want to do. But the committee would appreciate any specific recommendations any of you have for language changes to S. 556. A stupid question, because I know the answer, will you cooperate with us?

[Laughter.]

ALL. Yes, sir.

Senator JEFFORDS. All right. That takes care of that question. If S. 556 were to be enacted as introduced, what would be the specific economic and environmental impacts on your State? If you could just briefly do that and maybe fill in with some paper later on, we would appreciate it.

Mr. Ouimette?

Mr. OUIMETTE. If passed as introduced, I think certainly there will be some benefits to the State, for example, especially in terms of regional haze and I think that is where we would see the primary benefit lying. Also, I would add that any mercury reductions would also be a benefit.

Senator JEFFORDS. Mr. Nicholson?

Mr. NICHOLSON. Well, if I recall, the question also involved costs to the State, and I think one of the issues that we are concerned about and it reflects in our legislation is the compliance schedule, the time to comply and allow some of these technologies to be better understood, particularly in the mercury area. We are uncertain exactly what the CO_2 course ought to be followed, so there is concern about cost there also.

Senator JEFFORDS. Mr. Colburn?

Mr. COLBURN. Senator, if a bill that we are deliberating in Concord passes this session, there would be no incremental cost to this measure, with the possible exception of mercury, which still awaits greater definition on control technology costs and performance.

Senator JEFFORDS. Mr. Callaghan?

Mr. CALLAGHAN. I would predict a significant impact on the economy in the State of West Virginia for this reason. Focusing on the CO_2 issue, to my knowledge there is no technology out there available at any price to put on power plants to eliminate or decrease the CO_2 to the extent that you have put it in your bill. So you are essentially talking about fuel switching, probably from coal to natural gas, to make those levels. That would cause significant impact. We have about 18,000 direct coal miners in the State of West Virginia; probably another 35,000 in support of those 18,000. So you are talking about significant disruption of our economy if that were to happen.

Again, I think where we should go on it is look to clean coal technology and see what we can do to reduce the CO_2, instead of putting such a drastic impact on our State.

Senator JEFFORDS. Thank you.

Senator Voinovich?

Senator VOINOVICH. Mr. Nicholson, I was interested—did your multi-emission legislation—it got through one house and it is still in another right now?

Mr. NICHOLSON. It has passed the Senate and it is in the House.

Senator VOINOVICH. Did it include CO_2?

Mr. NICHOLSON. It did not, other than the requirement that the State study the issue of CO_2 and understand what we might be seeing from technology advances, clean coal technology et cetera, and make a recommendation back to the legislature.

Senator VOINOVICH. Do the utilities support the legislation?

Mr. NICHOLSON. They do support the legislation with the schedules that are particularly in it at this time to allow this knowledge gain.

Senator VOINOVICH. But currently, no utility supports the Jeffords legislation—this legislation. I would be really interested in your providing me and the chairman of the committee the background of the legislation that you put together and how you were able to get people together at the table, and what the levels were and the numbers and so forth, because maybe we could learn something from what you did.

Mr. NICHOLSON. I might . . .

Senator JEFFORDS. Excuse me. All the members will have an opportunity to submit questions, and I intend to submit some too, so please proceed.

Mr. NICHOLSON. I must say, though, that our bill is in the House and it has been stuck in our House Public Utilities Committee for quite a while. The real issue that bothers most people is the cost under a cost recovery provision, and particularly the non-utility industry is opposing it. So it is not clear sailing, totally.

Senator VOINOVICH. I would still be interested to see what you've done with it. I appreciate it.

Mr. NICHOLSON. Certainly.

Senator VOINOVICH. Mr. Callaghan, you and I are neighbors.

Mr. CALLAGHAN. Yes, sir.

Senator VOINOVICH. Southeastern Ohio. I was down in Belmont County here recently; a lot of miners. We had 14,000 of them. We have about 4,000 left in Ohio. You've got about 18,000. According to the people in my State in the coal industry, who are for clean coal technology and for moving forward with controlling emissions, their feeling is that if the CO_2 provisions of this bill and the mercury provisions go into place, that they are out of business. I would like you to comment on what I have been getting.

Mr. CALLAGHAN. That is the same information I have received. Certainly in West Virginia, you have I–64 goes through the State, the middle. What is above I–64 is a little higher sulfur coal than what is below I–64. Without question, everything above I–64 would be eliminated. It's a high-sulfur coal and we just couldn't get there.

Again, I'm not up here arguing that we ought to be putting more CO_2 in the air. That is not what I am saying. I am saying that we need to be careful as we walk through this that we don't run away our 18,000 miners and your 4,000 are still left, because the country does rely on this 52 percent of our energy from coal. So I am hearing the same thing—significant impacts, significant reductions if CO_2 goes into effect.

Senator VOINOVICH. My last question, Mr. Chairman. This is to Mr. Colburn. In your four-pollutant proposal for mercury, you endorse 70 percent reductions in 2004 to 2007; 85 percent to 95 percent reductions in 2009 to 2012. I think you probably saw the chart that I had up here before that showed the cost of 90 percent reductions in 2007 at $5,000 per pound of mercury. Part of this estimate is based on the lack of proven technology for mercury reductions, and hopefully we are going to have another hearing on what is available out there.

Would you endorse a mercury number based on co-benefits alone, or perhaps a co-benefits number with a trigger for a higher reduction only if the technologies prove to be available?

Mr. COLBURN. Senator, I think you get to precisely the point, and I would just come at it from a slightly different angle. That is that I don't believe the technology will be available unless there is a pretty aggressive number. Technology, as you know, doesn't develop for recreation. It develops to meet a need. If the Congress defines that need, then the technology will develop.

I was saying that I offered an offer—ask an engineer to do something, and you will get nothing but problems. That is the stage that we are in now. Tell an engineer to do something and you will get nothing but solutions. That is why the gloom and doom scenarios have not occurred. I believe that we are in that situation now that putting an aggressive line of demarcation out there by the Congress will accomplish that technology development. If it doesn't, then I would be ready to join hands with you and say we need to back off on that to what we can achieve and set the next technology goal.

Senator VOINOVICH. The only reason I mention that is my mentioning before that I visit these power plants and we have a company in Ohio that is really trying to do a job, and they've spent a lot of money over the years. I have been to other places, and they have just said that dealing with that problem is going to be very, very difficult, because they just say we don't have a handle on it. We know we can capture some of it, but how do we get the rest of it?

Mr. COLBURN. Senator, just to follow up, I think that coal does have a reasonably bright future, particularly over the next half century, and hopefully through coal gasification, which will probably address a substantial portion of the mercury issue itself. I know coal gasification has an energy penalty, but I suspect it is not as great as that we are already facing for example in ethanol energy technologies.

Senator JEFFORDS. I want to thank you all. We have to sprint over to the floor to vote. But we reserve the right always to keep questions coming to you, and I know you will give us good answers or at least correct answers.

Thank you very much.

[Whereupon, at 12:15 p.m., the committee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF HON. MAX BAUCUS, U.S. SENATOR FROM THE STATE OF MONTANA

Thank you, Mr. Chairman, for holding this hearing so that we can all continue to explore and debate this very important and complicated issue.

There has been, and continues to be, a great deal of interest in multi-pollutant legislation, on both sides of the aisle and within the Administration. I believe that all have the same goal as they consider the best way to craft multi-pollutant legislation—to achieve maximum environmental benefits in the most efficient and effective manner possible, at the least cost to our economy.

There are many reasons for this broad interest in taking another look at how the Federal Government regulates power plant emissions. Air pollution from the nation's power plants continues to be a significant public health and environmental problem, despite the great strides made in reducing emissions of SO_2, NOx, and fine particulate matter prompted by the passage of the Clean Air Act, and the Clean Air Act Amendments of 1990. Deregulation and restructuring of the electric utility industry in many areas of the country have complicated the cost equation associated with updating pollution control technologies. Industry has come to Congress, asking for greater regulatory certainty to help them plan for long-term capital investments in the electric utility sector. Concerns about the effects of global warming have for years prompted many to call for restrictions on CO_2 emissions.

I think the chairman's bill, S. 556, is a good starting point in this debate. I think Senator Jeffords does an admirable job of attempting to balance all of the competing interests and policies associated with a broad multi-pollutant strategy. However, I think we all realize that it will take a lot of time, discussion and debate to come to reach a final compromise that will work for the whole nation, and that will ultimately end up on the President's desk. I am committed to working with my colleagues on this committee in this effort.

As I have stated many times in the past, I accept the science of global warming and believe that it poses a serious threat that our generation must begin to address. However, Montana relies on coal for nearly 70 percent of its electricity generation, and the nation as a whole relies on coal for more than 50 percent of its electricity generation. Montana is also a coal-producing State, with some of the largest coal reserves in the nation. This is an important sector of my State's economy. Again, I think we can all agree that we need to move in a direction that cleans up power plant emissions, including emissions of carbon dioxide. As usual, however, the devil is in the details.

I also want to make sure that the interests of Western States are adequately addressed in any legislation that comes out of this committee. Western coal plants already tend to be cleaner and newer than plants in the midwest and east. They should not be unfairly penalized in relation to older, dirtier plants.

I think this committee has a tremendous opportunity here to do some real and positive good for the environment, for public health, without putting the breaks on the nation's economy, or shutting down its coal industry. I commend the chairman for challenging all of us to accomplish that task.

STATEMENT OF SHERWOOD BOEHLERT, U.S. REPRESENTATIVE FROM THE STATE OF NEW YORK

Mr. Chairman: Thank you for allowing me to appear at this important hearing. My testimony will be brief. I'm really here to make one simple, but significant point—the four-pollutant bill has bicameral and bipartisan (I guess I should say tripartisan) support. Congressman Waxman and I are as committed as ever to moving forward with the companion four-pollutant bill we introduced in the House.

Now some may say, "How can you talk about environmental legislation at a time like this?" My response is that just as we are being urged to carry on with our daily lives despite terrorist threats; we must carry on with the full gamut of our legislative business in the face of those threats.

We must do so because our environmental problems are just as real, just as significant, and just as solvable as they were before September 11.

The lakes in the Adirondacks are still acidifying. The ecological and economic consequences of that acidification are still serious.

The obvious damage caused by terrorists does not make the insidious damage caused by pollution any less threatening. Indeed, the consequences of global climate change will still be with us long after the war in Afghanistan is a distant event students will have to learn about from history books.

Now, even those who accept this analysis may say, "OK, but should we be passing laws now that could make us more dependent on imported sources of energy?" My answer is that we ought to be attacking our dependence on foreign oil primarily by becoming more energy efficient and developing alternative fuels, not by blithely ignoring the long-term environmental and economic costs associated with our continuing dependence on coal. Moreover, coal would still be a significant fuel after the passage of a four-pollutant bill, and substitutes for coal are readily available in North America.

So I think that if anything, the debate this committee is bringing to a head is long overdue. I hope this hearing will be a first step in bringing all the Federal, State and private sector players to the table for serious and (relatively) swift discussions about how to phase in a strict four-pollutant regime—a cost-effective regime that would give Americans cleaner air while giving utilities greater regulatory certainty.

Let me emphasize, though, that that regulatory certainty should come to be only—only—as part of a new regime that will significantly reduce the emissions from power generation. I would strongly oppose making any changes in New Source Review (NSR) unless they are implemented as part of, and at the same time as, a new pollution control regime.

And let me add with my own committee hat on that we are being pushed toward a new pollution control regime by science. The more we learn about air emissions, the more we understand the imperative to limit them.

For example, the new studies of acid rain that were released this past spring indicated clearly that without further cuts in both sulfur dioxide and nitrogen oxides, acid rain will continue to deplete soils, damage trees, acidify lakes and kill fish. The good news, though, is that the 1990 Clean Air Act Amendments are having a noticeable, positive impact, demonstrating that we have the power to remedy the situation.

Similarly, the National Academy of Sciences review of climate change science, issued this past spring at the request of the President, clearly indicates that, despite continuing uncertainties, climate change is a real and serious threat. But there, too, reviews, such as the Department of Energy's Five Laboratories study, indicate that we have the wherewithal to attack the problem.

So I want to congratulate you for holding this hearing and urge you to move forward as speedily as possible with a four-pollutant bill. On the other side of the Capitol and on both sides of the aisle, we are ready to work with you. Thank you.

Statement of Jeffrey Holmstead, Assistant Administrator for Air and Radiation, Environmental Protection Agency

Thank you, Mr. Chairman and members of the committee for the opportunity to speak with you today on the important issue of creating a better approach for reducing pollutant emissions from facilities that generate the electric power we rely on in this country. I believe that this hearing on S. 556 is an important step toward reaching a bipartisan agreement in this matter.

The Bush Administration is committed to putting American ingenuity to work on this tough issue—significantly reducing air pollution from electric utilities. The Administration is committed to updating the Clean Air Act requirements for power generators for the 21st century—but it must be done right to provide a secure energy future for this country. These issues must be seen as one, integrated goal: cleaner air and affordable, reliable energy for American consumers.

At the heart of our approach to multi-pollutant emissions reductions is the goal of achieving cleaner air and increasing energy supply. In his speech on the National Energy Policy in May, the President noted that a cleaner environment and adequate energy supplies are not competing priorities. Indeed, Mr Chairman, the opposite is true—as we saw just this past summer in California, not having an adequate electricity supply is bad for clean air.

President Bush and Administrator Whitman have clearly warned that failing to carefully plan for adequate supplies of energy can be bad for the environment. We just witnessed an unfortunate circumstance in California this past summer, when to help keep the lights on State officials had to relax pollutant emissions on power plants and ease limits on high-polluting backup generators. The Federal Government has taken steps to make sure that the environment in California is made whole down the road, but we believe it is unacceptable to be forced to tolerate higher pollution emissions because of a failure to site and build adequate electricity capacity.

We believe it is crucial that a comprehensive, legislative approach on multi-pollutant emissions reductions also provide industry and public planners with the certainty and flexibility they need to invest in new, clean power generation and efficient transmission. By carefully and responsibly planning, we can prevent in the future having to sacrifice clean air for power like California did last summer.

As the Governor testified some months ago, the Administration approach is to use a market-based trading system that will modernize some of the old, out-of-date rules that are holding us back. We need to set new, ambitious goalposts for industry—

and then let American ingenuity and America's businesses find the most cost-effective way of meeting those goals on a clear timeline.

Thus, the President has directed the Administrator of the EPA to work with Congress to develop legislation that would establish a flexible, market-based approach to significantly reduce and cap emissions of NOx, SO_2 and mercury from power generation. The Administration proposal to limit emissions from power generation will be the centerpiece of the President's promise to deal with emissions from old power plants.

We are delighted that Senator Jeffords and others on this committee share our commitment to modernizing the Clean Air Act. We look forward to working with you to craft a common-sense approach to meeting the challenge of creating a clean, affordable energy supply for America. If we integrate and balance our pursuit of these goals, we can have cleaner air and more reliable, affordable energy. An appropriate, well-designed cap-and-trade program will create incentives to stimulate investment in clean energy technologies, while ensuring that American consumers can still pay their electricity bills.

We are concerned that the approach taken in S. 556 would unnecessarily raise energy costs and jeopardize our energy supplies. Our economy can't afford that, especially at this time. American consumers, and America's employers, need reliable, predictable, affordable energy to light their homes and power their businesses. If we work together, we can achieve our most ambitious clean air goals—without crippling our economy.

The President remains committed to introducing a plan to improve the way we control air emissions from power generators. In the near future, I hope I will have the opportunity to discuss with you the details of such a legislative proposal. I look forward to the additional hearings you will need to address these important issues and to working with the committee to develop an approach that the President can support.

Introduction

As recognized by the President's National Energy Plan (NEP), one of the principal energy challenges facing us is increasing our energy supplies in ways that protect and improve the environment. Thus, the President directed EPA to propose legislation that would significantly reduce SO_2, NOx, and mercury emissions from power generation through a cap-and-trade program. Such a program, coupled with appropriate measures to address local concerns, would provide significant health benefits even as we increase energy supplies and maintain reasonable electricity rates.

Our work on this issue has given us insight that I believe will be helpful to you. The more I learn about the cost and inefficiencies of the current and future regulatory regime to which power generators will be subjected if we do not have new legislation, the more I am convinced that we can—and must—develop a smarter approach that protects the environment and public health while reducing the cost to consumers and industry and optimizing the size of both the State and Federal Government machinery necessary to achieve that protection. It is possible to achieve better results at lower costs, but not if we simply add yet another program on top of all of the existing regulations.

The current Clean Air Act has been enormously successful, but we can do better. Significant cost savings can be achieved for power generators and consumers through a comprehensive legislative package. I look forward to working with you to develop such an approach to reduce emissions from power generation. We applaud Senator Jeffords for tackling this important issue and for recognizing that a cap-and-trade program is the best way to achieve these reductions. However, we have significant concerns with S. 556 as drafted. Our analysis to date suggests that it could increase consumers' electricity rates by as much as 50 percent, which we believe is unacceptable.

In addition, the combination of emission reductions and timing is not feasible and could threaten the reliability of electricity supply. We are concerned that S. 556's short timeframes for installation of controls could lead power plants to be taken offline at important times, which could lead to electricity shortages. In addition, there are a number of issues that Congress should consider that S. 556 does not address. As drafted, S. 556 would make some existing requirements unnecessary, but would not eliminate them. Rather than add yet another layer of environmental regulations on top of the existing ones, we believe that S. 556 should eliminate those unnecessary existing requirements. S. 556 also does not have an allocation scheme. One lesson we should learn from the success of the Acid Rain cap-and-trade program is that when certain key issues can be resolved through clear legislation, we can avoid years of litigation, business uncertainty and costs, and delayed environmental protection.

Finally, and most importantly, the Administration strongly opposes including CO_2 reductions in any multi-pollutant bill. The CO_2 provisions in S. 556 will cost consumers too much and endanger our energy security by causing too much electricity generation to switch from coal to natural gas. Greenhouse gas emissions should be addressed in the context of climate change, which is being undertaken by the President's Cabinet level working group. For all of these reasons, the Administration must oppose S. 556. In my testimony today I will elaborate further on these key points.

Background

Over the last 30 years, we have made substantial progress toward improved environmental quality under the Clean Air Act. During this time, gross domestic product has increased almost 160 percent. At the same time, we have reduced emissions of six key air pollutants by 29 percent, while coal consumption has increased 77 percent and energy consumption has increased 45 percent. Eleven years ago President George H. W. Bush signed into law the most far reaching amendments to the Clean Air Act since its enactment in 1970. Included in those amendments was the Acid Rain cap-and-trade program, the first program tailored specifically to the utility sector, which is achieving significant environmental and public health benefits at a fraction of the initial cost estimates and with relatively little government bureaucracy. It is time to revisit and update the Clean Air Act once again in order to achieve the additional reductions needed to address public health and environmental problems in the most cost effective manner.

The Acid Rain Program is achieving its emission reduction goal at a fraction of the estimated costs because it allows and encourages innovative thinking and long range planning.[1] The existing program establishes a cap on SO_2 emissions to ensure that the environmental goal is met, and employs an innovative market-based allowance trading program to achieve the goal at lowest cost. Allowances are the currency with which compliance with the SO_2 emissions requirements is achieved. Sources, rather than government, decide the most cost-effective way to use available resources to comply. Units that reduce their emissions below the number of allowances they hold may trade allowances with other units in the system, sell them to other sources or save them for future use. There are neither restrictions on trading nor government second-guessing.

Allowance trading provides incentives for energy conservation and technology innovation that can both lower the cost of compliance and yield pollution prevention benefits. Simply, the allowance market puts a price or value on each ton of SO_2 not emitted. The association of a monetary value with reduced emissions encourages innovation: in the 1990's, scrubber costs decreased by approximately 40 percent and scrubber sulfur removal efficiencies improved from 90 percent to 95 percent, and experimentation led to the blending of fuels to lower emissions. To ensure that the cap is met and to provide credibility, sources also are required to install systems that continuously monitor and report emissions.

The Acid Rain Program has proven to be an excellent model for cap-and-trade programs. Compliance with the program has been nearly 100 percent and annual emissions of SO_2 from power plants have already been reduced over 6 million tons (about 35 percent) from 1980 levels. Greater reductions earlier than expected have lowered risks to human health and provided benefits to the environment sooner. Acid rain levels were dramatically reduced over large areas of the United States and trading did not result in geographic shifting of emissions, or "hot spots", as some feared. Despite the significant progress we have made under the Clean Air Act, air emissions from power generators are still contributing to serious public health and environmental problems. Administrator Whitman addressed these concerns extensively in her testimony before you on July 26, 2001. Rather than reiterate her testimony, I will emphasize just a few of her key points. Problems associated with sulfur dioxide (SO_2), nitrogen oxides (NOx), and mercury emissions are of national and international significance, and the interstate and long range transport of emissions continue to play significant roles in the nature and magnitude of the problems. Emission and deposition of SO_2, NOx, and mercury and their transformation byproducts are known to have a wide range of adverse effects on human health and the environment, including:

- SO_2 and NOx emissions contribute to fine particles, which are associated with premature mortality, aggravated chronic bronchitis, hospitalizations due to cardiorespiratory symptoms, emergency room visits due to aggravated asthma symptoms,

[1] Governor Whitman's July 26, 2001, testimony before this committee contains a detailed discussion of the success of the Acid Rain cap-and-trade program.

and acute respiratory symptoms. Fine particles formed from power plant emissions as well as mobile source emissions are of concern.

- NOx emissions contribute to ground-level ozone, which aggravates respiratory illnesses and causes lung inflammation, particularly for at-risk populations such as children, the elderly and those afflicted with asthma, emphysema, and other respiratory ailments.
- Mercury emissions contribute to mercury deposition in water. Children born to women who consume large amounts of mercury-contaminated fish while pregnant may be at risk for neuro-developmental defects.
- SO_2 and NOx emissions contribute to atmospheric sulfate and nitrate concentrations that cause visibility impairment, including impairment in many national parks and wilderness areas.
- SO_2 and NOx contribute to acid deposition, which damages lakes and streams, adversely affecting the fish and other species that live in them, and leaches nutrients from the soil.
- NOx emissions contribute to nitrogen deposition that may lead to eutrophication of estuaries and near-coastal waters and can damage forested watersheds.

EPA, States, and industry, working together, have made important strides in addressing the adverse impacts of fossil fuel combustion by the electric power industry since the passage of the Clean Air Act in 1970. Despite significant improvements in air quality throughout the country however, emissions from power generation continue to result in serious health, environmental and economic impacts. In 1999, the electric power industry was responsible for 67 percent of sulfur dioxide emissions, 25 percent of nitrogen oxide emissions, and 37 percent of mercury emissions in the United States.

Business as Usual

The President's flexible, market-based approach to reducing emissions from power generators stands in sharp contrast to the complex web of existing regulations which currently confront the industry. Over the years, Congress, EPA and the States have responded to specific environmental and public health problems by developing separate regulatory programs to address the specific problems. Each individual program uses its own approach on its own timeline to serve its own purpose. Absent changes to the Act, EPA and States will be forced to follow the same approach in future regulations. It is time to consolidate and simplify to achieve our clean air goals. A comprehensive legislative approach with mandatory caps could replace a good portion of the current regulatory requirements with a system that will reduce the administrative burden on industry and governments, use market-based approaches to lower compliance costs, reduce consumers' costs, and increase national energy security by providing the industry with more certainty about its future regulatory obligations. By enacting such an approach, we can achieve environmental and public health protection more effectively and at less cost. If we do it the President's way, it will be a win-win.

There are many regulations in place that will reduce air emissions from electric power generation. These regulations include both Federal and State requirements that address a variety of emissions including SO_2, NOx, CO, PM_{10}, and a number of hazardous air pollutants. These programs include the National Ambient Air Quality Standards for SO_2, particulate matter and ozone, the section 126 and the NOx SIP Call rules, the Acid Rain Program, new source review, new source performance standards, and the regional haze rule.

But the regulation of power generators does not end with existing regulations. EPA is obligated by a settlement agreement to issue by the end of 2004 a Maximum Achievable Control Technology (MACT) standard to require source-specific controls of mercury and other hazardous air pollutants from electric utilities. Emissions reductions are required by the end of 2007. States will also be requiring utilities to comply with Best Available Retrofit Technology (BART) programs (either source-specific standards or a trading program) to meet requirements to reduce regional haze.

It is expected that the existing fine particle and ozone standards now in place will also result in further regulation of power generators. Modeling shows that when full implementation of existing regulations such as the acid rain program, the NOx SIP Call, the Tier II standards for cars and trucks, the heavy duty diesel engine standards, and the low sulfur gasoline and diesel fuel rules are taken into account, additional reductions will be needed to bring areas into attainment. States will be required to develop plans for these areas. In addition, NOx and SO_2 reductions are also needed to reduce continuing damage from acid rain and nitrogen deposition.

Because States and EPA will have to find some way to significantly reduce NOx and SO_2 emissions, it is probable that power generators will be required to reduce their emissions significantly. Power generation accounts for a significant percentage of these emissions, and our analysis shows that there are significant reductions available at lower cost than from other sources. Additionally, States know that if they do not get the reductions from power generators, they will have to impose significant reduction requirements on other local industrial and commercial sources or impose local transportation control measures.

Under current law, the necessary reductions would be achieved through the development of individual State plans. States will not just control their own sources, however. They will be reaching out to control power generators and large industrial facilities in other States because transport from other States contributes to both ozone and fine particle pollution in many areas. This is what has happened in the eastern part of the country when States realized that emissions from sources in other States were significantly contributing to their 1-hour ozone non-attainment problems. Under section 126 of the Clean Air Act, a State can petition EPA and request that EPA require reductions from sources outside the petitioning State's borders. The petitioning State is entitled to relief if EPA finds that the sources are significantly contributing to the petitioning State's nonattainment problem. EPA's requirement, adopted in response to section 126 petitions, that sources in a number of eastern States reduce NOx emissions was recently upheld by the Court of Appeals for the District of Columbia Circuit. Since States now know that EPA has authority to address transport pollution through responses to 126 petitions or by issuing a rule like the NOx SIP Call, we anticipate that States will be turning to these types of control approaches early in the SIP process. Although those of us who are traveling that path with the current 126 petitions and NOx SIP Call believe it will eventually take us to our environmental goal, it has been—and still is—a very rocky road for industry, environmentalists, the States, EPA and other stakeholders.

This one-at-a-time, uncoordinated series of regulatory requirements for the power industry is not the optimal approach for the environment, the power generation sector, or American consumers. With most plants needing to install control equipment to meet these requirements, it is likely that this approach would lead to installation of controls that become obsolete and stranded capital investments as additional requirements are promulgated. Further, the attainment efforts of individual States and localities not only impose costs on these entities, but also can increase complexity for companies which face differing requirements when operations cross State lines. These factors are exacerbated by limited timeframes that may constrain available compliance options and thwart long range planning. These and other inefficiencies point to the need for a nationally coordinated approach that could reduce cost while improving environmental progress and accountability.

Changing the Way We Do Business: Certainty, Flexibility, Accountability and Innovation

We believe there is a better way, one that could cost American consumers and industry far less than under current law and ensure protection of the air we breathe in a far more certain, straightforward manner. I know that many members of this committee share that belief and are also working to develop such an approach. It would provide power generators with more certainty about their regulatory future and thus allow them to make wiser decisions about investments in new technology, which would improve energy security. This Administration is developing such a proposal. It will build on the successes of the Acid Rain cap-and-trade program. It would establish national cap-and-trade programs for NOx, SO_2 and mercury emissions from power generators (with appropriate measures to address local concerns). Such an approach will benefit the power generation industry, the economy, and the States, while improving public health and the environment.

Up-front knowledge of future requirements for multiple pollutants would lead firms to follow significantly different and less expensive compliance strategies at individual plants, compared with compliance choices which must be made as requirements are addressed in a sequential manner under the current law. The savings come from the opportunity to make cost-effective plant investment and retirement decisions with full knowledge of upcoming SO_2, NOx and mercury requirements, rather than investing in "add-on" control equipment to meet the requirements of each regulation. Integration, advance knowledge, and certainty regarding environmental requirements will have even greater value over the coming decade as the electric power industry undergoes further structural changes. An integrated package of measures that addresses both the existing regulatory requirements as well as many future environmental needs would provide the greatest degree of certainty and flexibility for the industry, while achieving the necessary emission reductions at lower cost than under current law.

In exchange for flexibility in methods to control emissions, a full accounting of emissions through continuous monitoring and reporting is essential, as well as significant consequences for failing to comply. Such provisions have been critical to the success of the Acid Rain Program, encouraging individual sources to find the most cost-effective means of compliance with the collective emission reduction goal.

Flexibility stimulates technological innovation, fuels economic activity and reduces cost to industry and consumers. Strategies and technologies for the control of SO_2, NOx and mercury emissions exist now, and improved methods are expected to become available over the next several years. The air pollution control and monitoring technology industry is expected to continue to respond with cost-effective compliance solutions just as they have done for the past 30 years. A predictable demand for such jobs over the next 15 years is preferable to the boom and bust cycle created by the current regulatory approach.

This approach also would reduce States' administrative burdens and obligations. A national cap-and-trade program with appropriate caps for NOx and SO_2 could provide the emission reductions necessary to bring a significant number of areas into attainment with the ozone and fine particle standards. Even those areas that would not be brought into attainment by these caps would need significantly fewer emission reductions to come into attainment. Our approach would significantly reduce the State resources needed to conduct modeling, planning and regulatory activities to attain the standards. Additionally, the Acid Rain cap-and-trade program is administered with a relatively small staff relying on strong, state-of-the-art data tracking and reporting capabilities. Thus, well-designed national cap-and-trade programs can help use government resources and taxpayer dollars more efficiently at both the State and Federal level.

Caps ensure that environmental goals are met. A cap that represents significant reductions of emissions protects the environment by reducing overall loadings. Consideration of local concerns is important in conjunction with trading provisions. Therefore, the National Energy Plan recommended that the Administration's approach include appropriate measures to address local concerns, such as the unlikely occurrence of an SO_2 "hot spot" or area of concentrated emissions. Significant reductions will go a long way toward addressing local concerns. In addition, EPA will be conducting modeling that will predict where emissions reductions will occur. Under the Acid Rain cap-and-trade program, we have not seen local hot spots because the highest emitters are often the most cost-effective to control and therefore, the most likely to control.

As I mentioned, EPA and the Administration are still in the process of developing our proposal. Several guidelines are shaping our efforts. These guidelines may provide a valuable basis as you weigh the proposals before you. They will also guide our assessment of other proposals, including S. 556. These principles are structured to ensure consistency with the NEP objectives. The NEP goals of increasing energy supplies, accelerating the protection and improvement of the environment, and increasing our nation's energy supply must be advanced. Toward that end, energy diversity, the preservation of electricity generation and transmission reliability, and improvement of energy efficiency/energy intensity of the electric power industry should be a key consideration. In particular, to prevent the reoccurrence of energy shortages and price volatility, a diverse mix of fuel sources should be maintained.

Specific Comments on S. 556

We share the desire expressed in S. 556 to significantly reduce and cap emissions of SO_2, NOx and mercury from power generation. We applaud your acknowledgment of market-based incentives, particularly cap-and-trade systems, as a powerful tool in environmental protection. In this way, S. 556 builds on successful elements of the Clean Air Act.

We do, however, oppose S. 556 because of concerns with the bill—both with some provisions that are in the bill and with some that are missing. We believe the emission reductions and timing in the bill will be too costly for consumers and will endanger national energy security. We believe the bill is missing some provisions—it should address the allocation scheme and integration with existing programs. Finally, we oppose inclusion of CO_2 in this bill.

First, let me explain some of our specific concerns about the SO_2, NOx, and mercury provisions in the bill. We are concerned that the significant emissions reductions are required too quickly. We do not believe it is reasonable to expect all the control technology installations to be completed in that timeframe without very high costs and electricity reliability problems. To meet these deadlines, facilities may need to be taken off-line during critical periods. Reliability problems could arise as large amounts of capacity are taken out of service for extended periods of time to install the control equipment necessary to meet the emissions reduction requirements. The abbreviated timeframe would force many generators to make these retrofits simultaneously. This would significantly reduce the amount of generating capacity available to meet consumer' electrical needs.

We have not modeled the specific provisions in S. 556, but useful information is provided by comparing the analyses EPA and EIA conducted to respond to a request from Senators Smith, Voinovich and Brownback with the analyses responding to a request from Senators Jeffords and Lieberman. In the Smith/Voinovich/Brownback analysis, when we analyzed SO_2 and NOx reduction levels similar to S. 556, mercury reduction levels more modest than S. 556 and no CO_2 reductions, we did not find significant impacts on coal production or electricity prices. However, in the analysis responding to the Jeffords/Lieberman request that had NOx, SO_2, mercury and CO_2 reduction levels similar to S. 556, we found significant ramifications: approximately a 20–30 percent decline of coal generation and a 30–50 percent increase in electricity prices compared to the reference case (depending on assumptions of energy technology penetration).

The 90 percent source-specific control for mercury is also problematic. We have not seen anything that demonstrates that every coal-fired power plant would be able to achieve 90 percent source-specific controls for mercury by 2007, without considerable fuel switching, which would be very disruptive to our economy and undermine energy security. In addition, requiring the same level of reduction at a plant that emits 0.1 pounds of mercury and a plant that emits 2000 pounds of mercury—regardless of cost—is neither efficient nor necessary.

We are also very concerned about the “outdated power plant” provision. Requiring every plant over 30 years old to meet New Source Performance Standards and New Source Review modification requirements seems unnecessary and could undermine the benefits of the cap-and-trade approach. Allowing sources to make reductions where it is most economical to do so is one of the reasons cap-and-trade programs should be less costly than command-and-control programs that achieve the same or even fewer reductions. When you have a hard cap, as you would under S. 556, requiring emission reductions at a specific source does not reduce the overall level of pollution, it just limits industry’s flexibility about where to make the reductions. Layering additional requirements, such as the “outdated power plants” provision, on top of a cap-and-trade program is very likely to increase costs without providing significant environmental benefits.

Second, we have concerns about what is not in S. 556. Comparing our experience on the Acid Rain Program with the NOx SIP Call and the Section 126 petitions demonstrates the benefit of having certain key issues decided by Congress rather than left to Agency rulemakings. Congressional resolution of key issues simplifies whatever Agency rulemaking is needed and decreases the opportunities for the program to get tied up in protracted litigation.

Perhaps the most important program element not addressed in the bill is integration of this new program with the existing Clean Air Act provisions. An effective market-based approach would make some existing provisions of the Clean Air Act unnecessary. For example, depending on the ultimate cap levels chosen by Congress, this type of legislation would obviate the need for Best Available Retrofit Technology requirements, mercury MACT, and new source review case-by-case technology requirements for power generators.

Also missing from S. 556 is the scheme for allocating allowances. Developing an allocation scheme requires answering numerous questions. Should the allowances be auctioned off or be handed out for free? If they are not auctioned, should they be allocated based on heat input or electrical and steam output? Should power generators that do not emit air pollutants (e.g., hydropower facilities) be given allowances? Should allowance allocations be updated, and if so, how frequently? Should allocations be fuel neutral? Imbedded in these and other questions are important environmental and energy policy choices with significant equity consequences. It may not be efficient for EPA to make these choices in rulemaking.

There are other issues as well that this committee should consider, such as coordination with existing State and regional programs like the Western Regional Air Partnership and the NOx reduction programs in the east. The committee may also wish to consider provisions to track environmental progress to evaluate the efficacy of the program this bill would establish.

Finally, the Administration strongly opposes including reductions for CO_2 in S. 556 or any multi-pollutant bill. Pursuing sharp reductions in CO_2 from the electricity generating sector alone would cause a dramatic shift from coal to natural gas and thus would run the risk of endangering national energy security, substantially increasing energy prices and harming consumers.

The Administration will not support any legislation that would cause a significant decline in our nation’s ability to use coal as a major source of current and future electricity. At the same time, the Administration will not support any legislation that does not enhance the cleanliness of coal-fired electricity generation and promote a future for clean coal technologies. In short, the Administration supports a clean coal policy as a critical component of our nation's energy and environmental policies, recognizing that other sources of energy also have a critical role to play.

Additionally, as Governor Whitman said when she testified before you in July, including CO_2 in this bill will slow down, if not prevent, the consensus necessary for passage of legislation to control multiple emissions from power plants. Governor Whitman and I both believe consensus on the appropriate levels and timing for reductions of NOx, SO_2 and mercury is achievable relatively soon. We should not delay the public health and environmental benefits from reduction of these emissions while we wait for consensus to develop on CO_2.

We agree that climate change is a serious issue we need to address. However, CO_2 has never been regulated as a pollutant under the Clean Air Act and does not pose any direct threat to human health unlike NOx, SO_2 and mercury. The current body of scientific knowledge does not provide information regarding atmospheric concentrations of CO_2 or reduction levels necessary to prevent dangerous interference with the climate system.

In April, the President convened a Cabinet-level policy review of this issue and was provided with initial recommendations that he accepted and announced on June 11. In that regard, the Administration is implementing two major initiatives on climate science and advanced energy and sequestration technologies. The United States now spends $1.6 billion annually on climate science to reduce uncertainties—a commitment unmatched by any other nation. The "National Climate Change Technology Initiative" will accelerate priority research and the application of advanced energy and sequestration technologies, recognizing that the real answer to addressing climate change in the long term lies in the development and global introduction of such technologies in this century. The cabinet-level policy review is ongoing. Finally, as greenhouse gas emissions are projected to grow exponentially in the developing world in the next two decades, we must evaluate the costs of imposing domestic reductions as a very high cost against potentially low-cost opportunities for mitigating and sequestering carbon emissions in the developing world.

We appreciate the role of S. 556 in generating important discussions and emphasizing the importance of a new approach to controlling emissions in the power sector. I look forward to the additional hearings you will need to address these important issues and to working with the committee to develop an approach that the President can support.

The history of Clean Air Act legislation is one of great accomplishments made possible by bipartisan efforts. I thank you for the opportunity to work with you to continue that great tradition.

ATTACHMENT

ECONOMIC ANALYSIS OF A MULTI-EMISSIONS STRATEGY

Prepared for: Senators James M. Jeffords and Joseph I. Lieberman

U.S. Environmental Protection Agency

Office of Air and Radiation Office of Atmospheric Programs

October 31, 2001

Executive Summary

In response to a May 17, 2001 request from Senators James M. Jeffords (VT) and Joseph I. Lieberman (CT), this report describes the results of a modeling study done to evaluate the potential impacts of reducing nitrogen oxides (NOx), sulfur dioxide (SO_2), mercury (Hg), and carbon dioxide (CO_2) emissions from the US electric power sector. In their request, Senators Jeffords and Lieberman asked the Environmental Protection Agency to undertake an economic assessment of four technology-based scenarios designed to achieve the following emissions caps in the US electric power sector by the year 2007:

- Reduce nitrogen oxides (NOx) emissions to 75 percent below 1997 levels;
- Reduce sulfur dioxide (SO_2) emissions to 75 percent below full implementation of the Phase II requirements under title IV;
- Reduce mercury (Hg) emissions to 90 percent below 1999 levels; and
- Reduce carbon dioxide (CO_2) emissions to 1990 levels.

The request also specified that EPA should evaluate the cost of achieving these reductions using four alternative technology scenarios:

- The Energy Information Agency's Standard Technology Scenario.
- The Energy Information Agency's High Technology Scenario, including technology assumptions with earlier introduction, lower costs, higher maximum market potential, or higher efficiencies than the Standard Scenario.
- Two scenarios from Scenarios for a Clean Energy Future published by Oak Ridge National Laboratory, National Renewable Energy Laboratory, and Lawrence Berkeley National Laboratory, which include assumptions about changes in consumer behavior, additional research and development, and voluntary and information programs.

Under each scenario, the costs of meeting the emission constraints are included in the price of electricity. Such costs include the purchase and installation of emissions control equipment and the purchase of emissions permits. Factors that mitigate projected cost increases include the availability of more cost-effective, energy efficient technologies for both consumers and electricity suppliers. EPA's analysis indicates that, under the conditions described above:

- Electricity prices in 2015 would increase by about 32 percent to 50 percent, depending on the technology scenario.
- Coal-fired electric generation would decline by 25 percent to 35 percent by the year 2015.
- Overall costs, measured by the decline in household consumption of goods and services, would be between $13 and $30 billion annually or 0.1 percent to 0.3 percent of total consumption. Under all four of the policy scenarios evaluated in this assessment, gross domestic product (GDP) would remain relatively unchanged as sacrificed consumption permits higher investment and government spending to reduce emissions.
- Oil and gas-fired generation would be expected increase by about 8 percent under more restrictive technology assumptions, but decrease by as much as 20 percent under scenarios that embody more optimistic assumptions about energy-efficiency demand and supply technologies.

The combination of increased prices and the availability of more energy-efficient equipment and appliances are projected to reduce electricity demand by about 10 percent. With the combination of higher prices and improved efficiency, total expenditures for electricity consumption in 2015 are projected to increase by about 17 percent to 39 percent, depending on the scenario.

The increase in electricity prices and cost of the program, as well as the impact on the fuel mix, varies considerably based the technology future that is assumed. For example, the 30 percent electricity price increase, the $13 billion reduction in personal consumption, and the 25 percent decline in coal use are all associated with the Clean Energy Future Advanced Scenario, which includes the most optimistic technology assumptions. Likewise, the 50 percent electricity price increase, the $30 billion reduction in personal consumption, and the 35 percent decline in coal usage are all associated with EIA's Standard Technology Scenario.

EPA was not asked to evaluate the merits of the alternative technology scenarios. We note, however, that they are the subject of considerable controversy. The Clean Energy Future scenarios have been criticized on several grounds: assumed changes in consumer behavior that are not consistent with historic behavior patterns, results from research and development funding increases that have not occurred, and voluntary and information programs for which there is no analytic basis for evaluating the impacts. On the other hand, supporters of those scenarios point to economic analyses showing that the assumed investments can pay for themselves over time. The range of estimates associated with the different technology scenarios highlights the importance of the technology assumptions.

In conducting the modeling requested by Senators Jeffords and Lieberman, EPA has assumed that the reductions would be achieved through a nationwide "cap-and-trade" system similar to the Acid Rain program established under the 1990 Amendments to the Clean Air Act, together with increasing penetration and performance of energy technologies. In accordance with the Senators' request, the analysis also assumes the use of banked allowances made possible by early emissions reductions achieved in the years 2002 through 2006. (In practice, significant reductions beginning in 2002 would be difficult to achieve.) Because of the contribution of those banked allowances to overall emissions reductions, the analysis shows emissions in 2007 above the caps. Regardless, 2007 emissions are substantially reduced from current levels. At the end of 2015 a small pool of banked allowances continues to be available for use in later years. The analysis contained in the report covers the years 2002 through 2015.

The results provided in this analysis should not be construed as forecasts of actual scenario outcomes. Rather, they are assessments of how the future might unfold compared to a previously defined reference case—given the mix of technology and policy assumptions embodied in each of the scenarios. The results also imply a national commitment that is successful in achieving the level of emission reductions described within the report.

The economic impacts of the emissions reduction scenarios are evaluated using Argonne National Laboratory's AMIGA model, a 200-sector computer general equilibrium model of the U.S. economy. The modular design and economy-wide coverage of the AMIGA model makes it a logical choice to analyze alternative technology scenarios. Although it does employ the same plant-level coverage of the electricity sector as the IPM and NEMS models used in other analyses, the pollution control technology assumptions are not included at the same level of detail as the IPM model. This may be particularly relevant for mercury controls, where the effectiveness varies by coal type, and may be difficult to model correctly without additional detail. In addition, we note that the AMIGA model is relatively new and has not been subject to the same degree of peer-review and scrutiny as the older IPM and NEMS models. It would be desirable in future work to establish the comparability of results across these models.

1. Introduction

1.1. Background

Responding to an earlier congressional request, the Energy Information Administration (EIA) released a detailed study reviewing the effects of a so-called "three pollutant" strategy in December 2000 (Energy Information Administration, 2000). The three emissions in the EIA assessment included nitrogen oxides (NOx), sulfur dioxide (SO_2), and carbon dioxide (CO_2). Although a coordinated climate and air quality policy appeared to lower costs compared to a series of separate policy initiatives, the EIA assessment indicated significant costs associated with capping emissions.

At about the same time, five of the nation's national energy laboratories released an extensive review of some 50 different policy options that might achieve cost-effective reductions of both air pollutants and carbon dioxide (CO_2) emissions. The study, Scenarios for a Clean Energy Future (Interlaboratory Working Group, 2000), indicated that domestic investments in energy-efficient and clean energy supply technologies could achieve substantial reductions in both sets of emissions at a small but net positive benefit for the economy.

On May 17, 2001, Senators James M. Jeffords (VT) and Joseph I. Lieberman (CT) sent a letter to EIA and EPA seeking further clarity in the scenarios examined by the December EIA analysis, stating that "the analysis appears to unnecessarily limit the market and technology opportunities that might significantly affect the costs and benefits of emission reductions. In particular, the potential contributions of demand-side efficiency, gas-fired cogeneration and of renewable energy sources appear to be inadequately represented."

In responding to this request, EPA modeled the combined impacts of both the emissions caps and the advanced technology scenarios specified by the Senators. We are aware that EIA has modeled the combined impacts but has also modeled the effects of the emission caps and the advanced technology scenarios separately. This approach provides perhaps a better technique for isolating the actual costs of the emissions caps. We have reviewed the EIA analysis of these separate effects and we believe that they offer interesting and important insights and that if we had performed the same kind of analysis we would have seen similar results.

This report responds to the Senators' request. The results provided in this analysis should not be construed as forecasts of actual scenario outcomes. Rather they are assessments of how the future might unfold compared to a previously defined reference case—given a national commitment to achieve the emission reductions, and given the mix of technology and policy assumptions embodied in each of the scenarios.

1.2. Technology Scenarios

In the letter to Administrator Whitman, Senators Jeffords and Lieberman asked for an analysis of four different scenarios, requesting that EPA "analyze the cost and benefits, including all sectors of the economy and impacts on both the supply and demand side of the equation, of the following multi-pollutant emission control scenarios for the nation's electricity generators. Where feasible, this should include power plants both within the conventionally defined electric utility sector as well as electricity generated by industrial cogenerators and other independent power producers."

The four scenarios are identified as follows:

- Scenario A: Standard Technology Scenario. Assume standard technology characteristics as defined in AEO2001. Further assume a start date of 2002. By 2007 reduce NOx emissions 75 percent below 1997 levels, reduce SO_2 emissions to 75 percent below full implementation of the Phase II requirements under title IV, reduce mercury emissions 90 percent below 1999 levels, and reduce CO_2 emissions to 1990 levels.
- Scenario B: High Technology Scenario. Continue the 2002 start date, but assume the advanced technology assumptions of both the supply and demand-side perspectives that are referenced in AEO2001. By 2007 reduce NOx emissions 75 percent below 1997 levels, reduce SO_2 emissions to 75 percent below full implementation of the Phase II requirements under title IV, reduce mercury emissions 90 percent below 1999 levels, and reduce CO_2 emissions to 1990 levels.
- Scenario C: Moderate Clean Energy Future Scenario. Continue the 2002 start date, but assume the moderate supply and demand-side policy scenario of the Clean Energy Future (CEF) study. By 2007 reduce NOx emissions 75 percent below 1997 levels, reduce SO_2 emissions to 75 percent below full implementation of the Phase II requirements under title IV, reduce mercury emissions 90 percent below 1999 levels, and reduce CO_2 emissions to 1990 levels.
- Scenario D: Advanced Clean Energy Future Scenario. Continue the 2002 start date, but assume the advanced supply and demand-side policy scenario of the Clean Energy Future study. By 2007 reduce NOx emissions 75 percent below 1997 levels, reduce SO_2 emissions to 75 percent below full implementation of the Phase II requirements under title IV, reduce mercury emissions 90 percent below 1999 levels, and reduce CO_2 emissions to 1990 levels.

In requesting an analysis of these four scenarios, the Senate request asked for ". . . results through 2020, in periods of 5 years or less, using the Annual Energy Outlook 2001 (AEO2001) as the baseline."

1.3. Multi-Emission Targets

Table 1 identifies the 2007 emission caps used for each of the four scenarios. The emission cap is defined by a benchmark emission level that is modified by the desired level (percentage) of reduction. For example, the benchmark for the SO_2 emissions cap is the Phase II requirements of the Clean Air Act Amendments. That total, 8.95 million short tons, is reduced by a specific percentage (75 percent) to reach the emissions cap of 2.24 million tons. Following a similar pattern, the remaining emission caps are set as 1.51 million tons for NOx emissions, 4.8 tons for mercury emissions, and 475 million metric tons (MtC) of carbon emissions.

Table 1. Benchmark Emission Levels and Assumed Emission Caps

Pollutant (Benchmark)	Benchmark Emissions	Fraction Reduced	2007 Emission Cap
SO_2 (tons in Title IV)	8.95 million tons	75 percent	2.24 million tons
NOx (tons in 1997)	6.04 million tons	75 percent	1.51 million tons
Hg (tons in 1999)	48 tons	90 percent	4.8 tons
C (metric tons in 1990)	475 million metric tons		475 million metric tons

1.4. Other Analytical Assumptions

As previously noted, the letter from Senators Lieberman and Jeffords requested that EPA use four different sets of technology and policy assumptions to meet the specified emission caps shown in Table 1. The full set of technology and policy assumptions are described more fully in section two of this report. All scenarios are implemented in 2002. At the same time, there are other key assumptions that EPA adopted to facilitate the evaluation of the four scenarios.

In addition to the different technology scenarios, EPA was asked to include the assumption that utilities would begin to make cost-effective emission reductions in the 5 years that precede the 2007 compliance date. These early reductions would be "banked" for use in the post-2007 period of analysis. For purposes of this simulation, the amount of allowances banked from 2002 through 2006 was calculated as the simple difference between the reference case projections and the actual emission trajectory of each scenario. The decision to earn and hold early allowances is based on the assumption that allowances are viewed as an asset that must earn at least an 8 percent real return.[1]

[1] In practice, it is more likely that significant reductions that contribute to any kind of allowance bank would be difficult to achieve before 2004. Assuming a delay in implementation to 2004 would raise the economic impact of any of the scenarios.

Following the assumption used in the CEF study, all four of the policy scenarios assume nationwide restructuring of the electric utility industry. This implies that prices are based on the marginal rather than the regulated, cost-of-service pricing now used throughout much of the country.

EPA employed the Argonne National Laboratory's AMIGA modeling system to evaluate the impact of capping emissions under the four different technology scenarios. AMIGA is a 200 plus sector model of the U.S. economy that captures a wide variety of technology characteristics and their resulting impact on key indicators such as emissions, employment and income.[2] EPA asked Argonne to benchmark AMIGA to the reference case projections of AEO2001. AMIGA was then modified to approximate the assumptions behind each of the four scenarios.

An economic analysis of a policy compares the world with the policy (the policy scenario) to the world absent the policy (the reference case or baseline scenario). The impacts of policies or regulations are measured by the resulting differences between these two scenarios. In effect, any meaningful analysis should compare the full set of benefits and costs to the extent possible.

For purposes of this exercise, there are at least seven categories of costs and four benefits that might be reviewed. The costs include: (1) direct investment costs, (2) operating and maintenance costs, (3) research and development and other government program costs, (4) transaction, search, and compliance costs, (5) adjustment costs associated with large changes in specific capital stocks, (6) lost economic flexibility created by additional emission requirements, and (7) potential interactions with the existing tax system. At the same time, there are at least four categories of benefits. These include: (1) direct savings from lower compliance costs, (2) process efficiency and other productivity gains, (3) environmental and health benefits not captured within normal market transactions, and (4) spillovers and/or learning induced by either the technology investment, or the R&D efforts.

The costs associated with the emission limits in each scenario are computed as the increased expenditures on pollution control, investment in more efficient equipment and appliances, research and development, tax incentives, and additional government programs—all relative to the reference case. The increased costs are coupled with credits for reductions in fuel use and productivity gains from technology. The economic impact of each scenario is reported in two ways. The first is as a change in household personal consumption, measuring the goods and services available for consumers to enjoy after subtracting these net expenditures. The second is as a change in economic output measured as Gross Domestic Product (GDP).

The AMIGA model reasonably captures those costs and benefits noted above that arise in market transactions. Some, such as loss of flexibility and adjustment costs on the cost side, and health benefits and spillovers on the benefit side, remain beyond the scope of this analysis.

2. Multi-Emissions Analysis

This section provides additional details about the technology assumptions that underpin the four emission scenarios. It also describes the results of the scenario analysis, both in terms of the various marginal costs associated with emission control strategies and the economy-wide impact of each scenario. Although EPA made every effort to calibrate AMIGA to the AEO2001 reference case, AMIGA is a different modeling system than EIA's National Energy Modeling System (NEMS). Hence, it was not possible to reproduce the exact AEO2001 reference case projections. Moreover, Argonne researchers recently upgraded AMIGA to incorporate SO_2, NOx, and mercury emissions. For this and other reasons, AMIGA currently reports results only through the year 2015. Nonetheless, the differences in the resulting baseline projections are minor for the purposes of this analysis.

[2] AMIGA is especially suited to the task identifying and evaluating a different mix of technologies in the production of goods and services within the United States. It is not only a 200 plus sector model of the U.S. economy, but it also includes the Argonne Unit Planning and Compliance model and data base that captures a wide variety of technology characteristics within the electric generating sector, including industrial combined heat and power systems and the typically available emission control technologies. When the electricity module is integrated with the larger macroeconomic system, the model can then generate key outputs including projected electricity sales and net generation, resulting emissions for each of the four pollutants under consideration, and the set of energy and permit prices associated with the resulting production levels. Finally, AMIGA can provide an estimate of the consequent impact on the economy including key indicators as consumption, investment, government spending, GDP, and employment (Hanson, 1999). For more background on the AMIGA model, see Appendix 5.1.

2.1. Modeling Technology Assumptions

Scenarios A and B are based on the AEO2001 standard and advanced technology characteristics, respectively. The standard technology assumptions of scenario A were used by EIA in the development of the AEO2001 "reference case" projections. The advanced technology assumptions of scenario B were used as a sensitivity analysis in the AEO2001. They demonstrated the effects of earlier availability, lower costs, and/or higher efficiencies for more advanced equipment than the reference case.[3]

Scenarios C and D are based on the recently published DOE-sponsored report, Scenarios for a Clean Energy Future (Interlaboratory Working Group, 2000; see also, Brown, et al, 2001). Both of the CEF scenarios assumed nationwide restructuring of the electric utility industry. From an analytical perspective, this means that prices are based on the marginal costs of generation, transmission and distribution of electricity rather than the regulated, cost-of-service pricing now used throughout much of the country. Moreover, both scenarios reflected increased spending for research and development and other programs designed to accelerate the development and deployment of low-carbon, energy efficient technologies. Each of the scenario assumptions are described more fully in the sections that follow.

2.1.1. Reference Case Scenario

The scenario A reference case assumes a "business-as-usual" characterization of technology development and deployment. As projected in the AEO2001 assessment, the nation's economy is projected to grow at 2.9 percent per year in the period 2000 through 2020. Given anticipated energy prices and the availability of standard technologies, the nation's primary energy use is expected to grow 1.3 percent annually while electricity consumption is projected to increase by 1.8 percent annually. Further details are provided in Appendix 5.2.1.

2.1.2. Advanced Technology Scenario

Under the AEO2001 advanced technology characterization, scenario B assumes that a large number of technologies have earlier availability, lower costs, and/or higher efficiencies. For example, the high efficiency air conditioners in the commercial sector are assumed to cost less than in scenario A. This encourages a greater rate of market penetration as electricity prices rise in response to the emissions caps. Building shell efficiencies in scenario B are assumed to improve by about 50 percent faster than in scenario A.

On the utility's side of the meter, the heat rates for new combined cycle power plants are assumed to be less compared to the standard case assumptions. This means that more kilowatt-hours of electricity are generated for every unit of energy consumed by the power plants. Moreover, wood supply increases by about 10 percent and the capacity factor of wind energy systems increases by about 15–20 percent compared to the reference case assumptions. In the AEO2001 report, the combination of higher efficiencies and earlier availability of the technologies lowers the growth in electricity use from 1.8 percent in the reference case to 1.6 percent.

2.1.3. CEF Moderate Case Scenario

The authors of the Clean Energy Future (CEF) report describe their analysis as an attempt to "assess how energy-efficient and clean energy technologies can address key energy and environmental challenges facing the US" (Brown, et al, 2001). In that regard, they evaluated a set of about 50 policies to improve the technology performance and characterization of the residential, commercial, industrial, transportation, and electricity generation sectors. The policies include increased research and development funding, equipment standards, financial incentives, voluntary programs, and other regulatory initiatives. These policies were assumed to change business and consumer behavior, result in new technological improvements, and expand the success of voluntary and information programs.

The selection of policies in the CEF study began with a sector-by-sector assessment of market failures and institutional barriers to the market penetration of clean energy technologies in the US. For buildings, the policies and programs include additional appliance efficiency standards; expansion of technical assistance and technology deployment programs; and an increased number of building codes and efficiency standards for equipment and appliances. They also include tax incentives to accelerate the market penetration of new technologies and the strengthening of market transformation programs such as Rebuild America and Energy Star labeling. They further include so-called public benefits programs enhanced by electricity line charges.

[3] The AEO2001 was published in December 2000 (Energy Information Administration, 2000).

For industry, the policies include voluntary agreements with industry groups to achieve defined energy efficiency and emissions goals, combined with a variety of government programs that strongly support such agreements. These programs include expansion and strengthening of existing information programs, financial incentives, and energy efficiency standards on motors systems. Policies in the CEF analysis were assumed to encourage the diffusion and improve the implementation of combined heat and power (CHP) in the industrial sector. For electricity, the policies include extending the production tax credit of 1.5 cents/kWh over more years and extending it to additional renewable technologies.

Broadly speaking, the CEF Moderate scenario can be thought of as a 50 percent increase in funding for programs that promote a variety of both demand-side and supply side technologies. For example, the moderate scenario assumes a 50 percent or $1.4 billion increase in cost-shared research, development, and demonstration of efficient and clean-energy technologies (in 1999 dollars with half as Federal appropriations and half as private-sector cost share). It further assumes a careful targeting of funds to critical research areas and a gradual, 5-year ramp-up of funds to allow for careful planning, assembly of research teams, and expansion of existing teams and facilities. In addition, the CEF moderate scenario anticipates increased program spending of $3.0 and $6.6 billion for the years 2010 and 2020, respectively. These expenditures include production incentives and investment tax credits for renewable energy, energy efficiency and transportation technologies. They further include increased spending for programs such as DOE's Industrial Assessment Centers and EPA's Energy Star programs.

The combined effect of the R&D and program expenditures, together with other policies described in the CEF report, implies a steady reduction in total energy requirements over the period 2000 through 2020. By the year 2020, for example, primary energy consumption and electricity sales were projected to decrease by 8 percent and 10 percent, respectively, compared to the CEF reference case.

2.1.4. CEF Advanced Technology Scenario

Building on the policies of the moderate scenario, the CEF advanced scenario assumes a doubling of cost-shared R&D investments, resulting in an increased spending of $2.9 billion per year (again, in 1999 dollars with half as Federal appropriations and half as private-sector cost share). In addition, the advanced scenario anticipates increased program spending of $9.0 and $13.2 billion for the years 2010 and 2020, respectively. The added spending covers all sectors including buildings, industry, transportation, and electric generation.

The combined effect of the program and R&D expenditures, together with other policies described in the CEF report (including a $50 carbon charge applied in the CEF Advanced Scenario), drove a steady reduction in the need for energy compared to the CEF reference case. By 2020 total energy use fell by 19 percent compared to the reference case. At the same time, electricity sales in 2020 were projected to decrease by 24 percent compared to the CEF reference case.

2.1.5. Implementation of the Technology Assumptions

The assumptions embedded in each of these scenarios have the effect of progressively increasing market penetration of higher performance energy efficiency and energy supply technologies. As shown in Table 2, the net effect of these assumptions is to lower the expected level of electricity consumption while continuing to meet the same level of service demanded by utility customers. The technology assumptions also have the effect of increasing the availability of cleaner energy supply technologies that reduce the level of emissions per kilowatt-hour of generation. The critical assumption used in the EPA analysis is that program spending affects both supply and demand technologies in a way that interacts with the emission caps that are to be imposed in 2007.

Benchmarked to the year 2010, Table 2 shows the percentage change of key indicators for each scenario with respect to its respective reference case. These changes provide EPA with approximate targets so that each of the scenarios can be mapped into the AMIGA model. As such, the figures in Table 2 should be seen as inputs into the AMIGA model, not outputs of the model.

Table 2. Influence of Technology Assumptions on Key Scenario Indicators—2010

Indicator	Scenario A Standard Technology Case	Scenario B Advanced Technology Case	Scenario C CEF Moderate Case	Scenario D CEF Advanced Case
Primary Energy	0 percent	−2.5 percent	−3.4 percent	−6.3 percent
Electricity Sales	0 percent	−2.4 percent	−5.9 percent	−6.8 percent
Carbon Emissions	0 percent	−5.0 percent	−7.4 percent	−10.7 percent
NOx Emissions	0 percent	−2.6 percent	−5.4 percent	−8.1 percent

By definition, scenario A assumes the standard technology assumptions of the AEO2001 reference case. Hence, there are no additional programs or policies that generate changes in the reference case technologies when the emission caps are imposed by the year 2007. The level of technology responsiveness grows for scenarios B, C, and D as a result of greater program spending.

The CEF advanced scenario, for example, assumes a significant increase in program funds to promote a variety of both demand-side and supply side technologies. As a result of this greater level of program activity, there is an accelerated penetration of energy-efficient technologies that drives electricity sales down by 6.8 percent in 2010 (compared to the CEF reference case for that same year). At the same time, the combination of a lower demand for electricity and an increased investment in cleaner energy supply technologies reduces both carbon and NOx emissions by 10.7 and 8.1 percent, respectively (again, compared to the CEF 2010 reference case). As EPA modeled this scenario, the bundle of policies in the CEF advanced scenario became, in effect, a complement to the emission caps imposed by 2007.

To avoid overestimating the impact of the policy scenarios in this analysis, EPA made a number of adjustments before implementing the CEF assumptions in the four scenarios reported here. First, the CEF analysis was benchmarked to a 1999 reference case. In the AEO2001 reference case, however, the demand for electricity in 2020 is about 10 percent higher compared to the CEF reference case. Second, the Senate request asked EPA to assume a 2002 start date in running the technology and policy scenarios. In effect, there are fewer years in which programs can achieve the desired level of technology improvement compared to the CEF scenarios. In addition, the CEF analysis includes a significant review of transportation technologies and policies. EPA chose to exclude all assumptions related to transportation, focusing only on the supply and demand-side technologies associated with electricity and natural gas consumption.

With the adjustments described above now reflected in the current analytical framework, and using the program cost information documented in the CEF study, Table 3 summarizes the incremental program costs that were assumed as necessary to drive the kind of changes in electricity consumption and emissions described in Table 2. Since transportation programs drove a significant part of the CEF expenditures, and since there are fewer years to implement policies, the estimated program expenditures are also smaller compared to the CEF assumptions.

Table 3. Incremental Policy Costs of the Technology Scenarios (billion 1999 dollars)

Scenario	2002	2005	2010	2015
Scenario A	0.0	0.0	0.0	0.0
Scenario B	0.8	1.6	2.7	2.9
Scenario C	1.2	2.3	4.3	4.8
Scenario D	2.1	3.9	5.2	5.5

Because scenario A characterizes existing program and technology performance, no additional funds are required to drive that scenario. Scenario B, on the other hand, anticipates some changes in the technology characterization that will affect the electricity sector as shown in Table 2. While the AEO2001 analysis anticipated no program spending to drive these changes, EPA assumed that additional spending would be required for scenario B. Calibrating to the CEF policy scenarios, EPA estimated that program and policy spending would increase by $0.8 billion in 2002, rising steadily to $2.9 billion by 2015. For scenario C, program spending increased by

$1.2 billion starting in 2002, rising to $4.8 billion by 2015. Finally, program spending in scenario D started at $2.1 billion in 2002 and increased to $5.5 billion by the last year of this analysis.[4]

The net effect of mapping increased program spending together with adjustments needed to update the assumptions of the CEF policy scenarios can be highlighted by reviewing the change in electricity generation for scenario D. In the CEF Advanced Scenario (based on a 1999 reference case), for example, the level of electricity generation in 2010 was lowered by 10 percent from the reference case requirements of 3,920 billion kilowatt-hours (kWh). As the CEF technology assumptions were applied in scenario D within this analysis (updated to the AEO2001 reference case), electricity generation was reduced by 9 percent from 4,253 billion (kWh). The trend was more pronounced in 2015. Rather than a roughly 16 percent reduction from a generation level of 4,200 billion kWh in the 1999 CEF Advanced Case, the scenario D equivalent in this analysis achieved only a 12 percent reduction from a generation of 4,580 billion kWh.

2.1.6. Reasonableness of the Scenario Assumptions

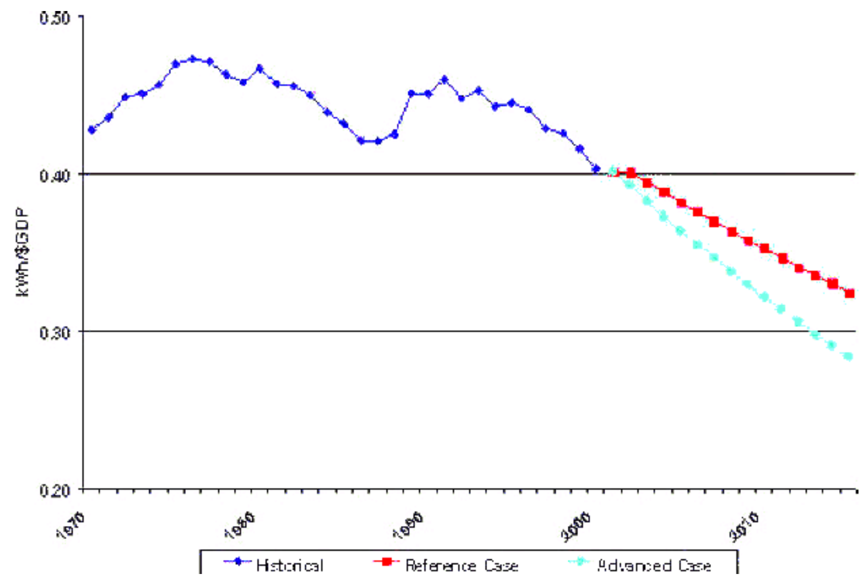
The results of the technology-driven scenarios should not be interpreted as an EPA endorsement of any of the policies or technology assumptions behind each of scenarios described in this report. On the one hand, EPA has not conducted any significant review of the EIA assumptions that underpin the AEO2001 projections. On the other hand, some analysts do not necessarily agree with the assumptions and projected level of impacts in the CEF assessment despite the fact that it was peer-reviewed and its findings published this fall in an academic journal. The EIA (2001), for example, notes that the CEF policies assume changes in consumer behavior that are not consistent with historically observed behavior patterns. Moreover, the EIA suggests that there is little documentation to support the assumed technological improvements generated by the research and development (R&D) initiatives described in the report. Finally, EIA notes that the effectiveness of voluntary or information programs may be less than assumed in the CEF scenarios. At the same time, the lead CEF analysts have responded to the EIA assertions by citing relevant economic literature and noting that the CEF study is one of "the most carefully documented and complete analysis of U.S. energy futures that has ever been funded by the U.S. government" (Koomey, et al, 2001).

Notwithstanding these concerns, EPA attempted to respond to the Senators' request by mapping in the critical assumptions of the CEF as a range of policies that provide a set of alternative assumptions about the future. In this regard, the scenarios are more like descriptions of alternative future outcomes rather than predictions or recommendations about how the future should unfold.

To provide a more complete context for understanding the magnitude of the changes in electricity generation that are suggested by the different scenarios, the figure below illustrates both the historical and projected trends in the nation's electricity generation. The information is shown as the number of kWh per dollar of GDP (measured in constant 1999 dollars). The historical data covers the period 1970 through 2000 while the projected trends are through the year 2015. The historical period shows a moderate level of volatility. The reference case projections suggest an annual rate of declining intensity of 1.6 percent per year through 2015 with a final value 0.33 kWh/$.

[4] The program spending assumptions developed in this analysis are used only to approximate the impact of the CEF scenarios. They do not reflect EPA endorsement of these spending levels.

Chart 1. Historical and Projected US Electricity Trends (kWh per 1999 $ GDP)



In comparison to the reference case, Scenario D (adapting the CEF Advanced Case assumptions) reflects a national commitment to improve both electricity supply and the efficiency of demand-side technologies. The presumption is that such a commitment would be supported by a significant increase in R&D and program spending as described above. Under these assumptions, the nation's electricity intensity is projected to decline at an annual rate of 2.5 percent, dropping to a final intensity of 0.28 kWh/$. This level of decline is greater than previously seen in the recent past. In the period 1980 through 1986, for example, and again 1993 through 2000, the annual rate of decline was only 1.7 percent. Hence, it appears that the assumptions driving the advanced scenario are aggressive. At the same time, however, the research undertaken by the CEF analysts indicates that the technology is available to achieve such a reduction should a national commitment be successful in driving similar policies.

2.2. Results of the Scenario Analysis

With the model benchmarked to AEO2001, and given the different mix of scenario assumptions previously described, AMIGA reports the results in the figures and tables that follow. More complete data, including reference case assumptions, are available in Appendix 5.2.

2.2.1. Emission Projections

All program and policy assumptions have a start date of 2002. Moreover, the analysis anticipates the use of banked allowances made possible by early emissions reductions achieved in the years 2002 through 2006 (as requested in the Senate letter). Figures 1 through 4 on the following page illustrate both the emissions projections and the impact of banking the early reductions on all four emissions caps implemented in 2007.

Although all four categories of emissions are down substantially, they only achieve 50–75 percent of the proposed cap by 2007 (shown as the dotted horizontal line in each of the above figures). This is because of the availability of the banked allowances that can be used by sources to meet emissions caps in 2007 and beyond. Note that costs would be noticeably higher if power plants were required to actually hit the target in 2007. In 2015, carbon and mercury emissions continue to be 15 percent or more above the target.

The reductions that generate the banked allowances are shown as the area to the left of each vertical dotted line as the differences between the reference case and scenario emission trajectories. The emissions above the cap are shown to the right of each vertical dotted line and between the scenario emissions and the dotted horizontal line. Subtracting these two areas on each graph reveals the level of the bank in 2015. Using Scenario D as an example, the remaining allowances in 2015 are 100 million metric tons for carbon, 1.3 million tons for SO_2, 0.2 million tons for NOx and 25 tons for mercury. In the case of carbon, the bank would last another 2 years at the rate of drawdown in 2015, or longer if the drawdown declined.

Figure 1. Carbon Emissions (million metric tons)

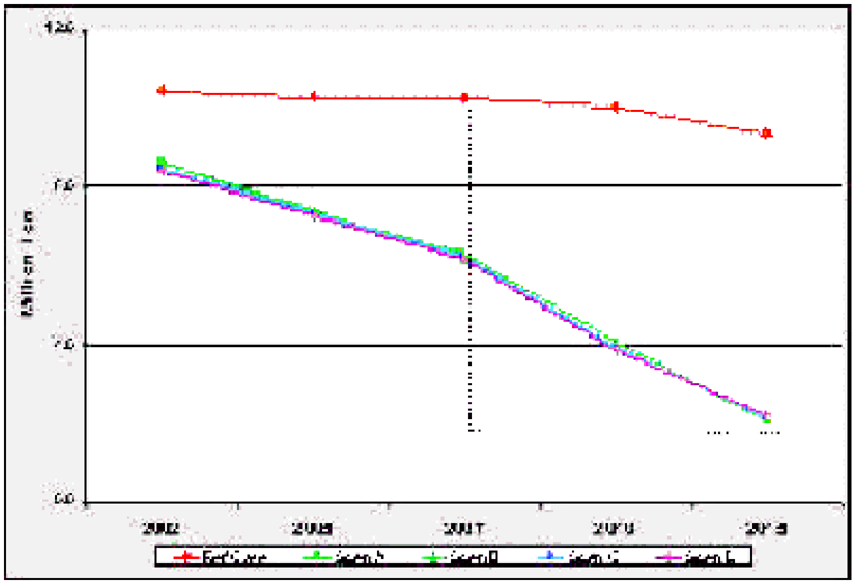


Figure 2. SO_2 EMISSIONS (MILLION TONS)

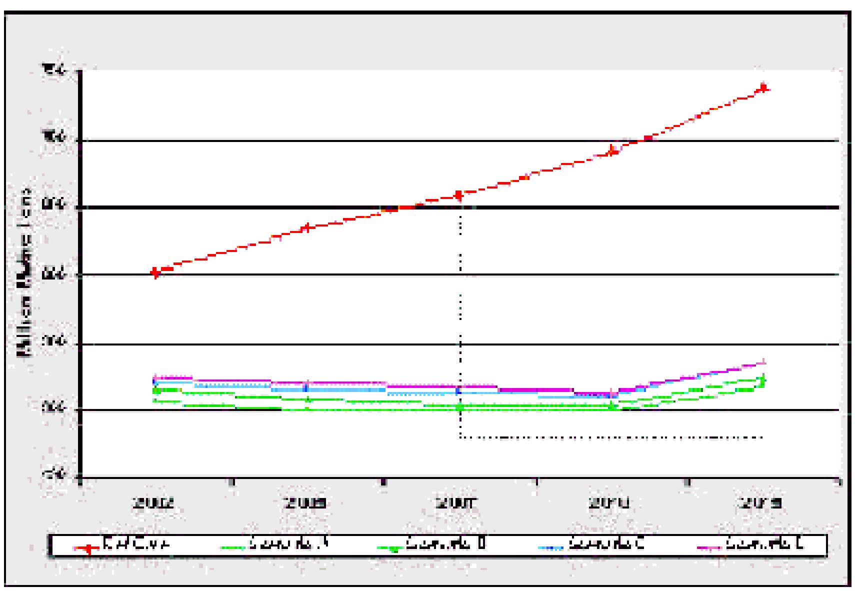


Figure 3. NOx Emissions (million tons)

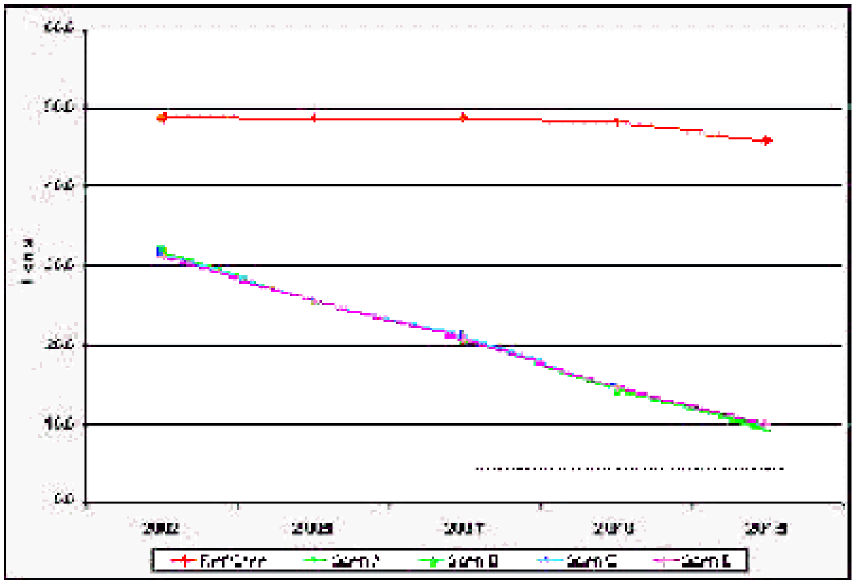
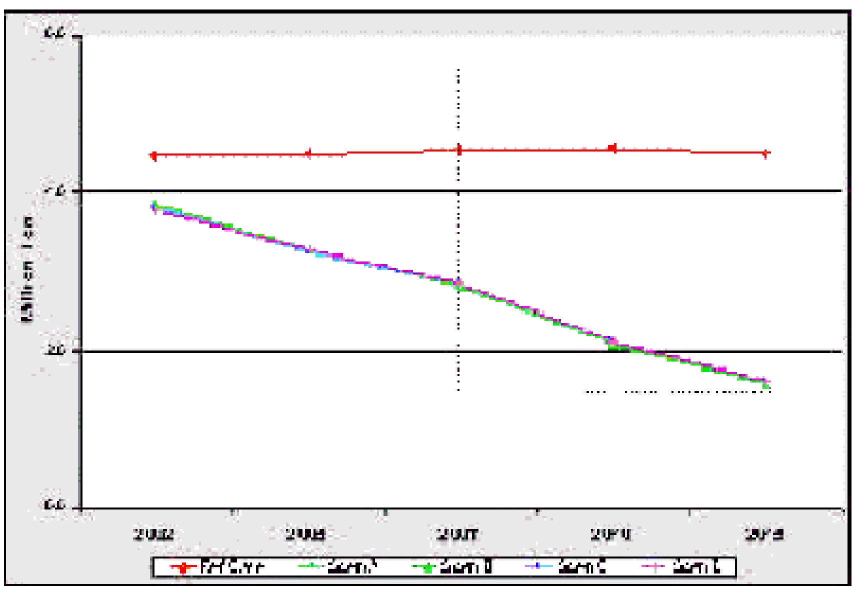


Figure 4. Mercury Emissions (tons)



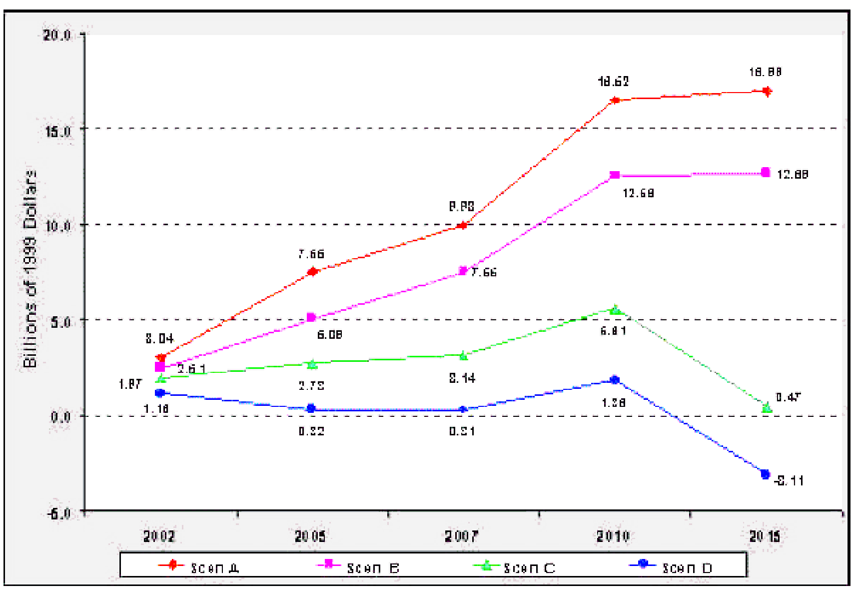
2.2.2. Changes in Electric Generation Expenditures

Given the assumptions and economic drivers in each of the scenarios, the AMIGA model calculates the capital investment, operation and maintenance, and fuel costs necessary to meet consumer demand for electricity. The incremental expenditures required to generate electricity under each of the four scenarios as compared to the reference case are summarized in Figure 5 (in billions of 1999 dollars). In effect, the incremental expenditures reflect the range of decisions made by the electricity sector to comply with each of the four scenario constraints-but do not reflect efforts made outside the electricity sector. Because these expenditures ignore spending on energy efficiency, research and development outside the electricity sector-spending that can be substantial-they are not measures of program costs. Note that incremental expenditures are incurred as early as 2002 in all four scenarios to generate early reductions that can be banked for use in 2007 and beyond.

The generation expenditures vary in each of the scenarios change for at least three reasons: (1) the size of the allowance bank made possible by early reductions driven, in part, by program spending prior to the introduction of the caps; (2) the varying levels of demand for electricity over time, resulting in changes in the overall mix of generation resources; and, (3) the gradual reduction in the banked allowances available for withdrawal necessitating additional actions to reduce emissions.

As expected, scenario A has the largest increase with expenditures rising by nearly $17 billion in 2015 compared to the reference case. The higher level of expenditures is driven by a 21 percent increase in unit generation costs caused primarily by the emissions caps and offset only slightly by a small decrease in electricity demand. With less energy efficiency technology penetrating the market, a greater level of control equipment must be installed and operated which, in turn, drives up the cost of generation. Scenario B follows a similar pattern with expenditure increases being offset by further reductions in electricity demand as more efficient technology penetrates the market. The expenditures for scenario C decline even further as reduced demand continues to lower both the level generation and the unit cost of that generation compared to scenario A. Scenario D, on the other hand, actually shows a decline in total expenditures by 2015. The combination of a 12.5 percent reduction on generation load together with only an 11.9 percent increase in the unit cost of generation (both with respect to the reference case) results in a $3.11 billion reduction in total electric generation expenditures.

Figure 5. Incremental Expenditures on Electric Generation (Billions of 1999$)



2.2.3. Marginal Costs

The marginal costs of emission reductions over the period 2005 through 2015 are shown in Figures 6 through 9 for all four scenarios.

Figure 6. Projected Marginal Cost of Carbon Reductions ($/Metric Ton)

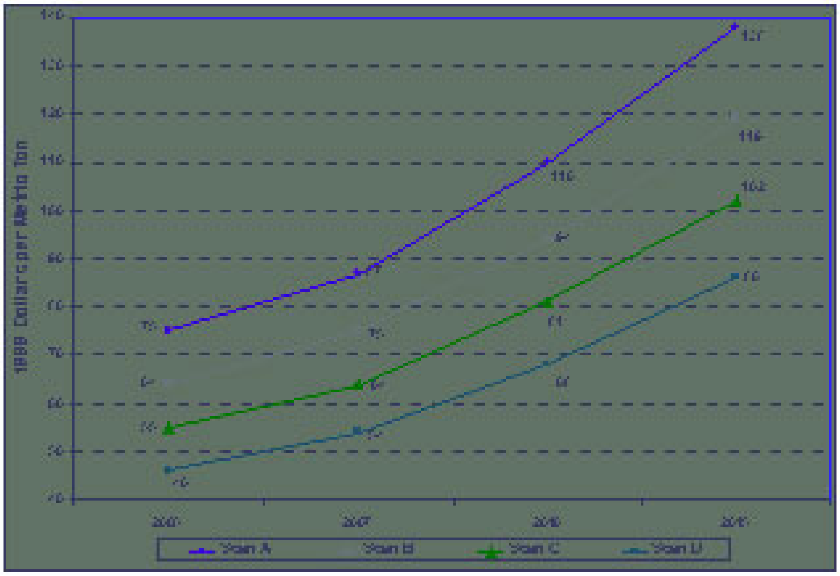


Figure 7. Projected Marginal Cost of SO_2 Reductions ($/Ton)

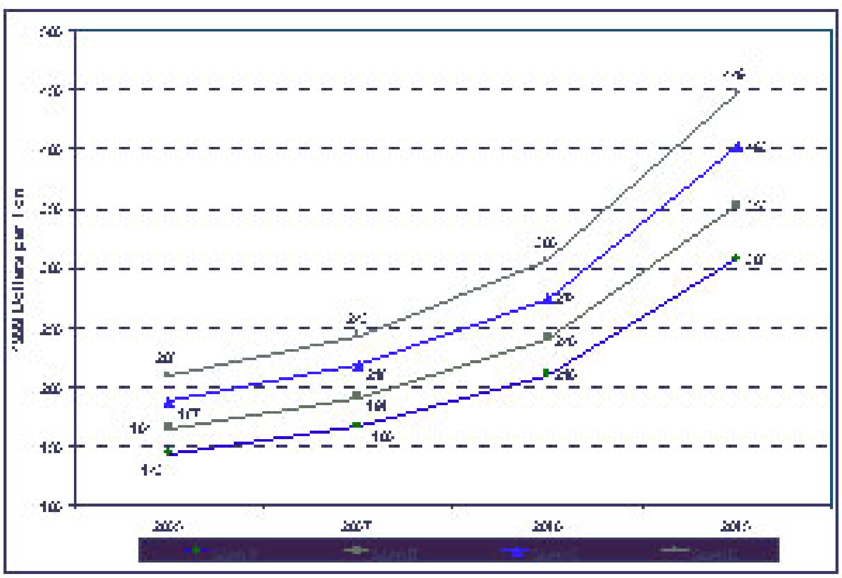


Figure 8. Projected Marginal Cost of NOx Reductions ($/Ton)

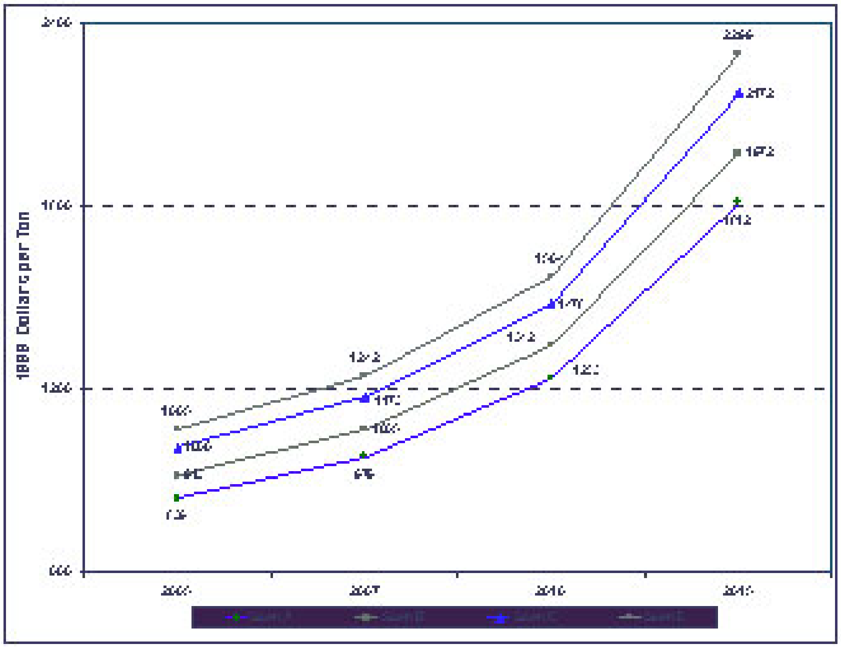
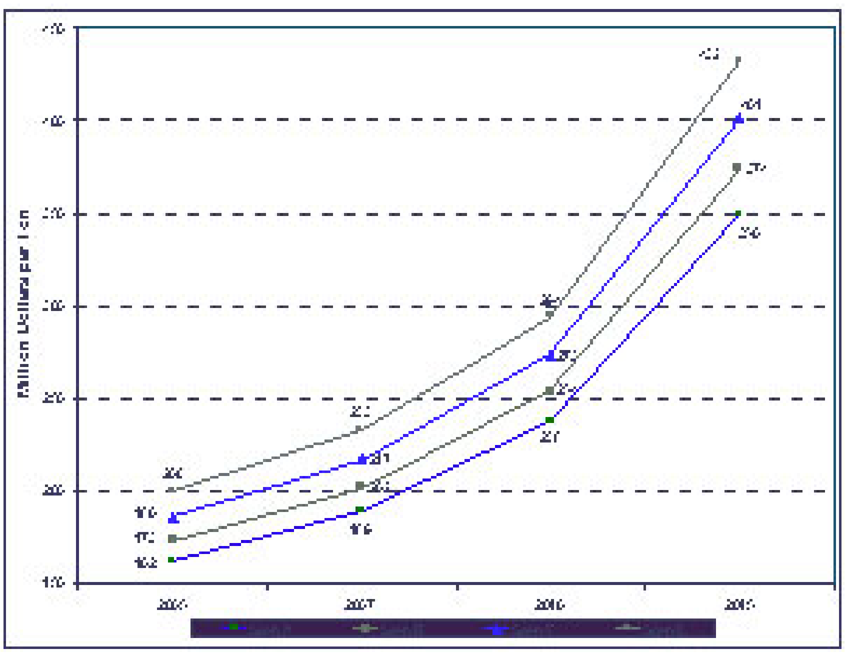


Figure 9. Projected Marginal Cost of Hg Reductions ($ Million/Ton)



The marginal cost of carbon reductions range from $46 to $138/metric ton through 2015 with each scenario showing successively smaller costs as technology characteristics improve and more energy-efficient and/or low carbon technologies penetrate the market. The marginal cost of SO_2 and NOx reductions through 2015 are less than \$450/ and \$2,300/ton, respectively, in all four multi-emissions reduction scenarios. The marginal cost of mercury reductions by 2015 ranges from \$350 million/ton to \$432 million/ton, again depending on the scenario.

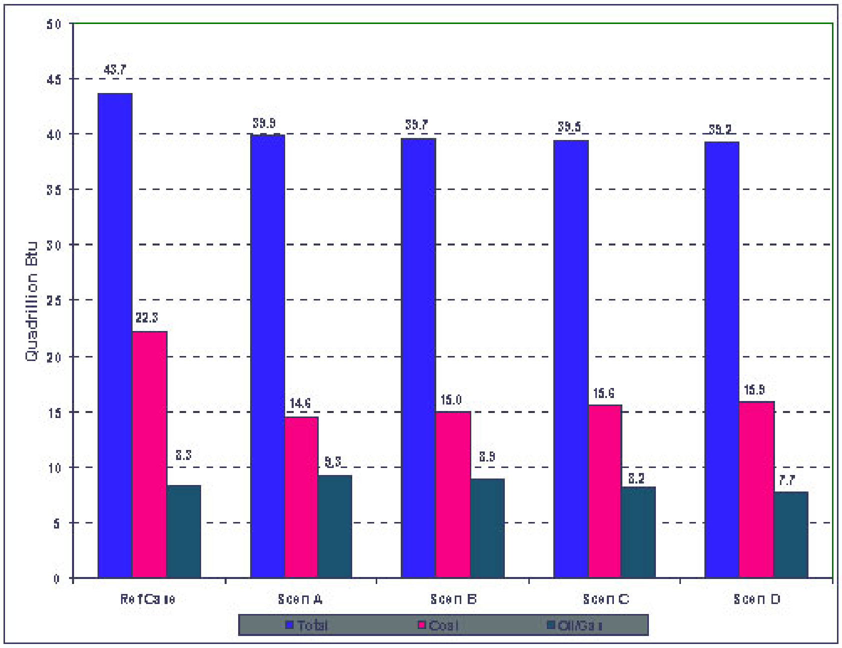
It is important to note that marginal cost reflects the additional cost of one more ton of reductions, and not the total cost associated with each pollutant. One can make a very rough estimation of this overall cost for each pollutant, on top of the costs associated with the other three, by multiplying half the marginal cost (to approximate average cost) by the volume of reductions. By 2015, as an example, scenario A returns cost estimates of \$15.2 billion for carbon, \$1.1 billion for SO_2, \$2.7 billion for NOx, and \$6.4 billion for mercury. In Scenario D, the cost estimates are \$8.6 billion for carbon, \$1.6 billion for SO_2, \$3.3 billion for NOx, and \$7.8 billion for mercury. Note that these figures cannot be added together for an overall estimate because they (a) double count the benefits of controlling multiple pollutants simultaneously, and (b) ignore the consequences of the underlying technology policy. We discuss overall costs below.

Surprisingly, the marginal cost of SO_2, NOx, and Hg reductions increases as the marginal cost of carbon decreases. The reason appears to be that as efficiency technology penetrates the market and reduces carbon prices, more of a price signal is required to generate further reductions in the three conventional pollutants. In the advanced scenarios, for example, both demand reductions and the increased use of gas tends to reduce carbon emissions. But gas prices begin to rise which allows coal to make a modest comeback with respect to scenario A. This is especially true as cleaner and more efficient coal technologies begin to penetrate the market as assumed in scenarios B through D. In order to offset the tendency for coal-generated emissions to increase, permit prices need to adjust upward.

2.2.4. Fuel Use Impacts

Figure 10 shows both total electricity consumption and the fossil fuel consumption used in the generation of electricity for the year 2010. The results are in quadrillion Btu in both the reference case and each of the four policy scenarios. As each successive scenario generates a greater reduction in electricity demand, coal use is reduced significantly (by about 30 percent). Gas consumption increases slightly in scenarios A and B, and decreases by a small amount in scenarios C and D as lower electricity consumption reduces the need for new capacity.

Figure 10. Total Electricity Consumption and Fossil Fuel Generation in 2010
(Quadrillion Btu)



2.2.5. Energy Price Impacts

The model suggests that under the conditions described above, electricity prices are expected to increase by about 30 percent (under scenario D) to 50 percent (under scenario A) by the year 2015. This is the logical result of increased control costs and permit prices. The combination of increased prices and the availability of more energy-efficient equipment and appliances reduce electricity demand by about 10 percent. Total electricity expenditures increase by about 15 percent to 30 percent depending on the year and the scenario (see Table 3, below, and the tables in Appendix 5.2 for more detail on the changing pattern of expenditures).

2.2.6. Economy-wide Impacts

Table 3 provides a summary of key macroeconomic data for the year 2010 to compare the impact of emissions reductions on both personal consumption and other components of gross domestic product (GDP). The effects on personal consumption show a decline of between \$13 billion and \$31, or 0.1 percent to 0.3 percent, depending on the scenario. This reflects the cost of the program in terms of the decreased well being of households who must forego a fraction of their consumption of goods and services in order to pay for both research and development programs, energy efficiency improvements, and more expensive electricity production. Table 3 shows little change in GDP under any of the policy scenarios, reflecting the fact that this foregone consumption turns up as expenditures in other categories of GDP, namely, investment and government spending.[5]

[5] A more complete assessment of each policy scenario can be made by reviewing the more detailed data contained in the Appendix.

Table 3. Summary of Economic Impacts by Scenario—2010

Analytical Scenario	Electricity End Use Demand (Billion Kilowatt-hours)	Natural Gas Use in Electricity Generation (Quads)	Coal Use in Electricity Generation (Quads)	Electricity Expenditures (Billion 1999 Dollars)	Personal Consumption (Billion 1999 Dollars)	Investment (Billion 1999 Dollars)	Gross Domestic Product (Billion 1999 Dollars)
Reference	4,346	8.3	22.3	269.4	8,902.0	3,042.4	13,211.7
A. Standard Tech	4,156	9.3	14.6	353.9	8,870.9	3,067.3	13,204.3
B. High Tech	4,112	8.9	15.0	337.4	8,873.7	3,067.0	13,209.5
C. Mod CEF	4,070	8.2	15.6	323.0	8,881.7	3,066.8	13,218.9
D. Adv CEF	4,025	7.7	15.9	308.9	8,889.2	3,066.7	13,227.2

The AMIGA modeling system reports the costs and benefits of each scenario with several major exceptions. The first omitted benefit is spillover and productivity gains beyond energy bill savings. A number of studies suggest that energy efficiency technology investments also tend to increase overall productivity of the economy, especially in the industrial sector. (Sullivan, et al., 1997; Finman and Laitner, 2001; and Laitner, et al, 2001). To date, however, no systematic effort has been undertaken to incorporate such benefits into the current generation of policy models. Hence, this potential benefit is not reported at this time. The second missing benefit includes gains in environmental quality, especially improved health benefits.

On the cost side, the model ignores costs associated with rapid changes in capital stocks, as well as potential loss of flexibility and interactions with the existing tax system. For example, the model forecasts significant changes in the level and composition of electricity generation in 2002, ignoring the difficulty of rapidly changing the capital stock by then end of 2001. Losses in flexibility occur when pollution control activities potentially interfere with efficiency and other operational programs at a regulated facility. Finally, there are interactions with the tax system when, in response to a rise in the relative cost of purchased goods, people decide to enjoy more leisure (which is now relatively less expensive), work less, and lower taxable income (Parry and Oates, 2000).

2.3. The Results in Context

Recent studies suggest significant economic consequences as a result of substantial emission reduction strategies (EPRI, 2000; and EIA, 2000). On the other hand, the presumption of a tradeoff between environmental and economic benefits may not provide an entirely appropriate framework for analysis of such policies (DeCanio, 1997). Indeed, there are a number of studies that show net economic benefits may be possible when a full accounting of both benefits and costs are included within an appropriate analysis (Krause, et al, 2001; and Bailie, et al, 2001).

At the same time, understanding the proper characterization and role of technology improvements (Edmonds, et al, 2000), and then capturing that characterization within an appropriate model structure (Peters, et al, 2001), is a critical aspect of all such economic assessments.

Finally, it is important to recognize that the mere existence of technologies and the potential for positive net benefits does not assure that these technologies will be commercialized and adopted, nor that the net benefits will be realized (Jaffe, et al, 2001). An unanswered question is whether and how policies might encourage these activities.

This current study, while drawing on credible data sources and applying a state-of-the-art modeling system, cannot adequately capture all such nuances associated with emission reduction scenarios. The results of this analysis should be viewed within this larger context.

3. Conclusions

The analysis suggests that under the conditions described above, emissions through 2015 will be significantly reduced although they won't meet the 2007 target. This is largely because of assumptions about the banking of allowances earned prior to 2007. At the same time, coal-fired electric generation is expected to decline by 25 percent to 35 percent by the year 2015. On the other hand, oil and gas-fired generation is projected to increase by about 8 percent under more restrictive technology assumptions, but decrease by as much as 20 percent under scenarios that embody more optimistic assumptions about energy-efficiency demand and supply technologies. Electricity prices are expected to increase by 32 percent to 50 percent in 2015, depending on the scenario.

The combination of increased prices and the availability of more energy-efficient equipment and appliances are projected to reduce electricity demand by about 10 percent compared to the reference case. With the combination of higher prices and improved efficiency, total expenditures for electricity consumption in 2015 are projected to increase by about 17 percent to 39 percent depending on the scenario. Interacting with other changes in consumer and business spending that is driven by each of the scenario assumptions, the personal consumption reduced by about 0.1 percent to 0.3 percent. This again depends on the year and the scenario.

The results provided in this analysis should not be construed as forecasts of actual scenario outcomes. Rather they are assessments of how the future might unfold compared to a previously defined reference case—given the mix of technology and policy assumptions embodied in each of the scenarios. The results from these scenarios imply a strong national commitment, one that is successful in developing the programs and policies necessary to achieve the level of emission reductions described within the report.

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5. Appendices

5.1. Description of the AMIGA Model

The All Modular Industry Growth Assessment (AMIGA) model is a general equilibrium modeling system of the U.S. economy that covers the period from 1992 through 2030.[6] It integrates features from the following five types of economic models:

1). Multi-sector—AMIGA starts by benchmarking to the 1992 Bureau of Economic Analysis (BEA) interindustry data, which a preprocessor aggregates to approximately 300 sectors;

2). Explicit technology representation—AMIGA reads in files with detailed lists of technologies (currently with a focus on energy-efficient and low-carbon energy supply technologies, including electric generating units) containing performance characteristics, availability status, costs, anticipated learning effects, and emission rates where appropriate;

3). Computable General Equilibrium—AMIGA computes a full-employment solution for demands, prices, costs, and outputs of interrelated products, including induced activities such as transportation and wholesale/retail trade;

4). Macroeconomic—AMIGA calculates national income, Gross Domestic Product (GDP), employment, a comprehensive list of consumption goods and services, the trade balance, and net foreign assets and examines inflationary pressures;

5). Economic Growth—AMIGA projects economic growth paths and long-term, dynamic effects of alternative investments including accumulation of residential, vehicle, and producer capital stocks.

In addition, the AMIGA system includes the Argonne Unit Planning and Compliance model that captures a wide variety of technology characteristics within the electric generating sector. This includes a system dispatch routine that allows the retirement and the dispatch of units on the basis of traditional cost criteria as well as the impact of various permit prices on operating costs. It also includes non-utility generation sources such as industrial combined heat and power applications and renewable energy systems.

Climate change mitigation policy has been the main application of the AMIGA system to date. But the AMIGA modeling system recently has been enhanced to include policies involving the reduction of sulfur dioxide, nitrogen oxide, and mercury emissions. Moreover, a new intertemporal optimization module has been added to AMIGA that allows an evaluation of early reductions and the banking of allowances to be incorporated into policy scenarios. Hence, the system is well suited to evaluate a variety of multi-emission strategies that are driven by price incentives as well as R&D programs, voluntary initiatives, and cap-and-trade policies.

The model includes a complete data base of all electric utility generating units within the United States. The cost and performance characteristics of the electricity supply technologies generally follow those modeled within the Energy Information Administration's National Energy Modeling System. The characteristics associated with the various emission control technologies generally follow those modeled within the Integrated Planning Model used by the Environmental Protection Agency.

[6] Because of recent upgrades and enhancements made in the model, the current reporting period is extended only through the year 2015. We expect the full reporting period to extend back to the year 2030 in the very near future.

The AMIGA modeling system is a highly organized, flexible structure that is programmed in the C language. It includes modules for household demand, production of goods, motor vehicles, electricity supply, and residential and commercial buildings and appliances.

The production modules contain representations of labor, capital, and energy substitutions using a hierarchy of production functions. The adoption rates for cost-effective technologies depend on energy prices as well as policies and programs that lower the implicit discount rates (sometimes referred to as hurdle rates) that are used by households and businesses to evaluate energy-efficiency and energy supply measures.[7]

[7]For a more complete documentation of the AMIGA model, see Hanson, Donald A, 1999. A Framework for Economic Impact Analysis and Industry Growth Assessment: Description of the AMIGA System, Decision and Information Sciences Division, Argonne National Laboratory, Argonne, IL, April, 1999. For an example of other policy excursions using the AMIGA model, see, Hanson, Donald A. and John A. "Skip" Laitner, 2000, "An Economic Growth Model with Investment, Energy Savings, and CO_2 Reductions," Proceedings of the Air & Waste Management Association, Salt Lake City, June 18–22, 2000. Also see, Laitner, John A. "Skip", Kathleen Hogan, and Donald Hanson, "Technology and Greenhouse Gas Emissions: An Integrated Analysis of Policies that Increase Investments in Cost Effective Energy-Efficient Technologies," Proceedings of the Electric Utilities Environment Conference, Tucson, AZ, January 1999.

5.2. Summary Tables for Study Scenarios

5.2.1. Reference Case Projections

Table 1. Summary Data Energy Consumption and Emissions	1998	2002	2005	2007	2010	2015
Total Primary Energy (Quadrillion Btus)	96.47	102.91	107.81	110.78	115.23	122.07
Total Electricity Use (Billion Kilowatt-hours)	3,411	3,714	3,942	4,104	4,346	4,697
Total Electricity Expenditures (Billions of 1999$)	223.8	236.7	245.9	255.3	269.4	291.3
Electric Sector Carbon (Million Metric Tons)	559	603	635	658	691	738
SO_2 (Million Short Tons)	13.24	10.46	10.31	10.23	10.02	9.35
NO_X (Million Short Tons)	6.01	4.47	4.49	4.54	4.56	4.51
Mercury (Tons)	47.36	48.86	48.81	48.70	48.25	46.01

Table 2. Summary Data Electric Generation (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal	1,829	1,961	2,055	2,100	2,157	2,189
Gas and Oil	462	584	672	788	967	1,329
Nuclear	674	712	740	732	720	639
Hydropower	325	322	323	323	323	324
Renewables	57	69	76	79	86	99
Total Generator Load	3,347	3,648	3,866	4,021	4,253	4,580

Table 3. Summary Data Cogeneration – Independent Power Production (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal Cogeneration	52	52	52	52	52	52
Gas and Oil Cogeneration	220	240	255	262	274	293
Biomass Cogeneration	27	29	30	32	35	40
Municipal Solid Waste and Other Cogeneration	12	10	9	9	9	9
Other Renewables Generation	6	5	5	5	5	5
Total Independent Power Production	317	336	351	361	375	399
Amount for Own Use	158	171	181	188	199	212
Sales to grid	158	165	170	173	176	186

Table 4. Summary Data Selected Energy Prices (1999 dollars)	1998	2002	2005	2007	2010	2015
Wellhead Gas Price ($/MCF)	2.02	2.28	2.49	2.57	2.69	2.83
Average Electricity Price ($/MWh)	68.82	66.82	65.39	65.19	64.96	64.95
Carbon Permit Price ($/metric ton)	0	0	0	0	0	0
Sulfur Dioxide Permit Price ($/ton)	0	0	0	0	0	0
Nitrogen Oxide Permit Price ($/ton)	0	0	0	0	0	0
Mercury Permit Price (million $/ton)	0	0	0	0	0	0

Table 5. Summary Data Macroeconomic Data (Billions of 1999$)	1998	2002	2005	2007	2010	2015
Real Gross Domestic Product (GDP)	8,882.2	9,770.2	11,431.3	12,116.7	13,211.7	15,264.3
Real Investment	1,577.0	2,018.4	2,474.0	2,697.5	3,042.4	3,768.4
Real Consumption	5,933.6	6,763.9	7,681.7	8,180.2	8,902.0	10,361.2

5.2.2. Scenario A: Emission Constraints Using Reference Case Technologies

Table 1. Summary Data Energy Consumption and Emissions	1998	2002	2005	2007	2010	2015
Total Primary Energy (Quadrillion Btus)	96.47	100.94	104.97	107.54	111.37	117.14
Total Electricity Use (Billion Kilowatt-hours)	3,411	3,685	3,831	3,958	4,156	4,417
Total Electricity Expenditures (Billions of 1999$)	223.8	279.7	298.2	318.1	353.9	404.5
Electric Sector Carbon (Million Metric Tons)	559	507	500	499	499	518
SO_2 (Million Short Tons)	13.24	8.66	7.35	6.34	4.04	2.07
NO_X (Million Short Tons)	6.01	3.85	3.24	2.86	2.11	1.58
Mercury (Tons)	47.36	31.82	25.39	21.11	14.43	9.34

Table 2. Summary Data Electric Generation (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal	1,829	1,668	1,609	1,566	1,467	1,406
Gas and Oil	462	644	746	855	1,095	1,429
Nuclear	674	712	740	732	720	639
Hydropower	325	322	323	323	323	323
Renewables	57	190	248	308	365	405
Total Generator Load	3,347	3,536	3,667	3,784	3,970	4,202

Table 3. Summary Data Cogeneration – Independent Power Production (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal Cogeneration	52	52	52	52	52	52
Gas and Oil Cogeneration	220	303	318	325	337	356
Biomass Cogeneration	27	29	30	32	35	40
Municipal Solid Waste and Other Cogeneration	12	10	9	9	9	9
Other Renewables Generation	6	19	19	19	19	19
Total Independent Power Production	317	413	428	437	452	475
Amount for Own Use	158	210	221	228	239	253
Sales to grid	158	203	207	209	212	222

Table 4. Summary Data Energy and Permit Prices (1999 dollars)	1998	2002	2005	2007	2010	2015
Wellhead Gas Price ($/MCF)	2.02	2.77	3.33	3.45	3.63	3.53
Average Electricity Price ($/MWh)	68.82	80.52	82.59	85.29	90.36	97.15
Carbon Permit Price ($/metric ton)	0	59	75	87	110	138
Sulfur Dioxide Permit Price ($/ton)	0	113	143	166	210	308
Nitrogen Oxide Permit Price ($/ton)	0	666	839	979	1233	1812
Mercury Permit Price (million $/ton)	0	129	162	189	238	350

Table 5. Summary Data Macroeconomic Data (Billions of 1999$)	1998	2002	2005	2007	2010	2015
Real Gross Domestic Product (GDP)	8,882.2	9,764.6	11,426.0	12,109.9	13,204.3	15,260.1
Real Investment	1,577.0	2,023.0	2,488.0	2,714.6	3,067.3	3,790.2
Real Consumption	5,933.6	6,755.1	7,663.6	8,158.3	8,870.9	10,336.3

5.2.3. Scenario B: Emission Constraints Using Advanced Case Technologies

Table 1. Summary Data Energy Consumption and Emissions	1998	2002	2005	2007	2010	2015
Total Primary Energy (Quadrillion Btus)	96.47	101.03	104.87	107.32	111.00	116.54
Total Electricity Use (Billion Kilowatt-hours)	3,411	3,681	3,814	3,929	4,112	4,346
Total Electricity Expenditures (Billions of 1999$)	223.8	273.9	289.1	306.7	337.4	381.2
Electric Sector Carbon (Million Metric Tons)	559	516	509	504	504	524
SO_2 (Million Short Tons)	13.24	8.65	7.37	6.20	3.91	2.14
NO_X (Million Short Tons)	6.01	3.86	3.26	2.82	2.09	1.58
Mercury (Tons)	47.36	31.9	25.59	20.84	14.37	9.70

Table 2. Summary Data Electric Generation (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal	1,829	1,692	1,649	1,586	1,501	1,476
Gas and Oil	462	652	723	841	1,048	1,318
Nuclear	674	712	740	732	720	639
Hydropower	325	322	323	323	323	323
Renewables	57	170	228	288	345	385
Total Generator Load	3,347	3,548	3,663	3,769	3,937	4,141

Table 3. Summary Data Cogeneration – Independent Power Production (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal Cogeneration	52	52	52	52	52	52
Gas and Oil Cogeneration	220	290	305	313	324	343
Biomass Cogeneration	27	29	30	32	35	40
Municipal Solid Waste and Other Cogeneration	12	10	9	9	9	9
Other Renewables Generation	6	16	16	16	16	16
Total Independent Power Production	317	398	412	422	436	460
Amount for Own Use	158	203	213	220	231	245
Sales to grid	158	195	200	202	205	215

Table 4. Summary Data Energy and Permit Prices (1999 dollars)	1998	2002	2005	2007	2010	2015
Wellhead Gas Price ($/MCF)	2.02	2.65	3.12	3.25	3.45	3.53
Average Electricity Price ($/MWh)	68.82	78.72	80.29	82.69	86.96	92.95
Carbon Permit Price ($/metric ton)	0	51	64	75	94	119
Sulfur Dioxide Permit Price ($/ton)	0	130	164	191	240	353
Nitrogen Oxide Permit Price ($/ton)	0	725	913	1065	1342	1972
Mercury Permit Price (million $/ton)	0	137	173	202	254	374

Table 5. Summary Data Macroeconomic Data (Billions of 1999$)	1998	2002	2005	2007	2010	2015
Real Gross Domestic Product (GDP)	8,882.2	9,767.2	11,429.0	12,114.0	13,209.5	15,264.0
Real Investment	1,577.0	2,022.8	2,487.8	2,714.3	3,067.0	3,790.5
Real Consumption	5,933.6	6,757.1	7,665.2	8,160.3	8,873.7	10,337.1

5.2.4. Scenario C: Emission Constraints Using the Moderate CEF Scenario Assumptions

Table 1. Summary Data Energy Consumption and Emissions	1998	2002	2005	2007	2010	2015
Total Primary Energy (Quadrillion Btus)	96.47	101.08	104.81	107.25	110.76	116.21
Total Electricity Use (Billion Kilowatt-hours)	3,411	3,678	3,797	3,903	4,070	4,279
Total Electricity Expenditures (Billions of 1999$)	223.8	268.3	280.9	296.3	323.0	360.4
Electric Sector Carbon (Million Metric Tons)	559	520	515	513	512	535
SO_2 (Million Short Tons)	13.24	8.50	7.33	6.24	3.93	2.17
NO_X (Million Short Tons)	6.01	3.80	3.26	2.86	2.11	1.63
Mercury (Tons)	47.36	31.51	25.5	21.07	14.56	10.01

Table 2. Summary Data Electric Generation (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal	1,829	1,701	1,680	1,641	1,559	1,558
Gas and Oil	462	657	693	775	964	1,182
Nuclear	674	712	740	732	720	639
Hydropower	325	322	323	323	323	323
Renewables	57	159	217	277	334	374
Total Generator Load	3,347	3,552	3,653	3,749	3,900	4,077

Table 3. Summary Data Cogeneration – Independent Power Production (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal Cogeneration	52	52	52	52	52	52
Gas and Oil Cogeneration	220	284	299	306	318	337
Biomass Cogeneration	27	29	30	32	35	40
Municipal Solid Waste and Other Cogeneration	12	10	9	9	9	9
Other Renewables Generation	6	15	15	15	15	15
Total Independent Power Production	317	390	405	415	429	453
Amount for Own Use	158	199	209	216	227	241
Sales to grid	158	192	196	198	202	211

Table 4. Summary Data Energy and Permit Prices (1999 dollars)	1998	2002	2005	2007	2010	2015
Wellhead Gas Price ($/MCF)	2.02	2.54	2.93	2.99	3.09	2.98
Average Electricity Price ($/MWh)	68.82	77.12	78.29	80.36	84.06	89.25
Carbon Permit Price ($/metric ton)	0	44	55	64	81	102
Sulfur Dioxide Permit Price ($/ton)	0	148	187	218	274	403
Nitrogen Oxide Permit Price ($/ton)	0	799	1006	1173	1478	2172
Mercury Permit Price (million $/ton)	0	148	186	217	273	401

Table 5. Summary Data Macroeconomic Data (Billions of 1999$)	1998	2002	2005	2007	2010	2015
Real Gross Domestic Product (GDP)	8,882.2	9,767.6	11,431.7	12,120.2	13,218.9	15,275.7
Real Investment	1,577.0	2,022.7	2.487.7	2,714.1	3,066.8	3,790.8
Real Consumption	5,933.6	6,757.1	7,667.3	8,165.3	8,881.7	10,346.6

5.2.5. Scenario D: Emission Constraints Using the Advanced CEF Scenario Assumptions

Table 1. Summary Data Energy Consumption and Emissions	1998	2002	2005	2007	2010	2015
Total Primary Energy (Quadrillion Btus)	96.47	101.12	104.76	107.08	110.44	115.66
Total Electricity Use (Billion Kilowatt-hours)	3,411	3,675	3,779	3,875	4,025	4,208
Total Electricity Expenditures (Billions of 1999$)	223.8	263.2	273.0	286.2	308.9	340.9
Electric Sector Carbon (Million Metric Tons)	559	525	521	517	514	537
SO_2 (Million Short Tons)	13.24	8.41	7.24	6.13	3.88	2.24
NO_X (Million Short Tons)	6.01	3.79	3.27	2.85	2.11	1.62
Mercury (Tons)	47.36	31.09	25.3	20.87	14.41	10.12

Table 2. Summary Data Electric Generation (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal	1,829	1,713	1,707	1,665	1,587	1,614
Gas and Oil	462	660	664	739	904	1,069
Nuclear	674	712	740	732	720	639
Hydropower	325	322	323	323	323	323
Renewables	57	149	207	267	324	364
Total Generator Load	3,347	3,556	3,642	3,726	3,859	4,009

Table 3. Summary Data Cogeneration – Independent Power Production (Billion Kilowatt-hours)	1998	2002	2005	2007	2010	2015
Coal Cogeneration	52	52	52	52	52	52
Gas and Oil Cogeneration	220	278	293	300	312	331
Biomass Cogeneration	27	29	30	32	35	40
Municipal Solid Waste and Other Cogeneration	12	10	9	9	9	9
Other Renewables Generation	6	14	13	13	13	13
Total Independent Power Production	317	383	398	407	422	445
Amount for Own Use	158	195	205	212	223	237
Sales to grid	158	188	192	195	198	208

Table 4. Summary Data Energy and Permit Prices (1999 dollars)	1998	2002	2005	2007	2010	2015
Wellhead Gas Price ($/MCF)	2.02	2.41	2.70	2.79	2.92	2.98
Average Electricity Price ($/MWh)	68.82	75.62	76.39	78.16	81.26	85.85
Carbon Permit Price ($/metric ton)	0	37	46	54	68	86
Sulfur Dioxide Permit Price ($/ton)	0	165	208	243	306	449
Nitrogen Oxide Permit Price ($/ton)	0	845	1065	1242	1564	2299
Mercury Permit Price (million $/ton)	0	159	200	233	294	432

Table 5. Summary Data Macroeconomic Data (Billions of 1999$)	1998	2002	2005	2007	2010	2015
Real Gross Domestic Product (GDP)	8,882.2	9,768.4	11,434.3	12,125.7	13,227.2	15,285.9
Real Investment	1,577.0	2,022.6	2,487.6	2,713.9	3,066.7	3,791.0
Real Consumption	5,933.6	6,757.1	7,668.4	8,170.0	8,889.2	10,355.9

RESPONSES BY HON. JEFFREY HOLMSTEAD TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. What is the current status of the Administration's review of New Source Review requirements and enforcement actions, relative to the President's direction in the National Energy Policy document?

Response. As you are aware, the Environmental Protection Agency (EPA) has been reviewing the New Source Review (NSR) program. This review is still underway, and we plan to release the results as soon as possible. The Department of Justice recently released a separate review of NSR enforcement actions.

Question 2. My and Senator Lieberman's request for analyses asked EPA to include electricity generated by industrial cogenerators and other independent power producers. These entities do not appear to have been included in the report that

EPA prepared. Please explain why that was the case. If they were included in the analyses, what effect would that have on EPA's cost projections?

Response. EPA's analyses did include both cogenerators and independent power producers. Please refer to table 3 in each of the five appendices, 5.2.1 through 5.2.5, which highlights the use of cogeneration and renewable resources. The tables are labeled "Summary Data: Cogeneration Independent Power Production (Billion Kilowatt-hours)" and include cogeneration by fuel type, and the amount of generation for onsite use versus sales to the grid. In the reference case, for example, gas/oil fired cogeneration increases from 240 billion kWh in 2002 to 293 billion kWh by 2015. By comparison, scenario D shows gas/oil fired cogeneration increases to 331 billion kWh in 2015.

Question 3. Please provide the committee with reliable data on the emissions inventory, power/energy production, and any other relevant information for industrial cogenerators and other independent power producers that would be necessary for the committee to develop an accurate pollution credit allocation scheme for these sources.

Response. The most current data on industrial cogenerators and other independent power producers can be found in EPA's Emissions & Generation Resource Integrated Data base (E-GRID). This information can be obtained at the following web address: http://www.epa.gov/airmarkets/egrid/index.html. We have also attached a CD-ROM version of this data base. Using that CD-ROM, open the Excel spreadsheet file EGRID98. Cogenerators and independent power generators are identified as NU.

Question 4. In testimony, you indicated that stringent national caps, as part of a cap-and-trade system, would be sufficient to protect local air quality, achieve compliance with NAAQS and regional haze requirements, and, if they were low enough, would obviate the need for several statutory and regulatory requirements. What modeling or analyses has the Agency performed that supports all three of these components simultaneously? Please provide the committee with that information.

Response. It is important to clarify that, even with new caps on power plants, there will be certain areas of the country that need additional emissions reductions to come into attainment with all the National Ambient Air Quality Standards (NAAQS) and to meet the goals of the regional haze program. We believe it would be inappropriate to attempt to address all State and local air quality concerns with a national cap on one industrial sector. Although national caps on utility emissions of sulfur dioxide (SO_2), nitrogen oxide (NOx), and mercury could alone be sufficient to protect air quality in many parts of the country, certain States and local governments will likely need to take action to reduce emissions from other types of sources to meet their individual air quality needs.

During the process of developing an Administration proposal to reduce emissions from power plants, EPA has started to conduct national-scale modeling that demonstrates the potential air quality benefits of multi-pollutant legislation. Attached are materials based on emissions projections for 2020 that show the relevant results of that modeling for a base case and for one possible, hypothetical multi-pollutant approach (Attachment A). The results illustrate improvements in regional and local air quality for fine particles ($PM_{2.5}$) and ozone (O_3), and have been provided to the committee previously in response to earlier inquiries.

Our analysis indicates that caps on SO_2 and NOx emissions from power plants could significantly reduce the number of $PM_{2.5}$ and O_3 nonattainment areas in the eastern United States. We also believe that national caps could greatly improve visibility throughout the country, although we also believe that any multi-pollutant bill should be consistent with the SOx reduction program developed by States participating in the Western Regional Air Program (WRAP) to improve western visibility.

Although we have not yet developed a Maximum Achievable Control Technology (MACT) standard to reduce mercury emissions from power plants, we believe that a cap could achieve reductions in mercury emissions the same as or greater than would be achieved under the MACT program. A cap would also set a limit on future emissions of mercury from power plants, unlike the MACT program, which would allow mercury emissions to continue to increase once the MACT standards are in place. Moreover, establishing a cap would create incentives for development of more cost-effective mercury reduction technologies; incentives that would not exist under the MACT program.

Given the substantial emissions reductions and air quality improvements that could be achieved by a well-designed multi-pollutant approach, we believe that, under such an approach, a number of current provisions that affect power generation may not be needed and could be phased out. Among these are the existing section 126 rule addressing interstate ozone transport, Best Available Retrofit Technology (BART) requirements, mercury MACT, and new source review technology-based requirements for sources covered by the legislation.

Question 5. Please provide the committee with data tables that show the efficiency of each facility in today's fleet of electric generating units (EGU), industrial co-generators, and independent power producers, in terms of the emissions of SOx, NOx, Hg, and CO_2, in tons per MWh in the latest year for which there is reliable data.

Response. The best source of data for the information on emissions in tons per MWh can be found in EPA's Emissions & Generation Resource Integrated Data base (E-GRID). This information can be obtained at the following web address: http://www.epa.gov/airmarkets/egrid/index.html. As noted in the response to Question 3, we have attached a CD-ROM version of this data base. Using that CD-ROM open the Excel spreadsheet file EGRID98. Cogenerators and independent power generators are identified as NU.

Question 6. Assuming that S. 556 were enacted as introduced in 2002, what would be the most economically efficient method of distributing allowances to EGU and non-EGU power producers? Which allocation method would result in the least cost to consumers in cents per kwh by 2010?

Response. The most economically efficient method of distributing allowances would be an auction, but only if the proceeds are used to cut taxes, for example, on labor and capital. This conclusion is based on a large volume of research on environmental regulation and economic welfare. If auction revenue is not used to cut taxes or if the allowances are allocated to existing sources based on historic activity as occurred under the Title IV Acid Rain program the same research does not associate higher or lower efficiency with any particular allocation method with one exception. Inefficiencies can be created by frequently updating allowance allocations based on future source behavior in competitive electricity markets for example, giving larger allocations to those sources in 2010 who produced more electricity in 2005. This can create inefficiencies by distorting the decision to produce electricity in 2005 by effectively subsidizing electricity generation via the allowance allocation. The less frequent the updating, the smaller any inefficiency would likely be. However, the inefficiency can be quite dramatic when the electricity sector is deregulated, when aggressive caps are placed on carbon dioxide (CO_2), and when updating is very frequent.

This effective electricity subsidy associated with an updating allocation does lead to slightly lower electricity prices for consumers compared to other allocation methods. Although this might appear to be a good way to shift some of the cost burden from consumers to electric power producers, it has the negative consequence of encouraging electricity consumption. This leads to more emission controls to meet the emission cap, when energy conservation would be cheaper for society, in turn raising the overall cost of the program. However, it is highly unlikely that any allocation method would fully offset the electricity price impacts of a stringent carbon cap.

Of course, economic efficiency is not the only issue associated with allowance allocation: It is also important to consider equity. Equity has many dimensions that must be addressed, including producers using different types of fuel, consumers versus producers versus fuel suppliers, owners versus employees, existing facilities versus new facilities, and those that have already taken actions to reduce emissions versus those who have not, as well as the distribution of costs among consumers of different socio-economic levels.

Question 7. Assuming enactment of S. 556 in 2002, would an additional 5 years for compliance time change any of the answers to the previous question?

Response. The answers provided in response to Question 6, which regard the selection of emission allowance allocation options, contrast different allocation options and are independent of compliance dates.

Question 8. Assuming the technology level of the reference case, that S. 556 is enacted in 2002, and the pollution allowances or credits within that legislation's caps are distributed by each of three methods (grandfathering, an auction, or a 4-year updating output based system), how many allowances would the utility and non-utility generators in committee members' States require to maintain generation at current levels and keep pace with market growth (1.8 percent) in 2010 and 2015? Please reply for each allocation system.

Response. Answering this question poses numerous challenges due to the complexity of the question and the detailed analysis that would be required. It would require substantial additional time and resources to conduct the necessary modeling and analysis.

Question 9. Last year, Robert Perciasepe, former EPA Assistant Administrator for Air and Radiation, sent a letter to Congressman Dan Burton, chairman of the House

Government Reform Committee stating that: "EPA's analysis of H.R. 2569, 'the Fair Energy Competition Act,' found an overall annualized cost of $11.5 billion to simultaneously achieve major reductions of 4 pollutants—NOx, SO_2, mercury, and carbon dioxide. This would result in an annual savings of $7.6 billion when compared to control responses that address each pollutant separately, while the benefits from SO_2 and NOx reductions alone would be more than $75 billion." The analysis EPA submitted to the committee last week did not include estimates of the cost savings or benefits of the pollution reductions. What would be the cost savings to the utilities of pursuing the four pollutant targets in a comprehensive, integrated fashion, as opposed to doing them each separately?

Response. EPA has not evaluated a "piecemeal" approach to achieving the emissions reductions called for in the Jeffords/Lieberman request. It would be difficult to conduct such an analysis without knowing more about how to assume that CO_2 could be regulated separately, since there are no existing programs that allow for the regulation of CO_2 from power plants. Unlike SO_2, NOx, and mercury, CO_2 is not regulated as a pollutant under the Clean Air Act.

The Administration strongly opposes including reductions for CO_2 in S. 556 or any multi-pollutant bill. Pursuing sharp reductions in CO_2 from the electricity generating sector alone would cause a dramatic shift from coal to natural gas and thus would run the risk of endangering national energy security, substantially increasing energy prices, and harming consumers.

The Administration will not support any legislation that would cause a significant decline in our nation's ability to use coal as a major source of current and future electricity. Half of the electricity generated in the country comes from coal. At the same time, the Administration supports efforts to substantially reduce emissions from coal-fired power plants and to promote a future for clean coal technologies. In short, the Administration supports a clean coal policy as a critical component of our nation's energy and environmental policies, recognizing that other sources of energy also have a critical role to play.

Question 10. What would be the approximate additional cost (in the retail price of electricity) of enacting in 2007 (after enactment in 2002 of the emission reduction requirements and timelines for SOx, NOx, and mercury in S. 556), a requirement that power plants must reduce carbon dioxide emissions to 1990 levels no later than 2012, versus the cost of including carbon dioxide as part of S. 556 enactment in 2002? In this hypothetical case, please note that the delinked carbon reduction requirement would not have been known in advance, and indicate in the response what assumptions the Agency makes regarding inter-sector and international trading of carbon credits.

Response. EPA has not performed the analysis to provide a precise answer at this point. We note, however, that any reasonable approach to reducing greenhouse gas emissions would be designed to achieve such reductions at the lowest possible cost before seeking reductions that are relatively more expensive. Based on the EPA and EIA analyses conducted at the request of Senators Jeffords and Lieberman, as well as the EPA and EIA analysis conducted at request of Senators Smith, Voinovich and Brownback, it is clear that reducing greenhouse gas emissions from the utility sector is very expensive compared to other possible approaches to controlling greenhouse gases. We believe that any legislation that imposes an obligation on utilities to reduce greenhouse gas emissions should allow them to satisfy that obligation by finding the most cost-effective way to reduce emissions of a specified quantity of greenhouse gases, rather than requiring them to reduce emissions from their own facilities. Under this type of approach, enacting a requirement in 2007 (as compared to 2002) would not result in stranded investments that could adversely affect retail electricity prices. EPA believes that any provision that requires significant carbon reductions directly from the utility sector would substantially increase retail prices of electricity, regardless of when it is adopted. As noted above, any benefits that would result from such a provision could be achieved through much more cost-effective approaches.

Question 11. EPA's analysis of policies to achieve the emissions reductions contained in S. 556, coupled with other energy efficiency and renewable energy policies such as those included in S. 556, concluded that utilities' expenditures would increase by $1.8 billion in investment costs in 2010 (Figure 5), while electricity bills would actually increase by $39.5 billion in 2010 (Table 13). EPA's analysis of a scenario that assumes no energy efficiency and renewable policies or technological advances as a result of this legislation shows that total electricity bills increase five times as much as the actual expense to industry, with industry receiving an annual profit of $68 billion by 2010. Why would such profits accrue to the industry?

Response. EPA has not done an analysis to specifically determine the source of the electricity price increases, but it is clear that this result is driven to some extent by our treatment of allowances and the costs associated with them, including the assumption that allowances were distributed at no cost to industry.

In our analysis, we followed the assumption in the Clean Energy Future study of a fully restructured electricity market that results in marginal costs setting the electricity price. In other words, the last electricity generating unit brought on line to meet anticipated demand will set the price for all other generators. If the last unit is an expensive peaking plant that runs at 10 cents per kilowatt-hour (kWh) for 2 hours, that unit would set the marginal clearing price in a competitive market and all plants would be paid 10 cents per kWh for that same 2-hour period—even if their own operating costs were 3 cents per kWh. At the same time, the value of allowances are included in determinations of market electricity prices, driving electricity prices upwards. Since allowances were distributed at no cost to sources, yet drive electricity prices upwards, large profits may accrue to the industry, despite the expected increased level of generating costs. In this case, the higher electric rates are primarily driven by the value of carbon allowances (with SO_2, NOx, and mercury permit values having relatively small effects).

Question 12. Please comment on the attached chart drawn from EPA's analysis.

all figures in billions of 1999 dollars

U.S. electricity revenues, 2010—Reference Case.	$269.4	Source Table 3, page 17
U.S. electricity revenues, 2010—Scenario A.	*353.9*	Source: Table 3, page 18
Increase in electricity revenues, 2010.	$84.5	
Incremental cost to electricity sector, 2010—Scenario A.	$16.5	Source Figure 5, page 13
Profit to electricty generators, 2010.	....	
U.S. electricity revenues, 2010—Reference Case.	$269.4	Source: Table 3, page 17
U.S. electricity revenues, 2010—Scenario D.	$308.9	Source: Table 3, page 18
Increase in electricity revenues, 2010.	39.5	
Incremental cost to electricity sector, 2010—Scenario D.	$1.8	Source: Figure 5, page 13
Profit to electric generators, 2010	$37.7	

Response. As described above, the incremental cost to electricity generators does not include the value of allowances, whereas the price of electricity does reflect the value of allowances.

The increased revenues (shown in the table above), accruing to electric power generators that receive free carbon and other allowances, are not accrued under alternative policy designs (see Question 13 below), although we would still expect to see significant increases in retail prices independent of the allocation method.

Question 13. What alternative policy designs, such as allocating allowances through an auction system that returns the revenues to consumers, or allocating to utilities in a fuel-neutral, output-based manner based on a generation performance standard, could reduce the costs to consumers implied by the chart in the previous question?

Response. One way to reduce costs to consumers is to distribute allowances through an auction system, which would raise government revenues that could be redistributed back to consumers or businesses in a variety of ways, such as by reducing existing taxes. This approach could have a double dividend to the extent that it offsets inefficient taxes.

Alternatively, allowances may be allocated at no cost to sources, as was done under the Acid Rain Program in the Clean Air Act (CAA). EPA has performed general analysis, noted also in Question 6, that show distributing allowances through an updating, output-based system for only those units that combust fossil fuel would result in the greatest decrease in electricity prices relative to other allocation methods. As we also noted, this can substantially raise the cost of the program in certain circumstances.

Other than allocations schemes, policy options that could yield lower electricity rates include renewable portfolio standards, auctions for building clean generating capacity additions, renewable energy production credits, investment tax credits, and low-interest government-backed loans.

Question 14. Has EPA conducted any modeling of alternative policy designs for achieving the specified cap levels that results in different electricity prices than those included in the report? If so, please provide the model results.

Response. EPA has conducted sensitivity analyses of how prices might be moderated through a combination of supplementary policies, such as renewable portfolio standards and investment tax credits. Based on certain assumptions about these sorts of policies, we found that in the year 2015, for example, electricity prices could be closer to 6.8 to 7.7 cents per kWh versus 8.6 to 9.7 cents per kWh. Of course, the total cost to society may be higher with these supplemental policies even though electricity prices are lower. For example, the burden of raising the necessary revenue to fund an investment tax credit or the cost of a renewable portfolio standard could well exceed the savings in electricity prices.

Additional policy alternatives, such as intensified research and development to improve control technology performance and reduce control technology cost have been considered, but not subjected to rigorous quantitative analysis. Clearly, any effort to develop and demonstrate improved technologies would be much less effective if used to address near-term compliance deadlines.

Question 15. As part of the regulatory impact analysis accompanying the PM–2.5 standard set in 1997, it seems that EPA estimated the reductions in SOx and NOx emissions from power plants that would be necessary to achieve compliance with that PM–2.5 standard. What reductions would be necessary? How have additional scientific studies and/or modeling done since the establishment of the standard changed the estimated necessary reductions and their health significance?

Response. In the 1997 Regulatory Impact Analysis (RIA), EPA attempted to estimate the total emissions reductions from all sources that would likely be needed to achieve compliance with the PM–2.5 and 8-hour ozone standards. Because emissions from many different types of sources contribute to concentrations of PM–2.5 and ozone, the Agency did not attempt to estimate the specific reductions in power plant emissions that would be necessary to achieve compliance with these standards.

However, in order to examine the likely costs and benefits of attainment strategies for the $PM_{2.5}$ and ozone standards, the 1997 RIA explored two different scenarios under which power plant emissions of NOx and SO_2 might be controlled.

Under the first scenario, the Agency analyzed options for partial (not full) attainment of the standards. Under this scenario, the RIA assumed a multi-pollutant approach for the power generation sector, including a cap on SOx emissions 60 percent below that specified in Title IV. The Agency further assumed that, because of banking, this cap would achieve an actual 50 percent reduction in SOx emissions by 2010. Thus, under this scenario, actual SO_2 emissions from power plants in 2010 were assumed to be approximately 4.5 million tons. The NOx limits for utilities were equivalent to those in the NOx SIP call. The model results showed that with these utility controls, coupled with a number of other source category controls, there would still be a number of residual nonattainment areas that do not meet the O_3 or $PM_{2.5}$ standards. Some have misinterpreted this early RIA work by claiming that EPA concluded that a 4.5 million ton SO_2 cap would be the only reductions needed from the utility industry to bring the country into attainment with the $PM_{2.5}$ standards.

Under a second scenario, the RIA discussed possible options for full attainment strategies. Among 16 other options involving other emission sectors, it suggested that 90 to 95 percent reductions in SOx emissions from power plants (i.e., equivalent to a national cap of less than one million tons) and NOx limits that were 33 to 67 percent tighter than those included in the NOx SIP call might be relied upon by State and local agencies to improve local air quality in the remaining O_3 and $PM_{2.5}$ nonattainment areas.

As noted above in our answer to question 4, we believe it would be inappropriate to attempt to address all State and local air quality concerns with a national cap on one industrial sector. Although national caps on utility emissions of SO_2, NOx, and mercury could alone be sufficient to protect air quality in many parts of the country, certain States and local governments will likely need to take action to reduce emissions from other types of sources to meet their individual air quality needs.

You also asked about the health significance of emissions reductions that would achieve compliance with the PM–2.5 standard. A number of studies that have been completed since 1997 appear to reinforce the scientific basis for the 1997 standard. These studies are summarized in EPA (2001) Air Quality Criteria for Particulate Matter, Second External Review Draft. U.S. Environmental Protection Agency, Office of Research and Development, Washington DC 20460. EPA 600/P–99/002aB-bB. EPA is assessing new science on the health effects of particulate matter as part of its ongoing review of the scientific criteria and standards. For example, it is currently not known whether certain $PM_{2.5}$ components or precursors are more toxicologically important than others. While SO_2 is a major contributor to $PM_{2.5}$ loadings, it is not the only significant contributor. EPA is evaluating studies regarding the effects of the different components of $PM_{2.5}$ on public health.

Question 16. What would be the increase in the retail cost of electricity above the reference case, if the statutory/regulatory schedule that you outlined in the hearing were to be implemented with the following assumptions and modifications? 1) Nonattainment designations for the NAAQS for PM–2.5 as published are made in 2005; 2) EPA finalizes a MACT for mercury emissions of 90 percent for bituminous coal and 50 percent for sub-bituminous coal using power plants; and 3) the BART guidelines become final in 2002 as proposed on July 20, 2001.

Response. In order to analyze future increases in the cost of electricity, we would need more information about the first assumption that PM–2.5 designations are made in 2005. Once such designations are made, States with PM–2.5 nonattainment areas will need to develop their own strategies for bringing these areas into attainment. As outlined in my testimony before the committee, we believe that many (if not all) States will seek further emissions reductions from power plants as part of their attainment strategies. They may seek reductions from power plants located within their own borders as part of the normal SIP development process. Under Section 126 of the Clean Air Act, they may also ask EPA to impose controls on upwind facilities in other States. We would need further information about the projected timing and magnitude of future actions to reduce emissions from power plants in order to project future increases in the cost of electricity under the assumptions outlined above.

However, EPA agrees with the assumption in the question that the cost and electricity rates of a multi-pollutant approach should be evaluated in comparison to what would happen under a "business-as-usual" approach (i.e., what would happen under current law if no new Federal legislation were adopted). Under any conceivable business-as-usual scenario, electricity rates would be slightly higher compared to the reference case. Under S. 556, electricity rates would be significantly higher than under any business-as-usual approach because S. 556 has very short compliance timeframes for pollutants regulated under the Clean Air Act and would also require the utility sector to reduce its CO_2 emissions, which are not regulated under the Act.

Question 17. What would be the impact of S. 556 on public health and the environment? Please reply specifically using the format, assumptions, and model that were employed by EPA in developing Chapter 4-Analysis of the Environmental and Human Health Consequences of S. 172, which was part of a report done by EPA in the summer of 2000 entitled "Analysis of the Acid Deposition and Ozone Control Act (S. 172)" in response to a request from the Senate Subcommittee on Clean Air, Wetlands and Private Property.

Response. EPA has not conducted a quantitative analysis of S. 556 such as was done for S. 172. However, based on analyses EPA has done on a range of possible reductions of NOx, SO_2 and mercury, EPA can provide a qualitative discussion of the potential health and environmental benefits of reducing NOx, SO_2 and mercury.

Emissions reductions of NOx and SO_2 on the order of those in S. 556 and those being considered by the Administration are projected to reduce concentrations of fine particles and ozone, which should help a number of counties attain the fine particle and ozone NAAQS. This would lead to substantial human health benefits, including fewer premature deaths, as well as fewer incidences of respiratory diseases and incidents such as chronic bronchitis, asthma, and hospital admissions for acute respiratory problems. Reductions in NOx and SO_2 emissions should also improve visibility across the country, particularly in eastern Class 1 areas.

Emissions reductions of this scale are also expected to decrease the amount of sulfur and nitrogen deposition and improve water quality and ecosystem health. Experience with the Acid Rain Program has shown that sulfur deposition levels respond quickly to reductions in sulfur emissions. This pattern would be expected to continue with further reductions, especially when sulfur and nitrogen species are reduced simultaneously. Recovery of lakes and streams also requires reductions in deposition of both pollutants. Annual NOx emissions reductions would be expected to increase the benefits to water quality and ecosystem health attributed to seasonal NOx controls under EPA's 1998 NOx SIP Call, and provide additional incremental benefits to the significant emissions reductions required by the Tier II and Heavy Duty Diesel Rules. NOx and SO_2 emissions reductions would decrease acidic lakes in the Northeast (except for naturally acidic streams) and would slow the rate of deterioration of stream water quality in acidic streams in the Southeast. Other ecological systems, including sensitive forests and coastal waters, would also be expected to benefit.

Reductions in mercury emissions would reduce mercury deposition from sources in the United States. Atmospheric chemistry indicates that local sources contribute significantly to mercury deposition; therefore reductions from sources identified in S. 556 would reduce local deposition as well as the United States' contribution to the global pool. Reductions in mercury deposition would be expected to help reduce fish contamination from mercury.

The CO_2 emission reductions that would be required under S. 556 would not provide any direct benefit to human health or the environment. These reductions are intended to reduce the risk of adverse affects from future global warming, although the extent to which they would reduce this risk is impossible to quantify at this time.

Question 18. Please compare the costs of electricity generation in the Moderate Clean Energy Future Scenario (C) and the Advanced Clean Energy Future (D) to the costs of electricity generation in the reference scenario.

Response. The table below provides level of generation, total generation costs, and cost per kWh for all five scenarios analyzed in response to the request by Senators Jeffords and Lieberman. Total generation costs (part A) refers to sum of the amortized capital investments in both power plants and control technologies, energy costs, and operating and maintenance expenses. Electricity generation (part B) refers to the amount of power supplied by the electric utility sector's own power plants. The generation cost per kilowatt-hour (part C) is the average cost found by dividing part A by part B for each year and each scenario.

	2002	2005	2007	2010	2015
A. Total Generation Costs (Billions of 1999 dollars)					
Reference Case	140.16	140.38	151.41	139.54	150.29
Scenario A	142.58	147.09	160.27	156.06	167.28
Scenario B	142.05	144.63	157.84	152.10	162.98
Scenario C	141.51	142.27	153.43	145.15	150.76
Scenario D	140.70	139.86	150.60	141.40	147.18
B. Electricity Generation (Billion kWh)					
1Reference Case	3,648	3,866	4,021	4,253	4,580
Scenario A	3,536	3,667	3,784	3,970	4,202
Scenario B	3,548	3,663	3,769	3,937	4,141
Scenario C	3,552	3,653	3,749	3,900	4,077
Scenario D	3,556	3,642	3,726	3,859	4,009
C. Generation Cost ($ per kWh in 1999 dollars)					
Reference Case	0.0384	0.0363	0.0377	0.0328	0.0328
Scenario A	0.0403	0.0401	0.0424	0.0393	0.0398
Scenario B	0.0400	0.0395	0.0419	0.0386	0.0394
Scenario C	0.0398	0.0389	0.0409	0.0372	0.0370
Scenario D	0.0396	0.0384	0.0404	0.0366	0.0367

Question 19. Please compare the total quantity of natural gas consumption for electricity generation and for all uses in the Moderate Clean Energy Future (C) and the Advanced Clean Energy Future Scenario (D) to the quantity of natural gas consumption in the reference scenario.

Response. For the analysis requested by Senators Jeffords and Lieberman, the table below shows three different aspects of natural gas consumption (measured in quadrillion Btus) for each scenario by year. Part A shows total natural gas usage for all end uses including industrial boilers and home heating systems as well as for electric generation units. Part B shows the consumption for only electric generation units of the nation's utilities. Finally, Part C shows all remaining gas consumption not used in the generation of electricity.

Natural Gas Consumption Referenced in EPA Multi-Emissions Analysis

	2002	2005	2007	2010	2015
A. Total Natural Gas Use (Quads)					
Reference Case	24.41	26.07	27.56	29.81	34.18
Scenario A	25.31	26.90	28.21	30.78	34.61
Scenario B	25.34	26.56	27.95	30.19	33.46
Scenario C	25.36	26.23	27.32	29.38	32.25
Scenario D	25.36	25.96	26.95	28.78	31.15
B. Natural Gas for Elec Gen (Quads)					
Reference Case	4.96	5.71	6.70	8.25	11.39
Scenario A	5.56	6.35	7.27	9.30	12.17
Scenario B	5.67	6.16	7.16	8.91	11.22
Scenario C	5.73	5.93	6.63	8.23	10.14
Scenario D	5.77	5.74	6.34	7.74	9.16
C. Natural Gas for Other Uses (Quads)					
Reference Case	19.45	20.36	20.86	21.56	22.79
Scenario A	19.75	20.55	20.94	21.48	22.44
Scenario B	19.67	20.40	20.79	21.28	22.24
Scenario C	19.63	20.30	20.69	21.15	22.11
Scenario D	19.59	20.22	20.61	21.04	21.99

Question 20. Why did EPA assume a fully deregulated retail electricity market in its analysis?

Response. In our analysis in response to the request by Senators Jeffords and Lieberman, EPA assumed a fully deregulated retail electricity market to be consistent with the Clean Energy Future (CEF) study, which assumed full national restructuring by 2008. We note however, that there is considerable uncertainly as to whether full restructuring will occur by 2008. We assumed that pricing of electricity generation would be competitive, in contrast to power generators receiving regulated cost-of-service prices. The power generation part of the electricity supply business is generally considered to be moving toward being a competitive market. In effect, prices reflect the cost of the marginal unit brought on-line.

Question 21. Does the Administration intend to exempt utilities from all Title I—CAA requirements in its multi-pollutant proposal?

Response. EPA believes that, compared with existing regulatory programs, a multi-pollutant approach would be a much more effective way of achieving many of the goals of the Clean Air Act. Thus, we believe that many current requirement that apply to power plants (including requirements under Titles I, III, and IV) should be replaced by a well-designed multi-pollutant approach. We also believe that it would be highly inefficient simply to add a multi-pollutant approach on top of existing requirements. Retaining all existing requirements on top of national caps on SO_2, NOx, and mercury would not provide any additional meaningful environmental benefits and would needlessly increase costs to businesses and consumers. The Administration is still formulating its multi-pollutant proposal, which will specify the existing Clean Air Act requirements that we believe should be replaced under our approach. We intend to provide you with our proposal soon.

Question 22. Please describe the EPA activities that will lead up to the final MACT rule for hazardous air pollutants, and specifically mercury, including the approximate schedule and data requirements.

Response.

REGULATORY DEVELOPMENT SCHEDULE FOR UTILITY MACT

Activity	Date
Data analysis and regulatory development	1/2001—8/2003
Convene the panel established under Federal Advisory Committee Act.	Meets periodically
Sign Proposal	12/15/2003
Public comment period	Early 2004
Sign and Promulgate Final Action	12/15/2004

EPA will promulgate a MACT for hazardous air pollutants for utilities based on the data collected for the 1998 Utility Report to Congress, data on mercury collected throughout 1999, and any other data that becomes available to EPA.

Question 23. What is the current status of the EPA review of the WRAP (Western Regional Air Partnership) submission on SOx reductions? What changes, if any, to the regional haze rule is EPA considering as a result of this submission?

Response. EPA has just begun the interagency review process of the WRAP Annex proposal. The WRAP Annex proposal was submitted to the Office of Management and Budget (OMB) on November 29. OMB will have up to 90 days to review the proposal. Once published in the Federal Register, there will be a public review period, and everyone who is interested will have the opportunity to comment on the proposal.

The changes which EPA intends to propose to the Regional Haze rule reflect the package that the WRAP submitted to EPA. The Annex includes milestones for emission reductions and a backstop market trading program.

Question 24. If S. 556 were enacted in 2002, what impact would that have on emission reduction targets assumed in the regional haze rule?

Response. The regional haze rule requires States to develop State Implementation Plans (SIPs) which establish "reasonable progress" goals for the 2008 to 2018 time period for improving visibility in each federally protected Class I area. The SIPs must also provide for the specific emission reductions measures necessary to meet the selected reasonable progress goals. One emission reduction measure that is specifically required under the CAA is best available retrofit technology (BART) for certain large older stationary sources. States are also required to revise their goals and strategies to improve visibility in 2018 and every 10 years thereafter.

The emission reductions provided by the national emission caps in S. 556 clearly go beyond what is likely to be required under the BART requirement for utilities. While these emission reductions would achieve substantial visibility improvements in Class I areas, we note that it would still be important to retain the requirements for SIPs for regional haze to ensure that a program is in place to comprehensively address the need and effectiveness of measures for visibility improvement from all types of emission sources.

Question 25. What change in the national inventory of criteria air pollutants would occur if the President's National Energy Policy plan were implemented? All of the committee's Democrats requested this information on May 21, 2001, from the Administration, without an acknowledgment or response thus far.

Response. Because this request was not directed to EPA, we are unaware of the Administration's response to it. We note, however, that the Administration is committed to reducing air emissions to ensure that all parts of the country meet the national ambient air quality standards for criteria air pollutants. We would expect the comprehensive programs called for in the the National Energy Policy (NEP) to substantially reduce emissions of criteria pollutants. These programs include a multi-pollutant proposal to significantly reduce and cap emissions of SO_2, NOx and mercury from power plants; a robust renewables portfolio; a program to reduce truck idling emissions; and the promotion of energy efficiency and conservation.

Question 26. Please describe the data and the sources of data on greenhouse gas emissions that EPA currently collects.

Response. EPA is responsible for publishing the Inventory of U.S. Greenhouse Gas Emissions and Sinks each year, which is submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as the official U.S. emissions inventory. Developing the emission estimates and the annual U.S. GHG Emissions Inventory document is an extensive effort, involving modeling and estimation by many Federal and State government agencies, research institutions, universities, and consultants. In addition, numerous statistical and informational data bases compiled by all levels of government, by trade and research associations, and by other public and private institutions, are valuable source of data inputs, or may supply secondary data sources, to the inventory development process.

The Office of Atmospheric Programs (OAP) within EPA provides technical oversight, performs quality assurance on all aspects of inventory development, and coordinates the expert and public review processes. Also within EPA, several offices coordinate in researching emission pathways and developing new procedures for estimating greenhouse gas emissions and sinks:

- The Clean Air Markets Division (CAMD) within OAP is home to the overall United States' greenhouse gas inventory program, including coordination and publication of the United States' inventory and participation in the technical discussions of the UNFCCC and Intergovernmental Panel on Climate Change (IPCC) related to emissions and inventories. It also prepares fossil fuel combustion emission estimates (based on energy data and emissions factors provided by the Energy Information Administration) along with estimates from a variety of other source categories.

• Under the authority of Section 821 of the Clean Air Act, CAMD collects CO_2 emissions data from electric generation sources affected under Title IV of the Act. These data are collected using continuous emissions monitors and are published annually as part of EPA's Annual Emissions Scorecard for Title IV affected sources. These sources represent over a third of United States CO_2 emissions.

• The Climate Protection Partnerships Division within OAP produces annual estimates for some of the non-CO_2 greenhouse gas emissions from a variety of agricultural, waste, energy, and other source categories (e.g., methane from landfills and coal mines). These estimates are based, in part, on information voluntarily provided by firms claiming emissions reductions pursuant to their participation in EPA voluntary programs.

• The Global Programs Division within OAP tracks emission trends for the ozone depleting substances and their substitutes, including HFCs, PFCs, and SF6. They also track emissions from other industrial sources of these gases, such as PFC emissions from aluminum smelting.

• The Office of Research and Development conducts research into a variety of source categories.

• The Office of Solid Waste and Emergency Response provides additional information on landfills and solid waste management systems, as well as the fate of products in landfills. These statistics contribute to estimates of methane emissions.

• The Office of Water provides information on domestic and industrial wastewater that is used in calculating emissions.

• The Office of Transportation and Air Quality (OTAQ) develops emission factors and detailed emission estimates for the transportation sector. Together with the Federal Highway Administration, OTAQ reports vehicle miles traveled, which are used to develop methane, nitrous oxide, and trace gas emission estimates.

In addition to the EPA, a number of United States agencies and departments are important contributors to the greenhouse gas emission inventory. A partial list of the roles of different Federal Government entities supplying data for the inventory or contributing directly to its preparation includes the following:

• The Energy Information Administration (EIA) gathers and compiles detailed information on energy production and consumption, which forms the foundation for the energy-related greenhouse gas emission estimates. The EIA also reports on the carbon content of fossil fuels consumed in the United States and develops emission factors that relate carbon emissions to fuel quantity burned. Likewise, the Department of Energy provides review and analysis.

• The Department of Agriculture compiles and reports information on fertilizer use, crop production statistics, and agricultural practices. The U.S. Forest Service (USFS) regularly assembles and reports an inventory of forest and soil carbon in the United States. This forest inventory is tracked over time to develop annual flux estimates. The EPA works closely with the USFS to expand the analysis of land use change, and forestry-related carbon fluxes embodied in the inventory.

• The Department of Transportation, the Federal Highway Administration, the Treasury Department, the Federal Aviation Administration, the Department of Commerce, the Bureau of Census, the United States Geological Survey, and the Bureau of Transportation Statistics are sources of valuable information.

Private groups publish several reference materials that provide data on industrial production and chemical use that are key to inventory development. State government agencies, academic researchers, consultants, and others also contribute to developing inventory estimates or serve as reviewers of the final estimates.

Question 27. Please provide any estimates that EPA has made or published in the last 5 years of the potential impact on the U.S. economy due to the direct and the indirect effects associated with global warming and climate change.

Response. In the last 5 years, EPA has conducted a number of studies on this topic, either directly or through funding other organizations. EPA has also participated with other government agencies and international organizations in analyses that have examined the human health, environmental, and economic consequences associated with climate change. In particular, EPA participated in the development of the recent U.S. National Assessment of the Potential Consequences of Climate Variability and Change for the nation. The following is a list studies that have focused on the development of methods, models and tools for assessing the economic impacts of climate change:

• *Impacts to the Mid-Atlantic Region:* As part of the U.S. National Assessment of "The Potential Consequences of Climate Variability and Change on the U.S.," EPA's Global Change Research Program within the Office of Research and Development sponsored a Mid-Atlantic Regional Assessment. This assessment was conducted in partnership with The Pennsylvania State University. One part of the assessment examined the potential impacts of climate change on forest-related sectors in the Mid-Atlantic Region. (Reference: Rose et al., "Simulating the economic impacts of climate change in the Mid-Atlantic Region," in "Mid-Atlantic Regional Assessment of Climate Change Impacts," B. Yarnal, L.S. Kalkstein, and J.D. Scheraga, eds., Climate Research, Special 7, Volume 14, No. 3, May 2, 2000, pp. 175–183.)

• *Sea Level Rise:* EPA has conducted a number of studies of the potential impacts of sea level rise (due to climate change) on coastal property. Included in these studies have been evaluations of alternative adaptation options for coping with sea level rise. For example, one EPA-supported study examine land use planning options by which coastal States might retain some of their public trust tidelands in perpetuity no matter how much the sea rises—at least in areas that have not yet been developed. (Reference: James G. Titus, "Rising Seas, Coastal Erosion, and the Takings Clause: How to Save Wetlands and Beaches Without Hurting Property Owners," Maryland Law Review, Volume 57, 1998, 1279–1399.

• *State-level Impacts:* EPA has published state-specific "fact sheets" that discuss the potential impacts of climate change on each of the 50 States. Included in some of these fact sheets are estimates of the economic impacts of climate change on specific sectors. (These fact sheets can be found on EPA's climate change website: http://www.epa.gov/globalwarming/impacts/stateimp/index.html)

Question 28. What is the status of the climate change policy review directed by the President?

Response. The climate change policy review is ongoing. The President's policy will be designed to advance the development and deployment of technology and other measures that will achieve real reductions in greenhouse gases and with the ultimate goal of stabilizing atmospheric concentrations of greenhouse gases.

Question 29. Is the Administration committed to adopting policies and measures aimed at returning U.S. anthropogenic emissions of greenhouse gases—individually or jointly with other nations—to 1990 levels?

Response. Article 4, section 2(b) of the Framework Convention on Climate Change requires Parties to communicate to the Secretariat on their policies and measures to mitigate emissions "with the aim of returning individually or jointly to their 1990 levels . . . " The prior section (Article 4, section 2(a)) describes the policies and measures that Parties shall adopt: "to demonstrate that developed countries are taking the lead in modifying longer-term trends in anthropogenic emissions consistent with the objective of the Convention."

The President outlined the position of the Administration on June 11, 2001. The U.S. Government is currently pursuing a broad range of strategies to reduce emissions of greenhouse gases in the major greenhouse gas emitting sectors of our economy. The U.S. Government climate change programs are achieving real results, helping to reduce greenhouse gas emissions by 66 million metric tons of carbon equivalent in 2000. The President's speech and the accompanying fact sheet can be found at: http://www.whitehouse.gov/news/releases/2001/06/20010611–2.html

Question 30. Does the Administration believe that ozone depleting substances, such as chlorofluorocarbons (CFCs), pose a direct threat to human health?

Most ozone depleting substances do not present a direct hazard to human health. Chlorofluorocarbons (CFCs), for example, are stable, nonflammable, low in toxicity, and inexpensive to produce. For these reasons, CFCs were thought of as "miracle chemicals" for the first 50 years they were in use before their destructive impacts on the stratospheric ozone layer were discovered. Some of the other ozone depleting chemicals such as methyl chloroform, carbon tetrachloride, halons, and methyl bromide range from moderately to extremely toxic but have been used in applications where exposures can be controlled to safe levels. An essential component of the rapid transition out of CFCs and other ozone depleting chemicals has been the development and regulatory approval of safe alternatives in dozens of critical industrial, consumer, and military applications. EPA's Significant New Alternatives Policy (SNAP) program under Section 612 of the Clean Air Act ensures that only alternatives that pose minimal risk to human health and the environment are used.

While ozone depleting chemicals in most cases do not pose a direct threat to human health, emissions into the atmosphere of these chemicals do significantly increase adverse health and environmental risks. Stratospheric ozone absorbs a large portion of ultraviolet light in the UVB wavelength region, and acts to protect the earth from much of these damaging rays. While limited sun exposure may be beneficial, excessive UVB radiation is associated with many harmful effects in humans including skin cancer, cataracts, and immune suppression. In addition, UVB also affects crop yields, degrades certain building materials, and may harm plankton and other marine life. Because of the detrimental health and ecosystem effects of increased UVB due to ozone depletion, the United States has joined 170 other countries under the Montreal Protocol in phasing out all ozone depleting substances.

RESPONSES HON. JEFFREY HOLMSTEAD TO ADDITIONAL QUESTIONS FROM SENATOR SMITH

Question 1. Some critics of a market-based multi-pollutant approach have said trading will lead to hot-spots. Others, critical of further emissions reduction regulation, have said it will mean the demise of coal combustion. How would you address these criticisms? Could the same criticisms be made of the Clean Air Act as currently written?

We are aware of concerns that have been expressed about hot spots. However, we have carefully monitored the existing Acid Rain Program and found no evidence to support this concern. The existing Acid Rain Program (Title IV of the Clean Air Act), has substantially reduced total emissions of SO_2 from power plants without increasing SO_2 concentrations or sulfur deposition in any localized area. In any event, Title I of the Clean Air Act contains a number of provisions that require State and local government and EPA to address unhealthy levels of regulated pollutants. These safeguards should remain intact as a backstop to ensure achievement of air quality goals. Additionally, as in the case of the Acid Rain Program, we intend to perform modeling during policy formulation to determine whether hot spots are a potential risk. When the Administration announces its proposal, we will make public modeling regarding that proposal.

The Administration also shares concerns regarding fuel diversity, and believes strongly in the importance of continued reliance on coal as an important source of energy. EPA analysis shows that fuel diversity would be preserved under further emission reductions of the stringency proposed in the letter from Senators Smith, Voinovich and Brownback as well as for the stringency levels being considered by the Administration, with most of the existing coal units installing control equipment and continuing to generate electricity. Additionally, EPA's analysis indicates that there would be more coal-fired generation under any reasonable multi-pollutant approach than under the Clean Air Act as currently written. The greater certainty provided under a multi-pollutant approach would allow more lead time for owners/operators to plan compliance and to build or repower coal-fired facilities, preserving more coal-fired generation than under the current Clean Air Act.

Question 2. I understand from utility representatives that EPA staff had a meeting with representatives of the Edison Electric Institute (EEI) in September, 2001, at which EPA staff presented a "business as usual" scenario that estimated the timing and levels of NOx, SO_2, and mercury emissions that would be likely to occur under existing law. Please describe that scenario, including the estimated timing and levels of reductions. Please provide any analysis EPA has prepared showing the costs and/or benefits of that "business as usual" scenario and any analysis EPA has that compares that cost to the cost of attaining comparable reductions under a cap-and-trade program. Please provide any slides EPA showed representatives of EEI at any meetings held between EPA and EEI representatives in September, 2001.

The slides from the presentation to EEI are attached as Attachment B. As indicated in the slides, EPA has started to analyze a regulatory "business-as-usual" future to provide a baseline for comparison of various multi-pollutant scenarios, including information about the true (or net) cost of scenarios, and the impact on electricity prices and coal consumption. While future requirements would likely include MACT standards for mercury and reductions in both NOx and SO_2 to help achieve the $PM_{2.5}$ and 8-hour ozone NAAQS, the specific levels of emission control are uncertain.

For the purposes of considering possible business-as-usual scenarios, EPA is estimating the scope and timing of these requirements. In doing so, EPA has made some preliminary assumptions about State and Federal rulemakings that have not been completed or, in some cases, not even started. Rulemaking will be conducted through the usual notice-and-comment process. These assumptions should not be viewed as prejudging the outcome of that process.

Question 3. Assuming promulgation of each of the rules on the chart you presented at the hearing (Electric Power Sector Faces Numerous CAA Regulations), please describe the effect on the level of coal combustion and the cost of electricity.

Although the chart lists a number of rules that we anticipate could be promulgated, it does not predict specific levels of reductions for those rules and the specific levels will affect the level of coal combustion and the cost of electricity.

Question 4. In your written testimony, you stated that there is a better way to achieve our air quality goals, "one that could cost American consumers and industry far less than under current law and ensure protection of the air we breathe." I am interested in determining how much cheaper it would be to reduce power generators' emissions through a new, cap-and-trade program than it would be under existing law. Has EPA conducted any analyses comparing the cost of reducing NOx and SO_2 emissions from power plants to specified levels under a cap-and-trade program with the cost of reducing emissions from power plants to the same levels under existing law? If so, please describe the scenarios EPA analyzed, including what EPA assumed for mercury reductions, and, for each scenario, describe the cost, the effect on coal consumption, and the cost of electricity.

EPA has not completed an analysis comparing the cost of reducing SO_2 and NOx under a multi-pollutant approach to the cost of reduction SO_2 and NOx to the same levels under the current Clean Air Act. However, as indicated above, EPA has started to analyze a business-as-usual approach under current Clean Air Act authority to provide a more accurate measure of the costs of a three-pollutant strategy. Under any scenario, however, a well-designed multi-pollutant approach would be significantly less costly than achieving the same reductions with existing regulatory tools.

Question 5. Prior to the stakeholders' meetings in early October, EPA released four maps showing non-attainment areas for the 8-hour ozone standard and the fine particles standard. Two maps showed areas that are not in attainment based on current data. Two maps showed projections for 2020 based on implementation of several EPA rules, including the Tier 2 rules, heavy duty diesel rules, and the NOx SIP Call. Please provide comparable maps showing projections of non-attainment areas for ozone and fine particles in 2020 making the same assumptions you made for the 2020 projection maps you provided to us plus the assumptions that power generators are subject to emission limits described in the letter Senators Voinovich and Brownback and I sent, dated June 8, 2001, requesting a multi-emission analysis.

Preparing the requested maps for the particular scenarios you describe would take a long time and a significant amount of resources because of the very involved computer modeling that would be required.

Question 6. In response to a follow-up question to Administrator Whitman after she appeared before us on July 26, 2001, she stated that "the Administration is working on developing a baseline based on current and future emissions regulations. After it is complete, the Administration will provide it to the Congress." When will you provide this baseline to the committee?

EPA will provide this analysis to the committee after it is complete and has finished interagency review.

RESPONSES BY HON. JEFFREY HOLMSTEAD TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. In your testimony you mention under the business as usual approach that "modeling shows that when full implementation of existing regulations such as the acid rain program, NOx SIP Call, Tier Two, and other regulatory programs are taken into account, additional reductions will be needed to bring areas into attainment for the ozone and fine particulate matter standards." What have you evaluated to reach this conclusion? Have you done any new modeling on these standards and the fine particulate matter precursors? Has this modeling been updated since the modeling for the 1997 standards: Can you please supply the committee with any additional modeling completed since the 1997 standards.

First, let me clarify that the modeling to which I was referring is modeling that assumes implementation of existing regulatory programs such as those listed above, as well as the heavy duty diesel engine standards, and the low sulfur gasoline and diesel fuel rules. The modeling did not assume that States or EPA would adopt new regulations to meet the $PM_{2.5}$ or 8-hour ozone standards. In contrast, in modeling a "business as usual" approach that predicts what would happen in the absence of new Federal legislation, one would need to assume that States and/or EPA will need to adopt additional regulations to meet current Clean Air Act requirements (such as attaining the $PM_{2.5}$ and 8-hour ozone standards).

EPA has always known that additional emissions reductions beyond those required under existing programs would be required to bring areas into attainment with the ozone and PM–2.5 standards. We believe that a well-designed mult-pollutant approach would be the least costly way to achieve a substantial portion of the additional reductions that will be needed. However, it is important to clarify that, even with new caps on power plants, there will be certain areas of the country that need additional emissions reductions to come into attainment with all the NAAQS and to meet the requirements of the regional haze program. We believe it would be inappropriate to attempt to address all State and local air quality concerns with a national cap on one industrial sector. Although national caps on utility emissions of SO_2, NOx, and mercury could alone be sufficient to protect air quality in many parts of the country, certain States and local governments will likely need to take action to reduce emissions from other types of sources to meet their individual air quality needs.

During the process of developing an Administration proposal to reduce emissions from power plants, EPA has started to conduct national-scale modeling that demonstrates the potential air quality benefits of multi-pollutant legislation. Attached are materials based on emissions projections for 2020 that show the relevant results of that modeling for a base case and for one possible, hypothetical multi-pollutant approach (Attachment A). The results illustrate improvements in regional and local air quality for $PM_{2.5}$ and O_3, and have been provided to the committee previously in response to earlier inquiries.

Our analysis indicates that caps on SO_2 and NOx emissions from power plants could significantly reduce the number of $PM_{2.5}$ and O_3 nonattainment areas in the eastern United States We also believe that national caps could greatly improve visibility throughout the country, although we also believe that any multi-pollutant bill should be consistent with the SOx reduction program developed by States participating in the Western Regional Air Program (WRAP) to improve western visibility.

In the 1997 RIA, EPA attempted to estimate the total emissions reductions from all sources that would likely be needed to achieve compliance with the PM–2.5 and 8-hour ozone standards. Because emissions from many different types of sources contribute to concentrations of PM–2.5 and ozone, the Agency did not attempt to estimate the specific reductions in power plant emissions that would be necessary to achieve compliance with these standards.

However, in order to examine the likely costs and benefits of attainment strategies for the $PM_{2.5}$ NAAQS, the 1997 RIA explored two different scenarios under which power plant emissions of NOx and SO_2 might be controlled.

Under the first scenario, the Agency analyzed options for partial (not full) attainment of the standards. Under this scenario, the RIA assumed a multi-pollutant approach for the power generation sector, including a cap on SOx emissions 60 percent below that specified in Title IV. The Agency further assumed that, because of banking, this cap would achieve an actual 50 percent reduction in SOx emissions by 2010. Thus, under this scenario, actual SO_2 emissions from power plants in 2010 were assumed to be approximately 4.5 million tons. The NOx limits for utilities were equivalent to those in the NOx SIP call. The model results showed that with these utility controls, coupled with a number of other source category controls, there would still be a number of residual nonattainment areas that do not meet the O_3 or $PM_{2.5}$ standards. Some have misinterpreted this early RIA work by claiming that EPA concluded that a 4.5 million ton SO_2 cap would be the only reductions needed from the utility industry to bring the country into attainment with the $PM_{2.5}$ standards.

Under a second scenario, the RIA discussed possible options for full attainment strategies. Among 16 other options involving other emission sectors, it suggested that 90 to 95 percent reductions in SOx emissions from power plants (i.e., equivalent to a national cap of less than one million tons) and NOx limits that were 33 to 67 percent tighter than those included in the NOx SIP call might be used by (relied upon) by State and local agencies to improve local air quality in the remaining O_3 and $PM_{2.5}$ nonattainment areas.

As noted above, we believe it would be inappropriate to attempt to address all State and local air quality concerns with a national cap on one industrial sector. Although national caps on utility emissions of SO_2, NOx, and mercury could alone be sufficient to protect air quality in many parts of the country, certain States and local governments will likely need to take action to reduce emissions from other types of sources to meet their individual air quality needs.

Question 2. Based on your ongoing analysis of a multi-emissions strategy, either for the Administration's proposal or the independent analysis you are conducting for this committee, what are the potential costs to non-utility industry sectors (for example, traditional manufacturers; other users of natural gas, farmers, polymers and chemical industries; and small businesses)?

The analysis used to support the development of an Administration multi-pollutant proposal is not yet complete, and will be made available as soon as it has undergone an interagency review. For at least two reasons, however, we believe that non-utility industry sectors would greatly benefit from a well-designed multi-pollutant approach. First, as noted above, a well-designed multi-pollutant bill would replace a number of existing (and relatively less efficient) regulatory programs. It would thus (1) be less costly to the utility sector than the existing Clean Air Act and (2) lower the demand for natural gas by allowing sufficient time for coal-fired utilities to install cost-effective control technology. Thus, industrial sectors not involved in the production of electricity will benefit from lower electricity and natural gas prices. Second, if the reductions are not achieved from the power generation sector, they will have to come from other sectors so that States can meet the national ambient air quality standards. Thus, a well-designed multi-pollutant bill is likely to reduce the regulatory burden that would otherwise need to be imposed on other industry sectors. Because emissions reductions in other sectors are generally much more expensive than equivalent reductions from power plants, the overall cost of the Clean Air Act would also be lower.

Question 3. Based on the S. 556, please provide the committee with a list of all power plants which would be subjected to section (D) MODERNIZATION OF OUTDATED POWERPLANTS, which requires power plants over 15 MW and 30 years old to update within 5 years to the most recent new source performance standards promulgated under section 111. Along with the list please include what NSPS requirements each facility must install, the size of the facility, the cost estimates, and the availability of the necessary workforce. In addition, please include a list of those facilities required to make the updates 6–10 years after the enactment date.

The data necessary to create the lists you have requested is not readily available. We are currently assembling this information to provide you with the lists as soon as possible.

Question 4. Did you perform an independent analysis of the CEF program proposals? Do you believe that the CEF are reasonable? How can consumer behavior be changed so radically?

EPA did not perform an independent analysis of the Clean Energy Futures (CEF). However, as we pointed out in our response to the Jeffords/Lieberman request, this study has been the subject of considerable controversy since its release. It has been criticized on several grounds, including: assumed changes in consumer behavior that are not consistent with historic behavior patterns; results from research and development funding increases that have not occurred; and inclusion of voluntary and information programs for which there is no analytic basis for evaluating the impacts. On the other hand, supporters of the report's findings point to economic analyses showing that the assumed investments can pay for themselves over time.

Question 5. Why didn't you compare the results of each case with the emissions caps to the same case without the emissions caps? Wouldn't this give the truest measure of the costs of imposing electricity sector emission caps? Aren't the savings you report in some of the cases simply a result of the assumed changes in technology and consumer behavior (which were not evaluated as to cost) and not the costs of achieving the emissions reductions?

EPA does not believe it was asked to do the analysis in this way. However, we agree that this comparison would provide important insights into the cost of the emissions control levels under the alternative scenarios of demand and supply side technologies. As you know, EIA did perform the analysis in this way and found, not surprisingly, that as one assumes more penetration by demand and supply side technologies, as described in the Clean Energy Futures, both the cost of producing the nation's electricity and the cost of achieving the emissions reductions declined. For the most aggressive technology scenario (which is likely to be unrealistic), EIA found the decline in the cost of meeting the emissions reduction targets is approximately 28 percent. Thus, the more aggressive technology scenario is likely to understate the actual cost of achieving emissions reductions. As we pointed out in our October report, we believe that if we had performed the same kind of analysis (as EIA) we would have found the same results.

Question 6. Can you explain how forcing electricity producers to incur costs to reduce their emissions further than now required can lead to stronger economic growth? This result seems very counterintuitive and needs substantial explanation.

The October EPA report notes that the higher electricity prices caused by the emission reductions targets do, in all the cases we studied, reduce personal consumption. Personal consumption is what determines our well being and changes in personal consumption should be viewed as the best aggregate measure of the costs of any program. GDP, in contrast, includes both investment and government spending from which households receive no direct benefit. In some cases analyzed in the report, the research and development and other program initiatives defined in the technology scenarios led to additional investment and government spending that were, in turn, large enough to offset the decline in personal consumption. Put another way, when households give up \$100 per year to pay for pollution control, that \$100 might remain in measures of GDP (if it pays for increased capital investment) or not (if it pays for increased operating costs). Either way, the cost is \$100.

Question 7. Do you believe the rapid rate of banking of allowances that occurs in your cases? Figures 1 through 4 in your report show dramatic changes right away. For example, CO_2 emissions appear to drop by almost 100 million metric tons in 2002 in one scenario while SO_2 emissions decline by almost 2 million tons. If this did not occur, would the costs of achieving the reductions rise substantially? Were cases prepared with more realistic banking scenarios?

We note in our October report that the request called for us to assume implementation in 2002 with banking beginning at that date. As noted in the report, a more realistic assumption would have been to begin implementation at a later date. If the final compliance dates were not extended, the overall cost of the required programs would likely be higher. However, since we did not analyze this scenario we cannot describe the size of the likely cost implications.

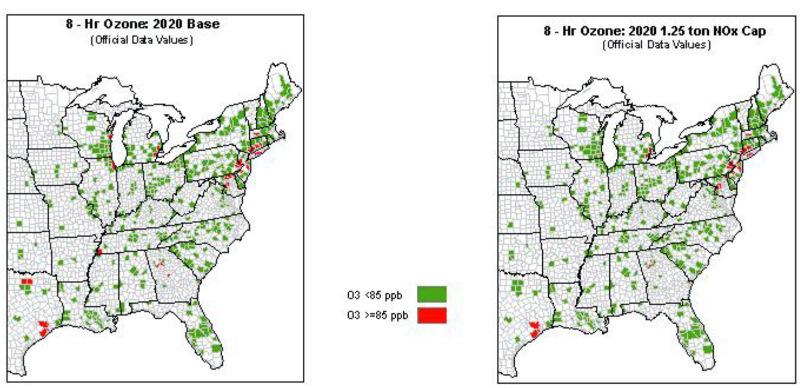
Question 8. Is the 300+ percent increase in non-hydroelectric renewables reasonable by 2010 in Scenario A? This seems very unrealistic. Can you provide the specific non-hydroelectric resources?

The model estimates that a large increase in renewables (primarily wind, geothermal and biomass resources) will result from electricity market conditions created by the increase in the price of electricity and the constraints on emissions, particularly CO_2, as described in Scenario A. We note that this represents 9 percent of the electricity supply, whereas non-hydroelectric renewables currently meet only about 2 percent of our electricity needs. To understand more fully whether this is "unrealistic" we would need to carry out additional engineering studies. These studies would help us gain a better understanding of the lead-time and funding constraints on these technologies.

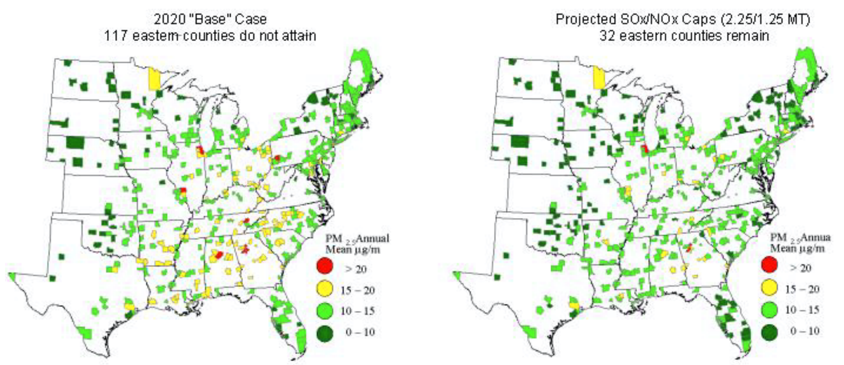
ATTACHMENT A

Alternative Base Case Projections for Ozone

- In 2020, with implementation of the SIP Call and Tier II, 42 eastern counties do not attain 8-hour NAAQS
- A 1.25 ton NOx Cap (national) reduces non-attainment to 27 counties

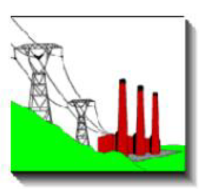


Alternative Base-case projections for PM2.5



ATTACHMENT B

Discussion of Multi-Pollutant Strategy

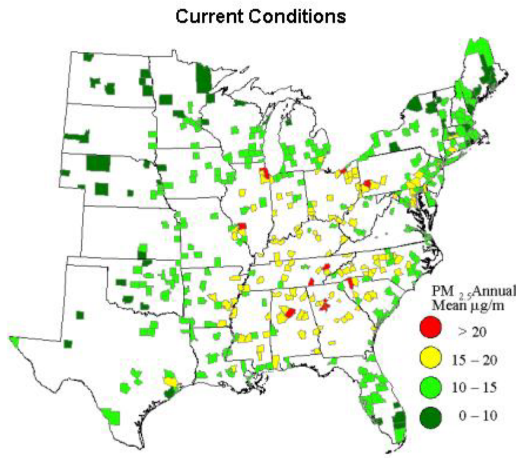


Meeting with EEI

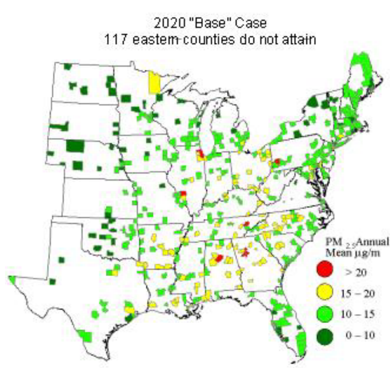
U.S. Environmental Protection Agency

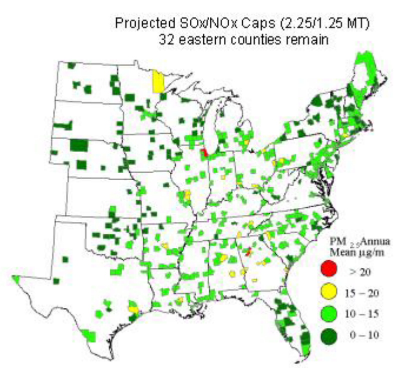
September 18, 2001

PM2.5 Non-Attainment – Current Data



Alternative Base-case projections for PM2.5

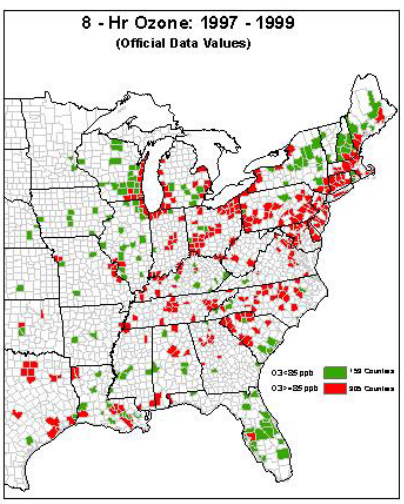




Schedule for implementing $PM_{2.5}$ NAAQS and Regional Haze Programs

2002-4	Regional planning bodies model annual SOx/NOx PM strategies
2003	3 years of $PM_{2.5}$ air quality data compiled and assured
2004-5	EPA designates areas for $PM_{2.5}$
2005	Likely Scenario: States file section 126 petitions for PM transport
2005-6	Interstate transport rule to address SOx/NOx emissions for $PM_{2.5}$ NAAQS and regional haze
2007-8	Attainment and Regional Haze SIPs due for $PM_{2.5}$
2010	Compliance date for interstate transport rule/126 petitions sources
2010	5 year deadline for attainment of $PM_{2.5}$ NAAQS
2013-14	Compliance for BART sources (*2018-19 for trading*)
2015-17	Potential 5-yr plus 2-yr attainment date extensions for local problems
2018	Second Regional Haze SIPs due

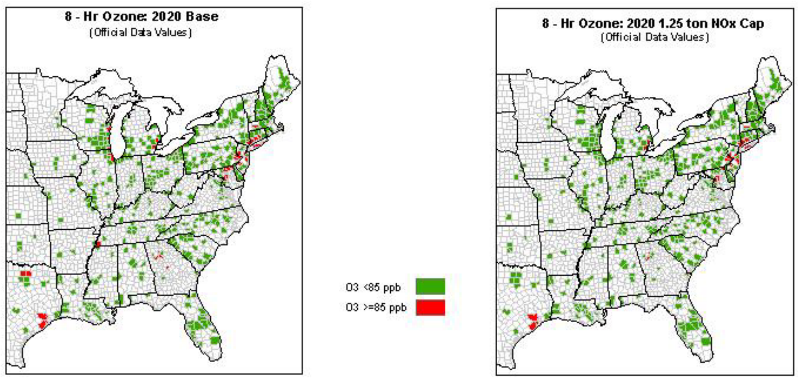
Ozone Non-Attainment – Current Data



Currently 305 counties in the eastern U.S. exceed the 8-hr ozone standard

Alternative Base Case Projections for Ozone

- In 2020, with implementation of the SIP Call and Tier II, 42 eastern counties do not attain 8-hour NAAQS
- A 1.25 ton NOx Cap (national) reduces non-attainment to 27 counties



Schedule for implementing 8-hour Ozone NAAQS and related actions

2003	Final rule on implementation of 8-hr O3 NAAQS
2004	Designation of 8-hour nonattainment areas Reinstate the NOx SIP call with respect to the 8-hour NAAQS
2005	Complete new modeling for additional "coarse grid" states. Make additional SIP calls as results dictate
2007	8-hr ozone NAAQS SIP submission date
2007-2008	Compliance with full NOx SIP call budgets for 19 States (assumes EGU at 0.15 #/mm Btu) EGU compliance for any "newly added coarse grid" States
2007-2010	Assess impact of SIP call budget New regional NOx reductions (SIP Call II) as appropriate with tighter limits
2009	Part D/Subpart 1 default date (5 years from NA designation)
2014+	Potential 5-yr plus 2-yr attainment date extensions for local problems

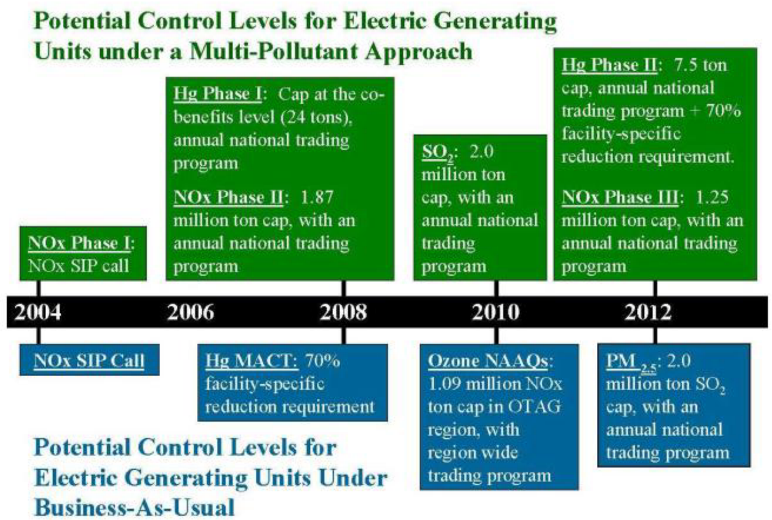
Mercury Timeline

- Propose MACT Regulations: December 15, 2003
- Promulgate MACT Regulations: December 15, 2004
- Compliance Date: December 15, 2007
- ** Case-by-Case MACT: All units commencing construction after 12/20/00 are subject to the case-by-case MACT provisions of section 112, which implemented on a state-by-state basis **

Mercury Reductions

- Range of Reductions Considered:
  - 60% - 95% (from mercury contained in coal)
  - 60% or greater reductions - $1.7 billion (for reductions ranging from 60-95%) - using activated carbon only
  - 80% or greater reductions - $2.7 billion (for reductions ranging from 80-95%) - using activated carbon only
  - If composite sorbent (lime + activated carbon) is used, control costs are reduced by > 40% to $1.1 billion and $1.7 billion, respectively.
- Under MACT, all sources (existing and new) would be subject to a source-specific limit.

COMPARISON OF REQUIREMENTS UNDER BUSINESS-AS-USUAL AND THE STRAW PROPOSAL



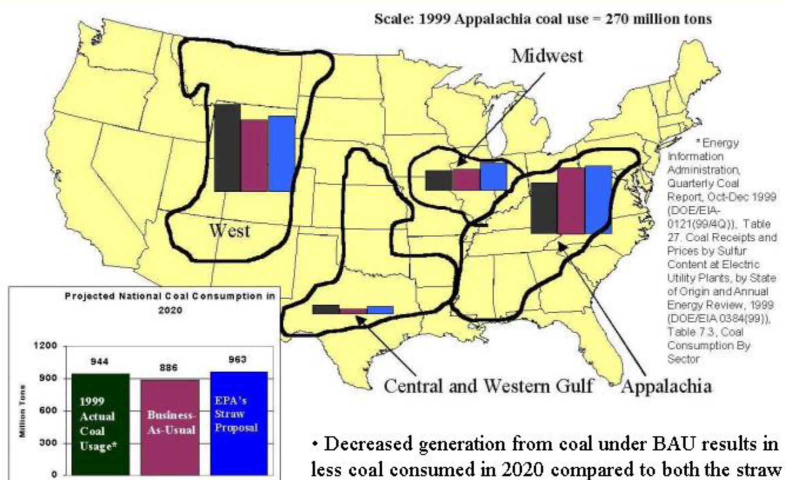
BUSINESS-AS-USUAL
EPA's OBLIGATIONS UNDER THE CAA

- **EPA has analyzed a regulatory "business-as-usual" future to provide an estimate of the true cost (i.e., net cost) of the Agency's straw proposal**
- **While future requirements would likely include MACT standards for mercury and reductions in both NOx and SO_2 in order to help achieve the 8-hour ozone and $PM_{2.5}$ NAAQS, the specific levels of emission control are uncertain**
- For the purposes of the business-as-usual analysis, EPA estimated the scope and timing of these requirements as well as the caps on emissions:
  - Though EPA has not yet determined the required Hg reductions for MACT under the CAA, for this analysis EPA modeled a facility-specific 70% reduction of Hg from fuel in 2008.
  - To simulate efforts to achieve the $PM_{2.5}$ and revised ozone NAAQS, EPA modeled an annual NOx emission cap in the OTAG region -- rather than at a national level -- at 1.09 million tons (equivalent to about 0.10 lb/mmBTU) in 2010.
  - For purposes of achieving the $PM_{2.5}$ NAAQS and national progress in reducing regional haze, EPA modeled an annual national SO_2 cap at 2.0 million tons in 2012.

BUSINESS-AS-USUAL FUTURE
RESULTS

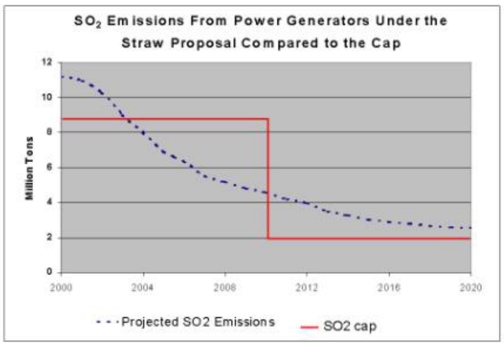
- EPA estimates that at the levels described above, costs would be approximately $3 billion more than under the straw proposal in 2020, even though the reductions for NOx & Hg are less significant than EPA's comprehensive strategy:
  - **The higher costs are due to stranded capital investments which result from the installation of controls that later become obsolete when additional requirements are promulgated, and by the reduced lead time when compared to the straw proposal.**
- The costs of a business as usual approach could be even higher due to the potential State imposition of trading restrictions through the SIP process.
  - **Even if the "business as usual" control levels are less stringent, costs of achieving those reductions are still likely to be higher than those of a more stringent multi-pollutant strategy due to the trading restrictions imposed through the state-by-state implementation of SIPs and the stranded capital investments.**

COAL CONSUMPTION IN 2020 BY COAL SUPPLY REGION



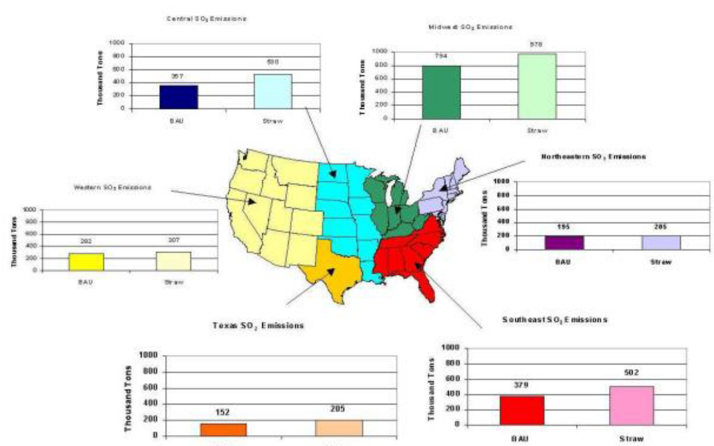
• Decreased generation from coal under BAU results in less coal consumed in 2020 compared to both the straw proposal and 1999 actual coal usage.

PROJECTED SO_2 EMISSIONS FROM POWER GENERATORS UNDER THE STRAW PROPOSAL



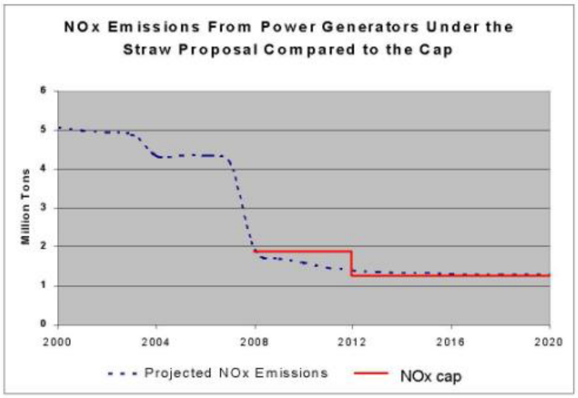
- The presence of the SO_2 allowance bank under Title IV (10.4 million tons at the beginning of 2001) will ease the transition into meeting the straw proposal's more stringent SO_2 cap of 2.0 million tons in 2010. Actual emissions from power generators are anticipated to be about 4.5 million tons in 2010, 3.0 million tons in 2015 and 2.3 million tons in 2020.

REGIONAL SO_2 EMISSIONS FROM ALL POWER GENERATORS IN 2020



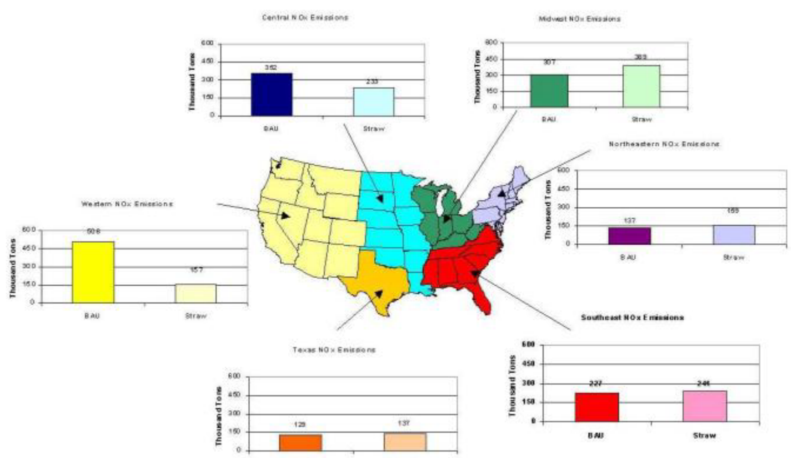
- *Note:* **Includes emissions from unaffected units**

PROJECTED NOx EMISSIONS FROM POWER GENERATORS UNDER THE STRAW PROPOSAL



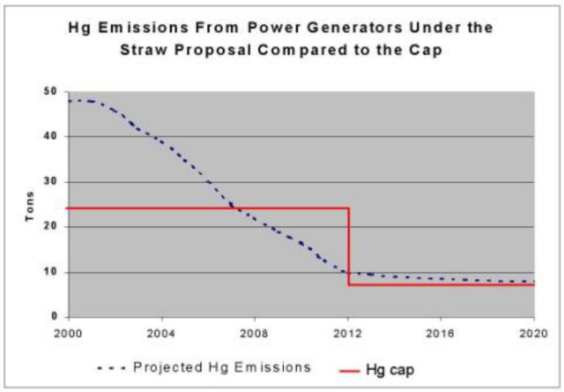
- EPA's analysis shows that sources are expected to reduce NOx emissions below the Phase II cap and bank emissions in anticipation of the more stringent limits that begin in 2012.
- The 2012 Phase III electricity generation NOx cap (1.25 million tons) is projected to be met by 2015. In 2010, NOx emissions from power generators are projected to be approximately 1.6 million.

REGIONAL NOx EMISSIONS FROM ALL POWER GENERATORS IN 2020



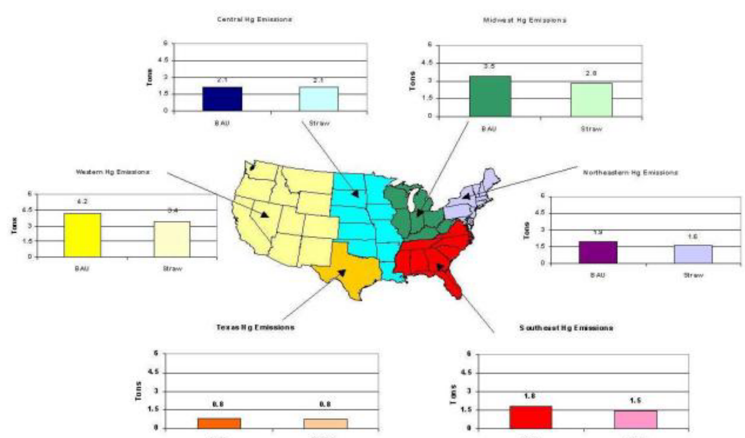
- *Note:* **Includes emissions from unaffected units**

PROJECTED Hg EMISSIONS FROM POWER GENERATORS UNDER THE STRAW PROPOSAL

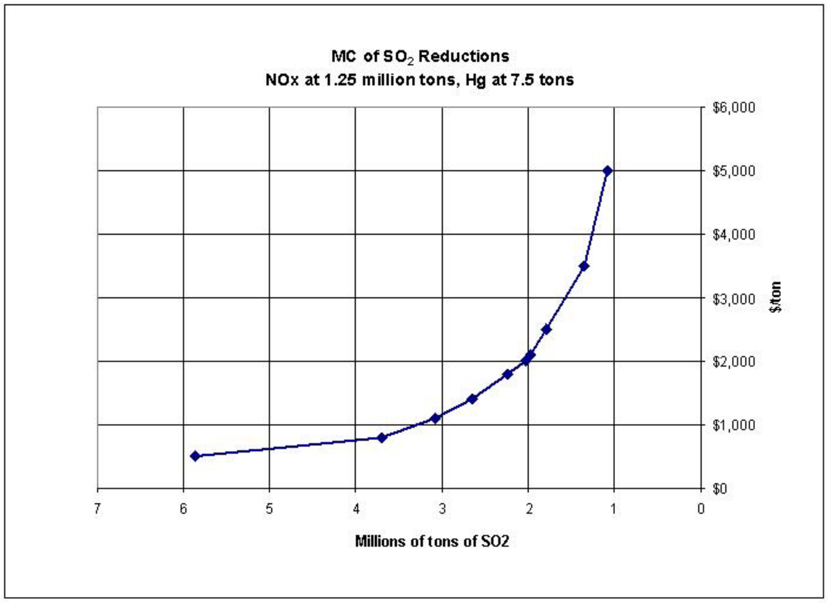


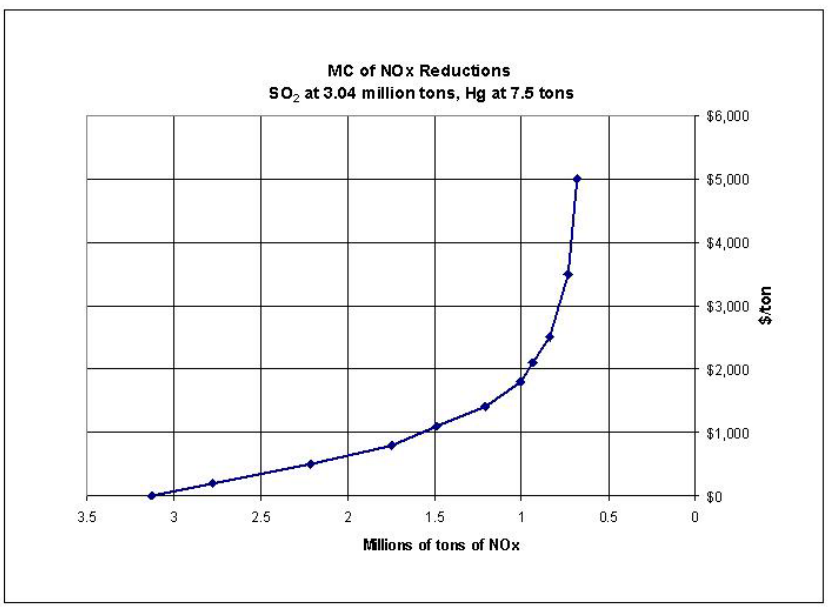
- Under the straw proposal, banked Hg allowances from either Phase I or Phase II may not be used to comply with the facility-specific 70% reduction that starts in 2012.
- The 2012 Phase II Hg cap on coal-fired electricity generators (7.5 tons) is projected to be met by 2020. Mercury emissions are expected to be 16.5 tons in 2010 and 8.5 tons in 2015.

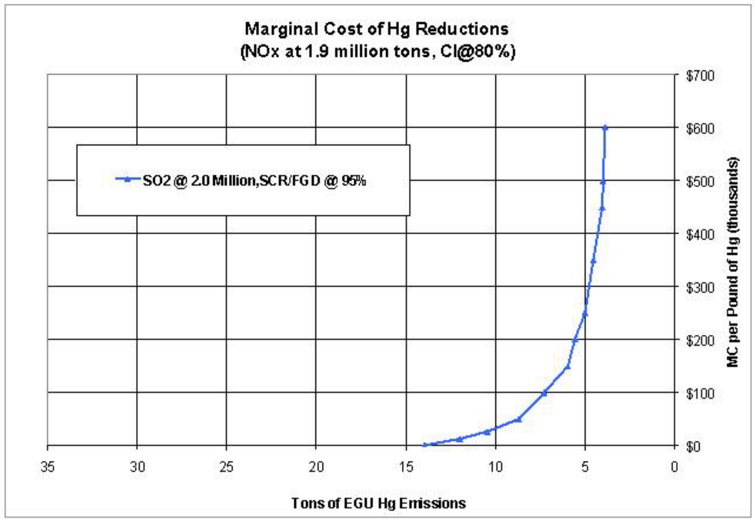
REGIONAL Hg EMISSIONS FROM ALL POWER GENERATORS IN 2020



- *Note:* **Includes emissions from unaffected units**


MC of SO_2 Reductions
NOx at 1.25 million tons, Hg at 7.5 tons
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
$/ton
7
6
5
4
3
2
1
0
Millions of tons of SO2


MC of NOx Reductions
SO_2 at 3.04 million tons, Hg at 7.5 tons
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
$/ton
3.5
3
2.5
2
1.5
1
0.5
0
Millions of tons of NOx



CONTROL TECHNOLOGY ASSUMPTIONS

EPA's Assumptions on the Costs and Removal Efficiencies of SO2, NOx and Hg Control Technologies		
SO_2 Technology Performance	SO_2 Removal Using Scrubbers	→ EPA assumes 95% SO2 removal from Limestone Forced Oxidation (wet scrubber), → 96% SO2 removal from Magnesium enhanced lime (wet scrubbers), and → 90% SO2 removal from Lime Sprayer Dryer (dry scrubbers)
	Cost of Scrubbers	→ Capital: $156/kw - $201/kw → FOM:$5/kw/yr - $9/kw/yr → VOM: 1-2 mills/kwh
NOx Technology Performance	NOx Removal Using SCR	→ EPA assumes 90% NOx removal. → EPA's cost and performance estimates were developed using publications by utilities, vendors, and control technology experts. All recently installed SCR retrofits are capable of achieving greater than 90% removal, as documented in papers by utilities and vendors.
	Costs of SCR	Costs for 500 MW unit → Capital: $62.12/kW → FOM: $0.41/kW-yr → VOM: 0.89 mills/kWh
Hg Technology Performance	Hg Removal Using ACI	→ EPA assumes 80% removal for ACI. → Initial full-scale testing at the Gaston plant supports this number.
	Costs of ACI	For units W/ HS-ESP: → Capital: $46.62/kw - $52.24/kW → FOM: $6.20/kw/yr - $7.48/kw/yr → VOM: .13 - 1.75 mills/kwh For units w/o HS-ESP: → Capital: $0.9/kw - $16.89/kW → FOM: $0.70/kw/yr - $2.62/kw/yr → VOM: 0.08 - 1.24 mills/kwh
	Hg Removal Using SCR + FGD	→ EPA assumes 95% removal for all coal types. → EPA bases its removal on analysis of ICR data (EPA, 2000) and German data (Fahlke and Bursik, 1995).

EPA'S ENERGY ASSUMPTIONS

EPA'S ENERGY ASSUMPTIONS	
Coal Price	→ $0.80/mmBtu (delivered) - Business-As-Usual in 2020 → $0.79/mmBtu (delivered) - Straw Proposal in 2020
Natural Gas Price	→ $2.74/mmBtu (delivered) - Business-As-Usual in 2020 → $2.70/mmBtu (delivered) - Straw Proposal in 2020
Demand in Electricity	→ 1.2% (assumes energy efficiency measures in the NEP)
Amortization Period	→ 30 years → In general, power generating and emission control technologies last longer than 30 years with maintenance and upgrades. The costs that EPA assumes in calculating the costs of meeting the straw proposal emission reductions incorporate the costs associated with any necessary maintenance or upgrade activities, therefore EPA believes it is appropriate to calculate costs amortizing over 30 years.

STATEMENT OF HON. MARY J. HUTZLER, ACTING ADMINISTRATOR, ENERGY INFORMATION ADMINISTRATION, DEPARTMENT OF ENERGY

Mr. Chairman and Members of the committee: I appreciate the opportunity to appear before you today to discuss the Energy Information Administration's analysis of multiple emission targets based on the provisions of S. 556, "The Clean Power Act of 2001."

The Energy Information Administration (EIA) is an autonomous statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely, and relevant data, analysis, and projections for the use of the Department of Energy, other government agencies, the U.S. Congress and the public. We do not take positions on policy issues, but we do produce data and analysis reports that are meant to help policymakers determine energy policy. Because we have an element of statutory independence with respect to the analyses that we publish, our views are strictly those of EIA. We do not speak for the Department, nor for any particular point of view with respect to energy policy, and our views should not be construed as representing those of the Department or the Administration. However, EIA's baseline projections on energy trends are widely used by government agencies, the private sector, and academia for their own energy analyses.

The projections in this testimony are taken from the two reports we recently released entitled Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants With Advanced Technology Scenarios, prepared at the request of Senators Jeffords and Lieberman; and Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants, prepared at the request of Senators Smith, Voinovich, and Brownback. These reports analyzed the impacts on electricity producers and consumers of constraints on the emission of sulfur dioxide, nitrogen oxides, carbon dioxide, and/or mercury at electric power plants. The assumptions used in the analysis cases prepared for these reports, as described below, were specified by the requesters for each report. This includes the emission limits specified, and, in the case of the report requested by Senators Jeffords and Lieberman, the technology assumptions used in each case.

The projections in these reports are not meant to be exact predictions of the future, but represent possible alternative energy futures, given technological and demographic trends, current laws and regulations, and consumer behavior as derived from known data. EIA recognizes that projections of energy markets are highly uncertain, subject to many random events that cannot be foreseen, such as weather, political disruptions, strikes, and technological breakthroughs. In addition to these short-term phenomena, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than projected in the reference case used in these reports. The costs to consumers and the impacts on the economy that are presented here are subject to considerable uncertainty, depending upon how the complex inter-relationships among many variables evolve.

S. 556 includes a provision that requires that all existing power plants must meet the most recent new source performance standards within 5 years of the enactment of the legislation, or on the plant's 30 th birthday, whichever date is later. In effect, this would likely require all existing coal plants to retrofit with scrubbers and NOx reduction equipment if they have not done so already, or retire. Since this provision was not included in the letter from Senators Jeffords and.

Lieberman requesting the study cited here, it was not included in EIA's analysis. Inclusion of this provision in the analysis would likely have changed the results of the study; in particular, the projected share of coal in electricity generation would likely have been lower, with consequent impacts on electricity prices and the cost of emission allowances.

Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants With Advanced Technology Scenarios

In the request from Senators Jeffords and Lieberman, the Energy Information Administration (EIA) was asked to analyze the impacts of emissions limits on nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon dioxide (CO_2), and mercury (Hg) from electricity generators against four cases with different assumptions concerning technology development and policies to reduce energy consumption and promote the use of cleaner technologies. The first case used the reference case technology characteristics in the Annual Energy Outlook 2001 (AEO2001). The second case assumed the high technology assumptions for energy demand, electricity generation, and fuel supply in AEO2001. The other two cases were based on the moderate and advanced cases from Scenarios for a Clean Energy Future. In all four cases, the same emissions limits were imposed on all electricity generators, excluding cogenerators. The start date for the reductions was assumed to be 2002. By 2007, NOx emissions are reduced to 75 percent below 1997 levels, SO_2 emissions to 75 percent below the full implementation of the Phase II requirements under Title IV of the Clean Air Act Amendments of 1990, Hg emissions to 90 percent below 1999 levels, and CO_2 emissions to 1990 levels, exactly as specified in S. 556 (Figure 1).

In this testimony, we focus on the reference case shown in the report, with and without emissions limits, in order to simplify the discussion and also because we believe this is the most likely future outcome. In general, the higher the assumed level of technology improvement in producing and consuming energy in a given case without more stringent emission targets, the lower will be the impact on electricity prices and electricity production resource costs[1] as a result of imposing emission limits in that case. However, in all cases the additional electricity production resource costs for meeting emission targets range from 8 to 9 percent of the corresponding costs in the cases with no additional emission controls. Also, the additional costs of developing and installing advanced technologies in the end-use and electricity sectors are not always explicitly considered in the advanced technology cases. Although the cost impacts of reducing emissions in these cases would be lower, the total cost including that of purchasing more efficient energy-consuming and producing equipment would likely be considerably higher than the impacts of controls in the reference case. .

Summary Results

Prices: With the imposition of emissions limits identical to those specified in S. 556 on the reference case, the average delivered price of electricity in 2020 is projected to be 33 percent higher than in the reference case due to the cost to electricity generators of meeting the limits (Table 1). Projected wellhead natural gas prices are also higher by 20 percent as a result of higher natural gas consumption by electricity generators.

Consumption: Due to the higher energy prices that result from the assumed emissions limits, total energy consumption is projected to be reduced by 7 quadrillion British thermal units (Btu) in 2020, or 5 percent, and projected energy expenditures

[1] The total cost of producing electric power, including the cost of fuels to generate electricity, operations and maintenance costs, investments in plants and equipment, and costs to purchase power from other generators.

are higher. The primary energy intensity of the economy-defined as total energy consumption per dollar of gross domestic product (GDP)-is projected to decline at an average annual rate of 1.9 percent between 1999 and 2020, compared to 1.6 percent in the reference case. Projected consumption of coal and electricity is lower with the emissions limits than in the reference case without the limits; however, as electricity generators reduce the use of coal, the projected use of existing nuclear power plants and natural gas and renewable generating technologies is higher, raising the consumption of these energy sources, relative to the reference case.

Emissions: Because of reduced energy consumption and the shift in the fuel mix to more natural gas, renewables, and nuclear power, projected CO_2 emissions in 2020 are reduced by 287 million metric tons carbon equivalent, or 14 percent, relative to the reference case, and emissions of SO_2, NOx, and Hg are also reduced consistent with the assumed targets.

Emission Controls: In order to meet the emissions caps, electricity generators must retrofit existing generators with equipment that reduces emissions of SO_2, NOx, and Hg. By 2020, an additional 19 gigawatts of scrubbers are projected to be added above the reference case level, while 6 gigawatts of NOx combustion retrofits, and 11 gigawatts of selective catalytic reduction post-combustion units, the most expensive of the NOx-reduction retrofits, are added above reference case levels. Selective non-catalytic reduction post-combustion retrofits are about 9 gigawatts lower than in the reference case, mainly because the case with emissions controls reduces coal consumption enough to make those retrofits unnecessary. Hg controls added include 49 gigawatts of spray coolers, and 88 gigawatts retrofitting with fabric filters, neither of which is needed in the reference case since no Hg emission targets are assumed in that case.

Resource Costs and GDP: Total resource costs to meet the cap are $177 billion[2] higher than in the reference case over the 2001–2020 forecast horizon. Real GDP is 0.8 percent, or nearly $100 billion, lower in 2007 in the case with emissions compared to the reference case, falling to 0.3 percent, or just over $50 billion, lower by 2020.

Electricity and Renewables

The introduction of emissions limits in the reference case results in substantially higher projected average delivered electricity prices relative to the reference case. Projected prices are 31 percent higher in 2010 and 33 percent higher in 2020 even as consumers reduce their consumption of electricity by 6 and 9 percent in 2010 and 2020, respectively (Figure 2). Annual expenditures are expected to be $158 more per household in 2010 and $154 more in 2020 as revenue to electricity providers is $58 billion and $59 billion higher in 2010 and 2020, respectively, some of which goes to pay for the higher costs of electricity production as described below.

Prices are expected to increase because the cost of producing power with emissions limits is more expensive than without limits. There are additional costs associated with the installation of emission control equipment, the purchase of emissions permits, and costs for fuels used to generate electricity. For example, in the case with emissions limits, 37 gigawatts of flue gas desulfurization equipment are expected to be constructed in 2020 compared with 17 gigawatts in the reference case. Combustion controls for NOx are installed at 52 gigawatts of generating capacity, compared to 47 gigawatts in the reference case, with additional retrofits of selective catalytic reduction post-combustion units for NOx control as well. There are also additional investments for fabric filters and spray coolers to reduce emissions of Hg, as well as use of activated carbon. Prices for fossil fuels are also expected to be higher. Natural gas prices to electricity generators are projected to be $4.52 per thousand cubic feet in 2020 in the reference case with limits compared with $3.68 in the reference case without limits. The effective price of natural gas to electricity generators, which includes the cost of a CO_2 allowance[3], reaches $6.31 per thousand cubic feet when the emissions limits are imposed. The higher projected price for natural gas also results from the higher costs associated with producing additional quantities of natural gas in the case with limits, which raises the average wellhead price of natural gas. Although the price of coal delivered to electricity generators is lower in 2020 when emissions limits are imposed, $17.28 per short ton compared to $19.34 per short ton in the case without limits, the effective price is projected to reach $81.28 per short ton, after including the CO_2 allowance cost.

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[2] All prices and expenditures are in real 1999 dollars.

[3] It is assumed in this analysis that electricity generators would need to purchase an allowance for each ton of CO_2 emitted, similar to the SO_2 control provisions of the Clean Air Act Amendments of 1990.

The projected higher electricity prices cause consumers to reduce their use of electricity, although higher projected natural gas prices dampen the impact of the higher electricity prices. Sales of electricity are expected to be lower by 261 billion kilowatthours in 2010 and by 443 billion kilowatthours in 2020 (Figure 3). These lower levels of consumption, combined with fuel switching by electricity generators, are reflected in the levels and types of generation. Projected coal-fired generation is reduced by 962 billion kilowatthours in 2010 and by 1,261 billion kilowatthours in 2020, 43 percent and 55 percent, respectively (Figure 4). The lower levels of coal-fired generation are expected to occur because emissions limits on controlled gases and Hg discourage the use of coal more than other fuels. Compared with coal, natural gas has lower emissions per unit, resulting in higher projected consumption levels for natural gas compared with the reference case without limits. The use of renewable sources and nuclear power is also expected to be higher in the case with limits because the costs of coal-and petroleum-fired generation are relatively more expensive. By 2010, nonhydropower renewable technologies, including geothermal, wind, biomass, municipal solid waste and landfill gas, and solar, are expected to produce 94 billion kilowatthours more than the 95 billion kilowatthours generated in the reference case without limits. In 2020, these renewable technologies are expected to generate 217 billion kilowatthours in the reference case with emissions limits, compared to 99 billion kilowatthours in the case without limits. Projected nuclear generation is higher by 21 billion kilowatthours in 2010 and by 59 billion kilowatthours in 2020, 3 percent and 10 percent, respectively, compared to the case without limits.

The higher projected price for electricity is due, in part, to the costs of obtaining emission permits. CO_2 emissions permit costs are included in the price of the fossil fuel to electricity generators. For the other three emissions, the permit costs are effectively included in the electricity price based on the cost incurred by the marginal generator.

The costs for SO_2 permits (allowances) are projected to be $46 per ton in 2010 and $221 per ton in 2020 in the reference case with emissions limits (Figure 5). The current price level for SO_2 permits is approximately $175 per ton. In 2020, the cost of SO_2 permits is projected to be $21 per ton higher than in the reference case without emissions limits, reflecting lower emissions limits and additional investments in emissions control equipment. The price for CO_2 permits is expected to be $93 per metric ton carbon equivalent in 2010, increasing to $122 per metric ton carbon equivalent in 2020 (Figure 6). This cost for CO_2 permits reflects the need to retire existing coal-fired capacity and switch to less carbon-intensive fuels, primarily natural gas. Currently, there are no economical technologies to sequester CO_2 emissions from coal plants. The cost for NOx emission allowances is expected to decline to zero by 2010 because the actions taken to meet the CO_2 limits result in NOx emissions being within the specified limit (Figure 7). The Hg allowance costs are expected to be $482 million per ton in 2010 and $306 million per ton in 2020 (Figure 8). Although the unit cost of Hg removal is high, the total cost for reducing Hg emissions is small when compared with costs to reduce CO_2 emissions.

To put the various allowance prices on comparable terms, Figure 9 converts the 2010 projected allowance prices for the four emission types to a cents per kilowatthour basis for two typical coal plants—one relatively uncontrolled and one equipped to remove 75–80 percent of NOx emissions and 95 percent of SO_2 emissions. As shown, for both plants the carbon allowance price would be expected to have the greatest impact on the operating costs of the plant. In the relatively uncontrolled plant carbon allowances would account for over two thirds of the total allowance cost, while in the more controlled plant, it would account for over 90 percent of the total. In reality, the impacts would vary from plant-to-plant depending on each plant's configuration and the quantity of coal consumed. However, this figure illustrates the relative importance of each of the allowance costs. For the industry as a whole, the cost of carbon allowances is by far the largest of the four emissions considered. The total value of carbon allowances in 2010 is about $44 billion, rising to $58 billion in 2020. This compares with the total value of allowances for the other emissions in 2010 of just over $2 billion, falling to under $2 billion by 2020. .

There are costs to power producers associated with electricity generation resulting from the emissions limits. The total cost of producing electric power includes the cost of fuels to generate electricity, operations and maintenance costs, investments in plants and equipment, and costs to purchase power from other generators. The sum of all these costs is called the resource cost. This resource cost is different from the marginal cost of generating electricity because it includes fixed costs, such as investments and portions of operations and maintenance costs, that do not vary based on production levels. Producers may not recover these fixed costs in competitive markets when the market price of electricity is at the same level as their marginal production costs, which only include fuel and certain other costs that vary with output levels. However, over time, producers need to recover their resource costs in order to remain in business. In the competitive marketplace which is assumed in these projections, a power producer would recover these costs during periods when the market price of power is higher than its production cost, for example, when a high-production-cost combustion turbine sets the market price while a low-production-cost pulverized coal unit is producing electricity.

For all the cases with emissions limits analyzed in this study, the resource costs are projected to be higher relative to the resource costs in the comparable cases without emissions limits. The largest increase is for fuels used to generate electricity. There are also costs associated with purchases of power from other generators and investment costs for new generation facilities or for retrofitting plants with emission control equipment.

From 2001 through 2020, the cumulative resource costs to generate electricity are expected to be $2,208 billion (undiscounted 1999 dollars) in the reference case with emissions limits, compared to $2,031 billion in the same case without the limits. Thus, the projected incremental cumulative expenditures attributable to emission limits that would be incurred by electricity generators is $177 billion, a 9-percent increase (Figure 10). These costs exclude the costs of emission permits that must be purchased by electricity generators because they are funds that are transferred among industry participants and do not represent actual resource consumption. The costs of the emissions permits are included in the delivered price of electricity, to the extent that they can be passed through to consumers.

In the reference case with emissions limits, the annualized resource costs in 2007 (the year the limits are fully imposed), which include financing and capital recovery costs, are $19.9 billion higher than projected in the reference case without limits. These incremental costs due to emissions limits are expected to be reduced to $19.1 billion and $18.1 billion in 2010 and 2020, respectively.

Resource costs are computed for the projected levels of consumption for each case. Since consumption is lower in the case with emissions limits (due to higher prices) there is also a loss in consumer surplus as a result of the reduced consumption.[4]

Natural Gas

In the reference case, natural gas consumption is expected to increase at an average annual rate of 2.3 percent over the forecast horizon. By 2020, total natural gas consumption is expected to reach 35.0 trillion cubic feet, an increase of 61 percent from 1999 levels. One of the fastest growing sectors for natural gas consumption is electricity generation. By 2020, the amount of natural gas consumed by electricity generators, excluding cogenerators, is expected to reach 11.2 trillion cubic feet, three times the volume used in 1999. In the next few years, natural gas prices are expected to decline from their record-high levels reached over the winter of 2001, dropping to $2.84 per thousand cubic feet at the wellhead by 2006. Although increased domestic production and imports keep pace with consumption, prices in the longer term rise as total demand grows, and wellhead prices are projected to reach $3.10 per thousand cubic feet by 2020 in the reference case.

Imposing emissions limits on electricity generators is expected to increase the demand for natural gas, during a period when the demand is already expected to be growing quickly. Because CO_2 emissions from natural gas are relatively low compared with other fossil fuels and natural gas is virtually free of SO_2 and Hg, electricity generators can help meet their emissions requirements by switching to natural gas. Imposing the limits on the reference case leads to higher natural gas demand by electricity generators. By 2020, the demand for natural gas by electricity generators is expected to reach 13.9 trillion cubic feet, 24 percent higher than the level of 11.2 trillion cubic feet projected in the case without emissions limits. Also, projected natural gas consumption in the commercial and industrial sectors is higher, primarily for cogeneration, which is not assumed to be subject to the emission limits imposed on other electricity generation, providing a stimulus for additional generation for self-use in these sectors. As a result, total natural gas consumption in 2020 is projected to increase to 38.4 trillion cubic feet, compared to 35.0 trillion cubic feet in the reference case without emissions limits.

[4]Consumer surplus is a measure of the benefit accruing to consumers who would be willing to pay more than the market price of electricity. For example, when the price of electricity is 6 cents per kilowatt-hour, a consumer who would have been willing to pay 8 cents gains a benefit of 2 cents per kilowatt-hour. By raising the market price to 8 cents, that surplus is lost. A rough estimate of the loss in this analysis is $2.5 billion in 2010, rising to about $4.5 billion in 2020. Over the period from 2001 to 2020, the total (undiscounted) loss to consumers is about $45 billion.

Higher natural gas demand results in higher prices. By 2020, the projected wellhead price reaches $3.72 per thousand cubic feet in the case with the emissions limits, compared to $3.10 per thousand cubic feet in the case without the limits (Figure 11). This results in higher natural gas prices for end users. Industrial prices, which are more closely tied to the wellhead price, are higher by 16 percent in 2020 compared to the reference case, while residential prices, which include more distribution costs, are higher by 8 percent.

Coal

Primarily due to the CO_2 limits, projected coal consumption is sharply reduced from the level in the reference case when emissions limits are imposed. When the costs associated with acquiring CO_2 allowances are added to the delivered price of coal, the effective delivered price to generators is projected to triple relative to that in the reference case by 2010 and reaches $3.97 per million Btu in 2020, approximately four times the reference case price. Due to CO_2 emissions reductions and measures taken to meet the Hg limit, coal-fired electricity generation is projected to lose a substantial share of the market to natural gas-fired generation, compared with the share of coal-fired generation in the reference case. In addition, higher projected electricity prices cause total electricity sales to decline, reducing overall generation requirements.

Because of lower installed coal-fired generation capacity and lower utilization of the remaining coal-fired capacity, projected coal consumption for electricity generation in 2020 is reduced to a level that is 43 percent of that in the reference case. Total coal production is projected to decline at a slower rate than the demand for coal in the electricity generation sector because, as a result of lower coal prices, consumption is projected to increase in other sectors not subject to the CO_2 limits, including industrial and coking coal and coal exports, assuming other countries do not impose new limits on coal consumption (Figure 12).

Although CO_2 limits have the greatest impact on coal consumption, both SO_2 and Hg emissions limits are projected to add to the cost of using coal and contribute to further reductions in coal-fired generation. In 2020, an additional 20 gigawatts of scrubber retrofits are projected to be added to meet the more stringent emissions limits on SO_2 and Hg. The assumed technology costs for emissions removal are based on current estimates. Coal production is projected to be reduced in all regions and shift to sources with lower Hg content, such as mines located in the Rocky Mountains, and away from lignite and waste coal, which have relatively high Hg content.

Residential End-Use Demand

Relative to the reference case, average residential energy prices from all sources (electricity, natural gas, and petroleum) are projected to be 17 percent higher in both 2010 and 2020. However, projected residential prices of electricity are 25 and 26 percent higher in 2010 and 2020, respectively. The higher prices in the case with emissions limits are projected to reduce residential energy demand, as consumers react to the higher prices by purchasing more efficient appliances and reducing their demand for energy services (Figure 13).

Since residential electricity prices are projected to increase more than the other fuels as a result of the emissions limits, the projected demand for electricity shows the largest decrease, as consumers switch to other fuels for their heating needs and overall appliance efficiency increases for electric equipment, such as air conditioners. The projected reduction in electricity demand is reflected in reduced CO_2 emissions attributed to energy use in the residential sector. Of the projected CO_2 reduction of 76 million metric tons carbon equivalent in the residential sector in the case with emissions limits in 2010, virtually all is attributed to the projected decrease in electricity demand. In 2020, the projected residential CO_2 emissions are reduced by 102 million metric tons carbon equivalent, or 27 percent, relative to the reference case.

Commercial End-Use Demand

The imposition of emissions limits in the reference case results in a 4-percent reduction in projected commercial delivered energy use in 2010, with electricity accounting for 83 percent of the projected decrease. In 2020, commercial energy demand is projected to be reduced by 2 percent, relative to the reference case. The cost of complying with emissions limits causes projected commercial electricity prices to be 33 percent higher in 2010 and 34 percent higher in 2020, compared to the reference case, while average natural gas prices to the sector are projected to be higher by 9 percent and 10 percent in 2010 and 2020, respectively, as electricity generators turn to natural gas to minimize their compliance costs. Commercial consumers are expected to minimize their own energy costs in the case with emissions limits through measures such as shutting off lights and equipment while not in use and by purchasing more efficient equipment.

Industrial End-Use Demand

Imposing emissions limits on the electric generation sector has essentially no impact on total delivered industrial energy consumption in the reference case because the industrial sector chooses to generate more of its own electricity (which is assumed to be exempt from the emissions limits), primarily from natural gas, accounting for a slight increase in total industrial energy consumption. While total delivered energy consumption is not significantly affected by the emissions limits, the fuel mix is altered. The projected industrial electricity price in 2010 is 40 percent higher than in the reference case due to the emissions limits and 43 percent higher in 2020. As a result, purchased electricity consumption is projected to be lower by 7 percent, or 0.3 quadrillion Btu, relative to the reference case in 2010 and by 13 percent, or 0.6 quadrillion Btu in 2020. At the same time, consumption of both petroleum products and natural gas is projected to be higher. Projected cogeneration from natural gas is higher by 61 percent in 2010 and 128 percent in 2020 compared to the reference case without emissions limits.

CO_2 emissions attributable to the industrial sector are reduced by 62 million metric tons carbon equivalent, or 12 percent, in 2010 and by 83 million metric tons carbon equivalent, or 14 percent, in 2020. The CO_2 reductions result from the reduction in purchased electricity.

Macroeconomic Impacts

The imposition of emission limits on electricity generators is expected to affect the U.S. economy primarily through higher delivered energy prices. Higher energy costs would reduce the use of energy by shifting production toward less energy-intensive sectors, by replacing energy with labor and capital in specific production processes, and by encouraging energy conservation. Although reflecting a more efficient use of higher cost energy, the change would also tend to lower the productivity of other factors in the production process because of a shift in the prices of capital and labor relative to energy. Moreover, an increase in energy prices would raise non-energy intermediate and final product prices and introduce cyclical fluctuations in the economy, resulting in output and employment losses in the short term. In the long term, however, the economy can be expected to recover and move back to a more stable growth path. . 10 Relative to a reference case projection for energy markets, a case with emissions limits has impacts on the aggregate economy. However, with alternative projections for energy markets, the same emissions limits will have different impacts on energy markets and subsequently different impacts on the economy. The macroeconomic assessment in this testimony evaluates the impacts of emissions limits on the reference case.

The macroeconomic analysis assumes a marketable emissions permit system, with a no-cost (grandfathered) allocation of permits. In meeting the targets, power suppliers are free to buy and sell allowances at a market-determined price for the permits, which represents the marginal cost of abatement of any given emission.

The introduction of emissions limits in the reference case results in a substantial increase in energy prices and subsequently in aggregate prices for the economy. The wholesale price index for fuel and power (WPI-Fuel and Power) gives an indication of the overall change in energy prices across all fuels. The WPI-Fuel and Power is projected to rise rapidly above the reference case without emissions limits by 14.6 percent in 2007, the target year for emissions reduction. Thereafter, this index remains approximately 15 percent above the reference case without limits through 2020. Higher projected electricity and natural gas prices initially affect only the energy portion of the consumer price index (CPI). The higher projected energy prices are expected to be accompanied by general price effects as they are incorporated in the prices of other goods and services. In this case, the level of the CPI is projected to be about 0.7 percent above the reference case without limits by 2007 and to moderate only slightly to approximately 0.6 percent above the reference case level through 2020.

How would the projected changes in energy prices affect the general economy? Capital, labor, and production processes in the economy would need to adjust to accommodate the new, higher set of energy and non-energy prices. Higher energy prices would affect both consumers and businesses. Households would face higher prices for energy and the need to adjust spending patterns. Rising expenditures for energy would take a larger share of the family budget for consumption of goods and services, leaving less for savings. Energy services also represent a key input in the production of goods and services. As energy prices increase, the costs of production rise, placing upward pressure on the prices of all intermediate goods and final goods and services in the economy. These transition effects tend to dominate in the short run, but dissipate over time. The unemployment rate is projected to rise by 0.4 percentage points above the reference case with no limits in 2007. Along with the projected increase in inflation and unemployment, real output of the economy is projected to be lower. Real GDP is projected to be 0.8 percent, or about $100 billion, lower relative to the reference case with no limits in 2007, and employment in non-agricultural establishments is projected to be lower by one million jobs. Similarly, real disposable income is expected to be reduced by 1.0 percent.

As the economy adjusts to higher energy prices, projected inflation begins to subside after 2007. At the same time, the economy begins to return to its long-run growth path. By 2020, the projected unemployment rate is 0.1 percentage points above the reference case, and real GDP is projected to be 0.3 percent, or about $50 billion, below the reference case projection. The impact on non-agricultural employment is projected to moderate to just over 400,000 jobs relative to the reference case in 2020.

Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants

This analysis responded to a request from Senators Smith, Voinovich, and Brownback to examine the costs of specific multi-emission reduction strategies in the electricity generation sector. In their request, Senators Smith, Voinovich, and Brownback asked EIA to analyze the impacts of three scenarios with alternative power sector emission caps on NOx, SO_2, and Hg:

Scenario 1: Reduce NOx emissions by 75 percent below 1997 levels, SO_2 emissions by 75 percent below full implementation of Title IV of the Clean Air Act Amendments of 1990 (CAAA90), and Hg emissions by 75 percent below 1999 levels by 2012, with half the reductions for each of the emissions occurring by 2007.

Scenario 2: Reduce NOx emissions by 50 percent below 1997 levels, SO_2 emissions by 65 percent below full implementation of Title IV of the Clean Air Act Amendments of 1990 (CAAA90), and Hg emissions by 65 percent below 1999 levels by 2012, with half the reductions for each of the emissions occurring by 2007.

Scenario 3: Reduce NOx emissions by 50 percent below 1997 levels, SO_2 emissions by 50 percent below full implementation of Title IV of the Clean Air Act Amendments of 1990 (CAAA90), and Hg emissions by 50 percent below 1999 levels by 2012, with half the reductions for each of the emissions occurring by 2007.

The key results included:

- Adding emissions control equipment to reduce NOx, SO_2, and Hg is projected to be the dominant compliance option. Emissions control equipment is expected to be added to many of the existing U.S. coal-fired electric power plants, which currently total just over 300 gigawatts of capacity.
- Decreased use of coal and increased use of natural gas in the electricity sector is projected to result when emission reduction efforts of these levels are required. By 2020, coal-fired electricity generation is projected to be between 4 percent and 10 percent below the reference case level, and natural gas-fired generation is projected to be between 4 percent and 10 percent above the reference case level.
- Emission allowance costs and electricity prices are projected to increase as the caps on NOx, SO_2, and Hg are tightened across the cases. The price of electricity is projected to be between 1 percent and 6 percent higher in 2020 than in the reference case. The nation's total electricity bill (in 1999 dollars) is projected to be between $3 billion and $13 billion (1 to 5 percent) higher in 2020 than projected in the reference case.
- Over the 2001 to 2020 forecast period, power supplier resource costs (in 1999 dollars) are projected to be between $28 billion and $89 billion higher than in the reference case. .

A key difference between this study and the one done for Senators Jeffords and Lieberman relates to the treatment of CO_2 emissions. In the Jeffords-Lieberman report, CO_2 emissions were specified to reach 1990 levels by 2007. In this report, there were no specific emissions limits for CO_2 in the main cases.[5] Therefore, the results of the two reports can be compared to show how limits on CO_2 affect the costs of mitigating SO_2 and NOx; and how the costs of Hg mitigation rise as the target becomes more stringent.

Figure 14 shows the allowance costs for SO_2, NOx, and Hg based on the three scenarios described above. The 75 percent reduction case has the same targets for SO_2 and NOx as in the Jeffords-Lieberman report. Comparing these allowance costs

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[5] A second set of cases with CO_2 emissions held at 2008 levels was run in order to examine the costs of purchasing offsets for any further increases in CO_2 emissions, as requested by Senators Smith, Voinovich, and Brownback.

to those shown in Figures 5 and 7, it is clear that the addition of CO_2 emission targets helps to reduce the costs of meeting the targets on SO_2 and NOx. For example, in 2020, the cost of reducing NOx emissions to 75 percent below 1997 levels without a CO_2 cap is $2825 per ton; when CO_2 emissions at 1990 levels are included, the cost drops to zero, because coal generation is reduced sufficiently to enable NOx emission targets to be met without further incentives to reduce coal use or add NOx reduction equipment. Similarly, the cost of reducing SO_2 emissions to 75 percent below the CAAA90 Phase II limits is $1737 per ton in 2020 without limits on CO_2 emissions, dropping to $221 per ton when CO_2 emissions must meet 1990 levels. As with NOx emissions, the reduction in coal use allows generators to meet the targeted SO_2 levels at a much lower marginal cost when CO_2 emissions are capped.

A comparison of Hg targets between the two reports indicates that the cost of mitigation rises more than proportionately with the amount of Hg to be reduced. Under Scenario 1 above, the costs of reducing Hg by 75 percent from 1997 levels is $85,000 per pound in 2020. In the Jeffords-Lieberman analysis, reducing the cap such that emissions would be 90 percent below 1997 levels yields an Hg allowance cost of $153,000 per pound in 2020, 80 percent above the 75-percent case when the mitigation is only 20 percent higher. The more stringent the cap, the more such expensive options as activated carbon to remove the Hg must be used, greatly increasing the marginal cost compared to less stringent targets.

Finally, Figure 15 shows the resource costs for meeting the targets in the scenarios described at the beginning of this section. Over the 2001–2020 time period, total resources would range from $28 billion to $89 billion (1999 dollars) above reference case levels in order to meet the three-pollutant targets specified for this report. This compares with Figure 10 from the Jeffords-Lieberman analysis, which shows increased resource costs of $177 billion to reach the levels specified in that report, including CO_2, relative to the reference case. Both the more stringent Hg limits, and the cap on CO_2 emissions, have a significant impact on the cost to the industry of meeting the increased mitigation required by the Jeffords-Lieberman assumptions. The difference between the two sets of cases-the Jeffords-Lieberman case and the Scenario 1 (75 percent emission reduction) Smith-Voinovich-Brownback case—could be even higher, for.13 several reasons. The loss of consumer surplus as a result of the lower electricity consumption is greater in the Jeffords-Lieberman case. Also, changes in resource costs in the Jeffords-Lieberman analysis are higher in the earlier years of the forecast horizon due to the earlier assumed compliance dates, the more stringent cap on mercury, and the cap on carbon dioxide. If the costs were discounted over time to reflect a higher value in the earlier years, this result would also raise the difference between the two analyses.

Conclusion

Based on the Jeffords-Lieberman analysis of the emission caps required by S. 556, electricity prices would be expected to be about 2 cents per kilowatt-hour higher (33 percent) in 2020 than in a case assuming current laws and regulations and assuming reference case technology assumptions. Consumption of coal would be greatly reduced, by about 50 percent in the case with emission controls compared to the case without controls. Additional use of natural gas, renewables, and existing nuclear units, as well as lower electricity consumption, is projected to offset the reduced coal usage. Resources for producing electricity would be about $177 billion higher under emission targets than in the reference case without targets (based on annual changes from 2001 through 2020 with no discounting). This does not include the loss of consumer surplus as a result of the reduction in consumption due to higher prices, which would represent an additional economic cost.

Thank you, Mr. Chairman and members of the committee. I will be happy to answer any questions you may have.

Table 1. Energy Market Data and Projections, 1999 and 2020

Projections	1999	2020 Without Emissions Limits	2020 With Emissions Limits
Primary Energy Consumption (Quadrillion Btu)			
Petroleum	37.9	50.4	50.3
Natural Gas	22.3	35.9	39.3
Coal	21.4	26.3	13.3
Nuclear Power	7.8	6.5	7.2
Renewable Energy	6.5	8.4	10.5
Total	**96.3**	**127.7**	**120.9**
Change in Primary Energy Intensity (Annual Percent Change, 1999-2020)	—	**-1.6**	**-1.9**
Electricity Sales (Billion Kilowatthours)	3,294	4,763	4,320
Electricity Generation, Excluding Cogenerators (Billion Kilowatthours)			
Coal	1,830	2,302	1,041
Petroleum	85	23	11
Natural Gas	370	1,488	2,072
Nuclear Power	730	610	669
Renewables	355	399	519
Total	**3,369**	**4,821**	**4,311**
Electricity Generation by Cogenerators (Billion Kilowatthours)	**303**	**440**	**664**
Prices			
Natural Gas Wellhead Price (1999 Dollars per Thousand Cubic Feet)	2.08	3.1	3.72
Coal Minemouth Price (1999 Dollars per Short Ton)	17.13	12.93	12.61
Average Delivered Electricity Price (1999 Cents per Kilowatthour)	6.7	6.1	8.1
Cumulative Resource Cost for Electricity Generation, 2001-2020 (Billion 1999 Dollars)	—	**2,031**	**2,208**
Emissions[a]			
CO_2 (Million Metric Tons Carbon Equivalent)[b]	1,511	2,044	1,757
SO_2 (Million Tons)	13.5	9	2.2
NO_x (Million Tons)	5.4	4.5	1.4
Hg (Tons)	43.4	45.2	4.3
Allowance Prices			
CO_2 (1999 Dollars per Metric Ton Carbon Equivalent)	0	0	122
SO_2 (1999 Dollars per Ton)	0	200	221
NO_x (1999 Dollars per Ton)[c]	0	0	0
Hg (Million 1999 Dollars per Ton)	0	0	306
Gross Domestic Product (Percent Change from Case Without Limits)	N/A	N/A	-0.3

[a]CO_2 emissions are from all energy sectors. Other emissions are from electricity generators, excluding cogenerators.
[b]CO_2 emissions are from energy combustion only and do not include emissions from energy production or industrial processes.
[c]Regional NO_x limits are included in the reference case, but the corresponding allowance costs are not included in the table because they are not comparable to a national NO_x limit.
Note: N/A = Not applicable
Source: National Energy Modeling System, runs SCENABS.D080301A, SCENAEM.D081601A, SCENBBS.D080301A, and SCENBEM.D081701A.

RESPONSES OF HON. MARY HUTZLER TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Efficiency of coal-fired generating plants

Question 1. What is the average efficiency of today's fleet of coal-fired steam electric generating plants?

Response. Based on the latest EIA data available in 2000, the average efficiency of the coal-fired electricity generating plant fleet was 32.7 percent.

Historical graph of efficiency of coal-generating plants

Question 2. Please provide a historical graph which shows the average efficiency of the coal-fired fleet over the last 25 years or as far back as reliable data is available.

Response. Please see the following graph which covers the period from 1949 through 2000:

Question 3. You indicated there would be certain improvements in technology that would reduce coal plant electricity production costs. What improvements are those, and what increases in efficiency result from their implementation? Would it be reasonable to assume that the efficiency of pollution control methods for SOx, NOx, and mercury, would improve similarly?

Response. Over time we expect that the cost and performance of new generating technologies will improve as they enter the market. For example, we assume that the efficiency of new pulverized coal-fired generators will improve from 36 percent to 38 percent while the efficiency of new advanced coal-fired plants will reach 49 percent. Similarly, the efficiency of new advanced natural gas-fired combined-cycle plants is projected to reach 54 percent. We also assume that the cost of a new generating technology will decrease over time as the technology is successful in penetrating the market. This is called the "learning effect." For example, the overnight cost of an advanced coal-fired unit (based on the integrated gasification combined cycle technology) in 2000 in the study Analysis Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenarios is $1220 per kilowatt. By 2020, due to efficiencies in manufacturing as more units are sold, the overnight cost in the reference case for that study is projected to drop to $1100 per kilowatt. Finally, we also assume that competition in electricity generation will have an impact on the operating costs of existing coal-fired and other generating technologies, based on historical improvements during the 1990's. For coal-fired steam plants, we assumed that general and administrative expenses will decline at an annual average rate of 2.5 percent through 2005, at which time it is expected that staffing will have been reduced to optimum levels. We also assume a reduction in operating costs of all fossil fuel plants of 2.5 percent annually through 2005, by which time the competitive impacts of electricity restructuring are expected to be complete. We currently assume that the cost and performance of emissions control technologies will remain fixed over the forecast period. These assumptions, however, are generally aggressive regarding both cost and performance. For example, we assume that a new selective catalytic removal system. (SCR) for nitrogen oxide (NOx) control on a 400-megawatt plant will cost approximately $60 per kilowatt. While only a small number of facilities have added them recently, analysis by the National Energy Technology Laboratory shows that the current costs average over $100 per kilowatt. Similarly, while most existing SCRs on U.S. coal-fired generating plants show NOx removal rates between 40 and 60 percent, we assume new facilities will achieve removal rates between 75 and 80 percent. It is certainly possible that further improvements in emissions control technology cost and performance characteristics will occur beyond what we assume. However, because S. 556 requires full compliance in 2007, the time available to make significant additional improvements in these technologies is not sufficient to expect these assumptions to vary.

Electricity price impacts of the National Energy Policy

Question 4. What would be the incremental change in the retail price of electricity in 2010 and 2020 above the reference case, if the President's National Energy Policy plan were implemented?

Response. We have not analyzed the impacts of the President's National Energy Policy plan. There are over 100 provisions in the plan, and most of them have not been fully defined at this time. For example, the plan recommends that the President direct the Secretary of Energy to set higher efficiency standards for covered products "where technologically feasible and economically justified." To date, the specifications for the new standards have not been set, and thus, we are not able to estimate their impacts on energy consumption. Until the specifications for each provision of the plan are determined, we will not be able to assess the potential impact of it on electricity prices.

Electricity-price impacts of environmental regulations

Question 5. What would be the increase in the retail cost of electricity above the reference case, if the statutory/regulatory schedule outlined by Mr. Holmstead in the hearing were to be implemented with the following assumptions: 1) Non-attainment designations for the NAAQS for PM–2.5 as published are made in 2005; 2) EPA finalizes a MACT for mercury emissions of 90 percent for bituminous coal and 50 percent for sub-bituminous coal using power plants; and 3) the BART guidelines become final in 2002 as proposed on July 20, 2001?

Response. The chart presented by Mr. Holmstead at the hearing presented the planned statutory/regulatory schedule. However, it did not provide enough detail for us to analyze its potential impact. To analyze the impact of the program outlined by Mr. Holmstead we would need to know what areas would be designated as non-attainment and what types of emissions levels and programs would be put in place to achieve the NAAQS standards. For example, we would need to know the emission limits or caps that might be placed on NOx and SO_2 emissions to meet the NAAQS and what type of program would be used. Without these details the program is only partially specified, and we are unable to estimate the potential price impacts. We would be able to answer this question once these specifications have been finalized by the Environmental Protection Agency.

Natural gas consumption impacts of environmental regulations

Question 6. What would be the change in natural gas consumption for electricity generation above the reference case if the statutory/regulatory schedule outlined by Mr. Holmstead were to be implemented, using the assumptions from the previous question?

Response. The chart presented by Mr. Holmstead at the hearing presented the planned statutory/regulatory schedule. However, it did not provide enough detail for us to analyze it potential impact. To analyze the impact of the program outlined by Mr. Holmstead we would need to know what areas would be designated as non-attainment and what types of emissions levels and programs would be put in place to achieve the NAAQS standards. For example, we would need to know the emission limits or caps that might be placed on NOx and SO_2 emissions to meet the NAAQS and what type of program would be used. Without these details the program is only partially specified and we are unable to estimate the potential price impacts. We would be able to answer this question once these specifications have been finalized by the Environmental Protection Agency.

Incorporation of global warming into EIA projections

Question 7. How does EIA incorporate global warming's effects into its projections for the number of annual cooling degree or heating degree days?

Response. EIA has not analyzed the potential impacts of global warming. The 20-year projections of energy markets published by EIA in its Annual Energy Outlook assume that weather patterns will be "normal" as determined by recent trends. Global warming would have future impacts on heating and cooling demand for residential and commercial customers, but the magnitude of those impacts has not been estimated, nor have assumptions about the increase in cooling degree days or decrease in heating degree days associated with global warming been made. If assumptions were to be developed concerning the effects on hearing and cooling degree days of future global warming, we could provide estimates of the impacts on space heating and cooling requirements in the residential and commercial sectors.

Effect of global warming on future energy markets

Question 8. What effect does the EIA project that global warming is likely to have on energy markets, supply, or demand, by 2020 and 2050?

Response. EIA's projections only extend to 2020. As noted in the response to question 7 above, EIA has not analyzed the potential impacts of global warming; rather, we assume that future weather patterns will be "normal" through 2020. Assumptions about the effects on heating-and cooling-degree days would have to be developed in order to estimate the impacts of global warming on future energy markets.

Impact of assumptions about retail electricity deregulation

Question 9. What impact does EIA's assumptions about the level, pace, and depth of deregulation in the retail electricity market have on EIA's projections of retail prices in the next two decades?

Response. EIA assumes that wholesale and retail electricity markets will become increasingly competitive over the next 10 to 20 years. In those regions and portions of regions that have already passed legislation or regulations calling for a movement to retail competition EIA assumes full competitive pricing based on the marginal costs of producing electricity, phased in through about 2005 to 2010. Roughly half of the States have so far adopted some form of restructuring.

The combination of increasing competition, falling coal prices and the improvement in the cost and performance of new generating technologies all contribute to the 9 percent decline in electricity prices seen in own reference case over the next 20 years. However, it should be pointed out that in some circumstances competitive markets can lead to higher prices than would historical cost of service markets. For example, if fuel prices to plants setting the market price or electricity went up sharply, consumers would see the impact immediately in fully competitive markets. In cost of service-based markets the higher fuel costs would be averaged in with all other costs and their impact would be muted. To the extent that there is an impact on the operating costs of fossil fuel plants as a result of competition, prices are expected to be lower in the near term compared to prices under cost-of-service regulation. However, once those efficiencies have been obtain prices could increase depending upon the behavior of coal and natural gas prices to electricity generators, particularly the price of natural gas.

RESPONSES OF HON. MARY HUTZLER TO ADDITIONAL QUESTIONS FROM SENATOR SMITH

Electricity rates

Question 1. As shown in Figure 2 of your written testimony, EIA estimated that electricity rates would increase under the scenario analyzed. How would the electricity rates compare to today's rates?

Response. Figure 2 of the written testimony shows electricity prices under the reference case, and under the reference case assuming the more stringent emissions caps of S. 556. In the reference case, average electricity prices fall to 6.1 cents per kilowatt-hour (in 1999 dollars) by 2020, compared to an estimated price in 2000 of 6.5 cents per kilowatt-hour (1999 dollars). In the reference case with additional emissions controls, the price of electricity is projected to reach 8.1 cents per kilowatt-hour (in 1999 dollars), about 25 percent above the 2000 estimate. This is due to the costs of the additional equipment that power plants would need to retrofit in order to meet the given emissions targets, the higher price of natural gas that would result from power plants switching from coal to natural gas, and the costs of emissions allowances.

Assumptions for future regulation

Question 2. Please explain the assumptions for future regulation under current Jaw used in comparing electricity rates for the scenarios with and without emission limits. Did your analysis assume reductions would be required under the mercury MACT? Did your analysis assume any additional reductions would be required of power generators to meet the fine particle or 8-hour ozone standard? On what did you base your assumptions? Is it reasonable to assume that power generators will not be required to make additional reductions under the mercury MACT or so that States can meet the fine particle and/or 8-hour ozone standard?

Response. In Energy Information Administration (EIA) analyses, the reference case incorporates laws and regulations in place at the time of the analysis. Rules or regulations not finalized, in early stages of implementation (without specific guidelines), or still being developed or debated are not represented. As an independent statistical and analytical agency, EIA does not take positions on how legislative or regulatory issues will be resolved or how regulations will, or should be, implemented.

The reference case for our analysis excludes several potential environmental actions, such as new regulations affecting regional haze, for which States are developing implementation plans; and State plans to meet the new National Ambient Air Quality Standards (NAAQS) for particulates, still being reviewed by the U.S. Environmental Protection Agency (EPA) and the courts. In addition, no effort is made to predict the Hg emission reductions that will ultimately be required by the Environmental Protection Agency under the authority of the Clean Air Act, or the outcome of lawsuits against the owners of 32 coal-fired power plants accused of violating the Clean Air Act, although those cases that have been settled are included.

As we state in our forecast publications, the reference projections are based on known technologies and their potential improvements, technological and demographic trends, and current laws and regulations. All laws are assumed to remain as now enacted. The impacts of emerging regulatory changes and their market effects are reflected. For the emissions scenarios included in this testimony and the study Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenarios, we assumed the same laws and regulations as for the reference case, and evaluated the impact of the more stringent caps on sulfur dioxide and nitrogen oxides; and the proposed caps on carbon dioxide and mercury, on electric generators. We did not assume in either case the reductions that would be required for a mercury MACT, or that there would be additional reductions in SO_2 or NOx to reduce particulates or comply with the 8-hour ozone standard. We based our assumptions on EIA's long-stated standard that until specific rules and regulations are promulgated, together with the details as to how they are to be implemented, EIA does not speculate on the form they may take or the stringency that they may require. While it is not unreasonable that additional reductions in SO_2 or NOx may be required to reduce particulates or ozone formation in various States, these rules have not been promulgated and are therefore not included in the reference case nor in the emission reduction cases, as they were not specified in the letters from Congress requesting multiple emission studies. In fact, the letters specified using the assumptions from the Annual Energy Outlook 2001.

Tools for projecting the range of baselines under current regulations

Question 3. The baseline EIA uses in its analysis assumes no further regulation under current. Even unamended, however, the Clean Air Act provides authority for further regulations the mercury MACT rule, for example. Does EIA have the tools necessary to project the range of baselines possible under current authority?

Response. EIA has the tools within its National Energy Modeling System to project energy market impacts under a wide range of input assumptions, including assumptions about mercury, both under a cap-and-trade system and under a MACT. What EIA does not have are the specific assumptions regarding the implementation of the regulations in the Clean Air Act. When these rules and regulations have been promulgated, EIA will include them in its reference case. EIA can also provide analysis that includes these regulations if the requestor(s) provide(s) the specific assumptions about their perceptions of the final form of the rule(s).

STATEMENT OF KENNETH A. COLBURN, DIRECTOR OF THE AIR RESOURCES DIVISION, NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

Good morning. My name is Ken Colburn. I am the Director of New Hampshire's air pollution control program, and I appreciate the opportunity to share with the committee some ideas regarding multi-pollutant approaches to reduce emissions from power plants. I applaud the chairman and ranking member for your leadership in tackling this issue due to its importance not only to public health and our natural environment, but also to our nation's economic future and global competitiveness, and what burdens the States will face in wrestling with these pollutants in the future.

A reassessment is timely, since it's been more than a decade since the last major amendments to the Clean Air Act. We've made significant progress. Overall pollution from power plants is declining—and air quality in many places is improving—despite substantial increases in economic activity and a near-doubling of coal consumption. In short, the Clean Air Act remains one of the most successful and important pieces of environmental legislation ever passed by Congress.

At the same time, the Act—and its implementation—must continue to evolve and improve in order to afford the public and industry the benefit of our collective learning since the 1990 Amendments. We should build on the successes of the past 10 years, particularly the Acid Rain Program's cap-and-trade approach, which—through cost-effective, market-based approaches—has shown that environmental and economic interests can be aligned, rather than at odds. We need to rectify several shortcomings, like how the Act ignores wind and how resistant some of its provisions have been to embracing new scientific developments and innovative pollution control approaches.

Most important, we need to improve its results. Many areas of the country still violate health-based air quality standards. Forests and aquatic ecosystems throughout the Northeast continue to suffer acid rain damage. Growing scientific evidence points to the profound health effects of fine particles in the body, the long-term consequences of toxic metals like mercury building up in the environment, and climate altering effects of carbon dioxide building up in the atmosphere.

Fortunately, multi-pollutant approaches like S. 556 promise to address all of these needs simultaneously. That's why the Northeast States strongly support the committee's efforts to draft comprehensive legislation to further reduce power sector emissions of SO_2, NOx, mercury and carbon dioxide. Only a comprehensive, "4-P" approach can give industry the investment and planning certainty it needs, while ensuring a reliable electricity supply and promoting a smooth transition to the mix of resources and technologies that will be needed to improve public health, sustain environmental progress, and enable continued economic growth in the future.

Note that a "3-P" approach will not accomplish this goal. Scientifically and politically, it is clearer than ever that climate change cannot be ignored. At some point, it will be necessary to not only hold the line against emissions increases, but to begin to decrease our contribution to the global burden of climate-forcing gases. In this regard, my understanding is that based on the Energy Information Administration's (EIA) analysis (of the Smith, Voinovich, Brownback proposal)—which is apt to represent a relatively conservative estimate—prices for CO_2 would be as low as \$10 per ton, and could go even lower with the inclusion of sequestration activities and non-CO_2 gases. The bottom line is that control programs for just three pollutants—if they result only in additional smokestack controls—will not provide industry with meaningful, long-term investment certainty, nor will it spur development in the United States of new, advanced energy technologies and renewable power sources to meet the global market demands of a carbon-constrained world.

In short, we won't gain on the future by wedding ourselves to the technologies and policies of the past. Ultimately, in the marathon of global competition, energy efficiency will win out over inefficiency—it's just a question of how much technology opportunity and competitive advantage we will squander by delaying. So, whether to provide existing utilities with greater certainty, or to give technology developers a clear reason to move forward, high-technology States like New Hampshire believe that action today on a multi-pollutant approach is economically (let alone environmentally) superior to inaction. Note that these views aren't limited to State air officials—many of the nation's largest utilities concur with this assessment.

States also have a more direct economic interest in Federal action now. All of us want to deal with upcoming attainment dates and designations in the most cost-effective way possible. States can do a lot of things better than the Federal Government, but adopting consistent regulations that effectively and equitably address the multi-State impacts of an industry involved in aggressive interstate competition is not a task best left to the separate States. Addressing power plants emissions—the largest, most cost-effectively controlled sources—through a nationally consistent, output-based approach—will take the smallest "bite" out of the nation's economy. Any emission reductions not achieved through an aggressive Federal multi-pollutant approach will have to be secured by imposing additional burdens on State and local governments to impose additional regulatory burdens on other, smaller sources. Failure to adopt effective, national 4-P legislation is a recipe for adding cost and needlessly burdening the economy in pursuit of the same environmental and public health objectives. Further, since Federal preemption puts substantial obstacles in the way of State efforts to control other major pollution sources (e.g., vehicles and fuels), small businesses will bear the brunt of achieving the emission reductions not secured through multi-pollutant legislation.

States like New Hampshire are also interested in the combined economic, health, and environmental benefits that a federally inspired technology push will provide. Specifically, energy reliability, energy cost savings, and energy security can be better served by energy efficiency and distributed generation technologies than by resorting to the historical practice of erecting vulnerable power plants and pipelines.

In addition, we'd like to address the persistent problem of transported air pollution in a more constructive fashion than the Act now allows. The Clean Air Act provided a mechanism—albeit an incomplete, cumbersome, and exhausting one—to address some transported pollution (i.e., that from stationary sources only). Although admirable in its intent, this mechanism has divided the country into bitterly opposing "upwind" and "downwind" camps, and wasted scarce State resources pursuing or responding to incessant litigation. Congressional inaction now will force States to continue to rely upon divisive interstate petitions under Section 126 and Section 110 of the Act to protect the health of our citizens. Dramatically reducing power plant pollution—through aggressive Federal multi-pollutant legislation using proven market mechanisms to produce economically efficient choices and provide regulatory flexibility—seems unquestionably more productive and cost-effective than burdening the States with solving interstate pollution transport problems through inherently litigious means.

Speaking of regulatory flexibility, New Source Review (NSR) has been the focus of much recent attention. Over the past decade, when many old, grandfathered power plants not only did not retire (as premised in Clean Air Act deliberations), but actually increased their output, the NSR program accomplished two very important things. First, it enabled States to secure much-needed pollution reductions at new sources that a business-as-usual approach could not have achieved. Second, NSR gave rise to the development and application of new and better emission control technologies. The application of NSR to modifications at existing sources has been more controversial, leading to contentious enforcement actions by EPA and several States.

The fact that a law is sometimes violated, however, doesn't mean we don't need it. The New England States unequivocally support the ongoing enforcement actions against companies that violated NSR requirements in the past, and feel strongly that any new legislation must not impede those actions or provide a pretext for letting past violators off the hook.

Going forward, however, there may be opportunity for consensus in making NSR improvements. Constructive progress is most likely to occur if we take a "systems approach" to the interlocking provisions of the Act. The ultimate lens we will use to evaluate the resulting combination of new provisions will be whether they guarantee substantially greater public health protection than the current statute. Specifically, States will be more willing to entertain greater regulatory relief if emission reduction commitments are larger, timely, certain (i.e., "locked down"), and become progressively more protective over time. We will not support relief today in exchange for promises of future reductions. In addition, the full suite of existing State authorities to go beyond Federal requirements when necessary to protect public health and the environment must not be abridged.

In conclusion, several States are already moving ahead to create an energy future that is cheaper, cleaner, more secure, provides greater competitive advantage, and more opportunity for technology jobs. We recommend that country as a whole do likewise by adopting an aggressive, national, 4-pollutant emission reduction strategy reflecting the core concepts of S. 556. The Northeast States have developed a set of general, consensus principles for such legislation—a copy of which is attached to my testimony—and I'd be pleased to discuss targets and timelines if you wish.

Thanks again for the opportunity to share these thoughts. I look forward to any questions you may have.

ATTACHMENT I

SUMMARY OF NORTHEAST STATES' PERSPECTIVE ON NATIONAL LEGISLATION TO REDUCE POWER PLANT EMISSIONS, SEPTEMBER 7, 2001

Emissions Reduction Targets

Northeast States agree that Federal efforts to achieve integrated reductions in multiple power plant pollutants should be implemented on an annual, output-basis with caps to limit overall pollutant levels. Possible reduction targets and timeframes are identified below. To ease comparison with other proposals they are presented in terms of a cap target and equivalent output-based emissions rate. However, this presentation is not intended to preclude discussion of dynamic or declining caps, a concept that we continue to explore, or of more aggressive targets than those described here.

SO_2 Target: National annual cap of approximately 4 million tons by 2004–7, with a further reduction to 2 million tons in the 2009–12 timeframe. These caps translate to average emissions rates of approx. 3.0 and 1.5 lbs/MWh, respectively and represent a 55 to 78 percent reduction from eventual 8.9 million ton Acid Rain cap. Implications of existing allowance "bank" must be addressed in developing SO_2 requirements.

NOx Target: National annual cap of approximately 2 million tons by 2004–7, with a further reduction to 1.3 million tons in the 2009–12 timeframe. These caps translate to average emissions rates of about 1.5 lb/MWh and 1.0 lb/MWh, respectively and represent a 70 to 80 percent reduction from current annual emissions of approx. 7 million tons. The 2 million ton cap can be achieved by annualizing NOx SIP Call requirements.

Mercury Target: National reductions greater than 70 percent by 2004–7 with a reduction goal of 85–95 percent by 2009–12. Further work needed to determine how to set standards that will achieve desired goals and to explore feasibility/acceptability of using market mechanisms to implement mercury reductions.

CO_2 Target: Return power sector emissions to 1990 levels by 2010 with an additional reduction of at least 10 percent to be achieved by 2020.[1] Additional work is needed to explore possible role of flexibility mechanisms (e.g., trading, early action, off-sector credits, etc.), cost caps, implications of recent international developments, etc.

Other Power Plant Pollutants: In the interests of regulatory certainty and comprehensiveness, other important power plant pollutants—such as primary particulate matter, other air toxics and carbon monoxide—may need to be addressed as part of multi-pollutant legislation. NE States are exploring potential options/targets appropriate to these pollutants.

Other Key Issues

As indicated above, a number of details concerning each of the targeted pollutants must still be addressed. In addition, the Northeast States are coordinating to develop specific recommendations in four broad issue areas likely to be closely linked to the multi-pollutant debate:

- Interaction of multi-pollutant legislation with New Source Review (NSR), Prevention of Significant Deterioration (PSD) and other existing or pending regulatory programs (e.g., BART, mercury MACT determination, etc.). Under no circumstances should new Federal legislation obstruct or limit enforcement actions undertaken to remedy violations of existing NSR requirements.

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[1]The Conference of the New England Governors and Eastern Canadian Premiers have committed to the long-term goal of reducing society-wide emissions of greenhouse gas by 75–85 percent. To meet these targets, it is likely that declining caps will need to be employed.

• Interaction of Federal multi-pollutant requirements with existing or future State requirements. Because States bear ultimate responsibility for meeting ambient air quality standards and protecting public health, any new Federal legislation must maintain the full scope of existing State authority to adopt more protective requirements.

• Addressing local pollution concerns and their implications for the design of future regulatory requirements (such as trading). States must retain the authority to respond as they deem necessary to remedy adverse local impacts. Provisions must also be included that require a Federal response to remedy local impacts of an interstate nature.

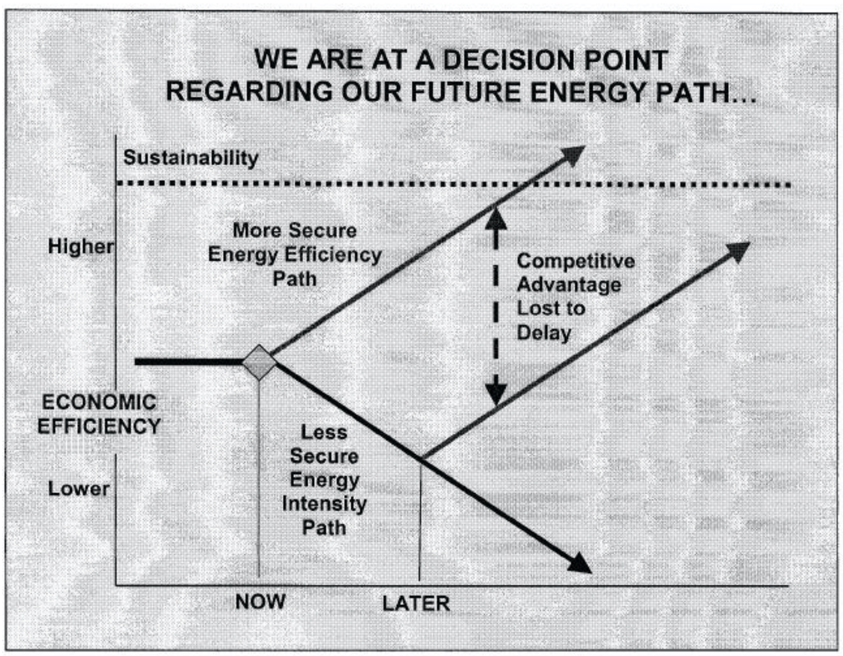
• The ability to include additional provisions to address long-term clean energy needs, including: ensuring the reliability of power grids, promoting clean distributed generation, encouraging renewable energy resources, continuing demand-side management, promoting combined heat and power, and supporting systems benefits programs.

ATTACHMENT II

Delaying optimal energy path decisions puts our competitive advantage at risk.

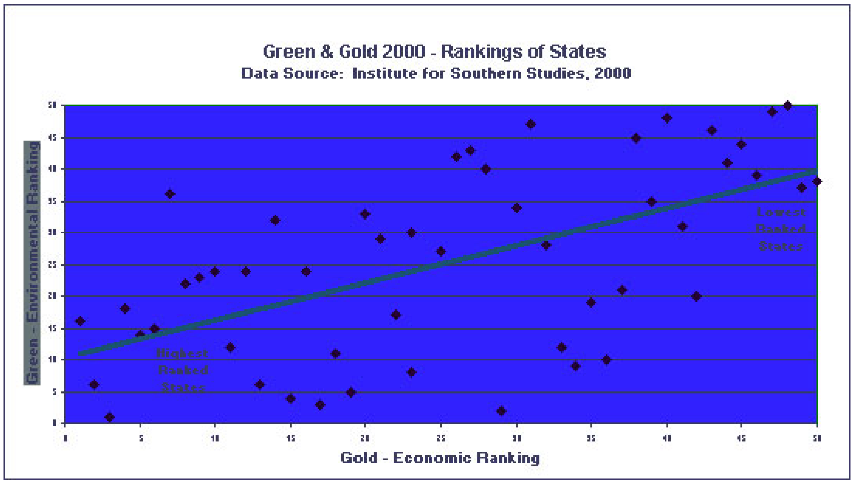
ATTACHMENT 2.
(of written testimony)

Delaying optimal energy path decisions puts our competitive advantage at risk.

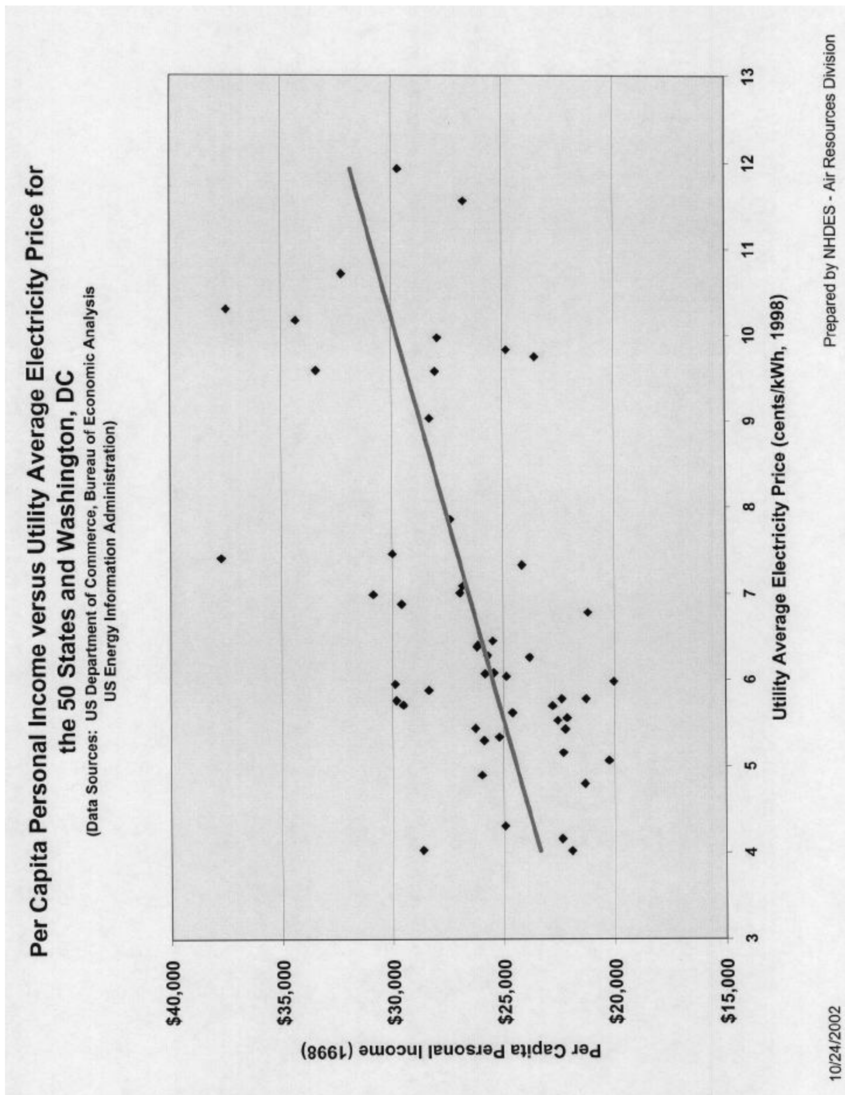


ATTACMENT III

The economic and environmental fortunes of States appear to be positively correlated, contrary to conventional wisdom that suggests they are mutually exclusive:



In addition, electricity costs do not appear to determinative of economic well-being—as measured by per capita income—also contrary to conventional wisdom:


Per Capita Personal Income versus Utility Average Electricity Price for the 50 States and Washington, DC
(Data Sources: US Department of Commerce, Bureau of Economic Analysis
US Energy Information Administration)
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
Per Capita Personal Income (1998)
3
4
5
6
7
8
9
10
11
12
13
Utility Average Electricity Price (cents/kWh, 1998)
10/24/2002
Prepared by NHDES - Air Resources Division

A New Approach to Air Pollution Regulation...

THE INDUSTRY-AVERAGE PERFORMANCE SYSTEM (IAPS)

IDEA:

Within a given category of polluters (electric utilities, industrial boilers, etc.), require all companies to pay a fee for each ton of pollution emitted, then refund the revenues collected back to these companies based on their production. For pollution sources like cars and large trucks, vary registration fees (within vehicle classes) based on pollution emitted.

RESULT:

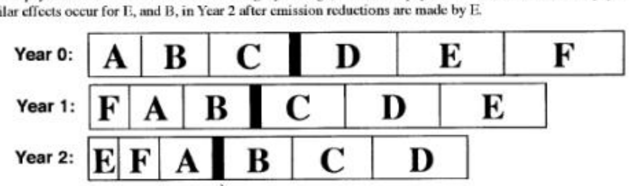
Emissions are discouraged and production efficiency (productivity) is encouraged, because the companies or sources that emit pollutants at a higher rate per unit of production than the category average end up paying (on a net basis) those which emit at a rate lower than the category average.

BENEFITS:

- Protects public health from air pollution that can be eliminated inexpensively, and simultaneously protects industry from unreasonable regulatory costs and cross-industry subsidies.
- Creates strong financial and market incentives to reduce emissions: for net payers, both pocket-book and market image suffer; for net payees, both are enhanced.
- Treats pollution from old sources the same as pollution from new sources.
- Encourages emission reductions all the way to zero, not just to regulatory compliance levels.
- Eliminates traditional battles over culpability among regions, responsibility among industrial sectors, and estimated costs to control; adjustments are easily implemented.
- Eliminates the traditional "boom or bust" regulatory cycle ("Set a standard, meet it, stop, wait, set a new standard"). Industry makes technology choices, not regulators.
- Less regulatory volatility reduces risk for technology developers; spurs development of new, more cost-effective environmental technologies.
- Creates a continuous improvement dynamic; each reduction lowers the category average.
- Allows all pollutants to be integrated into a single regulatory framework.
- Easily incorporates geographically differentiated controls based on different pollution impacts.
- Requires much less bureaucracy; largely self-administered and self-policing.
- Not a government revenue program (i.e., not a "pollution tax").

EXAMPLE:

- A, B, C, etc. are individual companies in the same category of polluters; width of box illustrates their emissions per unit of production.
- When F, a net payer, installs pollution controls (or more efficient production equipment) in Year 1, it becomes a net payee. F's action also reduces the category average, so C, a net payee in Year 0, becomes a net payer.
- Similar effects occur for E, and B, in Year 2 after emission reductions are made by E.



Bold line illustrates average for source category.

NH Rep. Jeffrey C. MacGillivray
Kenneth A. Colburn, NHDES Air Director

NHDES Air Resources Division
March 3, 1998

RESPONSES BY KENNETH COLBURN TO ADDITIONAL QUESTIONS FROM SENATOR SMITH

Question 1. Describe the actions that would be required by the Clean Air Act of the Air Resources Director in a State like New Hampshire over the next several years if the Congress fails to pass a multi-pollutant bill. Explain how those actions might affect New Hampshire's economy.

Response. This is a difficult question to answer specifically, because most of the actions that will be required of States like New Hampshire in the event that an aggressive multi-pollutant bill does not pass Congress remain unspecified by the U.S. Environmental Protection Agency (EPA). What is known, however, is that EPA has promulgated new, more stringent air quality standards for ground level ozone and fine particulate matter, standards that will be difficult to attain—particularly for downwind States like New Hampshire. In addition, EPA is in the process of establishing a concerted national program to improve visibility by reducing regional haze. This program will have the practical effect of imposing additional standards on the State.

What is also known is that the Federal Clean Air Act largely ignores the phenomenon of wind. It assumes that a State's air quality problems are of its own making. As a result, many wasteful, prescriptive, and cost-ineffective control measures have been mandated. The real pollution sources—when addressed at all—have achieved significant delay through litigation. This situation will persist until Congress acts—either to require large pollution sources such as coal-fired power plants to clean up their emissions of several pollutants that create environmental problems downwind, or to eliminate the culpability of downwind States for the pollution that they receive from upwind sources.

The latter is not a workable course, because it violates one of the principal purposes of the Clean Air Act—the protection of public health. The status quo is not a workable course, because the new Federal air quality standards will require new control measures—such as costly motor vehicle tailpipe testing (estimated previously at $10 million for New Hampshire) and controls on small businesses. In fact, it no amount of emission control in New Hampshire—no matter how expensive—would lead to ozone attainment within the State. The only workable, cost-effective course is to secure the reductions that would be provided by an aggressive, multi-pollutant emission reduction bill in Congress.

Without such legislation, the economic impacts on New Hampshire will be significant as the new Federal air quality standards are implemented. The direct costs of control measures, of course, will come directly out of the State's economy. Because in-state emissions are not the primary cause of New Hampshire's air quality problems, these controls will not achieve the desired goals.

Of equally profound impact are the indirect effects the State is likely to face. In the absence of Federal legislation to address multiple pollutants, New Hampshire will likely remain in nonattainment for certain pollutants. A nonattainment designation imposes significant sanctions to discourage additional economic development. In addition, New Hampshire's crucial recreational and tourism industries suffer disproportionately from the visibility, acid rain, mercury deposition, and climate impacts of emissions from uncontrolled or inadequately controlled power plants upwind.

The passage of an aggressive multi-pollutant emission reduction bill by Congress will dramatically reduce the harmful public health and environmental effects of air pollution in New Hampshire, and it is the most responsible and cost-effective way to bring New Hampshire and other downwind States into attainment with Federal air quality standards.

Question 2. In your testimony, you discuss the idea that a multi-pollutant bill could have beneficial effects for the economy and could improve energy security; can you elaborate on that?

Response. Several issues bear on this question. Attachment 2 to my written testimony (copy attached) offers a general principle regarding America's energy choices, a principle I will flesh out along with additional issues in my comments below. Ultimately, multi-pollutant legislation will make for more economically sound decisions, whether this happens through the inclusion of explicit energy efficiency and/or renewable energy incentives (as in State legislation proposed in New Hampshire), through a more level electric generation playing field as a result of a multi-pollutant reduction in the environmental subsidy that fossil-fired power plants now enjoy, or through the technological progress that such requirements are known to spur.

Ultimately in a competitive global economy, competitors possessing greater efficiency in utilizing resources will triumph over less efficient market entrants. Concerted efforts to enhance efficiency, then, are not a question of "if" but "when." Attachment 2 illustrates that, all else being equal, competitors that achieve superior efficiency sooner will enjoy a significant competitive advantage over those who first choose a less efficient path and then try to "catch up" later. In what Tom Friedman describes in his seminal book The Lexus and the Olive Tree as an increasingly "winner take all" global economy, catching up is very hard, if not impossible, to do.

This is particularly true of energy efficiency. If one considers the four "factors of production" or avenues of competition—Man, Material, Method, and Machine—aggressive efforts to enhance energy efficiency enhance each one. Material represents the resources and raw materials consumed. Opportunities to dramatically reduce the amount of energy resources consumed are now available for every sector of the economy. To the extent that energy efficiency opportunities are realized, greater competitiveness will accrue, and the economic resources thus freed up can be applied toward developing greater competitiveness in the other three factors of production.

One obvious candidate is enhancing Method—the technology and know-how that differentiates competitors in their cost structure and market presence. The development and use of advanced energy efficiency technologies is particularly significant because it offers a dual competitive advantage—such technologies both reduce the costs of production domestically and are marketable to others internationally. A good example—albeit an unfortunate one for the United States—is found in wind power. Today, as America looks increasingly to wind power as a cheap, clean, renewable energy resource, we find that our nation's market share of wind power manufacturers has shrunk from a dominant position to small minority in the last few decades. Companies from nations such as Germany and Denmark, that better perceived the dynamic illustrated in Attachment 2 (i.e., efficiency ultimately wins) than the United States did, are today selling their technology to us instead of vice versa. The same is occurring in solar energy applications.

In terms of energy, the other two factors of production—Man (or labor) and Machine (or capital)—initially play off against each other. One can invest in large, capital-intensive energy production facilities, or one can invest in smaller, labor-intensive facilities. The former—large central power plants linked together by a sophisticated transmission grid—characterizes the approach that America has taken to date. The latter is characterized by small-scale, renewable, distributed generation sources such as wind, solar, biomass, etc. Among many organizations to have investigated the economic opportunities provided by energy efficiency and renewables, the Worldwatch Institute considered the differences between labor-intensive and traditional capital-intensive energy approaches in a September 2000 paper, *Working for the Environment: A Growing Source of Jobs:*

> Numerous studies find that wind power compares favorably in its job-creating capacity with coal-and nuclear-generated electricity. In Germany, although wind energy contributed a still miniscule 1.2 percent of total electricity generation in 1998, it provide some 15,000 jobs in manufacturing, installing, and operating wind machines. In comparison, nuclear power had 33 percent of the electricity market, but supported a relatively meager 38,000 jobs; coal-generated power had a 26 percent market share and gave rise to 80,000 jobs. Given the rapid expansion of wind power in Germany, wind will likely overtake nuclear power as a source of jobs in 2000. [Page 41]

The benefits of siding with less capital-intensive distributed energy resources do not stop with job creation, however. Overlooked in the above analysis, for example, are substantial savings associated with enhancing and maintaining the nation's increasingly fragile electric transmission and distribution infrastructure. In addition, labor-intensive options better match costs to benefits, rather than requiring substantial initial capital outlays. The capital thus freed up can be utilized for other, more economically beneficial investments. Further, resources directed to labor-intensive rather than capital-intensive channels circulate faster in the economy (creating a greater multiplier effect), and are superior in fostering economically essential consumer demand.

Furthermore, traditional central-station-and-grid power is becoming increasingly unsatisfactory to meet the demands of tomorrow's businesses. Companies for which high power quality and reliability are essential cannot rely on grid power. Bank of Omaha's credit card processing operations, for example, depend on minimally polluting fuel cells—not for their environmental characteristics, but for the quality and reliability of their power. Far from "tracking" the economy, energy has declined over 40 percent in terms of energy per dollar of gross domestic product since the 1970's according to the American Council for an Energy Efficiency Economy. The fact that today's technology demands higher power quality and reliability than the grid can provide will only compound this decline.

Finally, energy security is a major concern since the September 11, 2001 terrorist attacks. Multi-pollutant legislation, and the relative opportunity that it would provide to energy efficiency and distributed energy sources, would contribute—rather than detract from—greater energy security in America. First and foremost, centralized power plants, transmission facilities, and pipelines are all very vulnerable targets. The least vulnerable energy is that which is never used, and that is what energy efficiency achieves. The next least vulnerable energy is that which is provided by relatively numerous, small, difficult-to-disable distributed sources. Furthermore, to the extent that renewable energy sources rather than oil-fired energy sources are utilized, greater energy security will be achieved over the relative insecurity of our current dependency on foreign oil. Correspondingly, energy efficiency could help ease many of the international tensions we now face, including those which derive from the U.S.'s current role in the Mideast and those relating to global climate change. The resulting contribution to greater multi-lateralism would, in turn, enhance both energy security and national security.

In short, one might analogize the race toward cleaner, more efficient energy supplies—a goal that will be materially assisted by the passage of aggressive multi-pollutant legislation in Congress—to the race to the moon back in the 1960's. No one would suggest that the lunar effort was easy or inexpensive, but nor would anyone suggest that the benefits that accrued from it—including numerous technological breakthroughs, the competitive advantage they provided, and international respect—were not worth the price.

Question 3. Please explain the charts in Attachment 3 of your written testimony and their relevance to our discussion of a multi-emissions approach to reducing power plant emissions.

Response. Attachment 3 of my written testimony (copy attached) contains two charts that are relevant to the committee's deliberation of multi-pollutant emission reduction strategies because the committee often hears testimony suggesting that economic and environmental interests are largely incompatible. Some interests suggest, for example, that the attendant increase in the cost of electricity following the passage of aggressive multi-pollutant legislation would cause the economy to suffer. Following this reasoning, one would necessarily conclude that (1) States which choose to be greener-than-average in their policies must do so at the cost of tolerating worse-than-average State economies; and (2) States with relatively high electricity costs must possess relatively distressed economies. The two charts in Attachment 3 illustrate that the facts clearly contradict this reasoning. Neither corollary is true, and as a result, the underlying assertion of incompatibility is incorrect.

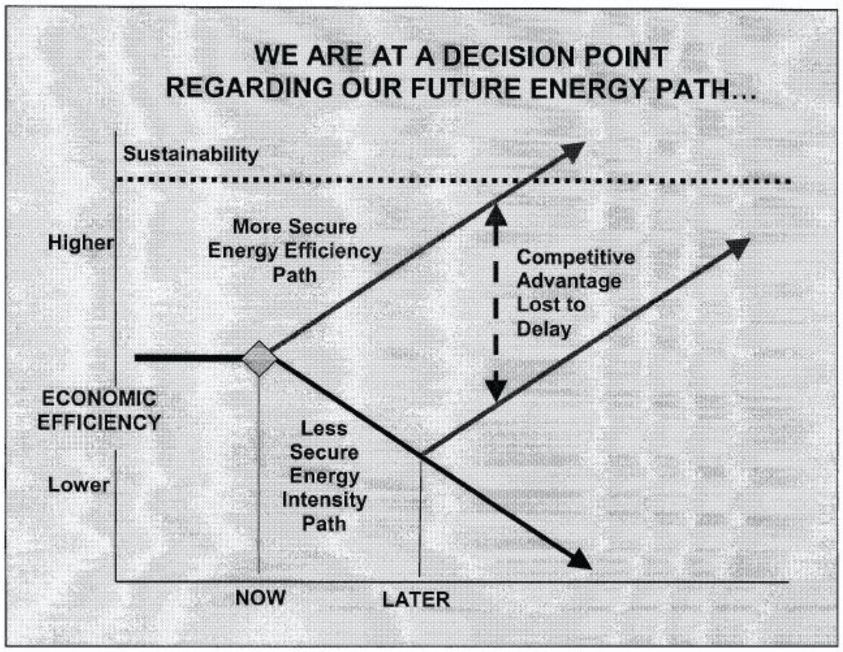
The first chart in Attachment 3, Green and Gold 2000, Rankings of the States, graphically juxtaposes the most recent rankings of the States by the Institute for Southern Studies. The Institute for Southern Studies periodically creates separate rankings of the States based on economic criteria (the basis of the "Gold" ranking), and environmental criteria (the basis of the "Green" ranking). However, when these two rankings for each State are paired on a scatterplot, a clear positive correlation emerges (i.e., "greener" States are more likely to have healthy economies than less green States and vice versa). The conventional wisdom employed by the interests which oppose aggressive multi-pollutant legislation requires the existence of a negative correlation (i.e., "greener" States will be less "gold" and vice versa). The actual data clearly shows that this is not the case.

The second chart in Attachment 3, Per Capita Personal Income versus Utility Average Electicity Price for the 50 States and Washington, DC, shows that opponents' assertion that increased electric rates lead to economic detriment is similarly contradicted by the facts. Using per capita income as a measure of State economic health, per capita income is graphically juxtaposed with State average electric rates. Once again, a positive correlation actually exists between higher per capita income and higher electric rates, rather than the negative correlation presumed to exist by opponents to aggressive multi-pollutant legislation.

Please note regarding both charts that correlation does not address causality. I do not maintain, for example, that higher electric rates cause higher per capita income, or that higher per capita income causes higher electric rates. However, causality is not important to this argument. The argument made by opponents is grounded upon the cornerstone that a negative correlation exists. The simple clear fact that a negative correlation does not exist is sufficient to render opponents' arguments bankrupt.

ATTACHMENT 2.
(of written testimony)

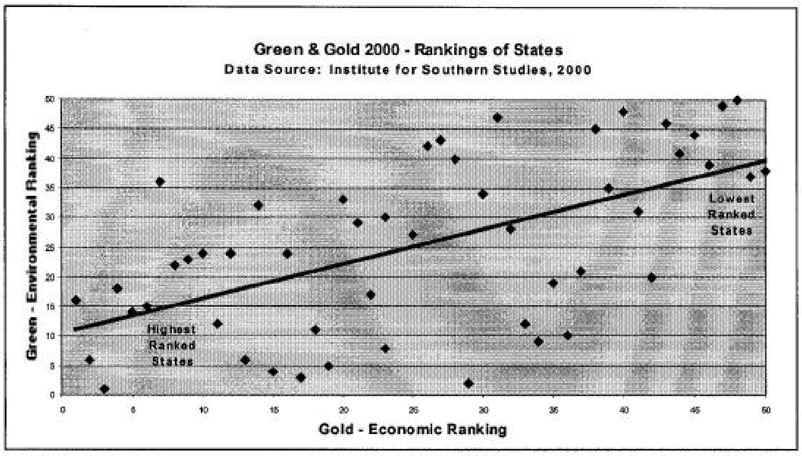
Delaying optimal energy path decisions puts our competitive advantage at risk.



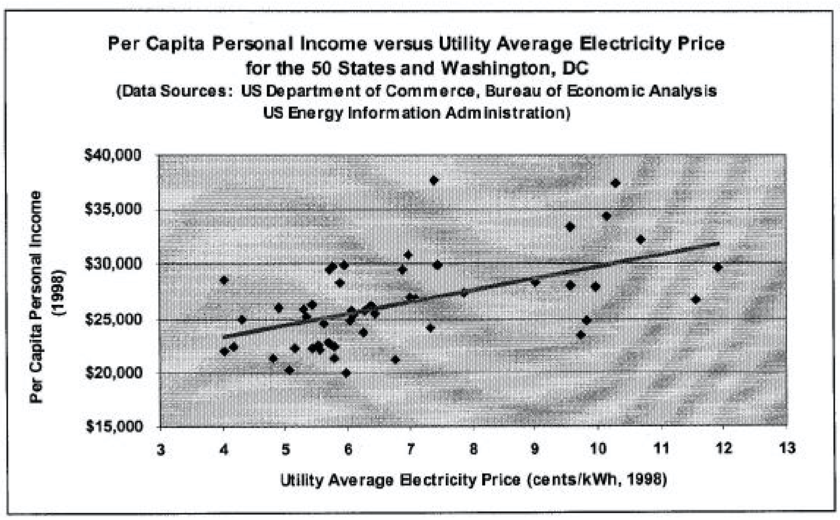
ATTACHMENT 3.

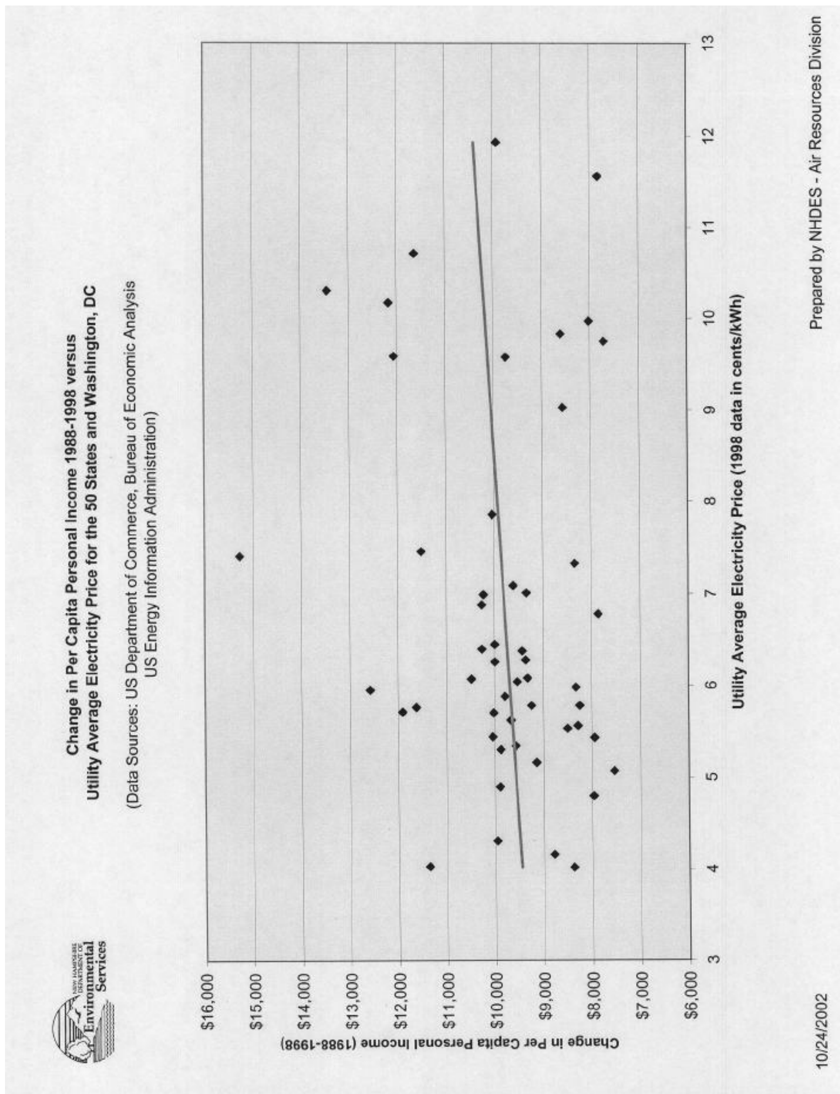
(of written testimony)

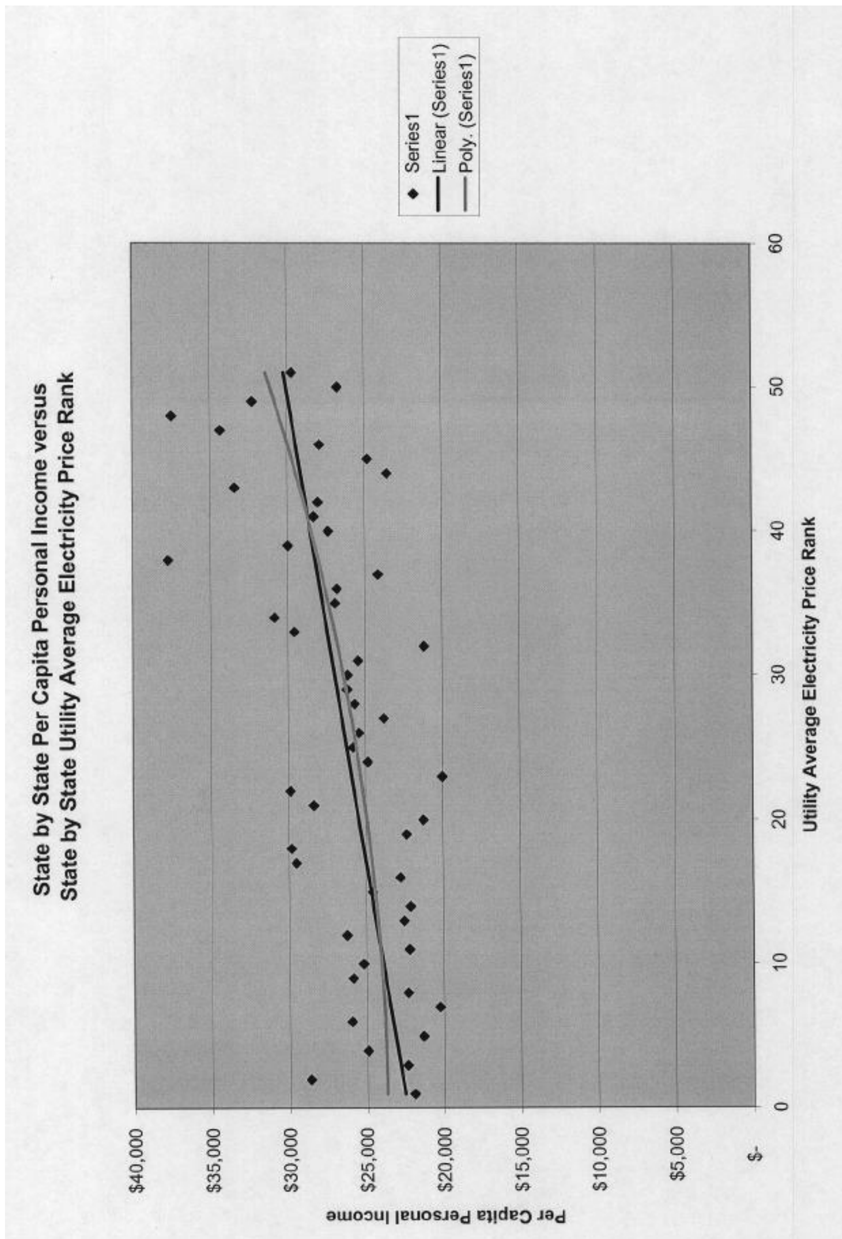
The economic and environmental fortunes of states appear to be *positively* correlated, contrary to conventional wisdom that suggests they are mutually exclusive:

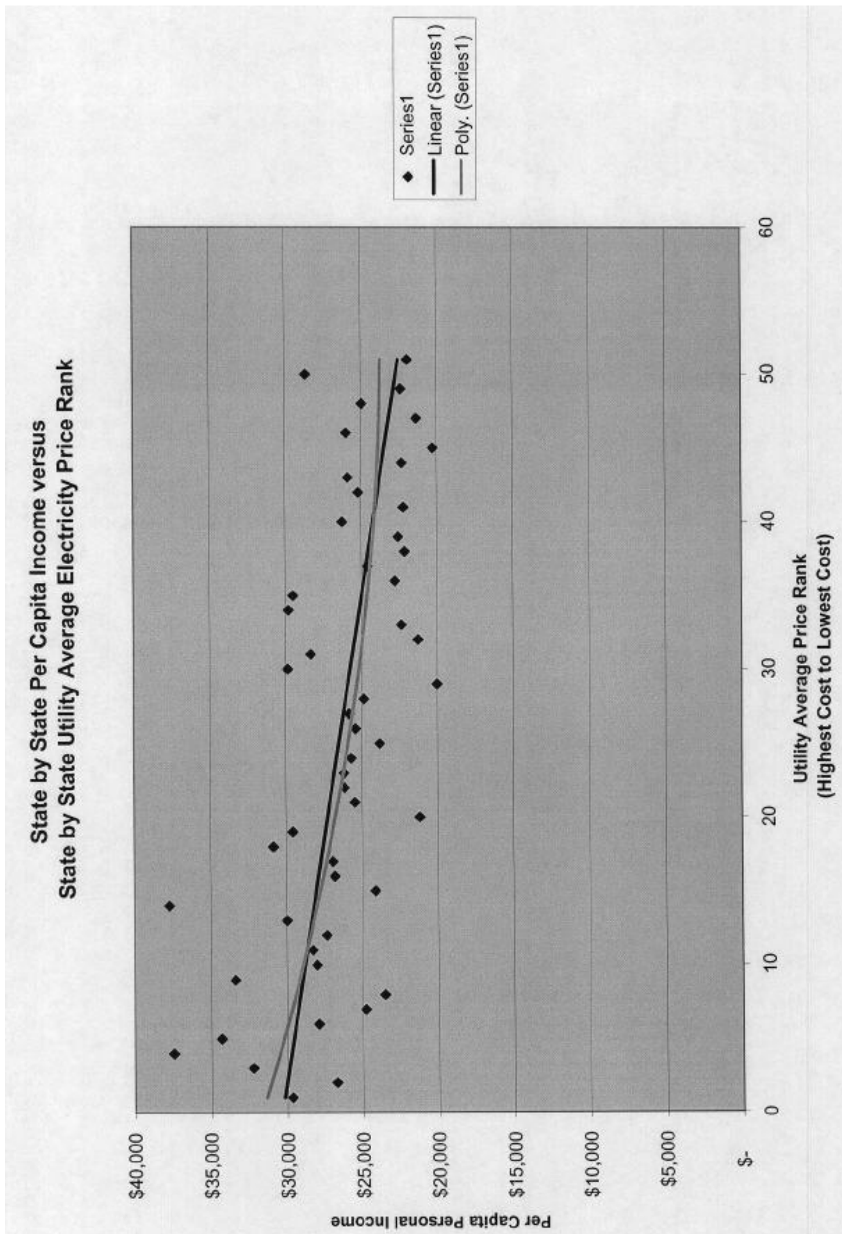


In addition, electricity costs do not appear to be determinative of economic well-being – as measured by per capita income – also contrary to conventional wisdom:




Change in Per Capita Personal Income 1988-1998 versus
Utility Average Electricity Price for the 50 States and Washington, DC
(Data Sources: US Department of Commerce, Bureau of Economic Analysis
US Energy Information Administration)
Change in Per Capita Personal Income (1988-1998)
$16,000
$15,000
$14,000
$13,000
$12,000
$11,000
$10,000
$9,000
$8,000
$7,000
$6,000
3
4
5
6
7
8
9
10
11
12
13
Utility Average Electricity Price (1998 data in cents/kWh)
Prepared by NHDES - Air Resources Division
10/24/2002


State by State Per Capita Personal Income versus
State by State Utility Average Electricity Price Rank
Per Capita Personal Income
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
$10,000
$5,000
$-
0
10
20
30
40
50
60
Utility Average Electricity Price Rank
Series1
Linear (Series1)
Poly. (Series1)


State by State Per Capita Income versus
State by State Utility Average Electricity Price Rank
Per Capita Personal Income
$40,000
$35,000
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$25,000
$20,000
$15,000
$10,000
$5,000
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30
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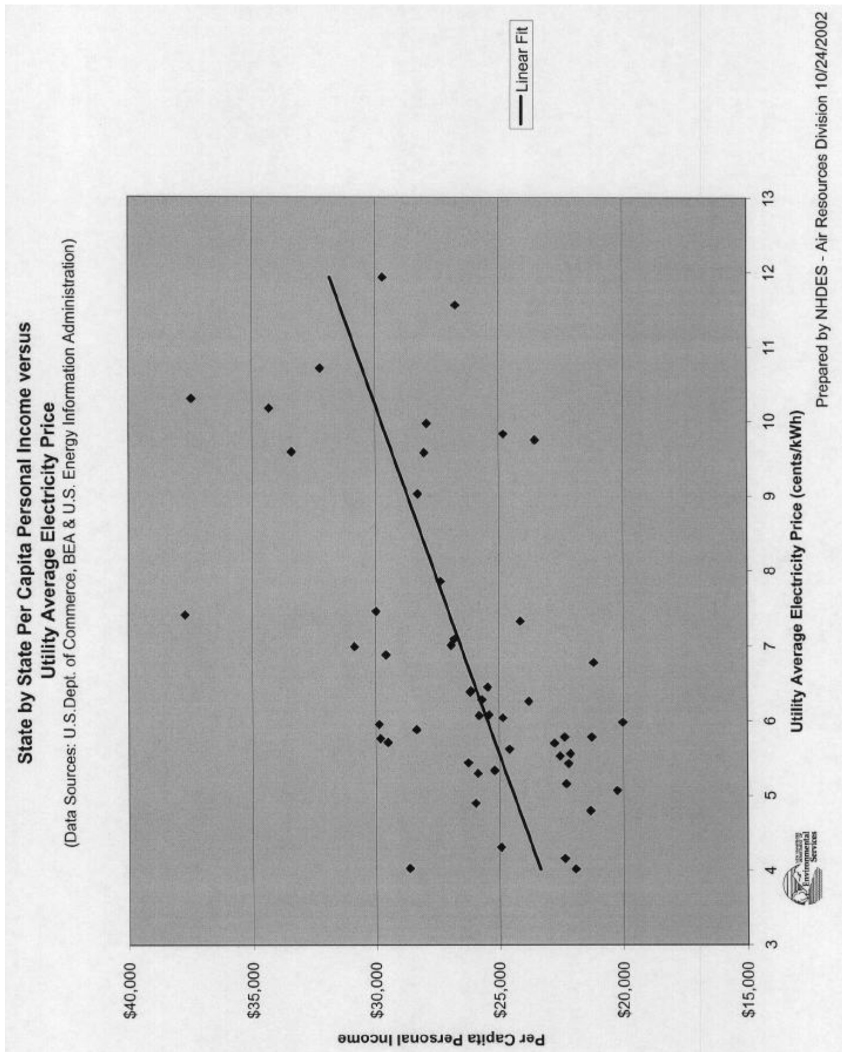
50
60
Utility Average Price Rank
(Highest Cost to Lowest Cost)
Series1
Linear (Series1)
Poly. (Series1)


State by State Per Capita Personal Income versus
Utility Average Electricity Price
(Data Sources: U.S.Dept. of Commerce, BEA & U.S. Energy Information Administration)
Per Capita Personal Income
$40,000
$35,000
$30,000
$25,000
$20,000
$15,000
3
4
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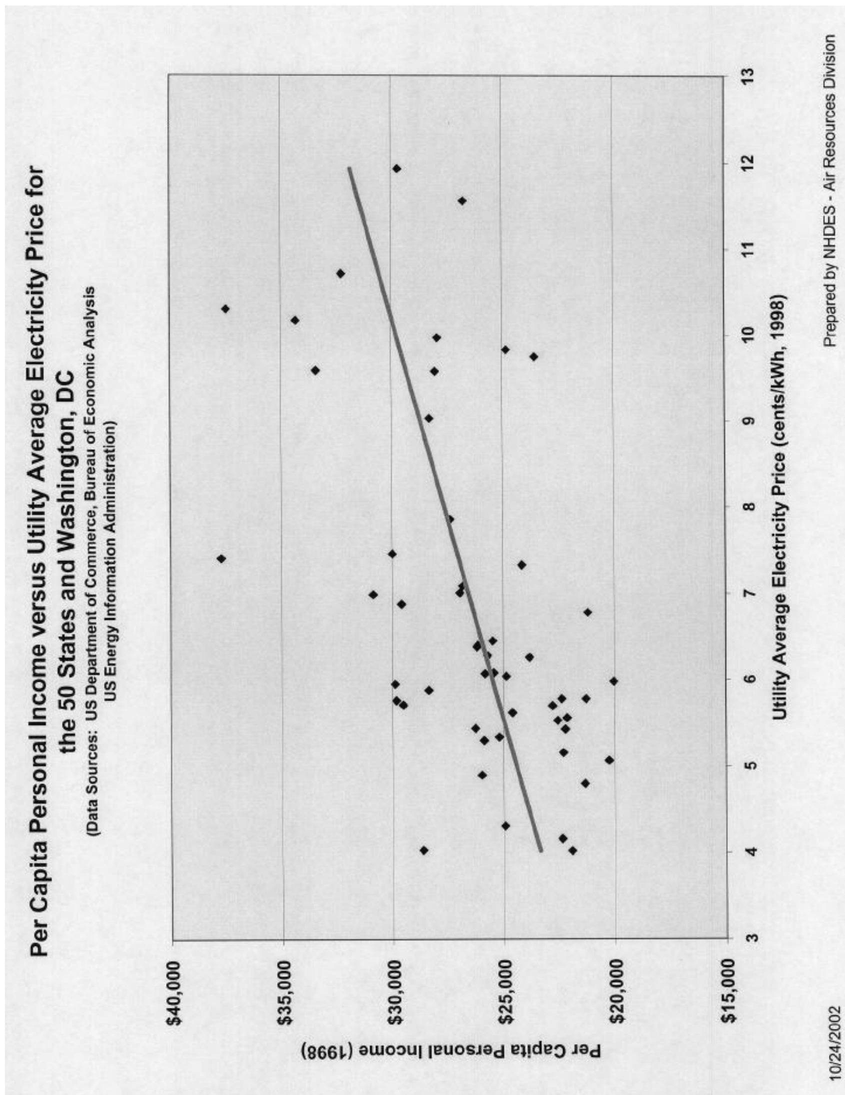
13
Utility Average Electricity Price (cents/kWh)
Linear Fit
Prepared by NHDES - Air Resources Division 10/24/2002


Per Capita Personal Income versus Utility Average Electricity Price for the 50 States and Washington, DC
(Data Sources: US Department of Commerce, Bureau of Economic Analysis
US Energy Information Administration)
Per Capita Personal Income (1998)
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$35,000
$30,000
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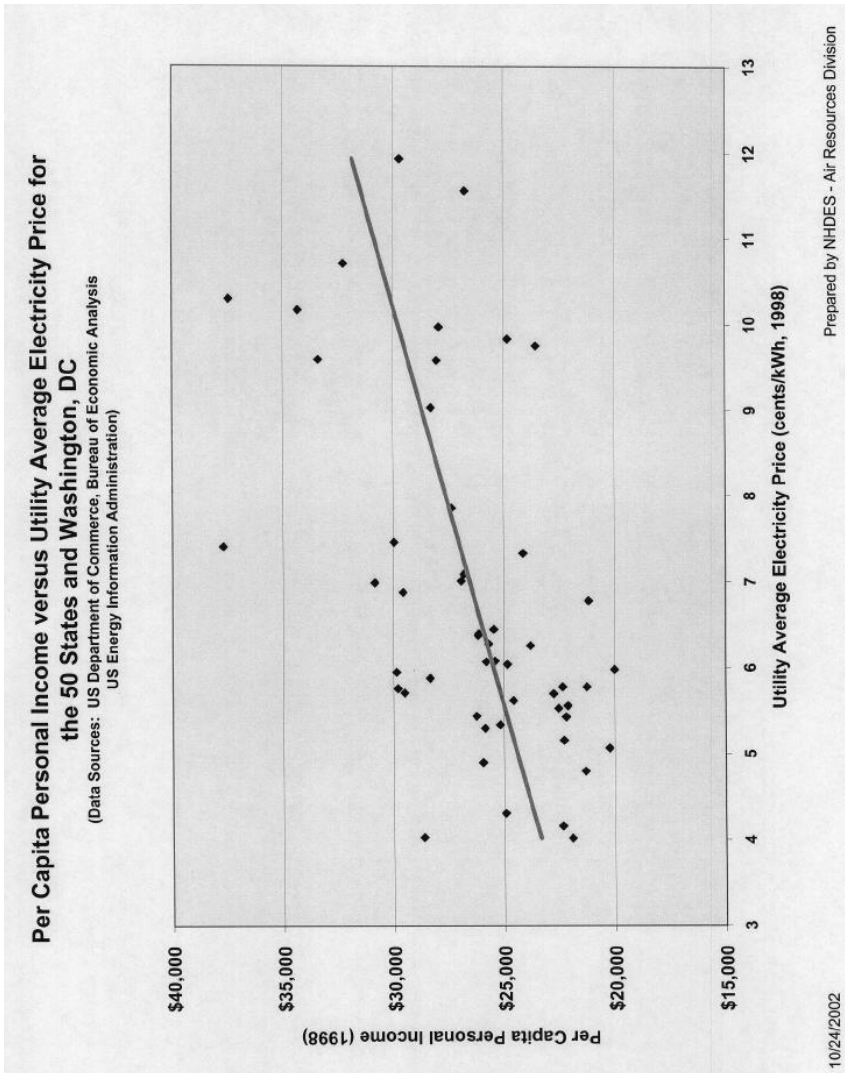
Utility Average Electricity Price (cents/kWh, 1998)
Prepared by NHDES - Air Resources Division
10/24/2002


Per Capita Personal Income versus Utility Average Electricity Price for the 50 States and Washington, DC
(Data Sources: US Department of Commerce, Bureau of Economic Analysis
US Energy Information Administration)
Per Capita Personal Income (1998)
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$35,000
$30,000
$25,000
$20,000
$15,000
3
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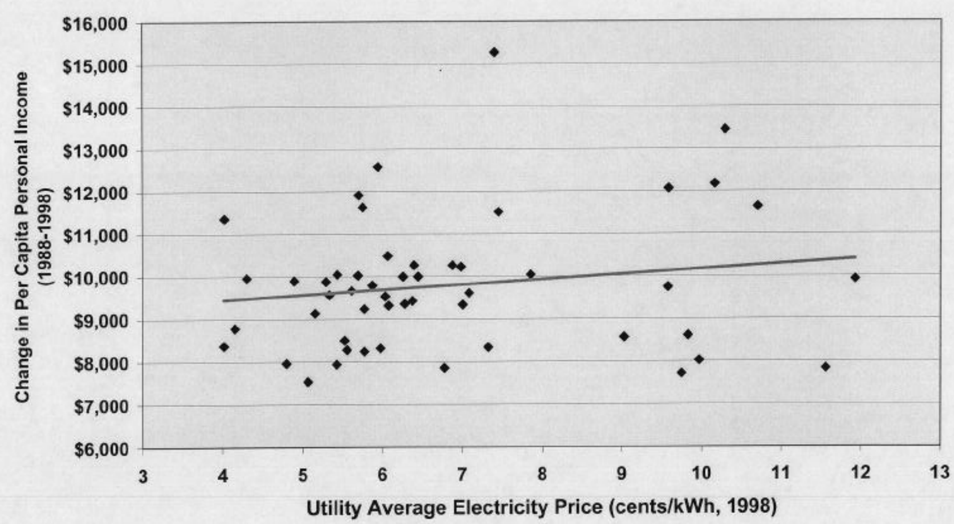
Utility Average Electricity Price (cents/kWh, 1998)
Prepared by NHDES - Air Resources Division
10/24/2002

Change in Per Capita Personal Income (1988-1998) versus Utility Average Electricity Price for the 50 States and Washington, DC
(Data Sources: US Department of Commerce, Bureau of Economic Analysis
US Energy Information Administration)



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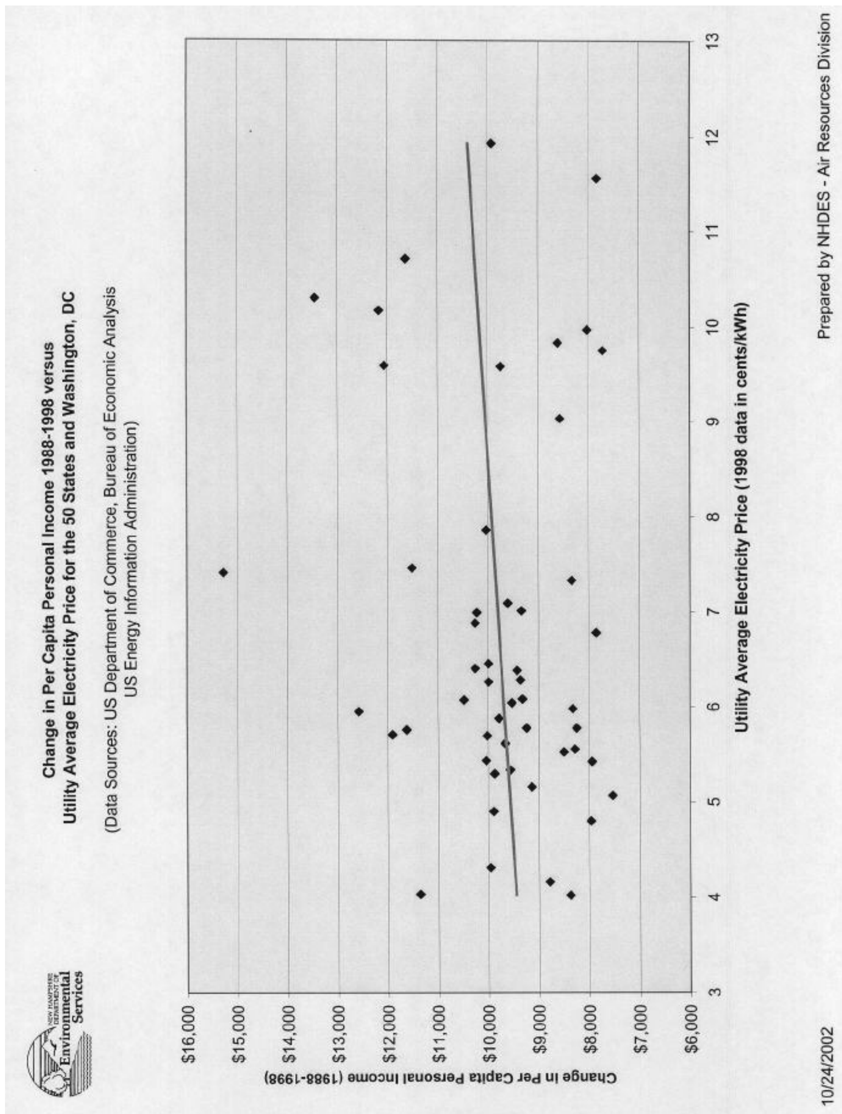
Prepared by NHDES - Air Resources Division



STATEMENT OF DAVE OUIMETTE, MANAGER, AIR POLLUTION CONTROL DIVISION, COLORADO DEPARTMENT OF HEALTH AND ENVIRONMENT

On behalf of the State of Colorado, I thank you for the opportunity to present the State's views on Senate bill 556, The Clean Power Act of 2001. My name is David Ouimette and I direct the activities of the Stationary Sources Program for the State of Colorado. I have worked in this area for the last 17 years.

Colorado is in support of legislation to reduce the health and environmental impacts of air pollution especially if this includes some streamlining of the Clean Air Act by replacing outmoded procedures with stringent standards for reducing air pollution. I will speak more about this streamlining in a moment.

However, prior to commenting on S. 556, I would like to point out the important strides made by Colorado in the recent past in improving air quality. Two years ago we negotiated a voluntary emissions reduction agreement with our local utility. The Agreement is now being implemented and it will result in a reduction of up to 10,000 tons per year of sulfur dioxide. This will aid in reducing the "Brown Cloud" so often seen in the Denver metro area.

In addition to this, we have begun to implement creative enforcement settlements that call for the violator to purchase green power and to implement other measures to improve energy efficiency. Such activities have resulted in small, but measurable decreases in demands for power from traditional electric utilities.

These efforts are above and beyond what is required by the Clean Air Act, and we believe it is important for the committee to keep in mind that States are not only implementing basic requirements but are also taking the initiative to go beyond what is envisioned in the Act.

Moving on to S. 556, we examined the proposed legislation in relation to several broad principles and I would like to first tell you what they are and how they would apply to the proposed legislation. Our principles are:

1. There cannot be "backsliding" from the environmental protections found in current law;

2. Any new legislation should not overlay the new standards or requirements on top of the existing Clean Air Act. Instead, any new requirements need to be integrated into the Act to avoid redundancy;

3. "Certainty" for both regulators and the regulated is crucial. Certainty, in this case, means establishing clear regulations all can readily understand;

4. With respect to the West we believe that there needs to be consideration of our energy demands and our tight supplies.

Let me elaborate on each of these principles.

1. No backsliding

There should be no less, aggregate emissions reductions under a multi-pollutant control strategy than that which would be achieved under the current "command and control" permitting program. We believe this principle can be met through an emissions trading program such as that contemplated by S. 556.

In addition, there should be no detrimental, localized effects which would threaten or exacerbate attainment of the National Ambient air quality Standards. In this regard, States need to continue to have the authority to deal with ambient air problems even after passage of multi-pollutant legislation.

2. New requirements should not merely be added to the existing program

We believe S. 556 is incomplete because it does not eliminating unnecessary parts of the Clean Air Act. For example, we believe that while crucial portions of the New Source Review permitting program, such as modeling and ambient air protection, should be maintained for new sources, we also believe that there are other parts of the NSR program that would be unnecessary. To illustrate, this legislation would likely result in the placement of all facilities under an area-wide or national emissions cap which will, presumably, require pollutant reductions at many facilities. In our opinion, these reductions in the aggregate will exceed that which could be obtained on a facility-by-facility basis, and, if this is so, there is no need for major modification permitting under the New Source Review rules. Therefore, States would no longer need to worry about interpreting what exactly constitutes a "Major Modification" versus "Routine Maintenance, Repair, or Replacement." Concerns about whether repair/replacement of certain power plant components once a year might be viewed as routine maintenance, but twice a year might be a major modification, would no longer exist saving considerable State and local program resources. S. 556 could serve as an excellent tool for cutting through these issues and instead substitute certainty with respect to both environmental gains as well as an understanding of the rules that regulators and the regulated must abide by.

An additional part of the Clean Air Act that should be examined is Regional Haze. Colorado strongly believes that the visibility of our pristine areas should be improved. However, to have both a multi-pollutant bill as well as a regional haze rule apply to utilities will be redundant. Either the Regional Haze rule needs to be implemented or multi-pollutant legislation, but probably not both. At this point we believe that it is still too early to make the determination as to which is best for the West and for improving visibility; both options have benefits and we hope the committee does not forestall either without further discussion. If Congress, in consultation with Western States, determines that eliminating the Regional Haze rule as it applies to utilities is the appropriate policy then more State efforts could be spent on other issues which will require regional collaboration, such as mercury control.

3. Regulatory Certainty

By this we mean that certainty is necessary for both the regulated entities and States who are responsible for implementing and enforcing the rules. One of the issues where Colorado, and most likely other States, have concerns is with respect to our ability to rely upon determinations made by EPA. Without wandering too far afield from our topic today, the numerous informal policies, letters, and written determinations from EPA make implementing the New Source Review program very difficult. In fact we are often subject to critical review from EPA because we made a decision based upon our understanding of the rules only to find we were unaware of the existence of an old interpretive memo. S. 556, with some changes, could provide us with an opportunity to start over and create a new program that will significantly lessen the burden to States to implement these complex rules.

4. Energy Demands in the West

Our last guiding principle is that new legislation should take into account the West's growing power needs. Earlier this year California had tremendous electrical power stresses that affected all of the West. We think it is important that legislation reflect that power supplies in the West are at a crucial juncture. While we made it past this summer without brownouts next summer will again be a challenge for the State. It is because of this future challenge to our generating capacity that we believe we should closely examine whether CO_2 targets are appropriate at this time.

Our concern is that we do not fully understand the implications of the CO_2 rollback provisions and there may be unintended consequences for energy supplies in the West that may be difficult to cope with. Conventional wisdom indicates that the only practical way to reduce CO_2 emissions from power plants while at the same time meeting electricity demand, is to burn fossil fuel more efficiently. This is an admirable goal. However, Colorado, like many Western States, depends upon coal-fired plants for a substantial portion of its generating capacity and these plants have limited ability to improve efficiency. The result is that they may not be able to be run at present levels and some may need to be shutdown. Given our tight energy supply, this could be a major problem for Western States. In lieu of the current CO_2 proposal in S. 556, we believe that an intense study of the impact of CO_2 reductions on power in the West as well as perhaps future hearings on the topic would be advisable to ensure that any reductions agreed upon do not have a secondary effect of causing power shortages or dramatically inflating the cost of power to consumers.

I hasten to add my hope that you do not misconstrue our statements to mean we are not concerned about CO_2 emissions. As you know there are many dimensions to the CO_2 debate beyond just power plants, including increased energy efficiency and use of renewable energy sources in other sectors of our economy. These strategies can effectively reduce overall CO_2 emissions and Colorado has robust, ongoing programs in these areas.

I would now like to walk through some additional comments on the provisions of S. 556. As your staff has already heard at a stakeholders meeting conducted October 4 and 5, the Western part of the country differs from the East with regard to the nature and extent of air pollution problems. For instance, with the exception of California, there are few serious ground level ozone problems out West that would argue for aggressive nitrogen oxide reductions at power plants. While we strongly believe that there should be no backsliding with respect to any proposal, we also believe that there needs to be a common sense approach to regulation such that if an area does not have a problem with a certain pollutant then programs in those areas should be able to focus efforts elsewhere where problems do exist. Therefore, we recommend that the bill be amended to reflect these East vs. West differences where they exist.

As a general proposition, Colorado supports emissions trading in a way that reduces overall costs to society to achieve emissions reductions. Colorado believes that a trading program would be beneficial in two ways, first it would provide incentives for sources to go beyond compliance in order to have marketable credits; and, second, it would allow certain sources to determine what is most cost effective for them in terms of coming into compliance. Therefore, we support the emissions trading provisions in S. 556.

Next, it is our view that the timeframe for making the requisite emissions reductions is impractical especially if these reductions are going to occur with the assistance of a trading program. In order for a 2007 target date to work, Federal legislation will have to pass, a market for emissions trading will have to be set up, EPA will have to promulgate the appropriate regulations, industry will have to determine if it is more cost effective for them to reduce emissions or buy reduction credits, and, States will have to work with their legislatures to make any necessary changes to

State laws. A 5-year timeframe for all of this is insufficient and this issue needs to be addressed.

On the proposed Nitrogen Oxides reductions, again we note that the West does not face the same problems as other areas and, because of this, suggest that any reductions required of power plants be no greater than that which can be achieved by good combustion technology, as opposed to use of add-on control devices. This approach would still provide an environmental benefit to the West with respect to regional haze reduction.

Next, Colorado supports the goal of reducing mercury emissions especially since the benefits of doing so are multi-media, affecting both air and water. However, the proposed legislation requires a 90 percent reduction of mercury from 1999 levels without regard for the emissions reductions that may already be achieved as a co-benefit of operating existing non-mercury pollution control equipment. This may put State regulators in the untenable position of having to enforce a 90 percent reduction without having technology available to industry to achieve that goal. Of further concern to State regulators is that current information suggests to us that the chemistry of Western coal with respect to mercury content and the presence of other minerals is such that mercury emissions are very difficult to control. This is an issue that warrants more study before emission reduction targets are set. Having said this, we do believe that an appropriate reduction number can be placed in legislation in the near future.

Final Recommendation

In the spirit of advancing the discussion on multi-pollutant legislation, we have a recommendation for the committee to consider. That is, in order for States and other stakeholders to more fully grasp the implications of the proposal, additional analysis would be helpful to flesh out various options as to how the multi-pollutant program would work. These analyses would be helpful for each pollutant, for market trading programs, for West vs. the East issues and for ideas to streamline existing Clean Air Act requirements.

Thank you again Mr. Chairman for seeking the views of Western States. We are a large and diverse area and more than one voice is necessary to adequately understand the concerns and environmental issues we face. We believe that the time is right for a multi-pollutant bill and that it would be of great benefit to human health and the environment.

RESPONSES BY DAVID R. OUIMETTE TO ADDITIONAL QUESTIONS FROM SENATOR SMITH

Question 1. How should the Clean Power Act, S. 556, be amended to address the East vs. West differences that you mentioned in your testimony?

Response. One of the big issues facing Colorado and other Western Regional Air Partnership (WRAP) States is the timing of implementation of various requirements with respect to any multi-pollutant legislation versus the Regional Haze Rule. In that regard, as proposals such as S. 556 are discussed and advanced there should be consideration of whether the Regional Haze Rule can either be eliminated with respect to SO_2 targets for power plants or, alternatively, whether such targets can be substituted for ones that may be contained in any multi-pollutant legislation.

Similarly, the legislation must require the EPA to coordinate other requirements of S. 556 with those imposed by the Regional Haze Rule, as that rule is implemented in the West. For example, one of the paths western States may take under Section 309 is to implement an emissions trading program for sulfur dioxide (SO_2). A trading program appears to also be contemplated by S. 556. It makes little sense to have two trading programs existing side by side; one should suffice. WRAP States should be given the option of joining a larger trading program if legislation like S. 556 is passed after implementation of the Regional Haze Rule.

Next, with the exception of California, there is no need for western States to reduce nitrogen oxide emissions to the levels required in the East to meet the ozone standard. Colorado suggests that aggressive combustion control may be adequate and additional technologies such as Selective Catalytic Reduction devices may not be needed for affected power plants. S. 556 should allow for an alternative nitrogen oxide reduction target in the West.

Regarding mercury emissions, as was pointed out in our testimony, western coal differs from eastern coal in ways that make it more difficult to reduce mercury emissions from western coal by using traditional control technologies. Colorado is still compiling information on this issue so it is difficult for us to say precisely what the legislative solution should be. Perhaps the emissions reductions targets should be based upon the type of coal burned rather than establishing just one target that all must meet even if that target may, in some cases, be unachievable. Whatever the approach used, sufficient time should be allowed for scientists to sort through the technology control options to determine what works best under varying, real-life circumstances.

Question 2. Would the benefits from implementing S. 556 in terms of regional haze be greater than those produced or required by the current WRAP process?

Response. This is not an easy question to answer without considerable analysis of various options allowed under the Regional Haze Rule. Our best guess is that the benefits would be similar but not identical, and would depend, in part, on how many States choose to take the section 308 or 309 planning option. That is, how many choose to participate in the emissions trading program under section 309 (if the requirement for one is triggered), and how many choose to go their own way under section 308 and require Best Available Retrofit Technology (BART) on affected facilities. The analysis is further clouded by the fact that the WRAP has not yet addressed pollutants like nitrogen oxides and particulate matter. How these pollutants are controlled could affect the answer to the benefits question.

Additionally, more facilities are brought into the program under the Regional Haze Rule than just power plants. Although power plant emissions predominate, emissions from other facilities contribute to the haze problem. Reducing those emissions will have a net benefit to the environment that will not be achieved by S. 556.

Since the question of benefits is a complex one, Colorado suggests that more analysis should take place to further describe the effects of S. 556 and the Regional Haze Rule before S. 556 is moved forward. In any event we believe that SO_2 should be addressed, but only under one regulatory scheme.

STATEMENT OF BROCK M. NICHOLSON, DIVISION OF AIR QUALITY, NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Good morning. My name is Brock Nicholson, and I am the Chief of Planning for the Division of Air Quality, North Carolina Department of Environment and Natural Resources. I represent the State agency that is responsible for developing, adopting and implementing the State Implementation Plan (SIP) for the State of North Carolina. In this role, I am involved in both regulation adoption and legislation dealing with sources of air pollutants, including utility boilers. I'm pleased to be here today to share some insights regarding the current North Carolina experience with multi-pollutant legislation and how that experience might relate to S. 556 under consideration by this committee.

Background

I would like to begin by giving some background on North Carolina Senate bill, S1078, which many people in our State refer to as the "Clean Smokestacks" bill. Today I will refer to the proposed legislation as the "NC bill." This bill was developed through a series of discussions conducted by the bill sponsors with various environmental groups, the State's two largest utility companies, and the State. The parties to those discussions reached a consensus in support of the NC bill.

Some industrial customers and groups, some agricultural customers and groups, a couple of small environmental groups, and a few other groups and individuals have opposed the NC bill. The part of the NC bill that opponents most frequently cite as the reason for their opposition is a provision that allows the utilities to recover, under the oversight of the NC Utilities Commission, control costs that are just, reasonable and prudently incurred under a cost recovery mechanism different from a normal rate-making case.

In general, the public and newspaper editors have been very supportive. The NC bill quickly passed the Senate 43 to 5 in the spring. It is currently in the House Public Utilities Committee, with cost to ratepayers and the mechanism for cost recovery being the major topics of discussion.

The NC bill requires all coal-fired utility generating units over 25 MW (all 14 plants in our State) to meet in-State aggregate mass emissions caps for sulfur dioxide (SO_2) and nitrogen oxides (NOx). These caps represent actual reductions of 73 percent and 77 percent respectively from 1998 levels. The SO_2 cap must be met in two phases; by January 1, 2009, about a 50 percent reduction; and by January 1, 2013, another approximate 50 percent reduction. The year-round NOx cap is to be met by January 1, 2009. There is an additional requirement that the State annually consider and report to the legislature whether controls beyond those in the NC bill have become both technically and economically feasible. If necessary, the legislature could then tighten the requirements.

For mercury, the NC bill requires an annual assessment of the state of knowledge on the expected co-benefit of mercury control when SO_2 scrubbers and NOx selective catalytic reduction (SCR) controls are installed. By March 2005, the State must recommend to the legislature specific additional control requirements if the co-benefits are less than expected and needed.

For carbon dioxide, there is a similar requirement in the NC bill to report annually to the legislature on control options and to make recommendations by March 2003.

The NC bill directs the State to use all available resources and means, including, but not limited to, negotiation, participation in interstate compacts and multi-state agreements to achieve comparable emission reductions in nearby States whose emissions affect North Carolina.

Comments on S. 556

Our department supports the aggregate emissions reduction approach. This approach would presumably incorporate a cap for each pollutant. Caps can provide for an efficient and flexible program to obtain reductions. Both implementing agencies and emission sources will benefit. This aggregate approach is one that, based on our consideration of and discussions about the NC bill, gives the sources flexibility and certainty to make the business decisions that are in their best interests while they meet the requirements of the legislation. In our view, the aggregate emission reduction approach was a key feature in getting the utility industry to support our bill.

However, caps must be meaningful from the standpoint of protecting public health and the environment. By that I mean that they must be sufficiently stringent to assure that the air quality goals are actually met. Caps must not be set at levels that merely facilitate a "robust" trading system. S. 556 appears to be sufficiently stringent to be meaningful.

However, unlike the NC bill, which requires all of the actual reductions to be in North Carolina, I would presume that S. 556 and the regulations that implement it would allow for a national trading program. Such a program must not only achieve the national aggregate reduction goal, it must also allow local air pollution problems to be addressed in a way that protects health and the environment. There must be a "states rights" or "authority" provision that allows for actual controls (no trading credits) to be applied to specific units for local air quality needs. Since public health protection is an overall goal, States must be able to assure NAAQS attainment even if the overall reductions exceed the national cap or such NAAQS controls "conflict" with the trading program. Such protections must apply not only to NOx and SO_2 emissions and the associated ozone and fine particulate matter, but also to mercury emissions, which can give rise to special local concerns about public health impacts.

Along with a strong Federal mobile source program, a multi-pollutant approach such as S. 556 will be a critical and important centerpiece of a strategy that is necessary for States to meet the NAAQS for 8-hour ozone and fine particles, $PM_{2.5}$. North Carolina, like many others, is a high-growth State in which about 70 percent of the counties where monitors are located violate the NAAQS for 8-hour ozone (aspects of which remain under review by the courts). For $PM_{2.5}$ the corresponding percentages of violating counties is about 50 percent. Our projected future emissions for NOx and SO_2 show that power plants are the substantial majority contributor in both categories. Control of these two pollutants is a must for public health now and in the future. The attached graphic of some recent ozone modeling shows that even with full NOx SIP call controls and all of the expected Federal mobile source controls in place, the NAAQS is not fully met.

Regarding the compliance schedule in S. 556, we observe that in the discussions that led to the NC bill, a consensus between the environmental groups and the two utilities produced a schedule, which is longer than the one in S. 556, but is nonetheless acceptable and would not adversely affect the economy or energy supply in North Carolina. However, as I said before, there has been more discussion in our legislature on cost recovery than on schedule.

As it is in many other States, mercury is a big public health issue in North Carolina. However, considering the uncertainties regarding measuring mercury and the expected, and perhaps relatively large, co-benefits of mercury reduction when scrubber and SCR controls are placed on the bituminous coal power plants, the drafters of the NC bill decided not to specify a control level for mercury. Instead, there is a requirement that the State study the issue of co-benefit, report annually to the legislature and make recommendations to that body by September 2004 on additional controls that would be needed for public health protection from mercury in North Carolina.

With respect to carbon dioxide emissions, the NC bill requires our department to recommend action to the legislature by March 2003. The 2003 date allows time to consider developments at the Federal level and in other States and to understand the benefits of energy conservation, greater use of natural gas, and the developing clean coal technologies including coal gasification.

North Carolina along with Georgia, South Carolina and Tennessee have been charged by their Governors to develop recommendations by March 2002 regarding a multi-pollutant strategy for utilities and innovative energy and transportation strategies that benefit air quality in the four-State region. Although the Southern Air Principles agreement signed by the Governors focuses on NOx, SO_2 and mercury, the States are also studying energy strategies that reduce carbon dioxide. We will also be monitoring the national scene for action on this important subject.

In conclusion, thank you for this opportunity to speak on this very important subject, and I am glad to answer any questions. Thank you again.

Statement of Michael O. Callaghan, Secretary, West Virginia Department of Environmental Protection

Good morning, my name is Michael Callaghan and I am the Cabinet Secretary of the West Virginia Department of Environmental Protection. I appreciate this opportunity to appear before the Senate Environment and Public Works Committee to comment on Senate Bill 556, the Clean Power Act of 2001. As most of you know, our State is one of the top producers of coal in the nation. I can tell you that I spent a large part of my work time dealing with environmental issues related to mining coal; some of the recent developments and initiatives may require my renewed focus on environmental issues related to burning coal.

Among other provisions, the bill calls for regulation of powerplants to achieve a 75 percent SO_2 reduction (beyond Title IV); a 75 percent NOx reduction (1997 base); a 90 percent mercury reduction (1999 base) and a reduction of CO_2 to 1990 emission levels. It may surprise some of you to learn that, with a few caveats, I am strongly supportive of the concept of multi-pollutant emission controls. Many of our environmental protection programs, including air quality, have developed in a somewhat parochial fashion, sometimes leading to a hodgepodge of complex regulations. Traditional command and control approaches often address only individual pollutants, in a facility specific manner. Furthermore, control requirements (or the lack thereof) can vary widely across jurisdictional boundaries within the same airshed. A national multi-pollutant strategy offers a superior environmental solution that could address many of issues relating to the existing and near-term air quality programs, such as visibility improvement (regional haze), 8-hour ozone standards and $PM_{2.5}$ standards.

First, I must state our biggest problem with the present content of S. 556. That is the provision regarding CO_2. We have severe reservations about the inclusion of a national emissions cap for carbon dioxide. Our senior Senator, Robert C. Byrd (in his support of the Climate Change Strategy and Technology Innovation Act of 2001, S. 1008), has stated the case much more eloquently then I possibly could. Furthermore, the entire Senate, in its adoption (by large majority) of Senate Resolution 98 (1997) acknowledged that a climate change treaty must include commitments from developing nations, especially heavy polluters. We recommend removing the CO_2 cap provisions from S. 556 but we also acknowledge that global warming needs to be addressed in a meaningful way, beginning with the approach set forth in S. 1008.

Now, I would like to discuss the NOx, SO_2 and mercury (Hg) reductions. Nearly always when regulations are proposed, there is an outcry from potentially affected industries telling us:

1) Why they can't do it; and
2) How much it would cost (a whole lot) if they could.

Of course, most of us are already hearing feedback to that effect on these provisions. Past experience has indicated that these arguments are frequently overstated but that doesn't mean they should be entirely discounted. I believe the primary issue is the level of the cap. Perhaps the stringency of the proposed caps is overly ambitious. Just as we are trying to effect a more holistic solution to the environmental aspect of the problem, we should concurrently embrace a broader view of the energy and economic impacts of potential strategies. That is where the Department of Energy and the Department of Commerce may provide a more comprehensive view than U.S. EPA alone. We must be especially careful if the cap is contemplated at a technology-forcing level or could lead to comprehensive fuel switching. If appropriate, viable levels of caps are determined, then the next step is ensuring equity. There must be some mechanism to ensure that legitimate issues concerning allocations under the cap(s) are fairly resolved. For example, we still have outstanding issues with EPA on the growth assumed in the NOx SIP Call. We fail to understand how the assumption for zero (1996–2007) new power plants could be considered reasonable.

Ultimately, we would like to see a multi-pollutant strategy that simplifies some of the existing control programs, including New Source Review (NSR) and Prevention of Significant Deterioration (PSD) and one that clarifies enforcement issues under those two programs. Such a strategy should also provide stability and certainty for affected sources by limiting liability (e.g., from Petitions under Clean Air Act, Section 126) for sources that demonstrate adequate compliance with the program provisions.

Thank you again for this opportunity to address the committee.

Statement of the Global Climate Coalition

The member organizations of the Global Climate Coalition, and the over six million businesses, companies, and corporations we represent, thank Chairman Jeffords and ranking member Smith for the opportunity to comment on S. 556, the Clean Power Act of 2001.

The GCC is the voice for business in the climate change debate, representing every major sector of the U.S. economy—including agriculture and forestry, electric utilities, railroads, transportation, manufacturing, small businesses, mining, oil and natural gas, and coal. Our members have participated in domestic and international discussions on the issue of climate change virtually from their beginning. Moreover, the industries represented by GCC members, by their own initiative, are responsible for some of the most innovative and technologically advanced solutions for addressing greenhouse gas emission issues. We remain committed to applying constructive approaches to voluntarily address the climate issue.

As the GCC represents a considerable portion of U.S. economic activity, any proposals to reduce emissions of criteria pollutants or carbon dioxide will have a substantial impact on the way our members do business, the States in which they operate, and on the consumers who use their products to enhance everyday life. Thus, our interest in this legislation is motivated by a desire to better understand the proposals now being considered and to offer the committee the benefit of our experience, wherever that experience can add constructively to the debate in the weeks ahead.

The GCC believes that S. 556, as a proposal to reduce greenhouse gas emissions, is seriously flawed and virtually unworkable. We base this assertion on the fact that the structure of S. 556 is virtually indistinguishable from the Kyoto Protocol, and thus prescribes the same types of unreasonable targets and timetables that would cause immediate and long-term damage to the U.S. economy, workers, and consumers.

Despite a continuing long-term trend of improved energy efficiency in our economy, U.S. economic strength, output, and energy use are directly related to carbon dioxide emissions. At a time when the U.S. economy is in a period of dangerous uncertainty, and thus highly sensitive to negative stimuli, the language regulating carbon dioxide found in S. 556 would increase energy costs, restrict productivity and impair overall growth.

S. 556 would increase the difficulty of maintaining the reliability of the electricity grid that links our homes, businesses, communities, cities, and States. Put simply, achieving the goal of reducing CO_2 emissions to 1990 levels in the year 2007 will require that a significant portion of the nation's electricity sector be shut down. Because America's demand for energy—specifically, electricity—is growing, this strategy would be unwise.

CO_2 emissions from electric power plants, despite efficient technologies and practices, are projected to increase by 217 million metric tons (or 39 percent) over the next 20 years as the demand for electricity increases. While acknowledging that 75 percent of the increase in electricity generation between 1999 and 2020 is projected from natural gas, power sector CO_2 emissions in 2020 are projected to be from 262 to 286 million metric tons above 1990 levels. A reduction of the magnitude required by S. 556 would be impossible to achieve without fencing in a significant portion of the nation's electricity generating infrastructure.

The levels of emissions reduction in S. 556 is on par with those called for under the Kyoto Protocol, which has been rejected by both the Bush Administration and Congress, in part, as being too costly to the U.S. economy. This notion was recently reinforced by the U.S. Energy Information Administration (EIA). In an analysis prepared for the Senate, EIA concluded that a multi-emissions reduction strategy "[meeting] the individual emissions limits for NOx, SO_2, mercury, and CO_2 [in S.

556] will all require significant effort; the CO_2 and mercury limits are likely to be the most difficult to meet."[1] Moreover, "to meet the assumed CO_2 limit, significant switching from coal to other fuels is expected, because low-cost technologies for capturing and sequestering CO_2 are not expected to be widely available" even by 2020, let alone in the 2002–2007 timeframe established in S. 556.[2]

While GCC members, as noted above, remain committed to developing and deploying technologies and innovations that reduce, avoid, or sequester emissions, we oppose a command-and-control approach to the issue precisely for the reasons put forth by EIA: "Among the four emissions that have limits in these cases, CO_2 emissions tend to be the most costly to reduce, largely through the premature retirement of existing coal plants and the increased use of natural gas and renewable technologies."[3]

It must also be emphasized that the scenarios with the lowest costs for reducing CO_2 emissions (as outlined in an earlier EIA report, Scenarios for a Clean Energy Future) are based on assumptions that EIA itself questions. These include assumed changes in consumer behavior that are not consistent with historical behavioral patterns; results from R&D funding increases that have not occurred; and voluntary and information programs for which there is no analytical basis for evaluating the impacts. Furthermore, some of the policy assumptions in Scenarios for a Clean Energy Future require legislative or regulatory actions that may not be enacted or, if enacted, may become effective at later dates than assumed.

If the Committee on Environment and Public Works reports out S. 556, it does so in the face of clear evidence the U.S. manufacturing sector has entered a downturn. Indeed, the manufacturing sector has been in recession since Fall 2000, triggered, in part, by the sharp increase in overall energy prices, particularly for natural gas and a concern over energy-supply reliability. During the last 7 months of 2000, more than 200,000 net manufacturing jobs were lost, largely due to sudden energy price increases. This human cost, combined with the $115 billion in higher energy prices paid by all energy consumers during 2000, cut about one-half of a percentage point off anticipated GDP growth just last year.

Energy-intensive industries, such as steel, auto making, chemistry, paper, coal mining and oil and gas extraction are especially affected by rises in energy costs. These costs vary widely across States and regions, as these industries tend to be located unevenly across the country. The East South-Central and East North-Central regions, heavy in coal mining and energy-intensive industry, shoulder a disproportionate share of the burden on manufacturing. Short supplies of electricity and natural gas, and the world price of petroleum, already have contributed to current economic hardships. In addition, the requirements of S. 556 would apply to many highly efficient combined heat and power units and boilers at industrial facilities, which would bear significant capital costs in addition to rising energy costs.

S. 556 would permanently impose these conditions on the economy by forcing electric generators to choose between investing large amounts of capital to continue using coal or building the new facilities necessary to switch to more expensive natural gas—perhaps jeopardizing the energy system's reliability during the transition. This, in the words of one manufacturing trade association, is a "Hobson's choice" not acceptable "absent an overwhelmingly compelling argument that human health, the environment or national security requires it."[4]

This last statement prompts the GCC to question the need to establish policy on emissions reductions whose extent reaches far beyond even the Clean Air Act. According to the latest Environmental Protection Agency (EPA) report on national long-term trends in air pollution, "the trend toward cleaner air has continued since EPA's formation in 1970, while during the same time, the gross domestic product increased 158 percent, miles traveled by cars and trucks increased 143 percent, and energy consumption increased by 45 percent."[5] The government's environmental arm has said that air is getting cleaner. There is every reason to expect, with government-private sector partnerships, and industry's continued commitment to voluntary approaches, that this trend will continue to be the norm in the United States even in the absence of legislation such as S. 556.

As we have stated many times in the past, answering the challenge posed by climate change is a long-term proposition that will require new technologies and new

[1] Strategies for Reducing Multiple Emissions From Electric Power Plants, U.S. Energy Information Agency, October 2001, x.
[2] Ibid.
[3] Ibid.
[4] Position on Multi-Emissions Legislation, National Association of Manufacturers, October 2001.
[5] Headquarters Press Release, Environmental Protection Agency, October 18, 2001.

ways of doing business. However, S. 556, which implicitly assumes the development, deployment, and consumer adoption of renewable energy and energy-efficient technologies by 2007, is unrealistic in this regard.

And it is a simple fact that renewable energy has not developed in such a way as to sustain the nation's growing appetite for energy. Even if it had, there are no assurances of affordability or that the public would embrace renewables. In a 2000 analysis of the Climate Change Tax Initiative, EIA argued that consumers would be "reluctant to invest in more expensive technologies with long payback periods to recover the incremental costs," and that energy efficiency is "only one of many attributes" they consider when purchasing appliances.

GCC also believes that this particular aspect of the multi-emissions issue suffers from the tendency by many to express overly optimistic assumptions about emissions control technology efficiencies on the one hand, and too conservative estimates of future growth in electricity demand on the other.

The Global Climate Coalition believes that S. 556 should be set aside in favor of a cooperative approach with the Bush Administration on this issue. The Administration's cabinet-level review of climate change policy, and its planning on power plant emissions, are ongoing; it should at least be given the time to complete its work and propose policy. S. 556's resemblance to the Kyoto Protocol—which has been dismissed by President Bush and effectively opposed by the Senate in the form of S. Res. 98—virtually ensures that it will be neither enacted nor signed into law. In the months ahead, we look forward to continuing to work with both the committee and the Administration in fashioning common sense policy approaches to these very complex issues.

STAKEHOLDER MEETING HELD BY ENVIRONMENT AND PUBLIC WORKS COMMITTEE OCTOBER 4-5, 2001

List of Participating Organizations

The Adirondack Council
American Chemistry Council
American Forest and Paper Association
American Lung Association
American Public Power Association
Clean Air Task Force
Clean Water Action (Connecticut State Chapter)
Edison Electric Institute
Electric Power Supply Association
Environmental Council of the States
Environmental Defense
The Izaak Walton League of America (Minnesota State Chapter)
National Environmental Trust
National Parks Conservation Association
National Rural Electric Cooperative Association
Natural Resources Defense Council
Northeast States for Coordinated Air Use Management (NESCAUM)
Ohio Environmental Council
Ohio Environmental Protection Agency
Southern Alliance for Clean Energy
State and Territorial Air Pollution Program Administrators/Association of Local Air Pollution Control Officials (STAPPA/ALAPCO)
Union of Concerned Scientists
U.S. Public Interest Research Group
Western Regional Air Partnership

AGENDA

Purpose of the Meeting—To identify issues, provide an opportunity to offer constructive proposals, and in other ways elaborate upon matters that need to be resolved in moving forward on multi-pollutant legislation in the 107th Congress.

Thursday, October 4, 2001

- 9:30 a.m.—Welcome and Opening Remarks by Senators Jeffords, Smith, and Voinovich
- 9:45 a.m.—Introductions and Opening Remarks by Senate EPW Staff
- 10:00 a.m.—Review Agenda and Ground Rules; Meridian Institute

- 10:10 a.m.—Technical Overview by EPA—current Acid Rain/NOx SIP Call program functioning, effectiveness, and cap/trade programs

The objective for each of the following four agenda items is to focus the discussion on how to solve environmental problems associated with the four pollutants. Thus, Day One will be focused more on the initial issue identification objectives of the meeting while still encouraging constructive proposals to emerge. There will be more time to explore such proposals on Day Two.

- 10:45 a.m. Business As Usual

Discussion of future under the Clean Air Act as written.

- 11:45 a.m. Lunch Break
- 12:45 p.m. Sulfur dioxide

1. Levels/timing
2. Technology
3. Trading/markets
4. Compliance/measurement

- 2:00 p.m.—Nitrogen oxides

1. Levels/timing
2. Technology
3. Trading/markets
4. Compliance/measurement

- 3:15 p.m.—Mercury

1. Levels/timing
2. Technology
3. Trading/markets
4. Compliance/measurement

- 4:30 p.m.—Carbon Dioxide

1. Levels/timing
2. Technology
3. Trading/markets
4. Compliance/measurement/standards

- 6:00 p.m.—Adjourn

Friday, October 5, 2001

- 9:00 a.m.—Summary and reflections on the prior day's discussion

Recognizing that aspects of the "cross cutting" issues of "flexibility" and "allocation" are likely to arise during Day One, the objective of Day Two, in general, is to build upon the constructive ideas that may have been expressed during the pollutant-by-pollutant discussion. In addition, specific subtopics, as listed, will also be discussed.

- 9:30 a.m.—Flexibility

1. Incentives
2. Regulatory Relief
3. Compliance

- 10:45 a.m.—Break

11:00 a.m.—Allocation Issues

1. Baseline
2. Auction
3. Generation Performance Standard
4. Output Based
5. Declining Cap

- 12:00 noon—Break for Lunch
- 1:00 p.m.—Open Session: Continue discussion of flexibility and/or allocation issues or followup discussion of concrete constructive proposals made at the meeting.
- 2:00 p.m.—Wrap up and Summarize Outcomes of the Meeting
- 2:30 p.m.—Adjourn

STATEMENTS SUBMITTED BY PARTICIPANTS OF THE STAKEHOLDER MEETING

STATEMENT OF AMERICAN CHEMISTRY COUNCIL

POSITION ON "MULTI-POLLUTANT" LEGISLATION

The American Chemistry Council is pleased to participate in the Senate Environment and Public Works Committee's stakeholder dialogue on "multi-pollutant" legislation. The American Chemistry Council represents the leading companies engaged in the business of chemistry. Council members apply the science of chemistry to create innovative products and services that make people's lives better, healthier and safer. The business of chemistry is a $460 billion enterprise and a key element of the nation's economy. It is the nation's largest exporter, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies also invest more in research and development than any other business sector.

Council members support protecting human health and the environment, including the air resources of the nation. Over the past twenty-five years, Council members have made their operations more energy efficient and reduced their air emissions. During that period, Council members constructed many "combined heat and power" systems—a significantly more efficient way of producing power than conventional electric generating units—and co-generation units produced 80 billion kilowatt-hours of electricity in 1998—and our members contributed nearly 45 billion kilowatt-hours of that total. These and other projects helped make the chemistry business 41 percent more energy efficient per unit of output than it was in 1974. Council members have also dramatically reduced air emissions while increasing production. For example, core Toxic Reduction Inventory (TRI) emissions are down 63 percent since 1988 even though production was up 27 percent. According to EPA data, ACC members also led all of industry in cutting emissions of 30 key HAPs—including mercury, since 1990. Likewise, ACC members have aggressively reduced SO_2 and NOx emissions.

"Multi-pollutant" legislation appears to be driven by three primary issues. First is the need to spur development of additional electric generating capacity. Second, is the dissatisfaction of certain stakeholders over the degree of emissions control achieved by the utility industry. Finally, is the willingness of certain portions of the utility industry, fueled by enforcement actions over alleged violations of the Act's New Source Review provisions, to consider a different regulatory scheme to address emission reductions of certain substances.

As the nation's major manufacturers of chemical products, many of which are derived from fossil-fuel feedstocks, Council members were significantly affected by the recent energy shortage. Its impact on the price of natural gas, which the chemistry business uses as both a fuel and a feedstock for making its products, significantly interfered with plant operations, causing plant closings, lay-offs, and cutting our exports by half. Being a major purchaser of electricity as well, we strongly favor maintaining a diversity of fuel sources, e.g., coal, oil, nuclear and natural gas, as a way of keeping energy supplies balanced and affordable.

Council members are highly regulated under the Clean Air Act and are constantly upgrading their facilities to comply with its various provisions. Our members (and others) are reducing mercury emissions pursuant to section 112 of the Clean Air Act, NOx emissions through Section 126 and EPA's NOx "SIP call" and some have opted into the Act's Title IV acid rain program.

Complying with the Clean Air Act has been difficult and costly for our members. Consequently, we have called upon EPA to revise some of its policies, including its implementation of the New Source Review (NSR) program which has stymied our ability to increase energy production, improve energy efficiency, and reduce emissions at our facilities. "Multi-pollutant" legislation—which will affect many CAA programs, yet only narrowly address the current problems with NSR, is not a substitute for complete NSR reform. Nonetheless, we are interested in innovative approaches that can ensure a consistent energy supply, improve the overall functioning of the Clean Air Act, and provide our members with cost effective options to continue improving their operations consistent with their commitment to Responsible Care(r), the industry's voluntary initiative to make our operations safer, cleaner and more responsible to the communities in which they operate. In this spirit, we suggest that the stakeholders consider the following important issues that should be resolved in the drafting of this legislation:

SUGGESTED QUESTIONS FOR CONSIDERING "MULTI-POLLUTANT" LEGISLATION

I. Basis and Purpose of Legislation

A. What are the problems, their cause, and scientific basis that the legislation aims to correct?

B. Does sound science underlie the diagnosis of the problem?

C. Is the current law unable to address the problem?

D. How will a "multi-pollutant" approach successfully address the problem?

II. Coverage

A. What sources and pollutants should be included in the legislation?

B. Does including controls for CO_2 unduly complicate passage of the bill?

III. Program

A. What level of control is needed to adequately address the problem?

B. Should the degree of control be based on a percentage reduction or specify a particular level of performance? If a percentage reduction, what should be the baseline for measurement?

C. What are the compliance mechanisms?

D. If facilities are required to achieve these levels of control, what provisions of the Clean Air Act should no longer apply to them and for how long?

IV. Timing

A. By what date will the facility be required to achieve the emission reduction?

B. If the bill applies to different source categories, will they all have the same compliance date?

V. General Policy Issues

A. How will the legislation affect the supply of natural gas and what impacts will that have on the manufacturing and residential sector?

B. How will local/State air quality problems be addressed if "multi-pollutant" legislation is enacted, e.g., if the degree of reduction is not sufficient to achieve attainment of ambient air quality standards, who will be required to bear the burden of achieving additional reductions and how will previous activities by sources to reduce emissions, be considered?

C. Does the "multi-pollutant" approach make sense for industries outside the utility sector?

D. How will combined heat and power units be addressed through this approach?

SUGGESTED PRINCIPLES FOR DRAFTING "MULTI-POLLUTANT" LEGISLATION.

If, after careful consideration of these questions, the Committee decides that "multi-pollutant" legislation is needed, the American Chemistry Council suggests that the following principles guide its development.

I. Coverage: "Multi-pollutant" legislation should cover only those industries and sources that want to participate in such a program by specifying those sources that opt in during the drafting of the bill. Generating units in other industries should be given the opportunity to voluntarily participate in the program. If the legislation addresses emissions from utilities, then Congress should adopt the definition of utility generating units in Title IV (acid rain provisions) of the CAA. This approach must be consistent with NAAQS implementation.

II. Program: "Multi-pollutant" legislation should only apply to emissions of SO_2, NOx and mercury and should not address CO_2. The legislation should establish emission levels for each of these three pollutants that require reductions to specified levels, needed to achieve specified goals, such as attaining National Ambient Air Quality Standards, considering technological limitations, costs, equity, and the effect on energy supplies such as natural gas. The participating industry or facility could achieve those emission levels through onsite reductions or through market oriented programs such as purchasing offsets and emissions trading. Emission levels should accommodate using a diversity of fuel sources, including coal, oil, nuclear and natural gas and must not discourage or restrict the use of any currently available fuels. It also should not result in non-participating facilities having to achieve more stringent reductions than the levels specified in the legislation in order to attain or maintain air quality. Last, any industry or facility participating in the program would be exempt from NSR, NSPS, BART, NAAQS, NESHAP for Hg, and other specified provisions of the statute for a specified period.

STATEMENT OF AMERICAN LUNG ASSOCIATION STATEMENT ON THE FOUR POLLUTANT LEGISLATION

The American Lung Association supports S. 556, the Clean Power Act. This comprehensive legislation will reduce and cap emissions of all four major air pollutants from power plants. We support the emissions targets and timetables in S. 556. Power plant emissions are seriously damaging public health and the environment.

The explicit recognition by S. 556 of the sanctity of the Clean Air Act is the cornerstone of the American Lung Association's support. Subsection 132 (e) states, "This section does not affect the applicability of any other requirement of this Act."

National Ambient Air Quality Standards

In July 1997, EPA issued new National Ambient Air Quality Standards (NAAQS) for ozone and fine particles. This action was based on EPA's findings that available research data showed that millions of Americans are exposed to levels of ozone and fine particles that are unhealthy and cause or contribute to illness, hospitalization and premature death.

New Research Confirms the Need to Implement the New Health Standards

Research programs on the health effects of particulate air pollution have been carefully coordinated to advance our understanding of the most important scientific issues. These studies show:

- Six dozen new short-term studies confirm the effects of particle pollution on premature death, hospitalization, emergency room visits, respiratory and cardiac effects;
- Recent laboratory and chamber studies of animals and humans have elucidated possible biologic mechanisms by which particulates contribute to mortality and morbidity;
- Studies demonstrate that infants and children, especially asthmatic children, the elderly, and those with heart or lung disease are especially sensitive to the effects of fine particle pollution.

Recently, more research has begun to focus on the effect of long-term, repeated exposures to high level of ozone. These include:

- A study of college freshmen who were lifelong residents of Northern or Southern California found a strong relationship between lifetime ozone exposure and reduced lung function.
- A study of 1,150 children followed for 3 years suggest that long-term ambient ozone exposure might negatively affect human lung function growth.

A 10-year study of 3,300 school children in Southern California communities found that girls with asthma, and boys who spent more time outdoors experienced diminished lung function in association with ozone.

Hundreds of Counties Violate the 8-Hour Ozone NAAQS

An examination of AIRS monitoring data for 1997–1999 found that 333 counties in 33 States have a 3-year average that exceed the 8-hour ozone NAAQS. Nearly 117 million people live in these counties. These data also show that in nearly all the States east of the Mississippi river 50 percent or more of the monitored counties violated the 8-Hour NAAQS.

Many of the Same Areas May Have Unhealthy Levels of Fine Particles

The fine particles monitoring system has only been operational since 1999. However, preliminary EPA data show a pattern of high fine particle levels across the eastern United States.

Protect the Clean Air Act

The Clean Air Act should not be weakened. The strict enforcement of the Clean Air Act enjoys broad public support. A broad consensus acknowledges that the existing provisions of the Clean Air Act have been very successful at reducing air pollution amid significant economic and population growth. The revised ambient air quality standards for fine particulate and ozone will create additional obligations to reduce pollution. Any Clean Air Act amendments must recognize the public health imperative of reducing criteria air pollutants and provide the necessary emissions reductions to achieve and maintain these air quality standards as expeditiously as practicable and no later than the deadlines required under the existing statute. We oppose proposals to repeal or weaken existing Clean Air Act requirements designed to protect and enhance regional and local air quality.

Statement of The American Public Power Association

The American Public Power Association (APPA) is the national service organization representing the interests of the more than 2000 State, municipal and other local government-owned electric utilities in the United States. Publicly owned electric utilities are among the most diverse of the three electric utility sectors, representing utilities in small, medium and large communities in 49 States, all but Hawaii. Seventy-five percent of public power utilities are located in cities with populations of 10,000 or less. Overall, public power utilities provide approximately 14 percent of all kilowatt-hour sales to ultimate consumers in the United States.

APPA feels that, done correctly, a market-based program for controlling multiple air pollutants such as nitrogen oxides, sulfur dioxides and mercury may prove more effective than the current piecemeal approach to achieving environmental goals. However, any such program must yield equal or superior environmental quality in a more cost-effective manner. We believe that one key element to making this approach more cost effective is to eliminate programs made redundant by this new approach. The New Source Review (NSR) program may well fit in this category. The underpinning goal of this integrated approach should be to achieve emission reductions at lower costs while assuring electric reliability, reasonable electricity costs, and energy security. Recent Energy Information Administration (EIA) studies indicate that this is possible for SO_2 and NOx and, if done correctly, mercury, however, these same studies indicate that including the greenhouse gas carbon dioxide (CO_2) as classic air pollutant in a multi-pollutant control program would have severe economic and energy security consequences.

APPA believes that a greenhouse gas strategy should be developed as a separate program that considers (1) the discrete characteristics of greenhouse gases (as distinct from the identifiable public health consequences of pollutants), (2) recognizes that absent affordable technologies to capture ghgs it poses a technological challenge, and (3) takes into account the difference in timelines (SO_2, mercury and NOx are pollutants that pose short-term health threats while ghgs that could potentially affect climate can be addressed over much longer periods of time to achieve results by the end of the century).

Unlike health-based pollutants that have measurable cost/benefit ratios and emissions reduction technologies, there are no similar benchmarks by which to measure the costs and benefits of carbon capture technologies available to assist industry and policymakers in establishing policies for the reduction of these gases. The technological challenges posed by CO_2 reductions in particular, the fact that CO_2 is not a pollutant that poses imminent health risks, and the fact these CO_2 emissions and reduction policies are directly related to electricity generation and energy policy, strongly suggest placing any Federal oversight or management responsibility of such gases within the U.S. Department of Energy.

APPA believes that as policymakers deliberate reform to the Clean Air Act regulatory program in conjunction with tightening emissions limits for SOx, NOx and mercury, critical attention must be given to the economic, consumer electric utility rate, electric reliability and energy security impacts of requiring such limits. Overall, reduction obligations need to be tied to overall impacts on human health, the environment, the nation's energy needs and economic growth. We are compelled to ask whether appropriate and accurate analyses of these impacts have been done. In addition, proper implementation of air quality programs must be based on sound science and must provide quantifiable benefits.

Following is a list of principles for consideration during the multi-pollutant control program stakeholders meeting. Cost-effective reform of the Clean Air Act to improve air quality should:

- Limit the emissions of NOx, SO_2 and mercury only. A multi-pollutant control program should not address greenhouse gas emissions, including CO_2. The Department of Energy should address voluntary approaches to CO_2 and ghg emissions.
- Move away from unit-by-unit, command and control approaches to programs that integrate flexible options such as emissions cap-and-trade strategies. Trading programs must recognize and credit utilities that have already made investments in air pollution control technology and newer 'cleaner' generating units. Over 56 percent of public power's operating coal units are less than 20 years old.
- Allow flexible market-based mechanisms with broad emissions trading and banking within and between utility systems.
- Promote technology and incentive based programs designed to foster development and greater use of clean coal technologies and renewable energy programs. Any cost-share or incentive program that may be developed to offset the cost of emissions controls under a multi-pollutant control program must provide benefits to all affected electric utility sectors on a competitively neutral basis.
- Include adoption of a multi-pollutant control program that is tied to Clean Air Act regulatory reforms designed to remove and replace existing programs that would be made redundant by a multi-pollutant approach. CAA reforms, at the very least, should include changes to the New Source Review program. Unit specific technology controls imposed under NSR and New Source Performance Standards (NSPS) programs significantly limit the emissions trading flexibility required for companies to achieve greater reductions in the most cost-effective and efficient manner. Underlying programs, including the NOx SIP call, Section 126 rulemakings, the proposed regional haze rule and new rules for ozone and particulate matter must be removed entirely or, in some cases, streamlined and coordinated with the new program to assure greater certainty for future planning.

In conclusion, APPA supports efforts to bring a rational approach to what currently is an uncoordinated and overly costly patchwork of new Clean Air Act regulatory requirements. Public power believes that additional ways to prevent stranded investments and reduce the uncertainties of incremental ratcheting of emission reduction requirements must be identified and implemented wherever reasonably practical.

STATEMENT OF AMERICANS FOR EQUITABLE CLIMATE SOLUTIONS

Americans for Equitable Climate Solutions (AECS) is committed to developing and promoting policies by which the United States can achieve economically efficient solutions to the problem of climate change. The organization has 501(c)(3) status and is financially supported by both individual donations and foundation grants.

AECS regards the Stakeholder meeting being conducted by the Senate Committee on Environment and Public Works as an important step toward developing a viable U.S. policy for protecting the climate system. We appreciate the Committee's invitation to comment on the aspects of the multi-pollutant legislation relevant to climate system protection. Items "D", "E", and "F" on the Committee's meeting agenda are directly relevant to the concerns of AECS.

There are three basic issues that AECS believes are of paramount importance in shaping the climate related provision of a multi-pollutant bill. Each of these large issues also involves a few important sub-points. The main points are:

1. The climate related provisions of an electric utility sector multi-pollutant bill must be structured to facilitate and encourage, rather than inhibit, the eventual transition to an eventual economy-wide domestic carbon emission control policy. The electric power sector accounts for only about one third of domestic carbon emissions. So clearly an electric power emission control bill represents only a start toward an adequate policy.

a. A comprehensive economy-wide system of carbon emission controls would be incomparably more cost-effective than a patchwork of sector specific regulatory systems.

b. To set carbon control policy on the path toward an efficient comprehensive system, rather than toward a wasteful patchwork, an electric power sector carbon emission control system must be, in effect, the first module of a more comprehensive policy. It must, in particular, avoid features that cannot be easily generalized to other sectors of the economy.

c. A patchwork of sector-specific programs would also be extremely difficult to adjust as new emissions data or new scientific evidence called for either increases or decreases in the stringency of emission controls.

2. Cost-effective economy-wide carbon emission control plans reduce emissions by creating property rights that reflect the scarcity of the atmosphere's ability to absorb greenhouse gases without triggering harmful climate change. Once such property rights have been created, the normal workings of the market ensure that uniform price signals discourage emissions throughout the economy. Specific structural features include:

a. Creating of a limited number of tradable emission allowances and allowing businesses wishing to introduce carbon-based fuels into the U.S. economy to purchase these allowances.

b. Establishing a "safety valve" price for carbon emission allowances at which unlimited quantities of allowances become available. The safety valve ensures that the economy is protected from harm even if the task of reducing carbon emissions proves to be unexpectedly expensive.

c. Recognizing that interests who are importantly disadvantaged by emission controls should be aided in their economic adjustment through grants of some emission allowances, tax concessions, or direct financial assistance.

d. Requiring emission allowances at or near the first point at which fossil fuel enters the U.S. economy in order to ensure comprehensive and uniform incentives and to minimize enforcement and compliance costs.

3. Auctioning carbon emission allowances would be far superior to allocating them by a GPS. The generation performance standard (GPS) would be a highly problematic feature and perhaps a fatal flaw in the carbon provisions of any electric power multi-pollutant legislation. The generation performance standard works like the combination of a tax on carbon emissions and a subsidy to electricity production. The tax and subsidy aspects are contradictory. This inherent contradiction undermines the cost-effectiveness of any policy using a GPS allocation of emissions allowances. As a result, allocating carbon emissions through a GPS would entail several serious disadvantages, including:

a. A GPS allocation of carbon emission allowances would impose much larger costs on society than would other available allocation methods such as an auction. Two analyses, one by Resources For the Future, an independent think tank, and another by the Energy Information Administration of DOE have both concluded that GPS entails far higher resource costs than auctioning allowances.

b. As shown in the just cited analyses, one specific consequence of the GPS as applied to the electric utility sector would be a sharp spike in natural gas prices, i.e., allocating carbon emission allowances by GPS would cause a considerably larger natural gas price increase than would be occasioned by the same level of carbon emission control accomplished with a more efficient system for allocating emission allowances.

c. The RFF analysis shows that the GPS would also cause a greater decrease in the asset value of the existing capital plant of the electric power sector than do other methods of allocating carbon allowances.

d. Systems using GPS cannot readily be generalized to the economy as a whole. Because the GPS subsidizes each unit of economic output, it requires a legal definition of every specific kind of output to be covered by the emissions regulations. It also requires a regulatory standard to stipulate the amount of the subsidy to be granted for each unit of output. Thus, an economy wide version of a carbon GPS system would seem to entail either in a tangle of carbon regulatory standards covering nearly everything in the economy or—since that is clearly impossible—a discriminatory and partial system filled with gaps, loopholes, and special exceptions.

STATEMENT OF CENTER FOR A SUSTAINABLE ECONOMY

Thank you, Mr. Chairman, for the opportunity to present the Center for a Sustainable Economy's (CSE) comments as stakeholders consider proposals to reduce greenhouse gas emissions.

Founded in 1995, CSE is a non-partisan, non-profit research and policy organization focused on market-based solutions to achieving a sustainable economy—one that integrates long-term economic prosperity and environmental quality.

We have used extensive economic modeling and analysis to examine the effects of market-based approaches to energy and climate change policy on the economy, business, and workers. Our latest study—released July 12 in advance of the last round of U.N. climate change negotiations in Bonn, Germany—shows that several of the largest economies in Europe have tailored market-based proposals to reduce greenhouse gas emissions without harming their economies.

CSE recommends that three basic elements be a part of any Committee proposal for reducing sulfur dioxide, nitrogen oxides, mercury, and carbon dioxide emissions: revenue-generation; "just transition" provisions for workers; and technology incentives.

Revenue

One of the proposals on your agenda is "cap-and-trade," where the government charges for the right to emit through sales or an auction at the time it distributes permits. This creates a market through which companies can buy and sell permits to meet their emissions targets. The revenues generated through initial government distribution can then be recycled back into the economy through incentives for the production of more energy-efficient technologies and vehicles; programs to develop alternative and renewable energy sources; transition assistance for energy-intensive industries and affected communities; improvements in energy infrastructure; or cuts in other taxes.

This revenue-generating approach has wide support among policy experts and economists. In a report released last June, the Congressional Budget Office said that the government's selling of emission allowances—as opposed to giving them away—and recycling the revenue back into the economy would reduce the overall cost to the economy of cutting greenhouse gas emissions by 50 percent.

In 1997, more than 2,500 economists, including eight Nobel Laureates, endorsed this kind of proposal to slow climate change. They stated that the most efficient approach the United States and other countries can use to reduce emissions of greenhouse gases is market mechanisms, such as the sale of emissions permits, in which "revenues generated . . . can effectively be used to reduce the deficit or to lower existing taxes."

It's important to remember that what the Committee proposes with respect to electric utilities will have profound and far-reaching implications for other sectors of the economy as we move forward on energy and climate change policy. It is our strong view that "grandfathering" companies based on past performance, if applied beyond the utility sector, could become an insurmountable administrative burden and would leave the government with inadequate revenues to address critical issues arising in the transition to an economy based on lower greenhouse gas emissions.

"Just Transition"

This debate has raised concerns in the labor community, especially in heavy manufacturing and energy-intensive industries, as to how they will fair if a multi-pollutant bill becomes law. CSE has consistently recommended that market-based policy packages be designed to minimize job dislocation and maximize job creation. These policies should be phased in gradually in an effort to hold the rate of shrinkage to the natural rate of turnover, so any change in employment level can be achieved through attrition rather than through layoffs.

Where this kind of job-loss mitigation is not feasible, policymakers should consider including a remedy that leaves displaced workers, on the average, as well off economically as if they had not lost their jobs. For example, in our forthcoming report Clean Energy and Jobs: A Comprehensive Approach to Climate Change and Energy Policy (Barrett and Hoerner), which analyzes a specific climate change proposal, we recommend income replacement, including health insurance and retirement plan contributions, as well as worker training. Since large-scale layoffs affect entire communities, we also recommend that funds generated from auctioned permits or other provisions be provided for investment in local community development.

Technology

Another critical concern is the need to advance new, cleaner, and renewable technologies. Properly structured incentives for these technologies can accelerate the rate of technology development and provide a variety of other benefits that would not otherwise occur with greenhouse gas emission limits alone. In fact, promotion of clean technologies can help mitigate some of the economic impacts of addressing greenhouse gas emissions.

CSE research indicates that providing incentives for clean technologies can have positive spillover effects for other related technologies that do not benefit from the incentive. This would happen, for example, if a tax credit for super-efficient vehicles resulted in higher gasoline mileage for vehicles that are not eligible for the credit.

There are also a variety of benefits to society as a whole from providing incentives for clean and renewable technologies. These public benefits include improved balance of trade; reduced national security risks associated with the need to maintain uninterrupted oil flow; reduced environmental impacts in the United States from local air pollution; and reduced risk of climate change from greenhouse gas emissions. Our survey of the research indicates that the local environmental benefits alone make incentives for clean and renewable technologies well worth the investment.

Thank you for considering these important issues as you debate the various multi-pollutant proposals.

Statement of Center for Clean Air Policy

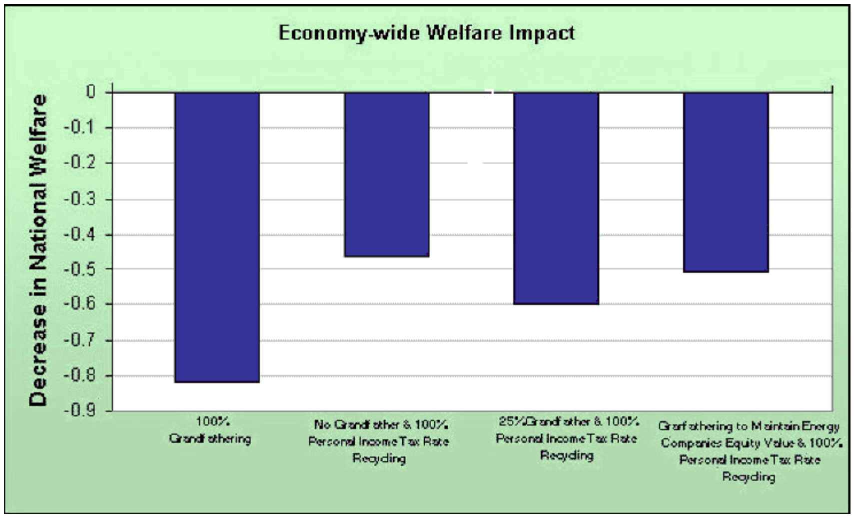
WHO WINS AND LOSES UNDER A CARBON DIOXIDE CONTROL PROGRAM?

Results

- An auction allowance allocation can result in lower costs to the economy than a grandfathering allocation.
- Stock value of electricity sector decreases under 100 percent auction allocation. Situation reverses with modest grandfathering.
- Shareholder value can be made constant by offsetting losses through grandfathering of allowances.

Key Assumptions

- Assumes the economy is on the economic efficiency frontier except for taxes. The only way to gain efficiencies is by lowering taxes. Assumes all energy efficiency measures have been exhausted.
- Assumes regulation applies to all sectors (economy-wide), not just the power sector.
- Assumes Annex 1 only trading.



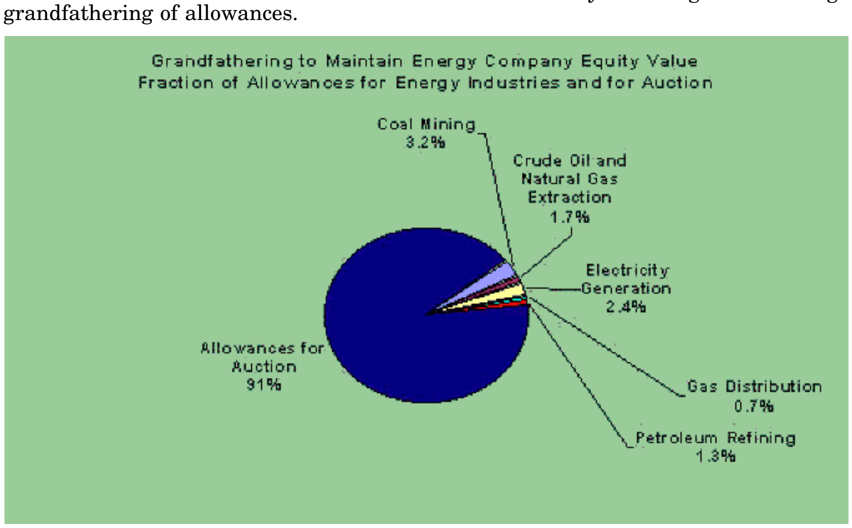
Result No. 1: An auction allowance allocation can result in lower costs to the economy than a grandfathering allocation.

- Auctioning allowances and recycling revenues through marginal tax rate cuts instead of grandfathering allowances can significantly reduce the total cost to the economy of an economy-wide CO_2 control program.
- When allowances are auctioned and revenues recycled through a personal income tax rate cut, the negative impact on the economy is half what it would be if all allowances are grandfathered.

Result No. 2: Stock value of electricity sector decreases under 100 percent auction allocation. Situation reverses with modest grandfathering.

- An auction allocation in which all revenues are recycled to taxpayers through a marginal income tax rate cut results in a net loss in equity value of almost 5 percent in the electricity sector.
- Grandfathering 25 percent of allowances to industries—14 percent to utilities and 11 percent to all other industries—and recycling 75 percent through marginal income tax rate cuts raises electricity sector stock value by 18 percent compared to a business as usual, no policy scenario.

Result No. 3: Shareholder value can be made constant by offsetting losses through grandfathering of allowances.



• The above figure shows the percentage of allowances needed to be given to each sector to hold stock value constant.
• Grandfathering 3.2 percent of allowances to the coal mining sector and 2.4 percent of allowances to the electricity sector mitigates reductions in stock value for these industries.
• The average equity value of the coal mining, crude oil/natural gas extraction, electricity generation, gas distribution and petroleum refining industries can be maintained at business as usual levels by grandfathering these industries only 9 percent of the total allowances under the full national carbon cap.

Applicability of Results to Sector-Specific Emission Caps

• This analysis assumed a large, economy-wide carbon cap applied equally to large and small users of energy, whereas several carbon policy proposals are focused on programs that control emissions from one sector only. The results of this study of economy-wide CO_2 regulation cannot be extended directly to a sector-specific program, but the finding that wholesale grandfathering of allowances will result in increases in a sector's stock value are likely to hold.
• The macroeconomic merits of recycling allowance auction revenues to reduce marginal tax rates would likely apply in a sector-specific approach as well.
• A sectoral approach is inherently less economically efficient than an economy-wide approach.
• This study's findings are promising enough to suggest that the cost-equity tradeoffs in using a mix of auctions and grandfathering should be carefully assessed for cap-and-trade programs targeting specific sectors.

Allowance Allocation Methods

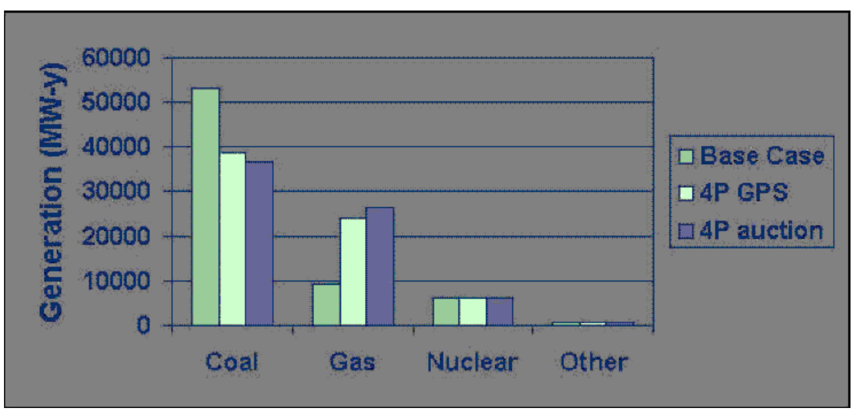
Auction—Sources must purchase allowances to cover every emission generated. In this scenario, we evaluate the effects of an auction allocation for carbon in the context of a four-pollutant (4-P) approach. A GPS allocation is used for NOx, SO_2 and Hg. This scenario is our "4-P Auction" approach.

Generation Performance Standard (GPS) or Output-Based-Sources that generate electricity are allocated emissions according to a standard national emission rate. Sources may purchase any additional allowances needed to cover every emission generated (or sell excess allowances). In this scenario we evaluate the effects of a GPS allocation for carbon in the context of a 4-P approach. A GPS allocation is also used for NOx, SO_2 and Hg. This scenario is our "4-P GPS" approach.

Result No. 1: Allowance allocation has a small effect on compliance strategy and emissions.

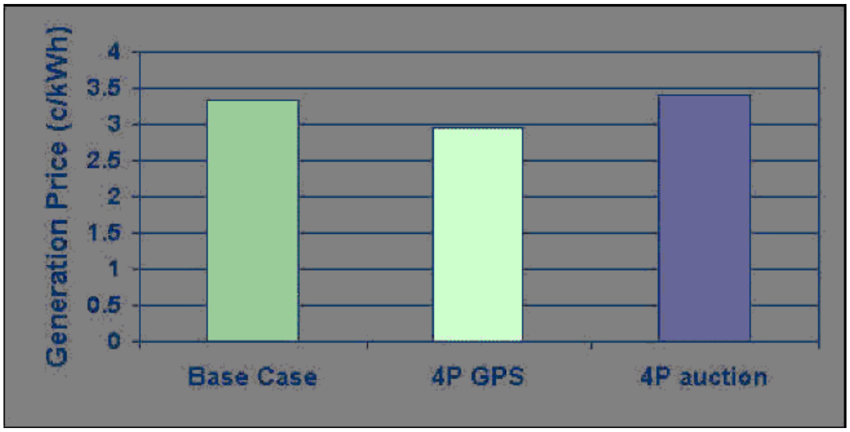
Generation Mix-Base Case v. 4-P Cases

(Gas price = $2.26/mmbtu, Elasticity not included)



• In both 4-P policy scenarios, we see a significant amount of fuel switching from coal to natural gas as well as additions of technology-based control measures.
• At the same allowance price for carbon, the auction allocation leads to slightly more fuel switching from coal to gas. The GPS allocation, in contrast, leads to more end-of-pipe control technologies than the auction approach.

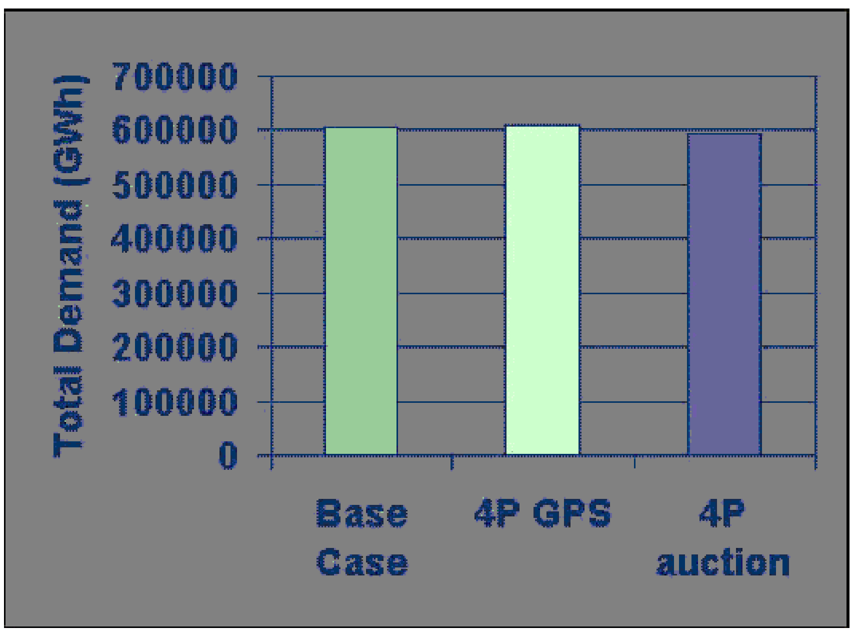
Result No. 2: Allowance allocation has a large effect on electricity price, affecting electricity demand.



Change in Electricity Generation Price from 4-P Cases

(Gas price = $2.26/mmbtu, Elasticity not included)

- An auction allocation leads to a higher electricity price as fossil generators pay for each unit of emission.
- A GPS allocation leads to a lower electricity price to the extent that gas-fired generators set the price.
- The lower electricity price associated with the GPS allocation leads to increased electricity demand, and the higher electricity price associated with the auction leads to lower electricity demand.



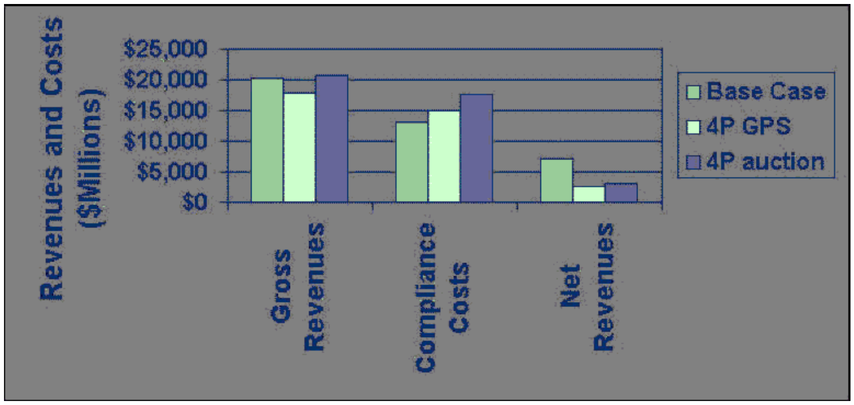
Demand Response to Price Elasticity (Price elasticity =–0.1)

- GPS leads to increased electricity demand while auction encourages conservation.

Result No. 3: Allowance allocation has almost no effect on industry profits.

Economic Performance of 4-P Policy Cases

(Gas price = $2.26/mmbtu, Elasticity not included)



- Revenues and compliance costs are higher under the 4-P Auction case and lower under the 4-P GPS case.
- Net revenues to the utility sector is virtually the same.

About the ORCED Model

- The model used in this analysis is the Oak Ridge Competitive Electricity Dispatch Model (ORCED), a dispatch model developed by Oak Ridge National Laboratory and adapted by the Center for Clean Air Policy.
- ORCED was used in the DOE Five-Lab Study as well as in other DOE projects.
- Modeling was conducted on the ECAR region.

PRINCIPLES ON MULTI-POLLUTANT POWERPLANT CLEAN AIR LEGISLATION

OVERARCHING PRINCIPLES

- The decade since the last Clean Air Act Amendments has brought an overwhelming body of fresh scientific evidence of human health and environmental damage associated with power plant air emissions, as well as increasingly cost-effective technology to reduce that damage.
- CATF supports the Clean Power Act of 2001 (S. 556).

Sulfur dioxide

- Compelling evidence of unacceptable long range impacts of sulfur dioxide emissions (e.g., ultrafine particles, acid rain, haze) as well as significant local impacts (e.g., $PM_{2.5}$ health impacts, visibility impacts on adjacent parks) has mounted consistently in 1990's.
- The evidence firmly establishes that nothing less than a 75 percent reduction in sulfur emissions from Phase II levels (to approximately 2.25 million tons) will begin to address the problem adequately. Provision should be made for even deeper cuts in later years to spur development and commercialization of cleaner technology.
- In addition, protection for near-plant communities and particularly sensitive resources and ecosystems must be assured. The best mechanism to assure broad local protections is the application of a date certain by which all plants must meet best available control technology; in turn, this standard should be revised periodically to incorporate technological and economic progress.
- Because of special haze and acidification problems in the Western States, a Western sub-national sulfur dioxide cap should be included to ensure that pro rata emissions reductions occur in those States.

Nitrogen oxides

- As with sulfur dioxide, the last decade has brought increasing evidence of unacceptable local impacts from nitrogen oxide emissions, both locally (ozone, $PM_{2.5}$) and long range (eutrophication, $PM_{2.5}$, ozone acid rain, haze)
- Nothing less than 75 percent year round reduction in nitrogen oxide emissions to 1.5 million tons will appropriately address these problems. Provision should be made for even deeper cuts in later years to spur development and commercialization of cleaner technology.

- Protections for local public health, ecosystems, and resources should be provided for as above in sulfur dioxide section.

Mercury

- Evidence of the potency and persistence of human health and environmental impacts of this substance is increasingly clear and grave in its implications.
- Plant-by-plant mercury cuts in the 90 percent range appear feasible through mercury-specific control technologies; there is the potential for significant co-benefit mercury reductions from other pollutant initiatives as well.
- Accordingly, there is no compelling reason at this time to consider mercury emissions trading/averaging.
- A comprehensive bill must address all mercury emission pathways, including re-emission and dispersal from fossil fuel combustion waste disposal sites.

Other air toxics

- The full range of air toxics should be addressed in any comprehensive bill if existing regulatory mechanisms for addressing these emissions such as section 112 are to be suspended.
- Details of these measures will depend on the specific air toxic in question.
- A comprehensive bill must address all air toxic emission pathways, including re-emission and dispersal from fossil fuel combustion waste disposal sites.

C02

- CATF supports a power sector CO_2 cap-and-trade system with caps set at 1990 power sector emission levels.

Regulatory relief

- New clean air legislation concerning power plants must further rather than replace the Clean Air Act's current key goals and benchmarks, including, without limitation, the attainment of national ambient air quality standards, prevention of significant deterioration in air quality, remedying visibility impairment, application of maximum available control technology for toxic emissions, and the advancement of new, cleaner technologies.
- States and localities must not be preempted from enacting tighter emissions controls than those contained in the Act.

Statement of Clean Power Group

Key Principles

- A suitable multi-pollutant cap-and-trade program can be an environmentally beneficial replacement for conventional new source review while improving industry certainty and reducing costs to industry and consumers.
- Under a cap, NSR does not provide emission reductions.
- A suitable cap without NSR will yield lower emissions than a conventional program with NSR.
- NSR reform must include both new and existing sources.
- All participants in a trading program should be treated the same with respect to allocation.
- Allowances should be redistributed frequently, based on output.
- New technology needs to be encouraged for all fuels.
- Caps should be phased in gradually with an economic circuit breaker.

Clean Power Group Proposal

- Apply gradually declining caps on NOx, SOx, mercury and potentially CO_2 for all generators.
- Caps replace BACT/LAER, offsets, mercury MACT, regional control programs.
- Backstops:
- NSPS requirement and local air quality impact review.
- Guaranteed cap "way-points".
- Minimum compliance levels for mercury.
- Economic circuit breaker slows tightening of cap if required.

Benefits

- Earlier reductions and more continuing reductions than other approaches.
- More complete/efficient NSR reform.
- Promotes adoption of energy efficiency and new technologies for all fuels.
- Minimizes cost through gradual implementation and technology forcing.
- Promotes timely development of new generating capacity.

- Compatible with future potential programs to control CO_2.

STATEMENT OF ELECTRIC POWER SUPPLY ASSOCIATION

Thank you for inviting the Electric Power Supply Association (EPSA) to participate in the Senate Environment and Public Works Committee stakeholder meeting to discuss proposed multi-pollutant legislation. EPSA and its member companies, who are participants in the competitive electric power market, look forward to participating in the meeting.

EPSA is a trade association that represents the competitive power supply industry including generators and marketers. The competitive power supply industry owns at least 33 percent of the existing generation capacity in the United States and has announced plans to build over 300,000 MWs of new generation. While most new generation facilities are fueled by natural gas, existing competitive generation burns all fuel types including renewables, coal and nuclear.

EPSA members recognize environmental policy has a significant impact on energy resources and investments. EPSA supports environmental legislation that takes advantage of competitive and market-based forces. Environmental policies should recognize and value the significant contribution to environmental quality improvement made by newer and cleaner sources of power generation and remove environmental legal and regulatory barriers to full and fair competition among these generators. At the same time, environmental policies should recognize and value the importance of existing facilities' contributions to national environmental improvements and their role in maintaining the reliability of the electric power system . As requested, EPSA provides the following principles and comments in advance of the stakeholder meeting:

I. EPSA Supports a Multi-pollutant Approach

EPSA member companies are now making and will continue to make large investments in pollution control equipment. Well-crafted legislation will enhance environmental compliance planning by companies and provide greater energy and environmental investment certainty while achieving air quality goals. Multi-pollutant legislation must include consideration of the following:

- A multi-pollutant approach that is flexible, market-based and recognizes the importance of fuel diversity in preserving the nation's energy security,
- Reductions in NOx, SO_2, and mercury (Hg) based upon careful consideration of national human health and air quality needs. Implementation schedules must allow time for project planning and construction and emission limitations must be within the bounds of technological capabilities,
- Inclusion of a CO_2 program to achieve the goal of enhanced planning and investment certainty needs to be part of the discussion. Any CO_2 program, whether mandatory or voluntary, must be flexible in its application, and market-based,
- Recognition of environmental performance improvements already made under the 1990 Clean Air Act.

II. EPSA Supports a Market Based Trading Approach

The cap-and-trade approach captures the power of free markets while satisfying air quality goals in a flexible, least-cost way. Appropriate caps for NOx, SO_2 and Hg must be established using the principles stated above. EPSA particularly emphasizes that any allowance trading system must provide for ready entry into the system by new, competitive power generation facilities. Trading systems will work best if allowance credits are:

- Broadly and fairly distributed,
- Available to new participants, and
- Freely traded in a robust market.

EPSA members have not reached agreement on the issue of a cap for CO_2, but do agree and support trading as a key element of a CO_2 program. Any CO_2 program must:

- Maximize trading flexibility, allowing trading or averaging within a company's portfolio of assets, both domestically and internationally, and
- Allow trading with other entities, and include offsite carbon offsetting or sequestration projects, both domestically and internationally.

III. EPSA Supports New Source Review Reform

Appropriate national caps for NOx, SO_2 and Hg must consolidate and replace the current and future requirements for numerous national and regional programs such as regional haze, $PM_{2.5}$, ozone transport and Hg Maximum Achievable Control Technology (MACT), as well as allow for reform of the New Source Review (NSR) process. NSR reform must include:

- Elimination of burdensome NSR requirements at existing power facilities,
- Replacement of BACT/LAER review with a modern new source standard that provides for expedited permitting of new, clean technology power facilities,
- Elimination of current offset requirements under any cap-and-trade system requirements.

IV. EPSA Supports a Legislative Safe Harbor Period

The goal of planning and investment certainty is only achieved if multi-pollutant legislation is comprehensive in scope and provides a safe harbor from further national and regional air emission reduction requirements for a period of 15 years or more.

The Electric Power Supply Association recognizes the importance of multi-pollutant legislation and offers the abovementioned principles and comments in support of a successful stakeholder meeting and ultimate legislation. EPSA and its member companies recognize that there are many complexities that surround each of the issues discussed above. We stand ready to assist you as you work toward successful development of a national multi-pollutant strategy.

STATEMENT OF ENERGY FOR A CLEAN AIR FUTURE

I. Goals

- Set emission reduction targets that respond to current and anticipated air quality needs
- Protect the environment while preserving the diverse fuel mix required for future economic growth and energy security
- Create a stable and predictable climate for capital investment in the energy sector
- Replace the multiple deadlines and requirements that now apply to the power sector with clear long-term emission reduction goals
- Implement emission reductions in phases to avoid jeopardizing reliability and allow development of advanced emission control technologies
- Rely on cost-effective trading programs as opposed to source-specific technology mandates

II. Three-Pollutant Framework

- Require a 62 percent nationwide reduction in annual NOx emissions, implemented in two phases (2004 & 2010) under a national cap-and-trade program (2.35 million ton cap)
- Require a 50 percent nationwide reduction in SO_2 emissions in two phases (2008 and 2012) building on framework of the Title IV national trading program (4.5 million ton cap)
- Reduce mercury emissions in two phases—30 percent by 2010 and a minimum of 50 percent by 2013, with deeper reductions if warranted by independent review, implemented through a national system of tradable mercury allowances
- Eliminate NSR/PSD program for existing generating units and control new units with NSPS-type guidelines requiring cost-effective controls reflecting energy and environmental impacts
- Assure that national programs for NOx, SO_2 and mercury will be the exclusive vehicle for national and regional controls for these pollutants, superseding existing authorities
- Create "safe harbor" for new reduction requirements until 2015

III. CO_2

- Set fuel-and-technology specific benchmarks for new units (no overall emissions target)
- Set fuel-and technology-specific heat utilization benchmarks for existing units or allow plants to use emissions baseline benchmarks
- Implement program through flexible market-based systems with the option of generating credits for cost-effective on-system or off-system reductions of CO_2 or other GHGs
- Assuming full industry participation, program would result in flattening rate of CO_2 emissions growth and addressing emissions from power plants (e.g., stabilizing existing units at 2000 levels by 2010)
- To encourage voluntary industry participation, provide safe harbor protection, baseline protection and credit for early action

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STATEMENT OF ENVIRONMENTAL DEFENSE

Environmental Defense welcomes the opportunity to participate in the stakeholder session convened by the Environment and Public Works Committee. We believe that the case for a comprehensive effort to address utility air emissions is compelling. Power plant emissions contribute critically to the problems of climate change, acid deposition, haze and air quality degradation in the West and non-attainment of the health-based standards for ground-level ozone and fine particles. A comprehensive approach must mandate aggressive reductions in all power plant emissions that lead to these crucial threats to human health and the environment. For that reason, Environmental Defense has endorsed the Jeffords-Lieberman power plant legislation.

Mandatory carbon dioxide reductions are essential

A comprehensive effort to address utility emissions in the United States must include provisions to cap and reduce emissions of carbon dioxide, the principal anthropogenic greenhouse gas. The United States is legally bound to observe the objective of "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."[1] The Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), released earlier this year, states that "most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations," and estimates that warming in the coming century will reach 1.4–5.8 C if emissions are not limited. IPCC finds that warming of between 1 and 2 degrees C is likely to pose high risks to unique and threatened ecosystems, and to lead to increases in the risk of extreme climate events.[2] This translates to an atmospheric concentration target of approximately 450 ppm CO_2-equivalent. In the view of Environmental Defense, the U.S. electricity sector, as one of the largest emitting sectors in the nation that is the world's largest emitter of CO_2, thus has an undeniable responsibility to make substantial CO_2 reductions to assist in meeting this target. Imposing this obligation on this sector is one of the most cost-effective policies the United States can adopt to meet its current treaty obligations. To date, however, notwithstanding the large number of voluntary efforts to achieve emissions reductions in the sector, total CO_2 emissions from electric utilities have continued to rise. Environmental Defense therefore urges enactment of legislation that places a strong, mandatory cap on CO_2 emissions from this sector and requires reductions to levels that are consonant with the goal of preventing dangerous interference in the climate system.

If land use crediting is to be included in multi-pollutant legislation, it must be done only in a way that guarantees the environmental integrity of the CO_2 emissions reduction program, and that supports a regulatory system for reducing greenhouse gas emissions from the utility sector. With poor design, the inclusion of credit for such activities could undermine a regulatory system, the principal purpose of which is to reduce emissions from utilities. However, it is possible that with appropriate rules, the inclusion of land use crediting in multi-pollutant legislation would provide the potential to make deeper and more rapid reductions in atmospheric greenhouse gases. Moreover, done properly, land use crediting can also provide ancillary environmental benefits, such as tropical forest conservation, forest restoration, and reduced soil erosion.

Further reductions in SO_2 and NOx are required

The sulfur dioxide program for curbing acid rain established by Title IV of the Clean Air Act has achieved a signal success in decreasing emissions of the pollutants that cause acid deposition at the lowest possible cost to emitters. During Phase I of the program sulfate deposition has been observed to decrease in many areas. For these results and for its forging of a new "cap-and-trade" template the program has been widely touted as a success. Notwithstanding these results, the program has not yet achieved the environmental objectives of safeguarding for the recovery of vital ecosystems from the ravages of acid deposition. Advances in atmospheric and health sciences strongly suggest that we must reduce SO_2 emissions by an additional 80 percent and, at the very least, extend the NOx reductions mandated in the NOx SIP call to nationwide coverage on a year-round basis. Recent EPA anal-

[1] United Nations Framework Convention on Climate Change (UNFCCC), Article 2, ratified by the United States with the unanimous consent of the Senate in 1992.

[2] In 2001, the U.S. National Academy of Sciences, at the request of President George W. Bush, issued a report analyzing climate science, finding that "temperatures are in fact rising. The changes observed over the last several decades are likely mostly due to human activities." NAS reported that IPCC's findings are "robust" and its work is "admirable."

ysis has shown that these reductions can be made well under $2,000 per ton for each pollutant, making them among the most cost-effective reductions available. Indeed, using that economic benchmark even deeper reductions, at least in the case of NOx, are available at similarly low cost from the power plant sector.

Since 1990, a body of scientific investigations has documented the deleterious health effects associated with fine particles and the need for policy actions to address these effects. Sulfur dioxide and nitrogen oxides are major precursors to the fine particles that reach the deep recesses of the lungs. These fine particles present distinct risks for individuals with respiratory and cardiovascular disease, the elderly who are at risk of cardiopulmonary impacts, children who are at greater risk of increased respiratory symptoms and decreased lung function, and asthmatic children and adults who are at risk of more serious symptoms. The benefits of safeguarding Americans from the harmful effects of fine particles are well-documented in EPA's Regulatory Impact Analysis for the 1997 NAAQS and recent analysis by Resources for the Future on the considerable benefits of expanding the NOx SIP call year-round.

We also now know that NOx emissions, which were underestimated as a cause of air pollution, in fact play an important role in the formation of fine particle concentrations, ground level ozone, acid deposition, western haze, and nitrogen deposition. We have also learned that sulfur dioxide not only contributes significantly to fine particle concentrations and acid deposition, but also to reduced visibility in our great scenic vistas. Thus, at the likely costs of achieving reductions in SO_2 and NOx emissions, national legislation that capped power plant emissions at these levels would provide the foundation, if not the complete structure, for highly cost-effective ozone and fine particle attainment strategies in a great many areas—in addition to addressing western haze and nitrogen deposition.

Further, acid deposition associated with SO_2 emissions is still a serious environmental problem. Sulfate concentrations of surface waters in the Southern Appalachian Mountains have been increasing steadily for more than a decade, making for an increasingly inhospitable environment for trout and other fish species. A majority of Adirondack lakes have not shown recovery from high acidity levels first detected decades ago. Forests, streams, and rivers in the Front Range of Colorado, the Great Smoky Mountains of Tennessee, and the San Gabriel and San Bernardino Mountains of California are also now showing the effects of acidification (NAPAP 1998). As documented in GAO's March 2000 Report to Congress (Acid Rain: Emission Trends and Effects in the Eastern United States), we must substantially curtail both SO_2 and NOx emissions to effectively protect threatened ecosystems.

Nitrogen deposition also threatens other important resources. Airborne deposition of nitrogen accounts for a significant percentage of the nitrogen content of coastal water bodies stretching from the Gulf Coast up and around the entire length of the eastern seaboard. Long Island Sound, the Chesapeake Bay, Delaware Bay, Tampa Bay, and North Carolina's Newport River are estimated to receive considerable nitrogen inputs from the air (Ecological Society of America, 1997). Indeed, the National Academy of Science's recent report on nutrient pollution in coastal waters estimates that atmospheric deposition is the dominant source of nitrogen from non-point sources in the Chesapeake Bay's major tributaries.

In sum, our current understanding of both sound science and sound economics obligate Congress and the President to move quickly to reduce substantially emissions of SO_2 and NOx. Again, only a substantial, year-round lowering of emissions levels will help address harmful fine particle concentrations, acid rain, and nitrogen deposition in coastal waters.

WRAP conclusions should guide policymaking in the West

The Grand Canyon, Rocky Mountain, Zion, Glacier, and Yellowstone National Parks are some of the most recognized natural wonders in the world. But each, as well as numerous other class I areas in the West, suffer from air pollution—known as regional haze—that can dramatically impair the vistas that attract millions of tourists to these vital parts of our national heritage annually. In the 1977 Clean Air Act Amendments, the Congress established a visibility protection program that was expressly intended to remedy existing and prevent future visibility impairment at class I areas. That statutory program was modestly successful in lowering emissions from large power plants whose plumes could be directly traced to impairment in a class I area. For years, EPA failed to adopt regulations to deal with the broader problem of regional haze—the regionally homogenous haze that emanates from a large number of sources and impairs visibility over a large area.

As a result, the Congress reinvigorated the program in 1990 by charging the Grand Canyon Visibility Transport Commission with making recommendations to address haze. The Commission, composed of western Governors, tribal leaders and

Federal agencies, relied heavily on citizen, business, and conservation group participation in fashioning a comprehensive approach for abating regional haze. Its successor agency—the Western Regional Air Partnership or "WRAP"-recently proposed to EPA a detailed plan for reducing SO_2 emissions from all stationary sources larger than 100 tons/year by 2018. That plan is based on a regional trading program with a declining cap, and would cut SO_2 emissions from western utilities by about 65 percent beyond the allocations under phase II of the acid rain program. The WRAP retained ICF Consulting to perform an economic analysis of the program, which found that a regional SO_2 cap in the West would have inconsequential impacts on the region's economy. The consensus-based, decentralized process that shaped this western policy has been broadly embraced by a bipartisan group of western Governors which have heralded this as a quintessential example of their "en libra" doctrine.

Any multi-pollutant legislation should ensure sulfur dioxide emission reductions in the West that are at least as protective of the nation's crown jewels as provided for under the recommendations put forward by western States and tribes. The national legislation must include an effective "nested" regional SO_2 cap.

NOx emission reductions in the West are imperative

There are compelling reasons to lower NOx emissions from the electric utility sector in the West. The West has its own ozone-related health problems. Places like Phoenix, Reno, Salt Lake City, Las Vegas, Denver, and broad reaches of California, home to millions of westerners, have elevated ozone pollution concentrations relative to the old 1-hour ozone standard or the new health-based 8-hour ozone standard. In addition, long-term monitoring data from the National Park Service indicate that ozone pollution concentrations in Canyonlands, Grand Canyon, Rocky Mountain, and Yellowstone National Parks are significantly worsening. This suggests that rising NOx emission levels in the West are increasingly reaching and impinging upon remote rural areas. NOx emissions in the West also contribute to deleterious fine particle concentrations, regional haze in several national parks, "brown clouds" in major western cities, and nitrate deposition in sensitive ecosystems. NOx emissions from the electric utility sector are a consequential source of this contaminant. While NOx emissions from the transportation sector will be lowered with fleet turnover under EPA's new emission standards for onroad light-duty and heavy-duty vehicles, NOx emissions from the electric utility sector will be of increasing importance relative to these reductions and in absolute terms as utilization of existing power plants increases and new sources come on line.

Multi-pollutant legislation must ensure considerable, year-round NOx emission reductions in both the eastern and western regions of the country.

Existing local protections must be maintained

Under no circumstances must the air quality protections provided by the Clean Air Act be weakened in power plant emissions control legislation.

For example, the NAAQS and PSD programs are the cornerstones of the Clean Air Act, establishing the framework for achieving and maintaining clean, healthy air across the country. While we vigorously support the use of well-designed, geographically tailored emissions cap-and-trade programs to address regional and national air quality concerns efficiently—and with superior environmental performance, such programs cannot supplant the core elements of Title I that protect local air quality. Comparisons between pure emissions caps with the emissions cap-and-trade program erected under the Clean Air Act's acid rain program are misplaced. The acid rain program was designed to complement, not replace, vital local air quality protections. Accordingly, we also oppose eliminating time-tested, effective local protections in favor of a national emissions cap. Vital programs and policies include, but are not limited to: nonattainment NSR and the corresponding requirements for LAER and offsets; PSD and the corresponding requirements for BACT; increments and class I area protection; the BART requirement under the visibility protection program; the requirement for existing sources in nonattainment areas to install RACM, and the safeguards on public participation in the permitting process for new and modified sources.

Multi-pollutant legislation must not become the guise for dismantling core Clean Air Act programs, including NSR, PSD, BART, RACM, and public participation in the permitting processes for new and modified sources.

STATEMENT ON ALLOWANCE ALLOCATION SYSTEMS, PRESENTED BY E. DONALD ELLIOTT ON BEHALF OF FIRSTENERGY CORP.

FirstEnergy supports the proposal to allocate allowances based on output on a generation-neutral basis to all sources of electrical power. This simple system allocates to each company a share of available allowances proportional to its contribution to electrical power.

FirstEnergy is a diversified energy services holding company headquartered in Akron, Ohio. It's four electric utility operating companies comprise the nation's tenth largest investor-owned electric system serving 2.2 million customers within 13,200 square miles of northern and central Ohio and western Pennsylvania. FirstEnergy is in the process of merging with New Jersey-based GPU, Inc., a transaction that will make FirstEnergy the fourth-largest investor-owned electric system in the country, based on serving 4.3 million customers. FirstEnergy owns and operates more than 13,000 megawatts of generation. Of this, 62 percent is coal-fired, 32 percent is nuclear and the rest is natural gas, oil, or pumped-storage hydro.

FirstEnergy has been a long-time supporter of market-based mechanisms to control pollution, and we believe that the next step in the evolution of trading systems is to allocate tradeable allowances to all producers of electricity on a fair and equal basis, not just those sources that are contributing to the pollution problems. In short, we support the "output-based, generation-neutral" method for allocating allowances.

The idea is a simple one: allowances should be allocated for producing electricity, not for producing pollution. This principle of allocating allowances based on output (rather than heat input) has been used successfully in several other environmental trading programs, such as the lead phase down for refineries, and Individual Transferable Quotas under the Marine Fisheries Act.

FirstEnergy filed extensive comments on the advantages of the output-based approach with EPA in the NOx SIP-call and we and others supporting this approach have discussed its advantages in series of meetings and other public forums with EPA and others over the last few years. In brief, the output-based, generation-neutral approach is superior to other methods for allocating allowances (such as the historic heat-input method used in the Acid Rain trading program) for the following reasons:

- Increases incentives for renewables and non-emitting generation.
- Rewards more energy efficient generation of electricity.
- Forces technology by creating strong incentives to develop new methods to reduce pollution.
- It is Fair—It does not favor one form of power generation over another, but lets the market decide between various forms of power generation.
- More fully internalizes externalities and creates dynamic incentives to invest more in non-polluting and less-polluting technologies.
- Promotes liquidity by creating a pool of readily tradeable allowances.
- Produces substantial co-pollutant benefits.
- Promotes energy diversity.

We are pleased that leading environmental economists such as Professors Robert Hahn (of AEI-Brookings) and Professor Robert Stavins (of Harvard University) have endorsed the output-based, generation neutral approach. In addition, during the last Administration, after substantial study and stakeholder participation, EPA in its action on the Section 126 petitions announced its intention to transition to an output-based method of allocating allowances.

We believe that the intellectual case for output-based allocation is clear in papers by Professors Hahn and Stavins and elsewhere. A comprehensive, output-based system produces far better policy incentives than an Acid Rain-type allocation system without creating the enormous capital demands on the utility industry and resulting instability that would accompany an auction. With the transition to competition, it is particularly important to allocate allowances on a far and even-handed basis that does not favor some methods of power generation or regions of the country. With output-based allocation of allowances, the only competitive difference between companies is properly based on the amount of pollution they produce per unit of power.

Some have tried to steal the name "output-based" by suggesting an approach that they call "output-based" but which excludes certain types of power generation for political reasons. We are strongly opposed to picking some forms of power-generation and disqualifying others. We think that the market should decide on the relative mix of technologies and fuels, but with a level-playing field that allocates valuable allowances equally to all technologies based on their contributions to power generation. We favor internalizing externalities, and allocating allowances to all forms of power generation equally and on a nondiscriminatory basis in proportion to their contribution to meeting the consumer's demand for power. A true "output-based" system is based just on electrical output and not other extraneous factors. Such a system will help to insure that we have a diversity of fuel-sources by creating stronger incentives for non-emitting generation and thereby providing more "room for coal" under stringent pollution caps.

Output-based, generation-neutral is a fair, non-discriminatory approach to allocating allowances, and we commend it to the Committee's attention.

STATEMENT OF THE HUBBARD BROOK RESEARCH FOUNDATION

The Hubbard Brook Research Foundation recently convened a team of scientists to synthesize over thirty years of acid rain data. The results of effort are relevant to the current mulit-pollutant legislation and are summarized below. This summary is based on a paper published in BioScience, vol. 51, no. 3, 2001. As legislation is developed, it is critical to include a provision for long-term observation and monitoring of the regulated pollutants and their effects. To this end, a summary of recommended funding to secure and improve existing national monitoring networks is included as well.

Long-term research from the Hubbard Brook Experimental Forest (HBEF) and other sites across the northeastern US were used to synthesize data on the effects of acidic deposition and to assess ecosystem responses to reductions in emissions. Based on existing data, it is clear that in the northeastern US:

- Reductions of SO_2 emissions since 1970 have resulted in statistically significant decreases in SO_4^{2-}in wet/bulk deposition and surface water.
- Emissions of NOx and concentrations of NOx in wet/bulk deposition and surface waters show no increase or decrease since the 1980's.
- There is considerable uncertainty in estimates of NH_3 emissions, although atmospheric deposition of NH4÷ is important for forest management and stream NOx loss.
- Acidic deposition has accelerated the leaching of base cations from soils, delaying the recovery of ANC in lakes and streams from decreased emissions of SO_2. At the HBEF, the available soil Ca pool appears to have declined 50 percent over the past 50 years.
- Sulfur and N from atmospheric deposition have accumulated in forest soils across the region. Slow release of these elements from soil has delayed recovery of lakes and streams.
- Acidic deposition has increased the concentration of toxic forms of Al in soil waters, lakes and streams.
- Acidic deposition leaches cellular Ca from red spruce foliage, which makes trees susceptible to freezing injury, leading to over 50 percent mortality of canopy trees in some areas of the Northeast.
- Extensive mortality of sugar maple in Pennsylvania has resulted from deficiencies of $Ca^{2÷}$ and $Mg^{2÷}$. Acidic deposition has contributed to the depletion of these cations from soil.
- 41 percent of lakes in the Adirondacks and 15 percent of lakes in New England exhibit chronic and/or episodic acidification. 83 percent of these impacted lakes are acidic due to atmospheric deposition.
- There have been modest increases in the ANC of surface waters in New England and no significant improvement in the Adirondack and Catskill regions with recent decreases in atmospheric S deposition.
- Acidification of surface waters results in a decrease in the survival, size and density of fish, and loss of fish and other aquatic biota from lakes and streams.

Further, it is anticipated that recovery from acidic deposition will be a complex, two-phase process in which chemical recovery precedes biological recovery. The time for biological recovery is better defined for aquatic than terrestrial ecosystems. For acid-impacted aquatic ecosystems, it is expected that stream macroinvertebrate and lake zooplankton populations would recover in 3–10 years after favorable chemical conditions were re-established, and fish populations would follow. For terrestrial ecosystems, trees would probably respond positively to favorable atmospheric and soil conditions over a period of decades.

Indicators of chemical recovery (soil percent base saturation, soil Ca/Al ion ratios and surface water ANC) were used to evaluate ecosystem response to proposed policy changes in SO_2 emissions. Projections using an acidification model (PnET-BGC) indicate that full implementation of the 1990 CAAA will not result in substantial chemical recovery at the HBEF and many similar acid-sensitive locations. While uncertainties remain, our analysis indicates that current regulations will not adequately achieve the desired ecological outcomes of the 1990 CAAA. These desired outcomes include: increases in the ANC of lakes and streams, improvements in the diversity and health of fish populations, decreases in the degradation of forest soil and stress to trees. Model calculations indicate that the magnitude and rate of recovery from acidic deposition in the northeastern US is directly proportional to the magnitude of emission reductions. Model evaluations of policy proposals calling for additional reductions in utility SO_2 and NOx emissions, year-round emission controls, and early implementation (2005) indicate greater success in facilitating the recovery of sensitive ecosystems and accomplishing the goals of the Clean Air Act than current 1990 CAAA targets. Note that until transportation emissions of NOx are curtailed, there will be increased potential for a condition where improvements in acidic deposition from SO_2 controls by utilities will be offset somewhat by NOx emissions. Specific emission reductions targets should be based on clear goals for the desired extent and schedule of recovery of sensitive aquatic and terrestrial ecosystems which are consistent with the goals of the Clean Air Act.

Environmental monitoring is critical to national environmental policy. Monitoring of atmospheric deposition and surface water chemistry provides the only quantitative means of assessing the efficacy of State and Federal policy. There are several national monitoring networks that provide data to scientists and policymakers and need greater security and support. Five specific networks require increased Federal funding to stabilize, expand and/or update the monitoring network.

1. National Atmospheric Deposition Program (NADP)—The NADP program is a successful inter-agency network that monitors wet deposition of sulfate and nitrate associated with fossil fuel emissions. The USGS is the lead Federal agency and the EPA plays a strong supporting role. The coverage and baseline funding for this program are adequate to ensure a high-quality network. However, as the oldest network in the United States, the system needs substantial modernization and a modest number of new sites.

Proposal	Amount	Agency
Federal support for annual operating costs.	$3.6 million	Inter-agency
Modernization of existing 260+ sites and installation of 10 new sites.	$6.0	EPA

2. Clean Air Status and Trends Network (CASTNet)—The CASTNet program, administered by the EPA, measures the component of atmospheric deposition that enters the environment in dry forms such as particles and gases. Monitoring dry deposition is critical to determining the total pollution load across the United States. In some areas, dry deposition contributes as much as 59 percent of the total sulfur deposition. At present, CASTNet is a sparse network with only 70 sites nation-wide and none in the central United States.

Proposal	Amount	Agency
Federal contribution to annual operating costs.	$5.0 million	EPA
Installation of 30 new sites	$1.5	EPA
Modernization of existing 79 sites	$3.1	EPA

3. Mercury Deposition Network (MDN)—The mercury deposition network is a patchwork of sites, occurring mostly in the Northeast, that is funded through contributions by State agencies. Some of the highest mercury emitting States, such as Ohio, Kentucky and West Virginia, have no deposition monitoring. Given the tremendous public importance of mercury pollution, it is essential that monitoring be established to develop a mercury deposition baseline and to track changes over time.

Proposal	Amount	Agency
Federal contribution to annual operating costs.	$1.0 million	EPA
Installation of 60 new sites and upgrade existing sites.	$2.0	EPA

4. Temporally Integrated Monitoring of Ecosystems (TIME) and Long-Term Monitoring—The TIME/LTM program monitors lake and stream chemistry and docu-

ments changes in response to changing emissions and acid deposition. This program is administered through the EPA. TIME/LTM is the only national network that directly measures the impact of atmospheric deposition and quantifies the affect of emissions controls. Funding for the TIME/LTM program is both inadequate and unstable. Funding has been cut 50 percent over the past 2 years and the program appears to be sited for discontinuation.

Proposal	Amount	Agency
Federal contribution to annual operating costs.	$2.5 million	EPA

5. Atmospheric Integrated Research Monitoring Network (AIRMon)—The AIRMon program provides high resolution precipitation and dry deposition chemistry using daily sampling methods operated by the National Oceanic and Atmospheric Administration (NOAA). Funding for this program has been flat for 10 years resulting in the unfortunate closer of 3 AIRMon dry depositionsites (Sequoia. CA; Panola, GA; and Burlington, VT). Without an increase in annual operating funds, more site closures are inevitable. Moreover, AIRMon equipment dates to 1984 and has exceeded its life expectancy.

Proposal	Amount	Agency
Federal contribution to annual operating costs.	$1.5 million	NOAA
Modernization of existing 20 sites	$1.0	NOAA

Statement of Izaak Walton League of America, Midwest Office

"Clean air is a public necessity; no person or agency has the right to degrade this resource." This statement from the Izaak Walton League of America's conservation policies embodies our position on multi-pollutant legislation intended to reduce pollution from the electric utility sector. The Izaak Walton League of America (the "League"), represents 50,000 hunters, anglers and outdoor enthusiasts from across the United States. We are united in our commitment to a basic mission that demands controls be placed on sources of pollution that endanger our health and environment.

As the largest single source of air pollution nationally, electric power plants pose a threat to our human and environmental health. The League's Midwest, Minnesota and Virginia power plant campaigns, active for over 4 years, are aimed at addressing this source of pollution.

In the upper Midwest, mercury pollution threatens our human health and our outdoor heritage, including angling. Fish in lake after lake have been tested and found too contaminated with mercury, a potent neuro-toxin, for consumption by significant portions of the population. As an excellent source of protein, fish should be safe for everyone to eat, including children and pregnant women. Economically, the impact on recreational fishing in upper Midwestern States like Minnesota cannot be overstated. In Minnesota alone, the overall economic impact of the sport-fishing industry tops $3.5 billion a year. If mercury pollution continues to degrade these areas, the communities dependent upon this activity to provide income to their families could be diminished. Only by reducing mercury-causing pollution can we begin to ameliorate the devastating impacts of mercury pollution. Electric utilities contribute over 30 percent of mercury pollution both in the United States and in Minnesota.

In addition, any comprehensive power plant legislation should include provisions to reduce other air toxic pollution resulting from power plant emissions. All pathways should be addressed, including re-emissions from fossil fuel combustion waste disposal sites.

Throughout the Midwest and Southeast, sulfur dioxide pollution threatens trout streams with acidification, national parks with regional haze that reduces natural visibility by more than 90 percent, and cities with health-endangering levels of particulate matter that causes asthma attacks and even death. Electric utilities contribute 65 percent of sulfur dioxide pollution in the United States and over 75 percent in Minnesota.

In the Midwest, crops are adversely impacted by the day-to-day exposure to ozone; there is no "safe" level of ozone exposure for crops. After entering a plant, ozone interferes with its ability to absorb sunlight, resulting in plant growth reduction that is costing Midwestern farmers over $200 million a year in crop loss. Nitrogen oxide pollution also endangers city residents, causing asthma attacks and other respiratory crises. Electric utilities contribute over 25 percent of nitrogen oxide pollution in the United States and over 40 percent in Minnesota.

The Midwest is home to the world's largest freshwater lakes system, the Great Lakes. We take great pride in the natural beauty, recreation and shipping opportunities these waters afford. But higher temperatures, like those experienced in the last two decades, mean higher rates of evaporation, the greatest influence on a lake's water levels. Many models predict a 1–5 foot drop in the Great Lakes, despite an increase in precipitation, causing devastating environmental and economic damage to ecological systems, the shipping industry and marina owners. In Minnesota, we cannot imagine our State without a Boundary Waters Canoe Area. However, in regions characterized by continual warming, the transition zones between forest types could migrate northward far enough to push our beloved "north shore" boreal forest into Canada. Electric utilities contribute over 30 percent of carbon dioxide pollution in the United States and nearly 40 percent in Minnesota.

Taken together, the effects of pollution from electric utilities cut across all regions and populations, and endanger our health and environment. Multi-pollutant legislation is the most effective and efficient manner by which to reduce power plant pollution, both in terms of cost and implementation. By requiring strict levels of reductions over an appropriate number of years, industry's concerns regarding reliability and certainty can be addressed. The League believes that Federal legislation should offer versatility in meeting emission reduction targets through, for example, plant modernization and fuel switching, while setting reduction requirements at the lowest achievable levels in the shortest possible timeframes. Specifically, the League supports S. 556, the Clean Power Act of 2001, which calls for strict levels of pollution reduction from power plants by 2007.

Finally, no comprehensive power plant legislation should preempt the ability of States to take further action to protect local health, including requiring more stringent emission limits.

The Izaak Walton League of America was founded in 1922 by concerned sportsmen and women working together to improve the quality of Midwestern waters. Enduring through the Great Depression, World War II, the creation of the Clean Air Act and many other national conflicts, clean air and water are still the guiding principles for the League's efforts around the country. Air pollution from power plants poses a serious threat to our nation's water, air, soil and health. Multi-pollutant legislation is the necessary first step to reduce pollution from the electric utility sector.

STATEMENT OF THE NATIONAL ASSOCIATION OF MANUFACTURERS

The goal of multi-emissions legislation is to replace conflicting and burdensome regulations with one clear set of goals that meet environmental and consumer goals of cleaner air and affordable power, as well as to give regulatory certainty to the electric utility industry. In addition, any multi-emissions legislation must be fuel-neutral and not inconsistent with an achievable fuel mix for running the economy. S. 556 achieves none of these goals. Instead, it sets unreasonable targets on top of existing regulations which would create a nationwide energy crisis. This country cannot afford further legislation that adds uncertainty to investment decisions, constrains productivity and conflicts with sound energy policy.

The National Association of Manufacturers (NAM) supports the goals of the Clean Air Act (CAA), as well as the need to provide greater simplicity and certainty in its implementation. However, the targets and timetables set forth in S. 556 achieve neither, and the NAM vigorously opposes them. The NAM is also opposed to including carbon dioxide in any multi-emissions proposal. Fixing the problems with new source review (NSR) reinterpretation can remove much of the uncertainty confronting U.S. manufacturing.

The NAM—18 million people who make things in America—is the nation's largest industrial trade association. The NAM represents 14,000 members (including 10,000 small and mid-sized companies) and 350 member associations serving manufacturers and employees in every industrial sector and all 50 States. The NAM's mission is to enhance the competitiveness of manufacturers and improve American living standards by shaping a legislative and regulatory environment conducive to U.S.

economic growth. Accordingly, the NAM has a direct interest in the multi-emissions legislation being considered by the Senate Committee on Environment and Public Works.

The manufacturing sector has been in recession since fall 2000, triggered, in part, by the sharp increase in overall energy prices, particularly for natural gas and a concern over energy-supply reliability. S. 556 would permanently impose those conditions on the economy by forcing electric generators to choose between spending large amounts of capital to continue using coal or to switch to increasingly expensive natural gas, perhaps jeopardizing the energy system's reliability during the transition. This Hobson's choice is not acceptable, absent an overwhelmingly compelling argument that human health, the environment or national security requires it.

S. 556 will adversely affect electric generation, drive up the demand for natural gas and, in turn, negatively impact manufacturers and the overall U.S. economy. The United States is already a net importer of natural gas and the likelihood of very large supply increases at reasonable prices is in question. Proposals to expand imports, including liquefied natural gas, should not be viewed as superior to using our most abundant, cheap and safely transportable energy source: coal. As stated in the President's National Energy Policy (issued May 16, 2001), "A primary goal of the National Energy Policy is to add [energy] supply from diverse sources. This means domestic oil, gas and coal."

Instead of maintaining coal-based generation as part of the electricity supply mix, S. 556 would require most coal-based plants to switch fuel, apply very expensive controls or shut down. Coal is the most abundant and inexpensive domestic energy natural resource. Coal-fired generation provides approximately 52 percent of the nation's electricity. Multi-emissions legislation should support—not discourage—clean affordable use of coal. Coal must be maintained and expanded as a viable energy source, or natural gas will increasingly become more expensive and potentially less readily available for homeowners, manufacturers and electric generators. New clean-coal technologies, particularly new coal gasification, can provide clean electricity and supplement natural gas supplies for other uses. This technology is only viable if emission standards support it.

In addition, the current gas transmission infrastructure is insufficient to handle the large increase in demand for natural gas expected for electricity generation. Major new investments will be required for adequate pipelines. The Energy Information Administration (EIA) estimates that coal-based generation would be reduced 38 percent to 42 percent from projected 2010 levels as a result of S. 556 and natural gas prices would increase about 18 percent. An independent electric utility industry study estimates a reduction of 54 percent in coal-based generation and natural gas price increases of 11 percent. Under the EIA analysis, the use of natural gas for electricity generation will increase by 60 percent.

Both studies envision huge increases in natural gas consumption and the NAM is concerned that the price-increase projections are grossly underestimated because of overly optimistic supply scenarios and inadequate consideration of the large gas infrastructure construction costs required. Tight supplies of natural gas could further exacerbate the energy problems presented by S. 556. For example, the EIA "integrated high gas price" sensitivity case will result in a 42 percent increase in natural gas prices in 2010.

Even without considering secondary natural gas industry costs, the July 2001 EIA report estimates that the cumulative compliance costs (2001 through 2010) for S. 556 will be $140 billion. EIA estimates that the price of electricity will be 29 percent to 32 percent higher in 2010, a $145 to $163 higher annual electricity bill for the average consumer. The utility industry estimates that costs between now and 2020 could be even higher—up to $578 billion (in present value) under a "high natural gas price" sensitivity. Whatever the costs turn out to be, S. 556 will result in substantial economic impacts, not just on regions affected by plant closings, but throughout the country, with a commensurate impact on Federal tax revenues.

The influence of S. 556 goes well beyond the utility industry. The economic costs, in terms of increased energy prices and losses in manufacturing production, are considerable. The electric utility industry estimates that S. 556 would reduce the Gross Domestic Product (GDP) for the United States by $75 billion in 2010 and nearly $150 billion in 2020. Job losses could reach more than 600,000 jobs in 2010, increasing to more than 900,000 jobs by 2020. For those still in the workforce, earnings may decline by $38 billion to $75 billion—or $300 to $550 per household. Increases in energy expenditures, along with the reduction in earnings, could erase any benefits from the President's 2001 tax cut.

S. 556 will have significant and negative implications for the manufacturing base of the U.S. economy. Energy-intensive industries, such as steel, auto making, chemistry, paper, coal mining and oil and gas extraction, will be especially affected by a substantial rise in energy costs. These costs will vary widely across States and regions, as these industries tend to be located unevenly across the country. The East South Central and East North Central regions, heavy in coal mining and energy-intensive industry, will shoulder a disproportionate share of the burden on manufacturing. Short supplies of electricity and natural gas, and the world price of petroleum, already have combined to create economic hardships. During the past 7 months of 2000, more than 200,000 net manufacturing jobs were lost, largely due to sudden energy price increases. This human cost, combined with the $115 billion in higher energy prices paid by all energy consumers during 2000, cut about one-half of a percentage point off anticipated GDP growth just last year. In addition, the requirements of S. 556 would apply to many boilers at industrial facilities, which would bear significant capital costs in addition to rising energy costs.

Under S. 556, manufacturers, as well as homeowners and other energy and feedstock consumers, will pay more for their electricity and natural gas. Manufacturers operate in a highly competitive world economy and are generally unable to pass those added costs on to their customers. Accordingly, sustained high energy costs, as would be created by S. 556, would limit available investment capital and dampen the robustness of the manufacturing community's economic recovery.

The NAM is also concerned that S. 556 contains excessive targets beyond the requirements in the Clean Air Act. The Clean Air Act currently regulates emissions through a range of programs that were designed to protect human health and the environment. Any additional ambient air pollutant reduction targets should be justified by objective and peer-reviewed epidemiological and laboratory studies to both demonstrate the need for and set reasonable targets to achieve any additional reductions. Reductions also should be targeted to specified levels to achieve specified goals. Excessively stringent emissions-reduction targets waste capital dollars that can otherwise be put into increasing productivity, energy efficiency and employment.

The NAM also is concerned that the timetables in S. 556 are too short. Not only would the deadlines create economic waste by forcing premature abandonment of capital assets, they would also prevent the deployment of promising renewable and clean-coal, electricity-generation technologies. Technological innovation is the key to maintaining both a strong economy and environmental quality, and therefore should be encouraged—not locked out. Even attempts to comply through large-scale substitution of natural gas may be thwarted by a lack of natural gas production and delivery capacity, as well as a backlog of new turbines. This raises serious electricity and natural gas reliability concerns.

Under S. 556, many plants would be forced to apply unproven and expensive technologies over a very short time period. In July 2001, an EIA analysis expressed concern that system reliability would suffer during the period when a large amount of emissions-control equipment would have to be added. Consumers could experience electricity shortages during the closing, siting and construction of new generation and the "down time" of existing facilities, seriously affecting the cost, availability and reliability of electric power. The EIA study also questioned the availability of appropriate technology, expressing in particular that mercury emission-reduction technologies are relatively new and untested on a commercial scale.

The NAM is adamantly opposed to creating a mandatory cap on carbon dioxide. Creating a regulatory scheme for CO_2 emissions would limit the use of fossil fuels and needlessly hinder the goals of current energy legislation moving through Congress that addresses infrastructure, supply and efficiency issues. Concerns about potential climate change are best addressed globally through more scientific study, voluntary technological initiatives and inclusion of developing countries in any climate change path forward. The best way to develop and implement the goals of climate change policy is through a strong economy with incentives coupled with removal of disincentives for energy efficiency and environmental improvements (such as NSR as currently implemented).

The need to stimulate development of additional electricity-generating capacity requires a new approach to air quality regulation. Projections of a 22 percent increase in U.S. demand for electricity over the next 20 years necessitate a fresh look at the interrelationship between energy and environmental policy goals. The NAM feels that the current regulatory structure of the Clean Air Act impedes regulatory certainty and stability, decreases compliance flexibility, increases compliance costs, hinders energy efficiency and reliability and actually impairs air quality. For example, the CAA's new source review (NSR) program tends to frustrate industries' ability to make continuous improvements to their facilities, processes and products that improve productivity, advance energy efficiency and enhance environmental quality. Clearly, environmental legislation that creates energy-reliability concerns, distorts investments and imposes excessive costs will dampen economic growth and prolong the current manufacturing recession.

STATEMENT OF THE NATIONAL ENVIRONMENTAL TRUST

National Environmental Trust (NET) supports the emissions reduction targets and timetables in the Clean Power Act, S. 556. NET believes that multi-pollutant reduction legislation for power plants should achieve the following:

1. Reduce emissions of the four major power plant pollutants by 2007:

- Nitrogen oxides (NOx) emissions should be cut by 75 percent from 1997 levels;
- Sulfur dioxide (SO_2) emissions should be cut by 75 percent below the requirements of the 1990 Clean Air Act acid rain program;
- Mercury emissions should be cut by 90 percent from 1999 levels; and
- Carbon dioxide (CO_2) emissions should be cut to 1990 levels.

2. Include mandatory, on-system reductions in carbon dioxide.

- Recent findings by the U.S. National Research Council and the Intergovernmental Panel on Climate Change confirm that global warming is real and will cause serious damage to human health and the environment, and that carbon dioxide emissions from manmade sources are the major contributor to the problem. We must begin to reduce carbon dioxide emissions now to lessen the damage to human health and the environment from global warming.
- Including carbon dioxide emission reductions as part of a comprehensive cleanup plan for all major power plant air pollutants is the most economically efficient approach, and provides electric utilities with the greatest degree of regulatory certainty. Excluding carbon dioxide from the plan and leaving it for later regulation will increase costs for electric utilities and consumers.
- A return to 1990 carbon dioxide emissions levels for the electric utility sector is consistent with longstanding U.S. law—the Framework Convention on Climate Change, which was signed by former President George H.W. Bush and unanimously ratified by the U.S. Senate.
- Carbon dioxide reductions necessary to return to 1990 electric sector levels must be met within the electric generating sector and among sources subject to the emissions cap. Power plants should not be allowed to obtain emissions credits necessary to return to 1990 electric sector levels from sources that are not subject to the cap.

3. Close the "grandfather" loophole that exempts power plants permitted before 1977 from modern pollution standards.

- Every power plant should meet the most recent state-of-the-art pollution control standards for new pollution sources. The new standards should be met either on the plant's 30th birthday, or 5 years after enactment of comprehensive power plant cleanup legislation, whichever is later.
- More than two-thirds of the power plants operating today were built before 1970. These plants were exempted from modern pollution control standards because it was assumed that they would retire and be replaced by new, cleaner plants. However, these plants have not retired, and will continue operating and emitting high levels of pollutants unless and until they are required to meet modern pollution control standards by a date-certain.

4. Protect local air quality and public health by reasonable limits on emissions trading.

- Trading sulfur dioxide and nitrogen oxide emissions credits under a national cap-and-trade system has the potential to create localized "hot spots" of high emissions levels and adverse impacts on human health. A trading program for these pollutants among electric utilities should contain safeguards to prevent such hot spots and assure improvements in local air quality affected by power plant emissions.
- The mercury cap should not be met through a trading program. Very small quantities of mercury can contaminate large geographic areas, rendering fish unsafe to eat, among other dangers. There is a real potential that trading mercury credits will result in the buildup of toxic mercury in certain local areas. Mercury reductions should be achieved at each and every plant.

5. Retain core Clean Air Act programs that achieve air quality objectives that are not met through a cap-and-trade system.

- Regulatory streamlining and compliance flexibility measures should not result in the elimination of core Clean Air Act programs that have a demonstrated track record of reducing power plant pollution, and that are not achieved through a cap-and-trade program.
- A cap-and-trade program is not designed to achieve the health-based National Ambient Air Quality Standards for fine particle matter and ozone. Fundamentally,

the NAAQS apply potentially to all sources of air pollution, not just electric utilities. Moreover, trading of SO_2 and NOx could contribute to NAAQS violations in certain regions of the country.

- Power plant cap-and-trade legislation is not likely to reduce NOx emissions prior to 2007, while the NOx SIP Call and Section126 Petitions call for reductions to begin in the 2003–2004 timeframe. Eliminating these programs will lead to many more years of ozone smog violations in the Northeast, South and Midwest.
- A cap-and-trade system cannot take the place of New Source Review. NSR protects local air quality by requiring individual plants to meet modern pollution control standards whenever they expand in a way that significantly increases emissions. A cap-and-trade program for NOx and SO_2, by itself, does not require individual plants to clean up, thus leaving open the possibility of damaging localized pollution impacts.
- The "Best Available Retrofit Technology" or "BART" rule cannot be replaced by a cap-and-trade system for electric utilities. First, BART applies to dozens of industries, not just electric utilities. Second, BART's goal is to restore pristine visibility to the nation's national parks and wilderness areas, something cap-and-trade is not designed to do. In fact, trading NOx and SO_2 emissions credits under a cap-and-trade program could make visibility worse in some areas.
- A cap on power plant mercury emissions does not take the place of the utility air toxics "Maximum Available Control Technology" or MACT rule. There are more than 67 different toxic air pollutants emitted by electric utilities. The utility MACT rule currently under development should apply to all of these, not just mercury.

6. Protect against contamination of soil and groundwater by air pollutants removed from electric utility stack emissions.

- Pollutants removed from electric utility stack emissions can be highly toxic.
- Comprehensive power plant cleanup legislation should ensure that these pollutants are properly managed and disposed of, and are not released to the environment or allowed to contaminate soil or groundwater.

Statement of National Rural Electric Cooperative Association

multi-emission legislation—electric cooperative principles

Electric cooperatives support an effort to achieve regulatory certainty that will allow for the efficient management of the resources needed to produce electricity and achieve reasonable emission objectives. Electric utilities are faced with ever expanding environmental requirements that are duplicative, piecemeal and unnecessarily expensive. A new approach would be welcome, but only if it addresses improvements in air quality in a way that harmonizes economic, energy and environmental goals. Any plan must at a minimum provide regulatory certainty and stability, increase compliance flexibility, reduce compliance costs, and maintain coal-based generation as part of the electricity supply mix while maintaining affordable rates for consumers and guarantee electric reliability.

Rural electric cooperatives serve three-quarters of the land mass in the United States and provide power to more than 35 million consumers in the rural and suburban areas of this country. Electric cooperatives generate over 32,000 megawatts of electricity for distribution to their consumers. Seventy-five percent of this generation is coal-based and will be the target of any multi-emissions legislation.

As small consumer-owned utilities, the nation's electric cooperatives provide their consumer-members with the lowest possible electricity rates and advocate fiercely for the well-being of their local communities. Any multi-emissions legislative proposal that would impact those rates will need to be closely reviewed to insure that the adoption is cost-effective and do not drain a local community's financial and economic resources and their most economically vulnerable citizens while at the same time protecting the environment.

Electric cooperatives support the effort to develop legislation that meet the aforementioned goals, nevertheless are concerned about the potential elements and details of the proposals. In general, electric cooperatives because of their size, characteristics, and dependence on coal for electric generation could be put at a severe economic disadvantage if a multi-emissions strategy is improperly designed.

Electric cooperatives are also extremely concerned that while multi-emissions policy has merit, legislation could be drafted without sufficient benefits to offset those additional costs. Multi-emission legislation must insure that once enacted that electric generating facilities have regulatory certainty for the future. If new legislation simply adds an additional requirement on electric generating stations without the removal of or non-application of existing requirements, the promise of any commensurate regulatory benefit will not be met.

Electric cooperatives believe that any legislation to alter the current regulatory scheme for electric power plants must include the following principles to achieve economic, energy and environmental goals. These goals will not be advanced if legislation only adds environmental costs and requirements.

Cooperative Principles

1. Programs to reduce emissions should be flexible and include emissions trading to minimize the costs of these programs on individual sources and the nation. Consistent with flexibility, programs should not include unit-by-unit or other command-and-control requirements, since the size, configuration and utilization of a given unit will determine the most cost-effective compliance option for it.

2. The timing and magnitude of emissions reductions for any program or combination of programs should not impair fuel diversity needed to provide affordable and reliable electricity to the nation's consumers over the coming decades. Collectively, the programs should reconcile any conflicting national energy and environmental objectives.

3. Programs to reduce emissions should incorporate adequate future regulatory certainty, whereby utilities making capital investments and other major changes would be reasonably assured that subsequent new or additional requirements would not prematurely supercede efforts to comply with the original programs or curtail the recovery of capital costs.

4. A program to reduce mercury emissions should be phased. The initial phase should be timed and directed toward recognizing and accounting for mercury reductions resulting from existing and additional controls installed to reduce SO_2, NOx and particulates. The latter phase should be timed so as to allow the cost-effective addition of controls, specifically for mercury, as needed to meet overall final program goals.

5. Any program directed at curtailing CO_2 emissions from coal-based units should be phased to bring about regulatory certainty, maintain national fuel diversity, and guarantee electric reliability. The initial phase should be directed at ensuring that technologies are available and cost effective for (1) the construction of new coal-based units that are significantly more carbon efficient than today's technologies can render and (2) the sequestration or capture of CO_2 emissions from the flue gas of existing coal-fired units. The latter phase should be timed to incorporate CO_2 requirements that are consistent with the ability to economically implement the technological capabilities developed during the initial phase.

6. Programs should allow sufficient lead times and phase-in periods for installation of additional pollution controls. Compressed timelines would unnecessarily escalate overall compliance costs due to supply shortages and would especially drive-up compliance costs up for smaller systems that generally are less attractive candidates for consultants and equipment vendors in a tight supply market.

7. Programs incorporating the trading of emissions credits, including a modified SO_2 allowance program, should be structured to equitably benefit all those entities that must comply with program requirements as well as the nation's electric consumers. Any allocation of emissions credits should be based on fossil fuel utilized to generate electric power.

8. Under programs incorporating national caps and trading of emissions credits, New Source Review requirements addressing modifications at existing units are unnecessary and should be eliminated.

9. Provisions for government/private sector R&D collaboration to advance combustion and pollution control technologies, such as those advanced in the NEET bill, should be incorporated into any "comprehensive air" legislation. When incorporated, these provisions should be structured such that all segments of the utility industry, including not-for-profit entities, can equitably benefit from them.

10. Programs that incorporate emissions trading should be structured to ensure no potential adverse effects on emissions credit pricing or emissions credit availability due to discriminatory market power. Smaller entities, and ultimately their electric consumers, must not be unfairly discriminated against in the emissions trading market place. Both generators and electric consumers should equitably benefit from emissions markets and their structures.

STATEMENT OF THE NATURAL RESOURCES DEFENSE COUNCIL

NRDC supports comprehensive power plant clean-up legislation to reduce and cap emissions of all four major air pollutants from fossil-fueled electricity generating units. We support the emissions targets and timetables in the Clean Power Act, S. 556, for carbon dioxide (CO_2), mercury (Hg), nitrogen oxides (NOx) and sulfur dioxide (SO_2). Power plant emissions of these four pollutants are seriously damaging public health and the environment. S. 556's emissions targets and timetables are necessary, feasible, and affordable measures to address these damages.—Power generation is responsible for 40 percent of U.S. emissions of carbon dioxide, the main cause of global warming, That is 10 percent of total world CO_2 emissions from fossil fuels and equals the total CO_2 output of Germany, Italy, and India combined.

- Power plant pollution is causing 30,000 premature deaths each year and a host of other damage to health and the environment. Reducing SO_2 and NOx to S. 556's targets would save tens of thousands of lives and avoid hundreds of thousands of illnesses each year by reducing levels of fine particles and ozone smog.
- Power plants are the last unregulated source of mercury into the air. Mercury is a potent neurotoxin and causes birth defects. Serious health hazards are posed both by Hg emissions that settle in the vicinity of sources and by Hg emissions that are transported long distances, Hg emissions that reach lakes and other water bodies enter the food chain and reach dangerously high concentrations in fish that are a regular part of the diet of millions of Americans.

Four Pollutants, Not Three

A four-pollutant strategy that includes CO_2 is needed to address the full range of damage to human health and the environment from power plant air pollution and at the same time provide the power industry greater certainty regarding future regulatory requirements. A three-pollutant plan that excludes CO_2 would result in additional irreversible damage from global warming. Controlling CO_2 is inevitable. A piecemeal program for the power sector would threaten the environment and cause higher costs for electricity producers and consumers.

Protecting Local Air Quality

Even under a program of tight national caps, local air quality improvement cannot be assured if new or expanded power plants can be built without modern, state-of-the-art pollution controls, or if large, old generating units are permanently grandfathered at high emission rates.

- NRDC opposes proposals to repeal existing Clean Air Act programs designed to protect and enhance regional end local sir quality. These include non-attainment, "PSD," visibility, and "new source review" programs, which are effectively cutting pollution in our biggest cities and protecting the vistas of our priceless national parks.
- In addition, NRDC supports S. 556's requirement that each generating unit older than 30 years must meet modern, state-of-the-art performance standards. Experience has now demonstrated that without such a requirement, dirty older plants will be life-extended indefinitely as a deliberate strategy that maintains, and even increases, high pollution levels.

Emissions Trading

NRDC can support emissions trailing provided the legislation adopts limitations appropriate to the characteristics of each pollutant.

- We can support trading of CO_2 control obligations between electric generating sources subject to S. 556's emissions cap. Power plants should not be allowed to meet their obligations with credits derived from other sectors that are not subject to emissions caps.
- For SO_2 and NOx, NRDC can support emissions trading among electric generating sources with safeguards to assure improvements in local air quality affected by existing power plant emissions, and with provisions to ensure that the Western region of the United States will achieve emission reductions at least proportional to the required national reductions.
- NRDC opposes trading of His control obligations because we have seen no analysis demonstrating that such trading will not compromise local health protection.

Allocating Allowances

Three allowance allocation approaches have been discussed.

- A system that grandfathered emissions allowances to power plants based on their "baseline" emissions would penalize sources that have invested in cleaner energy and reward the most polluting sources. We oppose this approach.
- Auctioning the allowances would avoid these adverse consequences while recognizing that no existing emitter has a "right" to use the atmosphere to dispose of its wastes. An auction could be designed to be revenue-neutral and to mitigate any potential adverse economic impacts on venous stakeholders.

• An output-based allocation system with periodic updating would also avoid penalizing cleaner sources and rewarding high emitters. Any output-based system should allocate allowances to electricity production by renewable sources and to verifiable demand-side efficiency projects as well as to production from fossil generators. Allocations should not be made for nuclear generating facilities because of other significant environmental externalities outside the arena of air emissions.

Efficiency and Renewables Mean Pollution Reduction at Lower Cost

A power plant bill that takes advantage of efficiency and renewable energy sources could lower Americans' electric bills by $30 trillion per year, cut CO_2 pollution by a third, and slash emissions of other pollutants in half, according to the November 2000 Department of Energy report, "Scenarios for a Clean Energy Future." Congress can assure these results by complementing emissions caps with provisions for:

• Stronger efficiency standards for appliances and buildings.
• A renewable power portfolio standard for each generating company.
• A public benefit fund to increase energy efficiency investments, supported by a charge on electricity distribution.

Also needed through other legislation are tax incentives to expend the market for today's best performing efficiency technologies and renewable generation, as well as increased R&D funding to develop the efficiency and renewable technologies of tomorrow.

Other Safeguards

NRDC supports requirements to assure that pollutants removed from fuels or stack gases will not be re-released into the environment. This provision is particularly important for volatile toxins such as mercury.

KEY FINDINGS FROM EIA'S ANALYSIS OF JEFFORDS-LIEBERMAN CLEAN POWER ACT

(By Alexander Perera and Daniel Lashof, NRDC)

EIA's analysis[1] of reducing multiple emissions from electric power plants demonstrates that the Clean Power Act (S. 556) can reduce emissions of soot, smog, and acid rain precursors by 75 percent, reduce mercury emissions by 90 percent, and reduce emissions of carbon dioxide to 1990 levels. The integrated policies in S. 556 simultaneously produce lower electricity and natural gas bills, both for households and the country as a whole.

Some key findings of the EIA analysis are:

• Average annual household expenditures on electricity can be reduced by $40 in 2010 and $200 by 2020 under the provisions of the Clean Power Act.[2] Assuming only "Moderate" energy efficiency measures, average annual household energy bills would be unchanged in 2010 and would be reduced by $100 in 2020.

• Despite a slight increase in electricity prices, the nation's net electricity bill[3] in 2010 would be $27 billion less under the Clean Power Act scenario when compared to EIA's reference case, assuming "Advanced" energy efficiency measures. By 2020 the savings rise to $60 billion. With "Moderate" energy efficiency measures the national net electricity bill savings would still be $16 billion in 2010 and $41 billion in 2020.

• Compared to the Reference case, the cumulative resource costs of providing electricity services through 2020 would be reduced by $220 billion assuming "Advanced" energy efficiency measures, or $120 billion assuming "Moderate" efficiency measures.

• Natural gas consumption in 2020 will be nearly 4 Trillion Cubic Feet/yr lower than in the Reference case, reducing natural gas expenditures by just under $30 billion, assuming Advanced energy efficiency measures. Natural gas expenditures would be reduced by $12 billion assuming moderate efficiency measures.

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[1]Energy Information Administration, 2001. "Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenarios." SR/OIAF/2001–05. October.

[2]CEF-JL Advanced scenario with emission limits relative to the Reference scenario.

[3]The net electricity bill is calculated from the gross electricity bill (total electricity sales multiplied by average electricity prices) by subtracting the cost of carbon emission allowances (carbon emissions multiplied by carbon allowance prices). This reflects a scenario where allowances are auctioned and the revenues are returned to consumers. If allowances were allocated based on electricity output rather than being auctioned, electricity prices (and the gross electric bill) would increase less than they do under the assumptions used by EIA.

• Carbon dioxide emissions from electricity generators are reduced to 1990 levels, as called for by the Rio Climate Treaty that was ratified by the U.S. Senate in 1992. This represents a reduction relative to the reference case of 220 million metric tons of carbon in 2010 and 300 million metric tons of carbon in 2020.

• EIA's analysis shows that the Clean Power Act's integrated approach is far more cost effective than a hypothetical bill that only caps emissions of sulfur, nitrogen, and mercury. Net electricity bills would be $30 billion lower in 2010 and $75 billion lower in 2020 under the Clean Power Act assuming Advanced energy efficiency measures compared to a case that only includes 75 percent reductions in sulfur, nitrogen, mercury emissions.[4] With only Moderate efficiency measures net electricity bills would be $20 billion lower in 2010 and $57 billion lower in 2020.

Comparison of Results from EIA Scenarios

	Reference	3P–75 percent Cut	S. 556-Mod.	S. 556-Adv.
Net Electric Bill 2010	$250	$252	$240	$230
(Billion dollars) Net Electric Bill 2020 (Billion dollars)	$290	$290	$250	$230
Carbon Emissions 2010 (Million tonnes carbon)	690	690	470	470
Carbon Emissions 2020 (Million tonnes carbon)	770	770	470	470

STATEMENT OF NESCAUM

Northeast States agree that Federal efforts to achieve integrated reductions in multiple power plant pollutants should be implemented on an annual, output-basis with caps to limit overall pollutant levels. Possible reduction targets and timeframes are identified below. To ease comparison with other proposals they are presented in terms of a cap target and equivalent output-based emissions rate. However, this presentation is not intended to preclude discussion of dynamic or declining caps, a concept that we continue to explore, or of more aggressive targets than those described here.

SO_2 Target: National annual cap of approximately 4 million tons by 2004–7, with a further reduction to 2 million tons in the 2009–12 timeframe. These caps translate to average emissions rates of approx. 3.0 and 1.5 lbs/MWh, respectively and represent a 55 to 78 percent reduction from eventual 8.9 million ton Acid Rain cap. Implications of existing allowance "bank" must be addressed in developing SO_2 requirements.

NOx Target: National annual cap of approximately 2 million tons by 2004–7, with a further reduction to 1.3 million tons in the 2009–12 timeframe. These caps translate to average emissions rates of about 1.5 lb/MWh and 1.0 lb/MWh, respectively and represent a 70 to 80 percent reduction from current annual emissions of approx. 7 million tons. The 2 million ton cap can be achieved by annualizing NOx SIP Call requirements.

Mercury Target: National reductions greater than 70 percent by 2004–7 with a reduction goal of 85–95 percent by 2009–12. Further work needed to determine how to set standards that will achieve desired goals and to explore feasibility/acceptability of using market mechanisms to implement mercury reductions.

CO_2 Target: Return power sector emissions to 1990 levels by 2010 with an additional reduction of at least 10 percent to be achieved by 2020.[1] Additional work is needed to explore possible role of flexibility mechanisms (e.g., trading, early action, off-sector credits, etc.), cost caps, implications of recent international developments, etc.

Other Power Plant Pollutants: In the interests of regulatory certainty and comprehensiveness, other important power plant pollutants—such as primary particulate matter, other air toxics and carbon monoxide—may need to be addressed as part of multi-pollutant legislation. NE States are exploring potential options/targets appropriate to these pollutants.

[4]Energy Information Administration, 2001. "Reducing emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants." SR/OIAF/2001–04. September.

[1]The Conference of the New England Governors and Eastern Canadian Premiers have committed to the long-term goal of reducing society-wide emissions of greenhouse gases by 75–85 percent. To meet these targets, it is likely that declining caps will need to be employed.

Other Key Issues

As indicated above, a number of details concerning each of the targeted pollutants must still be addressed. In addition, the Northeast States are coordinating to develop specific recommendations in four broad issue areas likely to be closely linked to the multi-pollutant debate:

- Interaction of multi-pollutant legislation with New Source Review (NSR), Prevention of Significant Deterioration (PSD) and other existing or pending regulatory programs (e.g., BART, mercury MACT determination, etc.). Under no circumstances should new Federal legislation obstruct or limit enforcement actions undertaken to remedy violations of existing NSR requirements.
- Interaction of Federal multi-pollutant requirements with existing or future State requirements. Because States bear ultimate responsibility for meeting ambient air quality standards and protecting public health, any new Federal legislation must maintain the full scope of existing State authority to adopt more protective requirements.
- Addressing local pollution concerns and their implications for the design of future regulatory requirements (such as trading). States must retain the authority to respond as they deem necessary to remedy adverse local impacts. Provisions must also be included that require a Federal response to remedy local impacts of an interstate nature.
- Ability to include additional provisions to address long-term clean energy needs, including: ensuring the reliability of power grids, promoting clean distributed generation, encouraging renewable energy resources, continuing demand-side management, promoting combined heat and power, and supporting systems benefits programs.

STATEMENT OF NISOURCE, INC.

NiSource, Inc. appreciates the opportunity to participate as an observer in the Stakeholder Meeting organized by the Senate Environment and Public Works Committee and to submit a brief statement of our views concerning goals and principles to include in multi-emission legislation. NiSource, a Fortune 300 energy company, is an investor owned public utility which is engaged in the businesses of generating electricity (primarily by combustion of coal) and distributing that electricity in Indiana, of transporting and distributing natural gas in numerous States in the Midwest, Southeast and Northeast, and of providing combined heat and power energy systems to commercial and industrial customers.

NiSource will support legislation that promotes wise energy and environmental objectives. Aggressive targets for reduction of emissions from the electric generating sector must be coupled with aggressive fostering of additional energy reliability and efficiency. Market mechanisms should be flexible to optimize investments in both objectives. We strongly believe that one of the best methods to achieve both environmental and energy policy goals is through maximizing the efficiency with which energy products are produced in this country. We have been actively seeking ways to enhance the efficiency of our coal-fired electric generating facilities and have also been active in developing extremely clean and efficient combined heat and power projects.

The current Clean Air Act regulatory regime is not conducive to, indeed in some ways is positively hostile to, generation efficiency. For example, current emissions standards often result in providing the quickest permitting and least stringent emissions requirements to energy projects that use fuel least efficiently. This is the opposite of what we believe is sound policy, and we urge that legislation set multi-emission targets and distribute allowances on an output basis, that recognizes the pollution prevention aspects of energy efficiency.

We also support the view that new source review discourages efficiency enhancements at existing facilities. However, we think that new source review of new facilities has even greater negative impacts on efficiency. It would not make sense, in our view, to foster efficiency modifications of existing sources while leaving intact a system that discourages construction of new clean and highly efficient sources.

Under current law a simple cycle gas peaking plant built on a greenfield can completely avoid Federal new source review requirements. At the same time, a far more efficient combined heat and power project planned for an urban area where the power is most needed and where it can be supplied without line losses and without exacerbating transmission bottlenecks, must run a long and uncertain Federal new source review gauntlet. Such new source review is very resource intensive, not only for the applicant, but also for resource constrained government agencies. Yet, under a system of emission caps, which is the most likely format of any multi-emission legislation, this long, resource intensive and discouraging process produces no overall reduction in emissions. There is legitimate concern about the local impacts of new sources, but such concerns can certainly be dealt with effectively without having to cling to the cumbersome and inefficient new source review process.

Some persons disparage concerns over new source review for new sources by pointing to the large number of new power plant projects that have been announced. Yet the impressive number for announced capacity reflects in large part what can be more easily permitted-such as greenfield peaking units. Even so, many of these announced projects will never see the light of day. The announced projects will also fail to adequately address the objective of optimizing fuel efficiency, solving transmission congestion in urban areas, and providing cleaner base-load energy.

More importantly, the burdens of new source review fall unequally on projects depending on size. Smaller projects, often connected with new construction, have far tighter margins for delay and uncertainty. Thus, the current list of announced power plant projects (some of which can avoid new source review as "synthetic minors") may well mask the fact that the smaller highly efficient combined heat and power projects, and other environmentally desirable projects, are not being pursued due to the disincentives presented by new source review.

The nation will benefit from multi-pollutant legislation that provides both regulatory certainty and the flexibility to invest in sustainable efficient energy projects.

Statement of Ohio EPA

Mr. Chairman, Thank you for the opportunity to speak to you today. My name is Christopher Jones and I am Director of the Ohio Environmental Protection Agency. As Director of Environmental Protection of a large industrial State, there are many challenges in my position. I welcome the opportunity to participate today so that our viewpoint will be considered prior to Congress initiating debate on the issue of multi-pollutant control for the utility industry.

Even after thirty years of various controls and standards, power plants remain the largest emitting category of sources in our State. At this time, there is an opportunity for Congress to move forward with a control regime that will substantially reduce emissions from power plants over the long term. Ohio EPA supports the concept of a multi-pollutant control program to cover three pollutants: sulfur dioxide, nitrogen oxides and mercury.

In Ohio, there has been a substantial reduction in emissions of sulfur dioxide over the past few years. However, despite these reductions, sulfur dioxide remains a pollutant of concern not due to its primary effect, (Ohio is within the ambient air quality standards for sulfur dioxide), but as a result of the secondary effect of sulfur dioxide emissions on fine particles and visibility. It is generally believed that sulfate particles make up a significant portion of the fine particulates in the eastern United States. It is likely that reductions in sulfur dioxide emissions, possibly along with other pollutants, will be needed to meet the $PM_{2.5}$ ambient air quality standard.

For nitrogen oxides, there is a current plan in place to substantially reduce emissions by means of the NOx SIP Call and the US EPA Section 126 action. These reductions will require expenditures of significant capital to control this pollutant. Many plants will be upgraded to emit NOx at levels that would be expected from a new coal boiler and we believe that any additional controls beyond the NOx SIP Call will need to be carefully reconciled with the SIP Call.

Finally, there remains excessive loadings of mercury into many of the streams and lakes in the State. Ohio has a statewide fish advisory in effect as a result of mercury in streams. The cumulative effect of the release of mercury into the environment from multiple media has lead to this condition, with air deposition being an important component. Additional legislation has the potential to lessen the impact of mercury deposition on the aquatic environment and should be included in the package.

The level and timing of the control are an important piece in any legislative package. In the NOx SIP Call rules drafted by Ohio EPA, we provided sources with additional time to comply with the NOx SIP Call requirements if there was a commitment to reduce sulfur dioxide emissions by 50 percent and mercury by 60 percent along with complying with the NOx SIP call by 2007. We believe that this level of control can be reasonably achieved within this timeframe. However, additional levels of control will take a longer time to achieve. Also, Ohio EPA believes that the legislation should focus on electric generating stations. Although some industrial facilities have large industrial boilers, it has been our experience that the combined effect of the emissions from industrial sources are not significant enough to warrant inclusion of industrial boilers in any bill.

Ohio EPA further supports the concept of a multi-pollutant control plan in order to provide for more regulatory certainty for the utility industry. If Congress can develop legislation that provides clear, achievable targets, the industry will be able to develop a comprehensive program to reduce emissions with the certainty that there will not be future regulatory standards that will need to met with respect to the traditional criteria pollutants. As part of the implementation of the visibility requirements, many utilities will need to install Best Available Retrofit Technology (BART). A multi-pollutant control bill should, by the end of the implementation phase, bring the existing fleet of utility boilers up to grade with standards that would meet the requirements to install BART. The level of control that is decided for the various pollutants is a critical factor in the ability to achieve additional reductions and continue the use of the domestic fuel supply of coal. Any limits that are ultimately developed should be reasonably achievable by the majority of the existing coal fired power plants in this country. It would not be prudent to set standards at such a level that for practical purposes there is a widespread conversion to natural gas in the electric generating capacity in this country.

At this time, Ohio EPA does not believe that any multi-pollutant control bill should include carbon dioxide. The fact is that this country has not agreed to the Kyoto Protocol or any other binding agreement to reduce carbon dioxide and other greenhouse gases. Until that occurs, it would be speculative to suggest that a certain level of control of greenhouse gases should be achieved. That being said, Ohio EPA supports energy efficiency and believes that energy efficiency credits can be one mechanism to provide an incentive to obtain emissions in both criteria pollutants and greenhouse emissions. Ohio EPA would support some modest incentives for energy efficiency projects from both the user and producer side that would result in lower electrical demand or that would result in more electricity being produced for the same amount of fuel burned. In either case, there would be a reduction in emissions in criteria pollutants and a secondary benefit of the reducing the emissions of greenhouse gases.

Thank you for your attention and I look forward to participating in the remainder of the discussions on multi-pollutant controls.

STATEMENT OF U.S. PUBLIC INTEREST RESEARCH GROUP

U.S. PIRG strongly supports the provisions of the Clean Power Act (S. 556). We believe that this legislation strikes the appropriate balance between protecting public health and the environment, and doing so in a manner that affords plant owners ample time and flexibility. The following principles underlie our support for the Clean Power Act or any other power plant emission reduction policy:

Comprehensive legislation must address the impacts of all major power plant pollutants

U.S. PIRG would oppose an approach that omits any of the four major power plant pollutants, including nitrogen oxides, sulfur dioxide, mercury and carbon dioxide.

Clean Power Act's emission reduction targets are warranted

Pollution from the electric power sector is taking a very serious toll on public health and the environment. The severity of these impacts warrant reductions at least as deep as those proposed in the Clean Power Act, and within the timeframe proposed in the Act. For example:

- Premature death: Sulfur dioxide from power plants forms fine particulate pollution (soot) in the air, which is responsible for an estimated 30,000 premature deaths each year. By weakening the respiratory system, soot is taking months and even years off of the lives of tens of thousands of Americans. Two thirds of all sulfur dioxide pollution emitted nationwide comes from power plants.
- Asthma Attacks and ER visits: Nearly half of the U.S. population lives in areas that do not meet basic health standards for ground-level ozone, commonly called smog. Scientists estimate that smog triggers six million asthma attacks and sends 159,000 Americans to hospital emergency rooms each year. One-quarter of the nitrogen oxide (NOx) pollution that causes formation of smog comes from electric power plants.
- Mercury contamination: Thousands of lakes and streams in 40 States have been posted with warnings not to eat the fish due to mercury contamination. Consumption of these fish can cause neurological problems, including developmental retardation in fetuses and young children. The biggest source of mercury contamination is from the smokestacks of coal-burning power plants, which are responsible for 32 percent of human caused mercury in the environment.

• Global warming: More than 2,500 of the world's leading climate experts have concluded that the planet is getting warmer due to pollution from burning fossil fuels such as coal. If this continues, scientists predict more violent weather, the northward spread of insect-borne disease, rising sea levels, and widespread disruption of ecosystems. Electric power plants are responsible for 40 percent of the nation's total emissions of carbon dioxide (CO_2). CO_2 is the main cause of global

The Clean Power Act provisions must not replace any other provision of the Clean Air Act, nor should the Clean Power Act be accompanied by language exempting any entity from applicability of the current law.

The four-pollutant emissions policy for the electric power sector should supplement rather than replace existing obligations to reduce emissions from power plants. No entity should be afforded an exemption from any exiting Clean Air Act program, including but not limited to New Source Review (NSR), prevention of significant deterioration (PSD), the National Ambient Air Quality Standards (NAAQS), the regional haze program, and the maximum achievable control technology (MACT) standards for air toxics.

Health of people living near power plants must be protected

There is considerable and mounting evidence that power plant pollution has its greatest impact on nearby communities. Consequently, an acceptable regulatory scheme for power plant pollution must ensure that every plant eventually meet the standard that reflects the emission rate achievable through the use of the best available control technologies. The Clean Power Act achieves this objective by requiring that every covered facility begin to meet these tighter emission standards at the time of its 30th year of operation. A regulatory regime that simply set a national cap and allowed individual plants to operate indefinitely with outmoded pollution controls would fail to adequately protect public health.

With respect to mercury and other air toxics, we believe that any level of emission trading could produce adverse health impacts for communities near plants that failed to adopt the most aggressive mercury reduction strategy. We therefore oppose emission trading to meet the emission reduction targets for mercury or other air toxics.

STATEMENT OF RESOURCES FOR THE FUTURE

Since 1952, scholars at Resources for the Future (RFF) have published more than 10,000 peer-reviewed articles. To gain more information; to discuss the methodology, analytical models, and/or assumptions upon which the points below are based; or to reach an RFF scholar, please contact the Communications Department at Resources for the Future, at 202–328–5188 or on the Web at www.rff.org.

AUCTION OF EMISSION ALLOWANCES WOULD DRAMATICALLY REDUCE THE COST OF CARBON REDUCTIONS

The success of the sulfur dioxide emission-allowance trading program[1] provides a justification for using a cap-and-trade approach to limit emissions of carbon and other pollutants from electricity generators. President Bush has spoken about the need for market-based approaches to reducing carbon emissions. Several legislative proposals now under consideration have suggested that carbon policies should first be applied to the electricity industry.[2] A critical issue in the design of a trading program is how emission allowances would be distributed at the start.

• The cost to the economy of initially auctioning emission allowances would be roughly one-half the cost of an approach that would allocate emission allowances at no cost to industry.[3]

• An auction leads to higher electricity prices than a free allocation, while it leads to smaller increases in natural gas prices. A generation performance standard (GPS)—a method that would update emission allocations based on shares of current

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[1]The sulfur dioxide emission-allowance trading program was created by Title IV of the 1990 Clean Air Act Amendments.

[2]Even in the context of an economywide carbon policy, the electricity sector will play an important role. This sector is responsible for one-third of U.S. carbon emissions, but is likely to be responsible for close to three-quarters of domestic carbon reductions under any cost-effective U.S. policy to combat global warming. Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity, U.S. Energy Information Administration (US EIA), 1998. (SR/OIAF/98–03), October.

[3]"The Effect of Allowance Allocation on the Cost of Carbon Emission Trading," by Dallas Burtraw, Karen Palmer, Ranjit Bharvirkar, and Anthony Paul, 2001. Resources for the Future Discussion Paper 01–30 (August) (www.rff.org/disc—papers/PDF—files/0130.pdf).

generation—leads to the smallest increase in electricity prices, but the largest increase in natural gas prices. Grandfathering—an approach that allocates allowances based on historic generation—falls midway between the other two approaches with respect to energy prices.[4] [5]

- The auction approach does a better job of preserving the value of existing power generation assets than does the GPS approach.[6] The value of assets would actually increase under the grandfathering approach, representing a substantial transfer of wealth from consumers to producers.[7]
- Auctioning allowances creates a source of revenue that could be returned to households by the Federal or State government, or by industry.[8] [9] The relative efficiency of an auction would be even greater if the revenues were used to reduce taxes on capital or labor income, which tend to reduce the level of economic output.[10] A portion of revenues could be directed to support energy conservation and other benefit programs.
- If an auction approach is used, it is possible to offset potential losses faced by electricity generators by giving them about 11 percent of the allowances for free, as compensation to fully maintain the value of their existing assets.[11] Granting a comparable amount of allowances (or dedicating revenues from an auction) to upstream providers of fossil fuels and workers in these industries would be sufficient to compensate them as well.[12]
- An efficient carbon policy should cover the entire economy rather than function as a patchwork of options affecting sectors differently.[13] The auction approach can be readily expanded to address all sources of carbon emissions.

A hybrid approach might be considered to meet various goals of efficiency and fairness. A hybrid could combine giving away a portion of the allowances through either the GPS or grandfathering approaches as compensation, with an auction set up to handle the rest. Over time, the auction approach could be phased in to achieve efficiency goals, which are especially important to long-term economic growth.

Statement of North Carolina General Assembly

SENATE BILL 1078: Improve Air Quality/Electric Utilities.
Committee: House Public Utilities
Introduced by: Senator Metcalf
Summary by: George Givens, Committee Counsel Tim Dodge, Research Assistant

Summary

Senate Bill 1078 would require reductions in the emissions of certain pollutants from large-scale coal-fired generating units owned by investor-owned public utilities. The bill would establish collective emission caps for nitrogen oxides (NOx) and sulfur dioxide, as well as a timetable for meeting these standards. The proposed bill would also:

- Direct the Environmental Management Commission (EMC) to develop and adopt standards and plans to implement programs to achieve the collective reductions in the timeframe established.
- Direct the Utilities Commission to allow each electric utility to recover the full costs of compliance with this bill.
- Direct the State to use its resources to compel other States and entities to make similar reductions, particularly those States whose emissions adversely im-

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[4] "Power Plant Emission Reductions Using a Generation Performance Standard," by Alan J. Beamon, Tom Leckey, and Laura Martin, 2001. US EIA (March).
[5] See note 3 above.
[6] See note 3 above.
[7] "An Evaluation of Cap-and-Trade Programs for Reducing U.S. Carbon Emissions," Congressional Budget Office, 2001 (June).
[8] "Returning Carbon Permit Proceeds to the Economy: Three Options" by Martha Phillips, 2001. Americans for Equitable Climate Solutions (February, www.aecs-inc.org/indexn.html, accessed 9/25/01)
[9] "A Proposal for Credible Early Action in U.S. Climate Policy," by Raymond Kopp, Richard Morgenstern, Billy Pizer, and Michael Toman, Resources for the Future (www.weathervane.rff.org/features/feature060.html, accessed 9/25/01).
[10] "When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets," by Ian W.H. Parry, Roberton C. Williams, and Lawrence H. Goulder, 1998. Journal of Environmental Economics and Management
[11] See note 2 above.
[12] "Confronting the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?" by Lawrence H. Goulder, in Climate Change Economics and Policy, edited by Michael A. Toman, 2001. Washington, DC: Resources for the Future.
[13] See note 9 above.

pact air quality in North Carolina or whose failure to make similar reductions would put the economy of North Carolina at a competitive disadvantage.

• Direct the EMC to evaluate the need for further reductions of NOx and sulfur dioxide (SO_2), and report its findings to the General Assembly and the Environmental Review Commission annually beginning September 1, 2004.

• Direct the Division of Air Quality to study issues related to the monitoring and control of mercury emissions from coal-fired generating units.

• Direct the Division of Air Quality to study issues related to setting standards for carbon dioxide emissions from coal-fired generating units and other stationary sources of air pollution.

The act would become effective when it becomes law.

Current Law

Under G.S. 143–215.107, the EMC is directed and empowered to prepare and develop plans for the prevention, abatement, and control of air pollution in the State. This includes regulation of the use of SO_2 allowances and NOx emissions in accordance with Title IV and implementing regulations adopted by the United States Environmental Protection Agency (EPA). In addition, the EMC is directed to develop and adopt a program of incentives to promote voluntary reductions of emissions of air contaminants.

Bill Analysis

Sections 1 and 2 would direct the EMC to develop and adopt standards and plans that would require reductions in both SO_2 and NOx emissions over the next 12 years. The bill would apply only to coal-burning power plants with a generating capacity greater than 25 megawatts that are operated by investor-owned, public utilities. 14 facilities in North Carolina meet this description, and are identified on the attached map. The emissions caps, and the reductions that would be necessary to achieve these caps, are illustrated in the table below:

Table 1: Proposed Maximum Annual Emissions Levels under Senate Bill 1078.

Pollutant	Quantity Emitted in 1998 (tons)	Proposed Emissions January 1, 2007 (tons)	Proposed Emissions January 1, 2009 (tons)	Proposed Emissions January 1, 2013 (tons)
Nitrogen Oxides (NOx).	244,8621[1]	Not to exceed 60,000	Not to exceed 56,000	Not to exceed 56,000
Sulfur Dioxide (SO_2).	475,5082[2]	Not specified	Not to exceed 250,000	Not to exceed 130,000

[1]U.S. Environmental Protection Agency, ''The Emission and Generation Resources Integrated Data base (E-GRID),'' Clean Air Markets Programs, 2000. Online: http://www.epa.gov/airmarkets/emissions/.

[2]U.S. Environmental Protection Agency. ''Emission Data for Power Plants, North Carolina, 1999.'' Online: http://www.epa.gov/acidrain/emission/index.htm.

Section 3 would create a mechanism for recovery of costs associated with implementation of the bill by the affected utilities. The Utilities Commission would set an environmental compliance expenditure-recovery factor on an annual basis allowing each electric utility to recover all just, reasonable, and prudently incurred environmental compliance expenditures separate from the electric utility's base rates. This recovery factor would include only include expenditures incurred after July 1,2001, that exceed the expenditures required to comply with the revisions to the State Implementation Plan (SIP) to reduce emissions of NOx pursuant to the final notice published by the EPA[3].

Section 4 would provide that the State actively seek to induce other States and entities, including the Tennessee Valley Authority (TVA), to achieve NOx and SO_2 reductions comparable to those proposed in this bill. The State would give particular attention to the States and entities whose emissions negatively affect air quality in North Carolina or whose failure to make similar reductions would put the economy of North Carolina at a competitive disadvantage.

Section 5 would direct the EMC to study the desirability and feasibility of reductions of NOx and SO_2 beyond those proposed in Sections 1 and 2 of the bill. The study would consider a variety of factors, including available technology, costs to consumers of electric power, reliability of electric power supply, actions taken by other States and entities that affect North Carolina, and the effects that further reductions would have on public health, the environment, and natural resources, including visibility. The EMC would report the findings of the study to the General

[3]40 CFR §51.121. July 1, 2001, Edition.

Assembly and the Environmental Review Commission annually beginning on September 1, 2004.

Sections 6 and 7 would direct the Division of Air Quality (Division) of the Department of Environment and Natural Resources to study issues related to the development and implementation of standards to control mercury and carbon dioxide emissions. The Division is to perform cost benefit analyses of the available control technologies and alternative strategies for reduction of emissions for mercury and carbon dioxide. For mercury, the Division would also study issues related to monitoring. The study of mercury emissions is limited to coal-fired generating units, while the study of carbon dioxide would evaluate all stationary sources of air pollution. Both studies would report to the EMC and the Environmental Review Commission, beginning March 1, 2002.

Section 8 provides that act would become effective when the act becomes law.

Background

The Federal Clean Air Act Amendments of 1990 addressed numerous air quality problems in the United States, including smog and acid rain caused by SO_2 and NOx emissions from fossil-fueled electric power plants. Because of concerns over these problems, the EPA in 1997 adopted a stricter Federal ozone standard. At the time, the EPA directed States to develop plans for meeting the new standard by July 18, 2003, with new controls phased in over several years. In September 1997, however, the EPA shortened the timetable and ordered North Carolina and 21 other Eastern and Midwestern States to revise their State Implementation Plans (SIPs) for controlling nitrogen oxide emissions by September 30, 1999. Under the accelerated "SIP Call," all of North Carolina's utilities and some large industries would be required to cut their NOx emissions by about two-thirds by 2003.

In 1999, The General Assembly took several steps to address air quality problems in North Carolina. The Ambient Air Quality Improvements Act (Act),[4] set limits on the sulfur content of motor fuels sold in the State and set out a schedule for enhancing and expanding the State's automobile emissions inspection program. These efforts were aimed in part at bringing the State into compliance with new Federal air quality requirements for ground level ozone. The Act also directed the EMC to develop and adopt incentives to promote voluntary reductions of emissions of air contaminants from industrial sources. These incentives included emissions banking and trading and credit for voluntary early reductions.

STATEMENT OF GEORGIA STAPPA-ALAPCO

This is an important issue for Georgia and the Southeast, given the unique air quality problems we have. A multi-pollutant strategy needs to be integrated with existing air requirements, and needs to consider regional differences

Many of the reasons to consider a multi-pollutant approach for the country are magnified in Georgia and much of the Southeast. The unique meteorological conditions we have-hot, humid days with periods of high stagnation-lead to formation of ozone, fine particulate matter, and regional haze in amounts and frequencies greater than in other parts of the country. The South's rapid growth, including its dramatic increase in permitting of new power plants, continues to aggravate these environmental problems.

The Southern Oxidant Study focused attention and generated a much better understanding on how air pollution forms and can be best controlled in the Southeast. The Southern Oxidant Study has pointed out the high naturally occurring vegetative volatile organic compound emissions in the Southeast, and the greater effect controlling nitrogen oxides must play in meeting air quality requirements for ground level ozone. This study is continuing, with a new focus on fine particulate matter. What we are finding so far is not good. Almost every new fine particulate matter monitor we have in place throughout Georgia is measuring levels above the present USEPA annual standard. Our neighbors are measuring similar levels, indicating that this is a regional problem that will require a regional and national solution to solve. Many areas of the Northeast and Midwest are not measuring such concentrations, which again points out the regional differences, which need to be taken into account with any national legislation. While we have yet to fully monitor and analyze the cause of these high fine particulate levels, indications are that sulfur dioxide emissions contribute significantly to this.

Georgia has been an active participant in the Southern Appalachian Mountains Initiative (or SAMI), which has been working to identify and recommend reasonable

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[4] SL 1999–328.

measures to remedy existing and prevent future air pollution adverse effects on air quality related values in sensitive areas of the Southern Appalachian area. This includes the effect of acid deposition on vegetation and streams, ozone on forest health, and multiple pollutants like sulfur dioxide and nitrogen oxides on regional haze. SAMI has been analyzing whether or not existing mandated controls, like the Title IV acid rain program, the NOx SIP rules, new vehicle standards and others, will be sufficient to remedy these environmental effects in the near term (2010) and in the longer term (2040). While

SAMI's work is not yet final, the initial results indicate that significant sulfur dioxide and nitrogen oxide emission reductions beyond what is presently required and on the way will be required to address near term and longer term environmental needs.

Georgia is also concerned about mercury in aquatic systems, or more directly, in fish. For most aquatic systems, atmospheric deposition is thought to be the primary source of mercury. We know that there are many sources of mercury to the atmosphere, both natural and human related. Some of the human related sources that are currently receiving attention include coal combustion, waste incineration, chloralkali production, and metal processing.

Since 1994, we've chosen to evaluate this issue and begin to address concerns by measuring fish tissue mercury concentrations and developing conservative fish consumption guidelines or advisories to help protect public health. Even though we've monitored thousands of fish samples for more than 40 chemicals, mercury currently is responsible for more than 70 percent of the advisories restricting fish consumption on Georgia's rivers, lakes, and coastal waters.

Because of these fish consumption advisories, mercury is currently a significant problem as we work through the difficult process of developing comprehensive Total Maximum Daily Loads or TMDLs for many of Georgia's waters. In this particular instance, we are trying to address inputs from all possible sources (and perhaps traveling great distances) by setting limits in one medium, water.

A coordinated, integrated program to significantly reduce mercury, sulfur dioxide, and nitrogen oxides, therefore, would greatly enhance our ability to solve air and water quality problems in Georgia. We understand that the regulated community is interested in more certainty about what will be required and when to meet all of these different requirements. States like Georgia are already looking ahead to critical dates in the future when regional haze and fine particulate State Implementation Plans will be due, and in what years additional reductions to support those plans will be needed. These dates all need to be carefully integrated with any multi-pollutant control strategy to maximize the impact of the emission reductions as soon as practicable.

With the projected future growth in the Southeast, we need some way to rely on how much sulfur dioxide, nitrogen oxides, and mercury will be allowed, so that growth does not offset any progress made with stricter emission limits on large power plants and industries. A cap-and-trade system could achieve this need. A trading program to implement this system would be most cost effective, but we would have concerns on how large the trading area could be, given the national legislation being considered, or if there would be any limitations on additional local control requirements. Emission reductions far outside Georgia or the Southeast will not have the impact of more localized reductions, especially given the unique meteorological conditions we have.

On June 1, the Governors of Georgia, North Carolina, and Tennessee signed the Southern Air Principles (see attached). These States agreed to consult, consider, and formulate a proposed joint multi-pollutant strategy for reducing nitrogen oxides, sulfur dioxide, and mercury. We would like a strong national approach to help support any State or regional programs we may develop.

In summary, we do see the need for and benefit of a national approach to regulating these pollutants. This will go a long way to helping us solve our problems with any additional local control measures that may be required.

CLEAN POWER ACT

THURSDAY, NOVEMBER 15, 2001

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
WASHINGTON, DC.

The committee met, pursuant to recess, at 9:34 a.m. in room 406, Senate Dirksen Building, Hon. James M. Jeffords [chairman of the committee] presiding.

MULTI-POLLUTANT CONTROLS: IMPACTS ON UTILITIES AND CONSUMERS

Present: Senators Jeffords, Lieberman, Clinton, Corzine, Carper, Chafee, Campbell, Inhofe, Voinovich, and Bond.

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. Good morning, everyone. The hearing will come to order.

Two weeks ago we heard from Federal and State witnesses about their views on S. 556. In this second hearing, we will receive testimony from affected companies and environmental and labor groups.

First, we are lucky to be joined by my good friend Governor Dean of Vermont. I appreciate your willingness to appear before the committee on this important issue, Governor, and especially after making the effort to get here last time and not quite doing it.

As my colleagues may know, the Governor is a medical doctor, an avid hiker. He has seen first hand what power plant pollution can do from the haze and the tree damage in the Green Mountains to the respiratory problems of children. The Governor has done great things for Vermont and will always be remembered as a statesman and environmentalist.

I am pleased that we are making progress in preparing a legislative record that supports a four-pollutant bill. I understand that the Administration's proposal will be out no later than the end of January. I look forward to that.

So it seems we are on a track of a markup of S. 556 in the first part of February; that is my goal. That should give our staff plenty of time to work out all the details for a smooth markup.

At the last hearing we heard a great deal about estimated increases in the price of electricity from the 4-P approach. But it was not all gloom and doom from the economists. There was good news. The overall cost to the economy of adopting the Clean Power Act would be essentially unchanged from the reference case almost regardless of which technology assumptions are made. And, of course, we know that the reference case does not accurately portray the world as it really is. It still does not consider the cost of many of the regulatory actions which EPA must take in the coming years to protect public and environmental health.

Given a more thorough consideration of the benefits and a more accurate baseline on the reference case, we are looking at positive economic impacts from the multi-pollutant bill. According to one of our witnesses today, that should include a net increase in new jobs.

At our last hearing, Senator Chafee asked an excellent question of the Administration witnesses. He asked: "What are the consumer cost impacts that will be associated with the Administration's multi-pollutant proposal?" The committee has been waiting for an answer from the Administration on that question, and the air quality and environmental effects of the National Energy Policy, not just the multi-pollutant proposal. Without objection, I would like to place the May 21 letter into the record.

We can help assure that the Clean Power Act has a positive impact by keeping the fourth P in the bill despite the Administration's views. We might be able to avert some of the economic damage that several studies have associated with the doubling of the greenhouse gas concentration. They say that the doubling will result in a loss of GDP of 1 to 2 percent, and will be reached by approximately 2060.

Two very important announcements were made since the last hearing. EIA reported that carbon dioxide emissions from electricity generation has risen by 26.5 percent since 1990, and total greenhouse gas emissions from the U.S. have increased by 13.6 percent. A more positive announcement came from Marrakesh. The Kyoto Protocol is now more or less complete. Japan plans to ratify it in the very near future and many other nations are expected to follow shortly thereafter. Unfortunately, these announcements reflect poorly on the United States. We have lost credibility with our global neighbors at a very delicate time, and our long-term business and environmental interests have been left unattended.

Real greenhouse gas reductions require real leadership, and real leadership requires taking real risks. Stemming the rate of growth of emissions is not adequate or responsible. Long ago, there was a famous Vermonter named Ethan Allen. He was the leader of the Green Mountain Boys, an important figure in the Revolutionary War. The story goes that he entered into negotiations to have the independent Republic of Vermont become part of Canada. Yes, Vermont was an independent republic for 14 years. Some say we still are.

[Laughter.]

Senator JEFFORDS. However, scholars now believe that his real motive was to provoke the United States into granting Vermont full and expeditious statehood by threatening to join Canada. Vermont was a hot commodity back then.

Much worse things than joining Canada could have happened. At least then Vermont would be part of a coordinated international effort to stop global warming. Ethan Allen and Vermont took a real, but calculated, risk in exploring this avenue. It paid off in statehood eventually, which, lucky for me, leads to having two senators in the U.S. Senate.

We know with some certainty that failure to significantly reduce all four pollutants in a coordinated fashion will lead to a worsening environmental and public health conditions, and it will simply exacerbate this certainty the power generators currently face. I hope the other members of the Administration will join me in taking the risk of leadership and helping us move the Clean Power Act through Congress early next year.

[The referenced letter follows:]

United States Senate

WASHINGTON, DC 20510

May 21, 2001

The President
The White House
Washington, D.C.

Dear Mr. President:

We have received copies of your proposal to deal with America's long term energy needs. Many of the proposals contained in the plan would affect laws within the jurisdiction of the Environment and Public Works Committee. Any relevant legislation to implement those proposals would therefore require Committee consideration prior to full Senate action. Before any possible Committee action on such legislation, we would appreciate receiving further information regarding the plan and its effects.

First, we request that you provide further details regarding any of the plan's recommendations that fall under the Committee's jurisdiction. In particular, please provide details, including criteria for agency consideration, regarding your recommendations:

A. To pursue multipollutant legislation to regulate power plant emissions.

B. To expand the Energy Star program. In particular, please describe the funding recommendations necessary to support this expansion.

C. To promote combined heat and power through flexibility in environmental permitting. In particular, what changes in permitting requirements are envisioned?

D. To take actions to remove constraints on the interstate transmission grid.

E. To direct the EPA to study opportunities to alter the reformulated gas program under the Clean Air Act.

F. To direct the EPA and the Department of Energy to streamline the permitting process for oil refineries.

G. To direct the EPA and the Department of Energy to adopt comprehensive regulations regarding refineries and consider the cumulative impacts and benefits of such regulations. In particular, please state the legal authorities for the regulations.

H. To direct the Attorney General to review existing enforcement actions under the New Source Review provisions to ensure they are consistent with the Clean Air Act and its regulations. In particular, please clarify how these actions may be inconsistent in view of the extensive case law on the subject, including *Wisconsin Electric Power Co. v. Reilly*, 893 F.2d 901 (7th Cir. 1990) and *Alabama Power Co. v. Costle*, 636 F.2d 323 (D.C. Cir. 1979).

I. To direct the Secretary of Interior to examine land status and lease stipulation impediments to federal oil and gas leasing, and to modify those impediments where they exist. In particular, please describe in detail contemplated modifications that relate to fish, wildlife, plants and their habitat regardless of whether changes would require legislative authorization.

J. To direct the Secretary of Interior to re-examine the federal legal and policy regime to determine whether changes to that regime would be required to site energy facilities in the coastal zone and on the Outer Continental Shelf.

In addition, for the purposes of Senate consideration of the relevant legislative elements of that plan, we would appreciate technical and analytical assistance from the Energy Information Administration, the Environmental Protection Agency, the Council of Economic Advisers, the Bureau of Economic Analysis, the Departments of State, Defense, Justice, Treasury, Interior and Transportation, and other Federal agencies with expertise. We ask that you direct the aforementioned agencies to provide us with answers to the following questions, and that they should assume in responding that the proposed plan is enacted by the end of this session of Congress:

1. What impact will the plan have on crude oil, natural gas, gasoline, diesel, and electricity prices paid by wholesale and retail consumers in the next 2 years?

2. What impact will the plan have on crude oil, natural gas, gasoline, diesel, and electricity prices paid by wholesale and retail consumers in the next 5 years?

3. How many barrels of crude oil, that would have otherwise been consumed under a business as usual scenario (i.e. the Department of Energy's Annual Energy Outlook), will be displaced annually by 2006 due to the plan?

4. How many tons of criteria (including PM-2.5) and hazardous air pollutants and greenhouse gases will be emitted in each of the years 2002-2006 due to enactment of the plan versus the amount of each pollutant or substance that would have been emitted if the plan were not enacted?

5. What impact would the plan have on jobs and different sectors of the economy, including small businesses?

6. How would the plan impact general environmental quality, including air quality, and ground and surface water resources, including ocean waters?

7. How will the plan bring us closer to compliance with our Senate-ratified treaty commitment of reducing greenhouse gas emissions to 1990 levels? When will that target be reached?

8. Please identify how, if at all, enactment would affect or implement relevant international treaty commitments, particularly those affecting relations with Canada and Mexico, including air and water quality.

9. What will be the increase in electricity generated from renewable resources by 2006 due to the plan? Please estimate the projected electricity generation capacity for each fuel in that year, and increases in distributed generation.

10. What amount of additional spent nuclear fuel will have been generated by 2015 and by 2025, as a result of the plan's nuclear power recommendations, beyond the 70,000 metric ton storage capacity of the proposed Yucca Mountain repository?

11. What changes, if any, in rules, regulations or Federal law regarding the acquisition of private property interests, including any plan to delegate Federal eminent domain powers to quasi-public or other non-governmental entities, are necessary to implement the plan?

12. Please quantify the improvements in efficiency of electricity and motor fuel consumption and production that the plan will stimulate for each of the next five years.

13. How many additional acres of Federal land, not currently in use or eligible for use for resource extraction (oil, natural gas, etc.), would have been brought into energy resource production by 2006? What specific Federal lands are likely to be affected? How many acres of Federal lands that currently receive statutory or regulatory protection from energy exploration will be opened to resource development and/or extraction?

14. What impact will the plan have on the ability to protect and recover threatened and endangered species, including aquatic species such as salmon?

15. How will the plan promote oil and gas drilling on public lands without harming fragile ecosystems such as wetlands, tundra, deserts, and coasts?

16. How many new refineries and electricity generating power plants (greater than 100 MW) would be built by 2006? What will the primary source of fuel be for those power plants?

17. How will the Department of Justice and the Federal Trade Commission and other agencies protect consumers against price gouging?

18. What statutes would have to be amended in order to implement the plan? In addition, please specifically note each case where plan implementation would require any form of expedited or modified Clean Water Act, Clean Air Act, Endangered Species Act, National Environmental Policy Act, or other Federal regulatory approvals or authorizations. What regulatory mechanisms will be used for these expedited processes?

Thank you for your consideration of our request. We look forward to a lively debate on the important matter of national energy policy. The facts and estimates provided in your response will ensure that Congress' deliberations will be well-informed. It would be helpful if the agencies' responses included details on any additional assumptions made in answering these questions. To expedite Committee and Senate consideration of these matters, we would appreciate a response no later than June 7, 2001. Please contact us if you have comments or questions about our request.

Sincerely,

Hillary Rodham Clinton

Harry Reid

Barbara Boxer

[illegible]

[illegible]

Ron Wyden

[illegible]

Max Baucus

Tom Carper

Senator Campbell.

OPENING STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

Senator CAMPBELL. Thank you, Mr. Chairman. I appreciate this second opportunity to hear some testimony on S. 556. I would also like to reiterate my opposition to the bill as it stands, for several reasons.

Principally, I oppose it because it fails to recognize the distinctions in air quality between the East and the West, as I mentioned the last time you called for a hearing. Traditionally, the Federal

Government has recognized the inherent differences between the East and the West and has allowed disparate treatment in the law to reflect those differences. For example, the Federal Government has recognized the particular scarcity of water in the West and that water rights are treated separate from the land. It has historically deferred to the State water courts in adjudicating claims.

First, this bill mandates sulfur dioxide emissions reductions by 75 percent but completely ignores the regional approaches to address the pollutants. S. 556 fails to even consider the careful work of the Western Regional Air Partnership, amounting to a slap in the face to many of us in the West.

Further, the Clean Power Act would impose significant reductions in nitrogen oxide emissions throughout the entire country. Yet, data raises issues whether the West even has a problem or not. Surely this bill is not intended to require power plants to make significant reductions where there are no problems in the first place.

One of the witnesses today, the American Lung Association, which is an organization which I respect a great deal, states that sulfur dioxide and nitrogen oxide emissions shorten the lives of 31,200 people each year. We already know that this is not a big problem in the West. Something like one-tenth of the emissions are in the West compared to the rest of the nation. So I would assume they mean that most of the people affected are concentrated in the East, not the West. Perhaps the East does have a poor quality of air, and maybe that is also the reason my home State of Colorado is expected to increase in population by 40 percent in the next 13 years.

I highlight these points in order to show that this bill is tailored specifically for eastern concerns with very little regard for the West. S. 556 pollution reduction schedule has been widely criticized as unrealistic, and that mercury monitoring and abatement technology is untested and untrue. Some members of the committee might scoff at that criticism, and I expect they are sincere in that, but I think that there may be something to that. I would also like to ask the Senators to consider that there are counters to the power industry. According to witnesses today, they are relying on the Institute of Clean Air Companies, which is a national association of companies that sell the very same technology that industry must purchase in order to meet what I think are unrealistic targets.

I should also note that when I refer to the West, and I know we have several members of the far West on the committee, I am not referring to California, where I was born and raised, but I am thinking in terms of the Rocky Mountain States and the basin States and the desert States——

Senator INHOFE. And Oklahoma.

Senator CAMPBELL. And Oklahoma, excuse me.

By any measure, S. 556 would significantly affect the coal industry, resulting in likely fuel switching to natural gas and definite and dramatic electricity cost increases to ratepayers. While I think that some are driven by real environmental concerns, some probably are also driven by the potential of bottom line profits. This bill would particularly disadvantage the people of Colorado as more than 80 percent of our State's electricity is coal-fired.

Simply put, I oppose this legislation, any legislation, in fact, that would significantly raise the cost to lower-and medium-income families without any corresponding gains in health or the quality of life.

Last, I do not support this bill because it calls for significant reductions in carbon dioxide, effectively reducing the use of coal. Our nation is at a time when we should be focusing on diversifying energy sources and improving the ones we have rather than becoming more dependent on foreign energy. Rather than debating the Global Warming Protocol, I would ask the committee what we would gain if it were implemented. Research has demonstrated that we would effectively postpone warming by 6 years, from 2094 to 2100, at a cost to the industrialized nations of the world that may lead from between $80 to $350 billion per year. We would certainly promote an exodus of American companies out of this country to the ones that are not bound by that accord and certainly detract from our tax base in the corresponding loss of jobs and the manufactured goods that we now rely on.

In any event, Mr. Chairman, I do appreciate your calling this hearing, and look forward to testimony from our panelists.

Senator JEFFORDS. Senator Lieberman?

OPENING STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Senator LIEBERMAN. Thanks, Senator Jeffords. Mr. Chairman, I appreciate very much your reference to Ethan Allen and the tradition of independence from Vermont, which you have certainly kept alive in our time. Let me just say that I am proud to declare myself one of your Green Mountain Boys.

Senator JEFFORDS. Wow. Thank you.

Senator LIEBERMAN. I am also proud to be one of the primary cosponsors with Senator Collins and yourself of this bill, making it, as we have all said, a tripartisan bill. This would set what I think are practical limits on the power plant emissions of sulfur dioxide, nitrogen oxide, mercury, and carbon dioxide.

I appreciate your steadfastness, Mr. Chairman, in going ahead with this second hearing and indicating that we will go to a markup in February. I hope that these discussions are not occurring without engaging the interest and involvement of the Administration. I was pleased to hear you indicate in your opening statement that you have had some reason to believe that the Administration will be coming forward with its bill by the end of January. While we naturally wish that the President had stayed with the position he took during last year's campaign to be in favor of four-pollutant legislation to reduce emissions, not just the three that we hold in common as targets of reductions but also carbon dioxide, nonetheless, at this point, for the Administration to come forward with a three-pollutant bill will at least join the issue and advance the discussion. I think that would be critically important.

As I look at the testimony for today, I worry that there is a danger here that we are not moving toward a solution, but we are moving toward stalemate. That would be disheartening. I feel very strongly that if we embrace this four-pollutant approach, it would be good not only for the environment, but certainly also for the utility industry which otherwise will continue to face an increasing mountain of regulation.

The need for action is clear here. The best science tells us that global warming is one of the most serious and pressing environmental challenges we face. If anything, the evidence is getting more compelling. If we do not act, scientists worldwide tell us the Earth's temperature is anticipated to rise between 3 and 10 degrees fahrenheit in the next century, with a host of extraordinary environmental, economy, and, not least, human consequences.

As you have said, Mr. Chairman, just last week close to 200 nations in the world agreed on a strategy for combatting global warming. Unfortunately, we were not among them. Because the Kyoto Agreement has now set rules that were drafted without consideration of the interests of America, of our environment and of our industry, I am afraid that we are going to pay a significant price for sitting on the sidelines.

As we look to the future, engaged as we are through the war against terrorism in very aggressive, multi-lateral global action, I hope that we will extend that very favorable policy to the environment, and particularly to global warming, as well.

With regard to the economic advantages of the legislation before us, I just want to quote James Rogers, President and CEO of Synergy, from testimony he gave before this committee in May. He said: "My company seeks comprehensive multi-emission power plant legislation because we want long-term clarity and certainty built into our environmental compliance planning process. Without some sense of what our carbon commitment might be over the next 10, 15, or 20 years, how can I or any other utility CEO think we have the complete picture of what major requirements our plants may face." That certainty is exactly what the Clean Power Act would provide.

In the last hearing, Mr. Chairman, we heard EIA and EPA testimony regarding the cost analysis of this bill. Frankly, I think the testimony did not clarify but clouded the situation. Most importantly, it ignored regulations that are already in the pipeline and, therefore, did not in their estimates provide an accurate picture of the eventual costs of business as usual; that is, going ahead with the current system and not providing a certain system through this bill of regulating the emissions of carbon dioxide. That is unfortunate and misleading, because it is the costs of these regulations that I think have driven the debate to this point.

The EIA assessment also had a very pessimistic view of technology development. In fact, EIA did not even testify regarding more optimistic scenarios that we had requested their counsel on. That was a mistake, I say respectfully, because technology has advanced remarkably through other cap-and-trade proposals that have been implemented.

I must say, finally, about the economic analyses that we received at the last hearing, even with the flaws, in my opinion, that I have just mentioned, these analyses ultimately found just a minimal impact on GDP from the Clean Power Act. If we assume technological innovation, lower resources costs to the utility industry, then business as usual is the conclusion I draw from their testimony.

So, we have got some work to do here. But it is critically important work. I know that you and I and Senator Collins are open to discussion and negotiation. I have in mind Senator Campbell's statement. I know that we are beginning to develop language that we want to present to senators from the western States to see if we could engage them further in the process of achieving some limits on carbon dioxide emissions. But bottom line, this is important work that affects the health and future of every American, and even more directly our children and grandchildren.

So I thank you, Mr. Chairman, for taking the lead in this. I look forward to the testimony of our witnesses today.

Senator JEFFORDS. Thank you.

Senator Inhofe?

OPENING STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

Senator INHOFE. Thank you, Mr. Chairman. Senator Smith had asked that I request unanimous consent that his statement be put in the record at this point.

Senator JEFFORDS. Without objection, it will be accepted.

[The prepared statement of Senator Smith follows:]

STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Good Morning. I would like to thank Chairman Jeffords for holding this second in a series of hearings on legislation to reduce emissions from our nation's electric utilities. Thanks also to the witnesses for appearing before us here today.

I offered most of my comments on this issue in my opening statement 2 weeks ago at the first legislative hearing on S. 556. I won't take up our time by repeating myself this morning. I would, however, like to emphasize that we now have two sets of analyses—one from EIA and one from EPA—that underscore the value of a multi-emissions approach. These analyses show that we can make significant reductions in NOx, SO_2, and mercury for less than the expected cost for partial reductions in just SO_2.

In the Clean Air Act Amendments of 1990, we committed to reducing sulfur dioxide emissions by nearly 7 million tons at an EEI-estimated annual cost of $7 billion. I'd like to point out that actual annual costs have been right around $1 billion—nowhere near as expensive as the original estimates. The EIA and EPA analyses show that we can achieve additional substantial reductions in SO_2 in combination with significant reductions in nitrogen oxides and mercury for less than $7 billion—the original estimates for the Acid Rain Program alone.

We need to remember, however, that it is not merely the existence of a market-based multi-pollutant system that will provide efficiency benefits—appropriate levels and timing are critical to the success of any such program. The chairman's bill, for instance, likely would not achieve the economic efficiencies available from a market-based multi-pollutant approach due to insufficient time to meet the aggressive target levels.

A comparison of the EIA analysis requested last year by Representative McIntosh—which is the closest to an analysis of S. 556 we have to date—with the analysis I requested earlier this year emphasizes the importance of setting appropriate emission levels and timeframes. For instance, average electricity prices in 2020 under the McIntosh scenario would be 25 percent higher than 1999 prices while 2020 average prices would be either lower or no more than 6 percent higher than 1999 prices under the most stringent scenario I had analyzed. Incremental resource costs also are significantly higher under the McIntosh scenario—$132 billion compared to only $89 billion.

These analyses show that if we set up a market-based multi-pollutant system correctly, we can achieve desired emission reductions in a cost-effective manner. If we don't do it correctly, however, we will impose unnecessary costs on industry and consumers alike.

Senator INHOFE. Let me build on this a little bit. I do think that when February comes around there are going to be a lot of changes and a lot of things will be considered. I think when that time comes we are going to have to come up with something that would contemplate and balance our nation's existing environmental achievements and the energy supply and security. I have four basic concerns with this legislation.

First of all, it is inequitable to require an across-the-board cut for all States as if we are all starting at the same point. My State of Oklahoma currently emits well below the national average. Oklahoma's environmental profile mirrors that of many of the western States, as was brought out by Senator Campbell. We do not have the SOx, NOx, and mercury problems. Therefore, before we are asked to reduce our emissions even further, other States in other regions should be expected to have their emission levels down to cleaner levels and closer to what Oklahoma is doing today. I think it is ridiculous to impose percentage reductions on us, at enormous marginal expense, before those regions who have significant air problems do their part.

Second, I think it is just very bad energy policy. By limiting fuel options for power generation, increasing the cost of electricity to Americans, and stopping the construction of new generating facilities, this bill is the very antithesis of sound national energy policy, which we have been talking about for quite some time. It would undo everything that proponents of a national energy policy have been fighting for, and we are still fighting for today and hopefully we will be somewhat successful before the end of this session.

It also is the antithesis of economic stimulus. S. 556 would make the price and availability of energy an economic national crisis. In Oklahoma, it would significantly change the source of energy away from affordable coal to a more expensive option, probably natural gas. Oklahoma depends upon coal for over 60 percent of our power. This is because coal is a much lower fuel cost versus natural gas, and the coal is a clean source of energy. The result is, Oklahoma utility rates are 19 percent less than the national average power rate, our utility rates are much lower than States that depend heavily upon expensive natural gas, such as New York, New Jersey, and California, or on renewables, such as Maine, and I know that Senator Collins is concerned about that, for generation.

S. 556 would ensure that our rates would go through the roof. Higher energy prices affect everyone. However, when the price of energy rises, it means that the less fortunate in our society have to make a decision between keeping their heat and their lights on and buying other essentials such as food.

One other area that concerns me, because, as I often say, back when Republicans were important and I was Chairman of the Clean Air Committee, we held hearings in quite a number of different places, including in Ohio, Senator Voinovich, about the problems with new source review. We have been wanting new source review reform. I think this adds even more regulations to an already over-complex regulatory scheme which includes the resource reform. As you know, I have been saying for quite awhile now that, unless reformed, EPA's new source review policies will continue to interfere with our nation's ability to meet our energy and fuel supply needs. I think this just magnifies the problem.

So, I think we need to address this. I know we are going to be doing it. I would like to make sure that anyone who happens to be listening to us now and is concerned with the higher prices of energy, with the predictable energy supply, that, by ignoring the Administration's policy, this bill in this form will pass this committee but we will have a much more reasonable approach when we get to the floor. Thank you, Mr. Chairman.

Senator JEFFORDS. Governor, how are you fixed for time?

Governor DEAN. I think I have got until about 10:30.

Senator JEFFORDS. Without objection, I will let the Governor speak next.

Senator INHOFE. I am going to be reserving the right to object. There are others who want to have opening statements. Is it your intention to have those opening statements after the Governor speaks?

Senator JEFFORDS. Yes. Right. I would just let the Governor slip into one of the slots on this side.

Senator BOND. What is your timeframe, Mr. Chairman, because some of us have commitments as well.

Senator JEFFORDS. Well, I do not think the Governor will take long.

Senator VOINOVICH. Mr. Chairman, I would be more than happy to allow the Governor to go forward and testify now before giving my opening statement. But I would do so on a commitment from the Governor that he would read my opening statement and the charts that accompany it. Do I have that commitment, Governor?

[Laughter.]

Governor DEAN. Senator, not only will I be very brief, but I promise not to leave until I absolutely have to. So I may get to hear your opening statement.

Senator VOINOVICH. I would just like to welcome you, Governor Dean. We have worked together in the National Governors Association on so many things and I have such high admiration for you, and many of the programs that you have put into place in your State we have copied in Ohio, and we are a better State because of some of the things that you have done in your own State. So, we are glad to have you here today.

Senator JEFFORDS. Please proceed, Governor.

STATEMENT OF HON. HOWARD DEAN, M.D., GOVERNOR OF THE STATE OF VERMONT

Governor DEAN. Let me first thank Senator Voinovich for his kind words. It was a great joy to work with a person who was very interested in bipartisan relationships, and I think we share a deep commitment to children. I certainly appreciate it and I look forward to hearing your views on these issues as in some of the other things that we worked together on. Let me also say in response to Senator Lieberman's comment about being a Green Mountain Boy, he may be closer than he knows, because the great shame of Vermont is that Ethan Allen in fact was born in Connecticut and immigrated.

[Laughter.]

Senator LIEBERMAN. I know that well. We carry on that tradition in Connecticut with a great furniture company that you may know about.

[Laughter.]

Governor DEAN. I have testimony which I have submitted. I thought I would simply go over the salient points. I was very interested in Senator Campbell's opening statement because it immediately reminded me of how this problem is perceived as a regional problem and a regional conflict. I think we have to look at it as an American problem, not a regional problem. I would urge all the Senators to try to come up with some kind of compromise bill that we really can move forward on. This has been a problem in the United States for 20 years. I do not know what the proper solution is. Obviously, I am very enthusiastic about your bill. But we really do need some help here.

I think those of us in the East, including the eastern Canadian premiers who the New England Governors meets with on a regular basis, cannot help the fact that the winds blow from west to east. We certainly have things that we need to do in terms of mobile sources. But in Vermont, even though manufacturing is our largest industry, we create about one pound per person per year of these four pollutants each. The American average is, say, 90 pounds of carbon dioxide and in the 30's and 40's for the other pollutants. So, we really do more than our share in terms of power and yet we still have days where we exceed the 1-hour and the 8-hour ozone limits because the wind blows from west to east, a fact that I do not think anybody in this room can do a whole lot about. So we really do need some resolution of this problem.

Our power source is very interesting. In our State, we get about one-third of our power from fossil fuel, most of which is natural gas which is a common fuel in New England, we get about 30 percent roughly from nuclear power, and roughly 40 percent of hydropower which we import from Quebec. So we do not make much power using coal. Therefore, our emissions are very, very low and we are almost always in compliance with Clean Air. In the days that we are not, it is because there is a wind that is blowing things in from elsewhere.

We really need to deal with that problem in some way, because there are a lot of issues that go along with it. The most spectacular is acid rain. Thirty-five percent of the lakes in the Adirondacks, which are just across Lake Champlain, are dead. There is no more fishing in those lakes, there is very little life in those lakes. A significant portion of our lakes have suffered dramatically because of acid rain. These are the pollutants that we are talking about in your bill that need to be reduced. That is an American problem, not a regional problem. I do not think that any region of the country would take glee in the fact that 35 percent of the lakes in the Adirondacks no longer have life in them because of the utilities.

So it is important that we address this problem in some way. We do need to be sensitive to the concerns of the West in terms of their power. We do not want to jack up power rates. New England power rates are higher than they are in the West, and, an interesting statistic, we have the seventh highest electric rates in the country in

Vermont. You would say, well, what do you expect with a power policy like that; you do not have coal. But the interesting thing is that our electric bills are twenty-second highest in the country. The reason for that is that we do an enormous amount of conservation. In fact, we started the only utility of its kind in the country last year called the Energy Efficiency Utility, where power companies actually pay something to a private group who got a contract and which goes around helping industries and, to a lesser extent, homes become more energy efficient. So, although our electric rates are high, the effect of our electric rates on the economy is roughly the average of the United States.

I am a physician, as you pointed out in the introduction. Clearly, these pollutants are problems for our health. Asthma is of concern. There are other concerns with these, particularly the sulfur and the nitrogen. We really do need some relief from this.

We just had a meeting of the National Regulatory Commissions. They all voted across-the-board, nationally, all regions voted to deal with a four-pollutant bill. I think that was a very positive step. Everybody in the country recognizes this is a problem. Everybody in the country, not just the East or the folks up in Canada across our border, but everybody in our country and, frankly, everybody in North America. The question is what can we do to deal with the problem. In our State again, we hope that we are going to meet the increasing demands through renewables, a program that the Federal Government has pretty much ignored since Jimmy Carter was President. We need to deal with these things. These things are more expensive in terms of kilowatt hour and initial production, but over the long-run they are not more expensive, especially is you couple it with a vigorous effort toward conservation and efficiency.

So, Mr. Chairman, I thank you for the opportunity to testify. I deeply hope that this bill passes, and I deeply hope that in the course of this bill passing we will be able to work out the regional concerns that we have. I think it is essential that we have a bill. Christine Whitman, who was one of the great Governors leading the fight against acid rain and against air pollution, is now the EPA Administrator. I hope that you will be able to work closely with her because she was one of the leading Governors in this country in fighting air pollution when she was the Governor of New Jersey. I know she feels that way as the Administrator of the EPA.

I really do believe that we can have a bill that makes sense, and I hope that we will be able to do that. It is important that this bill not only pass this committee, pass the Senate floor, but pass the House and be signed by the President. Thank you.

Senator JEFFORDS. Thank you very much, Governor. I could not have asked for a better or more supportive witness. I understand the National Governors Association has begun to address this matter, too. Do you know what they have been doing on this?

Governor DEAN. We have the same political problems that you have in the Senate, except that we operate by consensus which makes it very difficult to adopt anything that is the least bit controversial to more than one Governor. We have agreed on a three-pollutant bill. There are many who would like a four-pollutant bill, but we have agreed to support a three-pollutant bill. There are many of us, as I say, who would support more than that, and the

Association of Regulatory Boards actually does support a four-pollutant bill.

Senator JEFFORDS. You mentioned BACT, Best Available Control Technology, for new sources as one important provision of the Clean Air Act that should not be negotiated away. Are there other provisions, like Section 126 on interstate pollution, that you think need to be maintained?

Governor DEAN. Well, our pollution basically comes from two sources—mobile sources, cars are a problem for everybody in the country, and the East or Vermont is not an exception; and the stuff that blows in from elsewhere. I think we have a responsibility to deal with mobile sources, but that is not a subject of this bill. I believe in our State it makes sense to support the most vigorous, aggressive approach that we possibly can, and of course that is what we are supporting. Again, I would not negotiate that away. But we have to have a bill and I think the bill ultimately has to have the support of the broad base of the American people. I think the American people do support this bill no matter where they live. I think we need to get a bill that reflects their views that air pollution is something that we cannot continue to live with.

Senator JEFFORDS. Senator Voinovich, you may make your opening statement or ask a question, whichever you prefer.

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. I think I will make my opening statement, Mr. Chairman. I would like to say that I am happy that you are having this second hearing. As I stated at the last hearing, I am opposed to S. 556, as written. But I do agree that we need a multi-emissions bill, and so does the Bush Administration.

Governor Dean, it would be nice maybe if the Governors sat down on that three-pollutant thing and maybe gave us their thoughts on some of the numbers that are in this bill. I believe we could do a three-pollutant bill pretty quick if we all sat down and worked together on that. I know the people in your part of the country are interested in NOx and SOx and mercury, and I think we could get on with it. But by adding that fourth one, I think it really presents a situation where the Administration would not support it and many of us in the Congress would not be supportive of that.

I am pleased to have utilities, environmentalists, and mine workers testifying today. I understand, Mr. Chairman, that you propose a markup of this bill in February. I want you to know that Senator Smith and I believe that we need a hearing on the technologies for reducing mercury and CO_2, and we also I think need to hear from impacted groups, such as: chemical industry, manufacturers, mining industry, public power, and rural co-ops.

At our last hearing, I began to address the devastating impacts of S. 556 on Ohio and the midwest and on our nation's economy. I believe this bill will strike at the heart of our nation's manufacturing base in the industrial midwest. For example, Ohio produces 6.2 percent of our nation's manufacturing gross State product. When you compare Ohio's manufacturing production with New England, as you can see on this chart, Ohio's GSP for manufacturing is higher than all six of the New England States combined. There is Ohio at 93.4, and the rest of the New England States at 83.8 percent.

As I pointed out last week, one of the main reasons Ohio and the midwest are the center of U.S. manufacturing is our low cost supply of electricity and the use of coal. However, S. 556 will cause massive fuel switching away from coal. This will drive up the price of electricity and also cause massive job losses in Ohio and throughout Appalachia. By the way, Appalachia is one of the poorest parts of the United States of America. That is why we have the Appalachian Regional Commission.

Some of my colleagues discount such predictions of job losses. But the truth of the matter is that Ohio and the midwest in general have steadily lost coal industry jobs since the 1990 Clean Air Act Amendments. As Chart 2 shows, since 1990, Ohio has lost over 54 percent of its coal jobs. For the region—Illinois, Indiana, Kentucky, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia—coal jobs have declined 46 percent, from just over 108,000 jobs in 1990 to 58,000 in 1999.

When jobs are lost in one industry the repercussions are felt across every industry in the region. Indeed, from 1990 to 2000, Ohio coal mining companies lost $382 million in direct revenue from lost coal sales per year. If you use economic multipliers by the Department of Commerce, the economic impact for all industries in Ohio was about $824 million per year. For Ohio, the lost household earnings were about $224 million per year, and the total number of lost jobs was about 8,000. This is just one part of the picture. When you factor in the impact on businesses from higher natural gas prices, you can see the economic impact of S. 556 will be devastating to the entire economy. In fact, at the last hearing, if you recall, the witnesses said that if this bill passed the electricity rates would go up in our part of the country 50 percent, and because we would be using a lot more natural gas, our gas heating costs would go up at least 20 percent.

I do not think people realize how many industries use natural gas and the number of employees in those industries. You can just see what we have—farming, steel, metal, polymers, chemicals, food processing, all of these industries use natural gas. As we use more and more of it, you use it, Governor, in your State, one-third natural gas, we are using a lot more of it in Ohio, the demand for it goes up, the price goes up for it, and this winter it was devastating in our State, particularly for the least of our brethren, the poor and the elderly in our inner-cities and urban areas.

It is obvious that what we are doing is going to have a dramatic impact on our nation's economy and our competitive position in the world marketplace, and, Mr. Chairman, our national security. It is true that even though we come from different regions in this country, we are part of the same country. We do have a symbiotic relationship. If all of us want to achieve our goals of a clean environment, of meeting the energy needs of this country and having reasonable energy costs, we have to sit down together and try to reason and come up with a bill that we can all live with.

I am optimistic that all of us can reach a bipartisan compromise to continue to improve the environment and public health, reduce utility emissions, and I want you to know our utilities want to reduce emissions. You mentioned Mr. Rogers, Senator Lieberman. I will tell you, Senator, Mr. Rogers is opposed to this piece of legislation. He is supportive of legislation if we could just sit together and talk about it. We want to have greater regulatory certainty and ensure that American consumers will have safe, reliable, and cost-effective electricity. It is time for bipartisan discussions on a compromise bill. I believe working together we can get such a bill out of this committee. Thank you, Mr. Chairman.

Senator JEFFORDS. Thank you, Governor.

I understand that the chairman of the clean air subcommittee is going to hold a hearing this January.

Senator LIEBERMAN. Yes. Just to say to my friend and colleague from Ohio, we will hold a hearing on technological innovations that you have requested. I will be glad to work with you on it.

Senator JEFFORDS. Senator Corzine?

OPENING STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator CORZINE. Thank you, Mr. Chairman. I have a formal statement I will put into the record. But I will just commend you for holding this hearing today. As one might suspect, where New Jersey is located, how Governor Whitman reacted when she was Governor of the State, we have a very strong interest in making sure that the arguments, that I think actually do reflect the national interest, come forward with support for the four-pollutant approach. I appreciate the Governor being here today and the others who will testify.

I would reinforce that there is a growing weight of scientific and I think global political consensus with regard to issues on climate change which I think raise the bar with respect to the debate on this issue. None of us want to undermine the strength of our national economy. But that also has to be weighed against the real impact on the lives of people. So, this is a worthy discussion, whether from a technological point of view, economic point of view, political point of view, and I feel you should be commended and that all of us need to sit around this round table and come up with an action that addresses the needs of the people and our economy. Thank you, Mr. Chairman.

[The prepared statement of Senator Corzine follows:]

STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Thank you, Mr. Chairman. I commend you for holding another hearing on the important public health and environmental issues addressed by S. 556.

Like other committee members, I have delivered prior statements about the bill and listened to the statements of my colleagues. I think we all support SO_2, NOx and mercury reductions. I want to explain why I think it's so important to include carbon dioxide in the bill.

The scientific and political consensus have shifted toward action on climate change.

On the scientific front, the evidence grows ever more persuasive that human activities are the primary cause of the warming we have already observed, and that warming is expected to continue.

Just last week, researchers presented a paper at the Geological Society of America's annual meeting last week in Boston showing unprecedented rates of change in sea level during the past 250 years. The scientists showed that sea level has risen between 12 and 20 inches along Maine's coast, and as much as two feet in Nova Scotia during the past 250 years.

As a New Jerseyan, I am extremely concerned about this problem, and how it may relate to the beach erosion problems that we continually battle in my State. I think that may well be an example of the kind of hidden climate change costs that we are just now beginning to understand.

But it's not just the scientific consensus that's changing—the global political consensus is moving as well.

Last week's climate treaty in Marrakesh established a binding agreement on greenhouse gas reductions. Unfortunately, the United States was not engaged in those discussions, although we are the world's largest greenhouse gas emitters.

We need to support a four pollutant approach.

If the Administration won't lead on this issue, it's incumbent on Congress to do so. I want to thank Senator Jeffords and Senator Lieberman for providing that leadership in this committee. I want to reiterate my commitment to dealing with four pollutants in this legislation.

Reducing the other three pollutants should not come at the expense of existing protections.

Finally, I just want to add that reducing SO_2, NOx, and mercury should not come at the expense of provisions that protect local communities or provide for their public input. I'm referring to Title One provisions that some have suggested need to be eliminated in the name of economic efficiency.

Efficiency is not our only goal—we need to keep fairness in mind, and I think many of the Title One provisions under discussion are designed to ensure fairness and should not be undermined. Thank you, Mr. Chairman.

Senator JEFFORDS. Senator Chafee?

OPENING STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator CHAFEE. Thank you, Mr. Chairman, very much. It is evident from the hearing 2 weeks ago and also some of the comments today that this is obviously a contentious bill. A four-pollutant bill is going to be very, very contentious. Unfortunately, as Governor Dean says, it does pit the coal producing States against the downwind States as well as those who believe that global warming is a serious threat to our planet and those who do not. So I think through hard work, open minds, and a mutual desire to protect our economy as well as improve the air we breath we must hammer out a good bill. I do agree with Senator Lieberman that the next important step is to get the Administration to introduce their three-pollutant bill, which they have testified is forthcoming, and then we can move from there.

Mr. Chairman, I will cosponsor your bill S. 556 and look forward to working with everybody in this room to strive to make progress. I think it is interesting, Governor Dean, about how you talked about the price of energy being high but the actual bills being in the middle of the pack. That I think is inspiration to those that might be opposed to this bill that it is possible through conservation and good technology to solve some of the problems that we hear here in this hearing.

So thank you, Mr. Chairman.

Senator JEFFORDS. Thank you.

Senator Bond?

OPENING STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Senator BOND. Thank you, Mr. Chairman. Welcome, Governor Dean. We did not exactly overlap in the National Governors Association much, but I do appreciate your perspective. I would say that over a decade ago when we were talking about the Clean Air Act amendments and acid rain the midwest did take on a very heavy burden to try to clean up the acid rain. I happened to be a player in the Bird-Bond or Bond-Bird emissions trading to try to make that burden somewhat less. As you saw from the chart that Governor Voinovich entered about Ohio, it was still a very heavy burden.

Unfortunately, those amendments were pushed through just prior to the completion of a very expensive, very long-term national acid precipitation assessment project, NAPAP, I believe those are the appropriate terms, which said the most important thing we could do would be to put lime in some of those lakes, it would be far less expensive. I hope that you are considering that. I would support providing lime applications to regain the lives in those lakes, if that is appropriate.

Having said that, I think you recognize that we have the option for cleaning up our environment. Things like nuclear power, unfortunately, this committee has not been strongly in favor of it. We have not done enough to use a truly emissions-free source of electric energy. I would agree with everybody who said we need to use renewables. We use a lot of renewables in the midwest. But when you talk about natural gas being a significant source of your power, I think using natural gas as baseline electricity production is a terrible waste of a valuable resource. I heard Professor Glen Seaborg a number of years ago say that using natural gas for baseline electric power production is like taking priceless antique furniture and throwing it in the fireplace. It is a very real waste and it is a total misallocation of energy resources. In fact, if something like S. 556 were to pass, over my dead body——

[Laughter.]

Senator BOND. There would be such a tremendous increase in prices for coal that we would all shift to natural gas, we would freeze out the low income people in Missouri, and you would see your natural gas bills going through the roof.

Mr. Chairman, at our last hearing we did hear testimony about how this bill would cause American consumers to spend an extra $40 to $60 billion on electricity, force power plants to cut their use of coal by 40 to 50 percent, threaten tens of thousands more jobs across the country, force U.S. economic activity or GDP downward by almost $100 billion in 2007 alone. Unfortunately, 2 weeks after that we are still debating a multi-billion stimulus package.

Now putting aside the question of why we would depress the economy by $100 billion at the same time we are trying to stimulate it, I just want to raise for you the concern about some of the people this would affect. Most of us believe that the stimulus bill should include help for people suffering in the aftermath of the September 11 attacks. What would S. 556 do to them? Those people are out of work, unable to pay bills, unable to put food on the table. Well, the answer is that S. 556 will hurt those currently most in need. It would harm low income families and children. EPA estimates that a bill similar to this one would raise electricity prices 30 to 50 percent by 2015. We may not care that we are forcing big utilities to pay higher costs, but we should care that they will pass these costs on to their consumers. In the end, it would hurt our families, particularly those who are the most needy in our country.

Here is an article from the Kansas City Star that I ask to be placed in the record. It is entitled "Aid Agencies Brace for Winter Rush. Need May Exceed Money Available for Utility Bills Some Fear." If you have no objection, I would like to submit that for the record.

Senator JEFFORDS. It will be placed in the record.

Senator BOND. The article describes how large utility bills are forcing families to raid their food budgets to maintain their utilities. Relief agencies are seeing working families with five children trying to get by on $75 per week for food. As a result, food pantries are seeing an upswing in food requests. This article describes Sabrina McCoy, a Kansas City mother of two who supplements her $490 social security check with $60 a week she earns cleaning a bar. She was waiting for emergency food at a pantry, and she said: "I pay one bill and the others, the utilities get cutoff. Then I will pay what was cutoff and get something else cut." And low income families like Sabrina's have to spend 20 percent of their income on utility bills.

Last winter's bitter weather forced many to spend up to 30 percent of their incomes on utilities. We can cite the problems all across the State but, for the sake of time, I will not go into all of these. But because of last year's higher utility bills, 30 percent more families are on our State's LIHEAP crisis list; meaning, they have exhausted their assistance grants. California had 140 percent increase. These increases showed up all across the country. Lower gas prices this winter, which are temporary, will not help these people.

I support legislation, reasonable legislation to reduce air pollution. But we have to keep energy costs stable. The article concludes, "As cold weather creeps into Kansas City, the economy reels from terrorist attacks, area social service providers expect a flood of low income families seeking help with delinquent natural gas bills." I really think that this measure would make their situation much harder. I hope that we can go back to the drawing board and come up with a reasonable approach that will achieve our environmental goals without subjecting those most in need in our economy to the severe burdens that S. 556 would put on them. Thank you, Mr. Chairman.

[The prepared statement and referenced material of Senator Bond follow:]

STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Thank you, Mr. Chairman, for holding another hearing on S. 556. We must know all the effects of this bill as we consider how best to improve air quality.

At our last hearing, we heard how this bill will hurt the economy. Independent experts testified that this bill would:

- cause American consumers to spend an extra $40 billion to $60 billion on electricity
- force power plants to cut their use of coal by 40 to 50 percent, costing thousands of jobs
- threaten tens of thousands more jobs across the country through higher energy costs
- force total U.S. economic activity, or GDP, downward by almost $100 billion in 2007 alone

Unfortunately, 2 weeks later, we are still debating a multi-billion dollar stimulus plan. Putting aside the question of why we would depress the economy by $100 billion at the same time we are trying to stimulate it, I would like to talk about who these measures will affect.

Most of us believe that the stimulus bill should include help for people suffering in the aftermath of the 9/11 attacks. What would S. 556 do to people who are now hurting—those people out of work, unable to pay bills, unable to put food on the table?

The answer is that S. 556 will hurt those currently most in need. S. 556 will disproportionately harm low-income families and children. EPA estimates that a bill similar to S. 556 would raise electricity prices between 30 and 50 percent by 2015.

We may not care that we are forcing big utilities to pay higher costs. We should care that they will pass these costs on to their consumers. In the end, we will hurt our families, our single mothers, our elderly.

I have here an article from the Kansas City Star from September 27, 2001, that I would like placed in the record. [waive article] The title is "Aid agencies brace for winter rush; Need may exceed money available for utility bills, some fear."

The article describes how large utility bills are forcing families to raid their food budgets to maintain their utilities. Relief agencies are seeing working families with five children trying to get by on $75 per week for food. As a result, area food pantries are seeing an upswing in food requests.

Sabrina McCoy, a Kansas City mother of two, supplements her $490 Social Security check with $60 a week she earns cleaning a bar. As she stood waiting for an emergency food box at a pantry, she said "I pay one bill, and the other (utilities) get cutoff. Then I'll pay the bill that was cutoff, and something else gets cut."

Low-income families like Sabrina's must spend 20 percent of their income on utility bills. Last winter's bitter weather forced many in Kansas City to spend nearly 30 percent of their income on utilities. Where did these people cut back to make ends meet? In their food budgets. At the Olathe office of Catholic Charities, almost 700 families asked for food help in August, up from 352 last year.

Many of these poor households are still struggling to catch up from last winter. They had their gas shut off in the spring for failure to pay their bills and are surviving without heat during the warm weather.

According to Missouri Gas Energy, about 12,500 residential customers in Kansas City, Joplin and St. Joseph are without service now because they owe $10 million in utility bills. When winter comes, these people will be in very bad shape.

This problem is not unique to Missouri. Last winter, nearly 5 million American households applied for Federal Low-Income Home Energy Assistance Program funding—an increase of 1.2 million families over the previous year.

Because of last year's higher utility bills, 30 percent more families are on States' LIHEAP Crisis list, meaning they have exhausted their assistance grant and are in danger of shut-off.

California had a 140 percent increase in Crisis caseloads last year. Nevada had nearly a 1,000 percent increase in Crisis caseloads. In Rhode Island through September, fifty percent more families than last year have lost their gas or electric service.

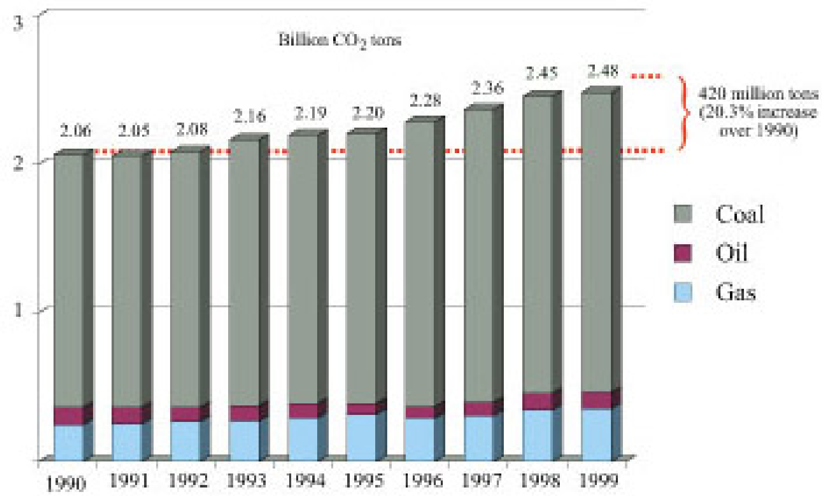
Lower gas prices this winter will not help these people. Even a normal winter and normal energy prices can lead to severe hardship among the nation's low-income households.

Witnesses later in the hearing will talk about the health benefits of this bill. That is important. However, we must also look at the human toll we will force our families to pay. We must ask how many homes will go without heat due to higher utility costs? How many families will cut back on food to keep their children warm?

I would support legislation to reduce air pollution from utilities. We need to provide certainty to industry to encourage them to innovate and keep our energy supply secure. However, we must also keep energy costs stable. The families in need in Kansas City, Missouri cannot afford higher utility bills. They cannot afford colder houses and less food on the table.

I will end with how the article begins, "As cold weather creeps into Kansas City, and the economy reels from the terrorist attacks, area social service providers expect a flood of low-income families seeking help with delinquent natural-gas bills." I hope we will not make their lives harder with S. 556.

Figure 1 Electric Industry CO_2 Emissions by Fuel Type



Source: Energy Information Administration, Emissions of Greenhouse Gas Emissions in the United States 1999, Table 10. http://www.eia.doe.gov/oiaf/1605/ggrpt/tbl10.html. Values converted from million metric tons carbon to billion short tons carbon dioxide.

Senator JEFFORDS. Thank you, Senator.

Governor, several States have expressed concern that without Federal legislation it might be politically difficult to control power plants so that local air quality is protected. Is that consistent with your view?

Governor DEAN. Clearly, the Clean Air Act, which was passed when Senator Stafford was chairing this, slightly before, has not been sufficient to deal with the national air pollution problems. I think if we have a concern about fuel prices, the solution is not to simply continue to pour vast amounts of these pollutants into the air, it is to ask the President, as we have asked, to release the extra $300 million of LIHEAP aid so that these folks can get the help they need.

I do not think we should be in the position of, as for example China does, of trading off economic growth with extraordinary pollution. That is a serious, serious issue.

This is a Federal problem. This cannot be solved at the local level. For exactly the reasons the Senators from the midwest have said, there is no incentive to control the pollution if all this stuff is going up the smoke stack and going to somebody else's backyard because there is a benefit to the people from Ohio and Missouri from burning coal without scrubbing it because they do get lower utility prices out of that. The problem is that does not take into account the incredible damage to the atmosphere, damage to the natural resources of our region of the country, which does not include just New England but also includes most of the entire eastern seaboard, and, interestingly enough, Kentucky and Tennessee and areas of that sort.

We have to have a national solution. That is why I am supporting your bill. We have to have a national solution because regions simply cannot do this on their own. Pollution knows no boundaries. Air pollution certainly knows no boundaries. Without a national solution, it just simply is not going to work.

I understand the concerns of the Senators who oppose this bill. But I would hope that we could all work together to try to come up with a solution where we are not going to do the terrible things that they have talked about to their economies but we also are not going to have the kinds of rushes on the emergency room that we have in New York City during the high ozone alert days, which are a high number and are increasing every year as the temperature goes up and the amount of pollutant load goes up.

Senator JEFFORDS. Are there other questions for the Governor? Senator Chafee?

Senator CHAFEE. Governor, you mentioned that this is an American problem. Senator Bond was saying put lime in your rivers and lakes. Would it be fair to say that if Missouri had the same situation we would probably come up with a better solution than putting lime in the Missouri lakes and ponds?

Governor DEAN. Senator, that has been widely discredited. The notion of putting lime in the lakes is clearly not going to work. I have not seen any scientific evidence, except for the one paper that he cited, that that is a reasonable solution.

It is not only the lakes. We do have to deal with the air. It is just simply not of acid rain killing the lakes, what about the problems of people's health? Putting lime in the lake is not going to reduce the number of kids who come to the emergency room with asthma.

So we do have to deal with this. I do not think that we need to make the midwest the boogie-man here. I do think there is a national solution. Everybody is going to have to figure out what it is. I also do not think the eastern States have clean hands either. We ought to do more about mobile sources. Perhaps we can come to a compromise where everybody deals with their particular problems. But it is a very, very serious national health problem and it is a national environmental problem. We cannot sweep it under the rug any longer.

Senator CHAFEE. Thank you, Governor.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. There is a real difference of opinion about global warming in the U.S. Senate. I have held hearings on it, Senator Lieberman has had hearings on it. The Administration has made it very clear that they would not support a four emissions piece of legislation. In other words, they are not going to go along with the CO_2. We might be able to work some kind of a compromise on giving some kind of credit for carbon sinks or something of that sort. But fundamentally, if we want to get something done in Congress to deal with this problem, we are probably going to be dealing with three emissions. The issue then becomes what the numbers should be in terms of those emissions.

If you knew that the emissions numbers in S. 556 would literally put coal out of business, would you have a different opinion in regard to those percentages? What we are trying to do is to reach percentages which will allow us to use clean coal technology, continue to be using this wonderful 250 year source of energy that we have in this country and, at the same time, cleanup our environment. If you knew that to be a fact, would you back away from this bill, at least the numbers that are in it and the timeline?

Governor DEAN. That is a difficult question. On the science, I do not think anybody in the United States, there are a few people, but the majority of people and policymakers in the United States would not want to eliminate coal as a source of power. I do not think that is reasonable. I do not think that is good for the economy. On the other hand, there are some huge improvements that could be made, which many of us believe should have been made under the terms of the Clean Air Act many, many years ago and have not been made. So, from a scientific point of view, I guess my answer is nobody wants to eliminate coal. We do need the technology to make it burn cleaner.

Now we get to the politics of it. I think we all know in Washington and other legislative bodies, which you and I have spent a great many of our years in, that if you do not ask for a lot, you end up with nothing at the end. So I would say the nature of what comes out of the Congress, particularly in negotiations with the House where this is going to be a very difficult issue, is really up to the people in this room to figure out, not for me. So I would try to refrain from giving advice about where we might go and what bill this committee ought to come up with, because this bill is really important. Nothing has been done for a long, long time on these issues, for over a decade, and I think we need the strongest possible bill that we can get for as far as we can get it because I think it is going to face a very difficult road through the Senate, the House, and then to the Administration's desk.

Senator VOINOVICH. I do not know how many hours I have spent on this, and many other people probably more than I have. I would like to see something come as a result of all of this work that we have put into it. What I am concerned about is that at the end of the road we are going to have a stalemate and nothing is going to get done, we are not going to improve the environment, and at the same time not do anything to deal with this looming problem that we are going to have to provide enough energy for the demands that we hope this nation is going to need in the future.

Governor DEAN. Well, there is a Senator who is not on this committee who one of his favorite phrases, which I think it is a wonderful phrase, is "we should never let the perfect become the enemy of the good." I am, in general, an incrementalist and I believe that passing something that really is significant, not something that is there for political reasons or to make people think we did something when we did not, but passing a significant improvement is always better than passing nothing. Then eventually you come back and see. Oftentimes, we find that when we pass significant improvements that they are not as expensive or as bad as the antis thought, or maybe they are not as complete as the pros thought either. So, again, that is really part of the process of the give and take.

From a political point of view should this bill get through the Senate, I think a bill like this will get through the Senate, I am not sure what will be in it when it does, but I think it will be a lot and it will be a good bill. What happens when you go over to the other side, it is clear that the more we give up in the Senate the more difficult it is if we ever get anything out of the House. One thing I will say, Senator, is you and I have known each other a long time and I know you to be an absolute person of your word. I have no doubt that if you could get a compromise out of this committee which you could support, that you would also vigorously support it in the House. I have such respect for you, having worked with you for so long in the National Governors Association, that that gives me some real hope if it is possible to come to a bill the committee could agree to.

Senator VOINOVICH. You can bet on it, if we can work it out here.

Governor DEAN. I know it will be difficult.

Senator JEFFORDS. Senator Lieberman?

Senator LIEBERMAN. Thanks, Mr. Chairman. Thanks, Governor Dean, for your leadership and your excellent testimony. Thanks for what you just said to Senator Voinovich. I agree with you. I hope we can work together to do something constructive here.

Just one question. I was quite impressed and encouraged by the agreement between the New England States and the Eastern Canadian Provinces on a climate change. I wonder if you could just talk about that for a little bit.

Governor DEAN. We meet every year with the Eastern Canadian Premiers, the six New England Governors, and we also involve in some instances Pennsylvania, New York, and New Jersey, although they are not signatories to this agreement. This is an international issue because winds know no boundaries. The Eastern Canadian Provinces, including Quebec, which is pretty substantial and has a significant economy, are deeply concerned about these four pollutants, particularly mercury, but all four pollutants. We have passed very, very stringent resolutions, even tougher I think perhaps than this bill, requiring or requesting our governments, both the Federal Canadian Government and the Federal American Government, to do something such as this legislation.

We are serious about it. We have actually passed in Vermont legislation that would allow us to phaseout the use of mercury in many, many industrial products over a period of years. That has been agreed to by all the six States and the five Eastern Canadian premiers. We feel very strongly about this. This is important for our environment, it is important for the health of our kids, particularly asthmatics, and it is something that has to be dealt with.

Senator LIEBERMAN. I appreciate the answer. Of course, the New England Governors are a bipartisan group.

Governor DEAN. Right.

Senator LIEBERMAN. Perhaps not as bipartisan as you and I would like.

Governor DEAN. I think we are two Democrats, three Republicans, and one Independent.

Senator LIEBERMAN. That is what I meant. OK. Thanks.

Senator JEFFORDS. Senator Clinton?

OPENING STATEMENT OF HON. HILLARY RODHAM CLINTON, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator CLINTON. Thank you, Mr. Chairman. I am delighted to see you, Governor Dean. Thank you for your leadership on this and so many other issues. I share your analysis that in the absence of a strong bill that takes into account what we do know about the scientific basis for reducing the four pollutants that have adverse health effects coming out of this committee, it will be difficult to end up anywhere in negotiations, starting on the floor of the Senate, with a bill that actually produces results.

Governor Dean, perhaps you could share maybe some insights into how you have built what is a remarkable consensus in your State about what needs to be done with respect to energy efficiency and alternative energy sources, and how you have also taken the health effects that you are also so concerned about and injected those into the discussion effectively.

Governor DEAN. There is a consensus and our State has a particularly high environmental conscientious, although I have received some flack actually for some of the sources of power that we do use. There are those who would criticize every source of power and then demand as much as they possibly want regardless of what the source is. As I had mentioned previously, we are fortunate in that we get about 40 percent of our power from Canada, it is hydropower so it is completely renewable; we get about 30 percent of our power from nuclear power, we have a plant in our State; and the rest is from the New England power grid, which is mostly natural gas although there is a mixture.

Our principal problem is mobile sources, which is not addressed in this bill, but which I recognize we have an obligation to address. Our State along with California, Massachusetts, and New York has also been pivotal in pushing electric vehicles, not because electric vehicles are going to take over Vermont, it is hilly terrain and cold climate, but because it is a technology that has enormous value particularly in cities and somebody has got to push the technology. The four States, I think going back to Governor Wilson, Governor Weld, and myself, and Governor Pataki, have really pushed hard in those areas. We recognize that our States cannot just simply complain about stuff blowing in from the West, we have also got to do something about our own concerns.

In the health areas, the issue is more serious in your State or in Senator Corzine's State, large urban areas, than in our State, although we do trace the few out of compliance days that we have, particularly on one-and 8-hour ozone limits, with increases in the visits of asthmatic kids to emergency rooms. It is a very, very clear connection to what happens when the level of air pollutants rise, particularly the ones that we are discussing here, and the number of kids that get into trouble. Again, we do not have the problem that you have in New York and New Jersey and other urban States, but we do notice the correlation. That is one of the reasons that I am here to support this bill.

Senator CLINTON. I appreciate very much your commitment as a doctor as well as a Governor and as someone who is interested in these important energy and pollution issues. One of our challenges is obvious—we have to persuade people that carbon dioxide is a problem and we have to figure out how to deal with it. Do you have a particular way you explain that to skeptics or how you try to demonstrate that the United States should be concerned about this issue, it is in short as well as long-term interest to address it now, it is not going to get any better in the absence of our taking action?

Governor DEAN. I think that, basically, my attitude as a physician is that science explains itself. Initially, when the concerns about global warming were raised over a decade ago there were a lot of skeptics. Now there are fewer and fewer as we see what the numbers are, and as we see what modeling does around the world, and as we actually begin to see some climate changes as we look back over the records to look at past climatic changes and what their various involvements were.

I am not an expert in global warming and so I would hesitate to venture what I would consider a scientific opinion. But I do read the literature and I think I am equipped to do that because of my scientific background. I came to the conclusion some time ago that global warming was a serious threat, and I have come to the conclusion over the last couple of years that it is a very serious threat and that we are going to have to deal with it. It is not going to do any good to put it off because we are going to have more of a problem later on.

I saw some very interesting statistics from folks who said that even if we pass this bill, the amount of carbon dioxide is not going to go down dramatically and there is only going to be a fairly minimal change. But it is like fixing a budget problem, which I am in the middle of doing in our State, the earlier you go after it the lower the base is and the better off you are, because this is all cumulative.

So I do happen to favor dealing with a four-pollutant bill and dealing with the carbon dioxide problem. Although, I would basically take any substantial and significant bill that we could get through both houses and get the President to sign, because I think this is a critical issue that cannot wait for another year.

Senator JEFFORDS. Senator Carper?

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. To my old compadre and running mate, Governor Dean, welcome. I understand you have another meeting at 10:45. If that is the case, I will withhold any questions. I just want to be respectful of your time.

Governor DEAN. I appreciate that, Senator. I think this is the first time we have actually gotten to talk in your new capacity. I appreciate all the leadership that you showed when you were chair of the National Governors Association. I also thank you for mentioning the time because I had not looked at my watch and I now see that I am about 10 minutes late for my next appointments.

Senator Carper. All right. Just one quick comment. Governor Dean and I were invited almost 2 years ago to come as Governors to meet with the Senate Democratic Caucus I think over in the Library. They invited us down just to talk about what was going on in States, and we had the opportunity for about an hour to share with the Democratic Senators what we were doing with respect to welfare reform, childhood education, early childhood, providing health care for people, prescription drugs, and on and on. When the session was over, I will never forget, one of the Senators said to me during the intermission, I think you were within ear-shot, he said, "We invited both of you down here in the hopes that someday you would consider running for the U.S. Senate. After listening to all that you are doing as Governors in your respective States, we want to go home and be Governors."

Governor DEAN. We already have two great Senators that I like and I intend to support them.

Senator CARPER. I understand. If time would have permitted, I would say one of us has had the opportunity already to serve now in the Senate, and someday you will too, if that is what you would like to do. But if you could maybe submit in writing, Governor, if you were sitting here and the rest of us were sitting out there, what would you do as a Senator on the issues that are raised in the legislation that your Senator has introduced.

Governor DEAN. I think I want to refrain from that question. That is essentially political advice. I, first of all, think it is a bad idea to give Members of the U.S. Senate political advice, especially when you are not in the Senate.

Senator CARPER. Everyone else does.

[Laughter.]

Senator CARPER. Even my 11 year-old son yesterday. So why shouldn't you?

Governor DEAN. Let me just thank you very much for your kind remarks, and I thank the chairman very much for his kindness and his leadership on this issue which is an extraordinarily important issue.

I do want to just conclude by saying that I do hope we have a bill this year. I hope that this bill will make it all the way through. I understand there will have to be some compromises. You started off with an outstanding bill and certainly one that I support. But in the end, at the end of the day, it is just critical that we get a bill through both houses that is a meaningful bill which really significantly and substantially improves both the environment and the health of Americans.

Again, I urge the committee and the Congress to look at this as not an eastern problem, but as an American problem that all of us have to deal with in some way. We certainly do not wish to cripple anybody's economy or take coal off the table as a fuel because we have a 250 year supply of it and we need to continue to use that as a fuel. But we do substantially need to improve this problem. It is a very significant problem that has made a big difference, and not for the good, both in the health of our kids and in the nature of our environment. So I hope that the committee will be able to move forward on this.

Senator JEFFORDS. Thank you very much for your most helpful testimony. You certainly are excused. Thank you for coming. We share your optimism and also understand the problems. Thank you.

Governor DEAN. Thank you.

Senator JEFFORDS. Our next panel is Gerard M. Anderson, president and COO of DTE Energy Resources and DTE Energy Company, Detroit, Michigan; Mr. Jeffry Sterba, chairman and president and CEO of the Public Service Company of New Mexico; Robert LaCount, air quality manager of the environmental affairs of PG&E National Energy Group, Bethesda, Maryland; and Jeffrey C. Smith, executive director, Institute of Clean Air Companies, Washington, DC.

Thank you, gentlemen, for being here this morning. We are going to have a vote sometime within the next 20 minutes or so. I am not asking you to rush, but just noting that we may have to interrupt at that time while members vote.

Mr. Anderson?

STATEMENT OF GERARD M. ANDERSON, PRESIDENT AND COO, DTE ENERGY RESOURCES, DTE ENERGY COMPANY, DETROIT, MICHIGAN

Mr. ANDERSON. Good morning, Mr. Chairman and Senators. Thank you for inviting me here today. I appreciate the opportunity to address you on this important issue. Let me state at the outset that our industry supports making continued progress on emission reductions. Let me also state the EEI supports an integrated multi-emissions approach that, if designed properly, can achieve important environmental, energy, and economic goals.

Because of multiple, uncoordinated, overlapping existing regulations, the electric power industry faces enormous challenges and uncertainty as it tries to devise appropriate plans for our country to develop new generation capacity, upgrade existing plants, and add emission controls. A reasonable, integrated multi-emission strategy would streamline the regulatory process, accomplishing meaningful air quality benefits at much lower cost while protecting electric reliability.

To achieve these results, EEI has developed a set of six criteria that we believe should underlie a multi-emissions approach, and I would like to take the remainder of my time to go through those six criteria.

First criteria: Fuel diversity should be maintained for generating electricity as a matter of both national energy and national security. Coal is currently the backbone of our electricity production in this country, accounting for 50 to 55 percent of all our electricity in our nation. The EIA has recently determined that coal-based electricity generated in this country would decline by 40 percent or more if this bill is enacted, and, in turn, natural gas generation would increase by roughly 60 percent. The challenges and costs that such a shift would entail should not be underestimated by this committee.

Second principle: Maximum flexibility should be provided to achieve the emission reductions we all are targeting. This bill, in our estimation, takes a step backward in terms of the need for regulatory flexibility and efficiency. In addition to the stringent emission caps mandated by the bill, it also introduces a new concept—modernization—which would require every single power plant to install the most stringent controls. Many power plants would be forced to shut down due to the cost of emission control retrofits. I can say that with absolute certainty.

Furthermore, the bill requires extreme levels of reduction in mercury emissions and specifically excludes the trading of mercury. Rejecting mercury trading does not make sense. Rejecting trading will substantially increase compliance costs and will reduce the incentives for companies like mine and our suppliers to innovate and be creative. Further, we believe an honest assessment of science demonstrates that hot spots are not an issue, or at least are an issue that can be dealt with.

Third principle: Every element of a comprehensive multi-emission approach, beyond just the amounts and timing of emission reductions, needs to be resolved in order for a balanced package to be achieved. Such a package must include reform of the new source review program.

The EPA's current interpretation of NSR is a departure from how the program has been understood and implemented for decades, and it prevent power plant operators, like us and existing plants, from making necessary improvements and undertaking routine maintenance. I will give you an example. At our Monroe Power Plant, one of the largest in the country, we have the opportunity to increase efficiency of our generating units and produce more electricity with the same fuel input, something that is good for our environment, something that is good for our customers. However, because of current NSR regulations, our ability to undertake these projects has been substantially complicated, to put it mildly.

Fourth principle: Adequate time for compliance must be provided. Compliance within the timeframe set forth in this bill would leave companies like mine no choice but to begin a massive construction effort essentially immediately. This fact has two practical consequences. The first is, the ability for technology innovations to come into play would be all but eliminated. Much of what we are discussing here today will be achievable in the future at much lower cost if technological innovation is given an opportunity to play its natural role. Second, the scale of the construction effort required by this bill would require large numbers of our power plants to be off-line for long periods of time.

Put very simply, the required construction effort would dwarf anything our industry has seen previously. This would certainly increase the cost of power and, in many regions, I believe would severely impact the reliability of the overall electric grid as well.

Fifth principle: This legislation should not include mandatory CO_2 reductions. CO_2 emissions are a national policy issue affecting all segments of the economy. If a national consensus is reached on this issue, our industry will do its part. Until such time, however, addressing CO_2 in isolation in the power generation sector is ill-advised.

Instead, we recommend that Government continue to work with our industry to improve the voluntary climate challenge program. This program has produced very real and meaningful reductions in our sector of the economy, and we think it is a model that can be extended to other sectors as well.

Sixth, and final, principle: The emissions reductions must be cost-effective, in an aggregate, be manageable. Put differently, our industry needs to be able to undertake the emissions reductions without rocking its financial core. I will quickly shed some light on this by giving you an example from our company.

We estimate the cost of this bill for us to be $2 billion in capital, and that our annual operating costs would rise by $200 to $300 million annually. I can tell you unequivocally that those expenditures would absorb every dollar of cash generated by our power production fleet for the next 15 years at minimum. Given that prognosis, my decision would be straightforward—a substantial portion of our generating fleet, especially our coal generating fleet, would be retired, with the attendant impact on jobs, tax base, and power costs. I do not believe an outcome like this is necessary for us to continue to make progress in reducing emissions, improving the environment, and improving public health.

Since 1975, my company has reduced particulate emissions 90 percent, sulfur emissions 60 percent, NOx emissions 40 percent, while increasing output 45 percent. We are currently in the process of reducing NOx an additional 70 percent. Such strong progress can continue without forcing large portions of our plant fleet into retirement. I thank you.

Senator JEFFORDS. Thank you very much.

Mr. Sterba?

STATEMENT OF JEFFRY E. STERBA, CHAIRMAN, PRESIDENT AND CEO, PUBLIC SERVICE COMPANY OF NEW MEXICO, ALBUQUERQUE, NEW MEXICO

Mr. STERBA. Thank you, Mr. Chairman. I appreciate being able to address you all today. I am Jeff Sterba, chairman, president and CEO of Public Service Company of New Mexico. From the opening comments that the Senators made, it is clear that there is a consensus that now is the time for a coherent and cohesive energy and environmental policy that will assure reliability and security of supply, economy of resources, and environmental protection.

As a company, we support a streamlined power plant emission reduction program that improves air quality, provides the industry with appropriate regulatory certainty, and brings order to what can really be called chaos caused by duplicative and ineffective regulatory programs that in some instances impede us from even being able to improve the operating efficiency of existing power plants. We are committed to working with this committee and others to develop appropriate legislation that requires the further reduction of SO_2, NOx, and mercury, and provides the operational certainty power producers need to meet growing demand for electricity.

There are several reasons, however, why PNM cannot support a uniform, one-size-fits-all emission reduction program as proposed by this bill. First, I would generally echo the comments that have been made by Gerry on behalf of EEI. But additionally, and I think most importantly, the emission reduction levels that are mandated by this bill appear to be a policy response to environmental conditions that simply do not exist in our region.

I agree with the notion that pollution does not adhere to State and local boundaries. But in the western region, we are talking about a territory that encompasses 40 percent of the land mass and has significantly different characteristics in terms of the air pollutants which are emitted from power plants. I have attached a series of charts in my testimony which reflect these different emission levels between the West and the nation as a whole. Let me refer to them briefly.

The main air quality challenge in the West related to power plant emissions is visibility impairment and national parks and wilderness areas. There is not a single non-attainment of national ambient air quality standards for ozone or fine particles resulting from power plant emissions. The pollutant of interest for visibility protection is SO_2. If you look at Figure 1, you will notice that western power plants are already well controlled for SO_2 emissions, with rates of one-third of what the average across the entire nation, including this part of the country, is.

Furthermore, in response to the recently promulgated regional haze rule, new regional emission limits have been agreed to as part of a true collaborative, regional, stakeholder-based consensus process known as the Western Regional Air Partnership, or WRAP. The WRAP, and that is not rock music, consisting of State air regulators, environmental groups, Federal land managers, EPA, tribes, industrial sources and power companies, has developed SO_2 emission limits that respond to real-time air quality conditions in the western United States and will result in a further emissions reduction of SO_2 by more than 30 percent. It is our view that any Federal multi-emission reduction proposal should embrace the WRAP's work with respect to SO_2 and not overlay additional reductions to respond to issues in other regions of the country.

With respect to NOx, again western power plants emit NOx at a much lower rate, greater than 20 percent lower, than other power plants across the country. This is demonstrated in Figure 2 of the attachment to my testimony. In addition, work done by the Grand Canyon Visibility Transport Committee showed that NOx emissions from power plants have very little impact on visibility impairment in the western National Parks and Wilderness Areas. Furthermore, with the exception of California, which does not have a single coal-fired power plant, the western States have very few areas that are in non-attainment status for ozone, which is demonstrated in Figure 3 of the attachment. In those areas, the non-attainment results not from stationary sources, power plants, but from mobile transportation sources.

Thus, the ozone non-attainment issues that are severe issues in other parts of the country do not justify further NOx emission reduction from power plants in the West. It would be wrong to require western customers to pay for the installation of expensive retrofit controls to reduce NOx emissions when that expense would result in no meaningful environmental benefit and in an area in which NOx emissions have already been reduced.

Concerning mercury, as Figure 4 in my testimony illustrates, western coal-fired power plants burn primarily sub-bituminous coal that has a much lower mercury content than coal burned in other regions. Additionally, mercury emissions from western sub-bituminous coal are primarily elemental mercury as opposed to particle-bound our ionized mercury, the methyl mercury that I am sure you have heard about.

All research that I am aware of clearly points out that it is methyl mercury that must be limited for the health of the food chain.

No technology that I am aware of has demonstrated effectiveness in controlling elemental mercury on a consistent basis. It would be impossible for our power plants to comply with the bill's 90 percent mercury reduction requirements from their existing low levels.

Concerning the individual pollutants, western considerations can be taken into account by:

Building on the recommendations of the successful WRAP stakeholder process for SO_2. Legislation should respect both the magnitude and the timing of the WRAP SO_2 emission reductions.

Ensuring that the costs associated with NOx emission reduction requirements are reasonably proportional to the potential benefits from those controls. Although the appropriate NOx emission level and implementation schedule for western power plants has not been finally determined in the WRAP process, the appropriate emission levels should be achievable with aggressive combustion controls.

Third, developing a mercury control program that accounts for the difficulty in reducing elemental mercury emissions with presently available control technologies and allows time for the development and demonstration of new technologies.

Let me take just a brief moment to address the issue of greenhouse gas emissions, an issue that I, too, am very concerned about. This is a long term global challenge. For power plants, the challenge is improving combustion efficiency and capitalizing on technology advances that over time will reduce our dependency on fossil fuels. Prematurely forcing the retirement of existing capital stock will freeze this technology transition, forcing a massive shift to natural gas. Not only does this potentially disrupt reliability and security, cause higher prices, and create significant competition for limited gas resources with other important industries, I believe it will impede the ability to transition to new technologies that will emit less CO_2 that today are not proven or cost-effective. A better alternative is to encourage experimentation through voluntary programs, incentive improvements in combustion efficiency, and strongly support R&D and pilot programs.

We are committed to working with this committee to develop a program that will work for the benefit of the country. Thank you.

Senator JEFFORDS. Thank you.

Mr. LaCount?

STATEMENT OF ROBERT LACOUNT, AIR QUALITY MANAGER, ENVIRONMENTAL AFFAIRS, PG&E NATIONAL ENERGY GROUP, BETHESDA, MARYLAND

Mr. LACOUNT. Thank you. Mr. Chairman and members of the committee, I am pleased to appear before you this morning to represent my company, PG&E National Energy Group, and our coalition, the Clean Energy Group. The CEG members are listed on the chart to my left. With assets in every region, we share a commitment to providing clean energy and promoting policies that are sustainable from both environmental and economic perspectives. We believe that the best way to accomplish this is to work cooperatively with Government, industry, consumers, labor, and the environmental community.

Thank you for taking the time to engage in discussions that can lead to a very meaningful consensus on a question of national importance—how best to foster energy security, reliability, and economic growth, while protecting the environment and improving air quality. The time to begin discussions on these issues is now, because our industry is facing a series of regulations that could be more efficiently and economically addressed in an integrated and comprehensive manner.

CEG believes there is a common sense solution to reduce emissions in nitrogen oxide, sulfur dioxide, as well as mercury and carbon dioxide. An integrated approach would deliver significant and timely emissions reductions and provide our industry with needed regulatory certainty.

Mr. Chairman, we commend you and Senator Lieberman for introducing legislation that addresses air quality and climate change issues in an integrated manner. Although CEG is in general agreement with the scope of the emissions addressed in S. 556, we are not in agreement with the emission reductions levels, the timelines for achieving these reductions, and the limits placed on flexibility. Also, we believe that the birthday provision is unnecessary. Finally, an integrated air quality program must address the current deficiencies of the new source review program.

CEG has spent considerable time in analyzing how to balance these key provisions so that both environmental and economic results may be optimized. Our approach sets defined targets for emissions reductions on a national basis and uses market-based systems to achieve these reductions. We believe that only a legislatively established national program will provide the needed compliance certainty.

The reductions and timelines set out in our proposal are shown in this chart. Our proposal capitalizes on the co-benefits of various emission reduction technologies, provides the industry adequate time to make investment decisions, and allows time for the commercialization of new technologies. The first level of reductions builds off the existing NOx SIP Call and the Acid Rain Program, coincides with the compliance schedule for EPA's mercury regulations, and complements the expected timelines for $PM_{2.5}$ and regional haze rules. Our proposal, therefore, allows the time for current compliance schedules to be fully implemented, while coordinating the schedules and approaches for future programs.

With regard to carbon dioxide, CEG advocates a unique approach that results in minimal cost and resource impacts while encouraging renewable resource development and energy efficiency investments and maintaining fuel diversity. Our program is based on three underlying principles: timelines for reductions must be reasonable; flexibility is required; and verification of reductions is essential.

With regard to NSR, the Clean Energy Group proposal does not advocate eliminating the NSR program. However, CEG believes that the existing NSR program must be changed to ensure that it complements the integrated program by facilitating expedient emission reductions, promoting clean energy sources, and encouraging efficiency improvements without imposing unnecessary cost and delays.

With regard to cost, we are currently finalizing an analysis of our proposal. We believe this analysis differs from the EPA and the EIA analyses presented at the November 1 hearing, in two main ways. The CEG analysis employs a business as usual scenario that accounts for both current regulations as well as those authorized under the Clean Air Act for future implementation. It includes significant flexibility for complying with carbon requirements, including the use of offsets generated outside of the power sector. In terms of national average residential energy prices, our proposal would result in minimal price increases on the order of $5 per month by 2015. Our proposal maintains fuel diversity in that it results in a shift of about 5 percent from coal to natural gas use, while the impact on natural gas prices would be less than 6 percent by 2015. In terms of coal production under both our business as usual and our policy case, Rocky Mountain and midwestern coals become more economically competitive and gain market share as many coal-fired units install scrubbers to comply with new SO_2 and mercury limits.

The series of air quality regulations that our industry currently faces is not just a result of Federal activities. Some of the greatest pressures are coming from States. At least a dozen States, including Illinois, Michigan, and Texas, are addressing or are considering addressing one, two, three, or all four emissions. Some are even designing separate trading systems. If this continues, and we believe it will, our industry will have to comply with 50 standards, 50 sets of rules, and 50 trading regimes.

This is particularly true for companies such as ours that have operations in multiple States. In fact, we operate two large coal-fired facilities in Massachusetts. We will be meeting some of the toughest emissions standards in the country for all four emissions at these facilities. However, we believe that if a national program were in place, we would be able to do so more efficiently and cost-effectively.

I look forward to responding to your questions. Thank you.

Senator JEFFORDS. Thank you, Mr. LaCount.

Mr. Smith?

STATEMENT OF JEFFREY C. SMITH, EXECUTIVE DIRECTOR, INSTITUTE OF CLEAN AIR COMPANIES, WASHINGTON, DC

Mr. SMITH. Thank you, Mr. Chairman. I am Jeff Smith, executive director, Institute of Clean Air Companies. It is a pleasure to be here on November 15, the eleventh anniversary of the Clean Air Act Amendments of 1990. The Institute is a national association of companies that supply air pollution control and monitoring technology for all types of stationary sources, including power plants. ICAC members supply the complete spectrum of competing control technologies for emissions of mercury, SOx, NOx, all the other criteria pollutants, and all 189 air toxins. Thus, the Institute speaks for the entire industry, not just one technology. We do not, however, supply technology for CO_2 control, and I will not therefore address CO_2.

The air pollution control industry believes that the technology will be available to achieve the NOx, SOx, and mercury reductions in S. 556. During the 31-year history of the Clean Air Act, the air pollution control technology industry has always delivered on the charge this committee has given it. There is no reason to believe this time will be any different. A multi-pollutant bill makes sense both technically and cost-wise, as my colleagues on this panel have stated.

A reliable, demonstrated control technology exists for coal-fired power plants to remove over 95 percent of SO_2 emissions, over 99.9 percent of particulate emissions, over 90 percent of NOx emissions. These levels are being guaranteed in the field today. The somewhat harder question is what to do about mercury emissions from coal-fired power plants, and that is where I will focus my testimony.

There has been some discussion of markets this morning, and I think it is important to note at the outset that the air pollution control technology markets have historically worked well. Setting regulatory drivers spurs technical performance and cost improvement. Total costs fall dramatically as control technology moves from R&D to full-scale commercialization. For reasons developed in my written testimony, it is reasonable to assume that this traditional successful operation of the air pollution control market will apply to the development and enhancement of mercury control technology.

The key to well-functioning markets is regulatory certainty. We heard that a moment ago with regard to the utility industry. It is certainly true with regard to control technology development. If the goal is technology innovation, then it is important to enact a clear, certain, performance-based mandate. Mr. Chairman, your bill would do this and allow coordinated compliance with numerous programs, such as acid rain, attainment of the one-and 8-hour ozone standards, regional haze, fine PM, and so on. For example, controls to remove SO_2 may significantly reduce mercury and $PM_{2.5}$, thus lowering the evaluated cost for each individual pollutant that may otherwise be addressed in a separate regulatory program.

Dollars spent on compliance are recycled in the economy, generating jobs in construction and materials fabrication, in addition to jobs in air pollution control technology companies. For example, compliance with the NOx SIP Call alone is creating over 25,000 person years of employment a year for the 7 years begun in 1999, as detailed in Appendix III of my written testimony.

EPA's data shows that existing controls are already removing mercury, and in some cases large amount of mercury, as a side benefit of removing other pollutants. In general, we believe technology available today can achieve total mercury reductions of 90 percent on bituminous coals, and 70 percent on sub-bituminous coals.

Research on mercury control technology has been underway in the United States for a decade, and a multi-pollutant law would stimulate more R&D and results. Appendix II of my testimony contains a partial list and summary of ongoing R&D projects which are in general designed for 90 percent mercury removal, with the added goal of cutting costs 50 to 75 percent over the next one to 10 years.

The important point here is that R&D is maturing to full-scale demonstrations today, even in the absence of a legislative mandate, and covers a wide range of coal types and existing equipment configurations. Many of the project teams include utility end-users as well as technology developers, which indicates the wide-ranging, cooperative effort underway. By the required compliance deadline, this R&D, along with already demonstrated technology, will, in our opinion, yield a variety of increasingly cost-effective options for achieving the NOx, SOx, and mercury removal requirements of S. 556.

In conclusion, we believe that this committee does not have to pick a technology winner. The marketplace is adept at doing so. The course of technology development is too unpredictable to say what the best approach will be in 7 years, in 10 years. Experience strongly indicates, however, that there will not be one universal approach. Technology development markets will continue to work well, and the chairman's bill provides the requisite incentives for these markets by providing clear goals without specifying the precise compliance technology.

Mr. Chairman, Senators, that concludes my testimony. I look forward to your questions.

Senator JEFFORDS. Thank you all for very excellent statements. We will now go into the question period.

For Anderson, Mr. Sterba, and Mr. LaCount, I am sure you have all seen the chart that Mr. Holmstead brought with him at the last hearing. It showed the numerous regulations that power sector will face in coming years. Has the Administration presented any of you with an estimate of the projected cost of industry compliance with those regulations?

Mr. ANDERSON. The Administration itself has not presented us with estimates of those, but we certainly have on our own tried to best forecast as we can the status quo or business as usual and then calculate the cost of those.

Senator JEFFORDS. Mr. Sterba?

Mr. STERBA. Same answer. I am not aware of it.

Senator JEFFORDS. Mr. LaCount?

Mr. LACOUNT. One of the difficulties in trying to even estimate the cost of those programs is one of the main point for which we are here today; and that is, the regulatory uncertainty. As we look over the next 10 years, it is very difficult for us at this time to even estimate the cost for those programs because there are so many questions yet to be answered about exactly how they would be implemented, what authorities under the Clean Air Act will they exactly take, and exactly how the decisions will be made in the proposals and implementation of those programs, and in many cases court decisions as well.

So, that is why it is very difficult at this time for us to even quantify cost on those programs and then think about how we would comply with them.

Senator JEFFORDS. Thank you. Assume the EPA or industry has, or can, come up with a reasonable, accurate baseline cost of these regulations, would it not be most appropriate to subtract that baseline cost from EPA analysis done for the committee to get an incremental cost estimate for S. 556?

Mr. Anderson?

Mr. ANDERSON. Well, I think that we certainly have compared our perceived cost of this to what we perceive the business as usual case to be, and we perceive the cost here to be substantially higher than the business as usual case. I think, in addition, we would recommend to this committee that economic efficiency in energy policy would suggest that there is a lot that can be accomplished but that we ought to be very careful about the levels and the timing at which those levels are implemented to minimize cost here.

So, we are certainly advocates of continued progress and advocates of continued reductions. But the timing of those reductions is critical, as are the absolute levels.

Mr. STERBA. I guess the only thing I would add, Senator, would be that, as has been stated already, the difficulty of estimating what the cost of compliance with the existing multiplicity of regulations makes what would otherwise be a simple arithmetic calculation problematic. This bill, it is very clear what is intended, it is very clear to estimate what the cost of it would be, and we believe that those costs have been fairly represented by the EIA and EPA analyses.

Mr. LACOUNT. Although it is very difficult for us to exactly estimate the cost of each of those programs that would be implemented over the next 10 years, we think it is important to make an attempt to quantify the overall, generally speaking, what kind of cost that it would be to compare proposals such as S. 556 with.

In our modeling we have made an attempt to do that. So, in our business as usual case, we have looked at not only regulations that are on the books today, but also those that the Clean Air Act currently authorizes for implementation over the next ten to 12 years. When we do that, and then we look at certain proposals that provide a lot of market-based incentives, we find that the cost increases beyond the business as usual, in many cases it is very minimal. With our proposal, even when we throw in carbon with maximum flexibility, again, we do find minimal cost increases above the business as usual case.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. Mr. LaCount, in your testimony you mention that your company, which owns two large coal-fired facilities in Massachusetts, will be complying with the State's new four-pollutant reduction regulations. What are the CO_2 and mercury levels under the Massachusetts proposal, and how will your company comply with those two for your two coal-fired plants?

Mr. LACOUNT. Particularly the mercury component of the Massachusetts regulations, actually it leaves a lot of uncertainty for us at this time because the regulation does not specify an exact requirement for mercury. It creates a process for continuing to look at what is feasible at that plant, and then comes up with a date on which that final reduction requirement would be set in regulations. A lot of the timing of that fits in with existing technology processes that are underway at EPA, specifically speaking of the mercury regulations that are being developed.

In terms of CO_2, the regulations talk about capping emissions at 1990 levels and having an ability to generate emission reductions of CO_2 both on-system as well as off-system. So at this time as we are developing a compliance plan, we are certainly looking for energy efficiency increases that are available at the plants to reduce CO_2 emissions, but also at the same time looking for other market-based solutions that would allow us for off-setting emissions outside of the plant as well.

Senator VOINOVICH. I understand that your group supports a four-pollutant approach. But I want to make it clear. Do any of your companies support the Jeffords-Lieberman bill as drafted?

Mr. LACOUNT. We think it is, first of all, very important to include carbon. We think it is a lost opportunity if that is not included in legislation at this time. However, we think in doing that maximum flexibility needs to be a part of that program as well. At this time, we think it is important that more flexibility would be there and be allowable than what is currently in S. 556.

Senator VOINOVICH. You have got a fairly diverse membership in your group?

Mr. LACOUNT. Yes, we believe we do.

Senator VOINOVICH. I know nationally over 50 percent of electricity comes from coal. What would be the overall fuel mix for companies in your coalition?

Mr. LACOUNT. I can say that for the coalition overall, we certainly represent significant amounts of the same fuel mix that the nation currently has. I can speak more specifically to my company, and my company is made up of approximately 50 percent coal at this time.

Senator VOINOVICH. Mr. Anderson, in your testimony you give an example of how the EPA's current interpretation of NSR prohibited your company from increasing the efficiency of your Monroe Plant while at the same time not increasing emissions. Can you explain to the committee what happened and how the EPA's program has changed in recent years. This is a big, big issue here.

Mr. ANDERSON. Yes, this is a lost opportunity for our industry. The particular case can be generalized to many turbines across not only our company but the industry. We filed for an applicability determination for replacing an old turbine with a higher efficiency new turbine, one that would allow us to use 5 percent less fuel in producing the same amount of energy. What we got back was a determination that NSR did apply and what would therefore be required is a restriction of the output of that turbine should we choose to put it in place.

The result of restricting output is simply to not take advantage of a higher efficiency turbine and to shift that output to lower efficiency turbines. I think this will either have that impact as people around the industry look at it or simply force people to choose not to do these projects.

Senator VOINOVICH. Mr. Sterba, do you think it is possible today to meet the mercury reductions in S. 556?

Mr. STERBA. Whether it is technically possible across some sources of coal, I cannot comment on that. I can comment specifically that relative to the coal that is burned predominantly in the West, I know of no technology that can gain 90 percent removal of mercury given that the predominance of it, about 80 percent of it, is elemental. So I am not aware of a technology that can accomplish it in the West—at any cost.

Senator VOINOVICH. I am glad you pointed out the differences in terms of the kind of emissions from mercury that we have. I know that is a big problem and that is why I am interested in having a hearing on the issue of the technology in terms of mercury, because I have been to company after company and they are at wits end in terms of what they can do in order to bring down the mercury.

Mr. STERBA. Senator, one of the things that is interesting about mercury is that if you look, and I am not the person that is most technically involved with this in our company, but if you look across the experiments that have been done and the testing that has been done, the difficulty is consistency of removal. You see very different kinds of outcomes depending on the coal chemistry and the formation of the boiler.

I think that this committee undertaking that kind of a hearing is a very important aspect. Technology is how we are going to get there. Trying to do it too fast, turn over capital stock too fast, has an enormous cost that not only has a cost side, it also freezes what technology options are available as you have to make a massive investment to reach a 2007–2008 timeframe.

Senator VOINOVICH. Mr. Smith, you represent the technology people. What is your response to that question in terms mercury?

Mr. SMITH. I think he is absolutely right, and you are too, Senator Voinovich, in the sense that coal type is important. Sub-bituminous, found more out in the West, is lower in chlorine, and for various chemical and other reasons is more difficult to control. As you know, in my testimony I distinguished between bituminous and sub-bituminous, and I said we as an industry feel 70 percent is probably doable today, not 90, 70. But looking down the road a year, 2 years, 5 years, 10 years, making reasonable extrapolations of the development of R&D and test programs underway, I think it is reasonable to assume we could get there. But you are right, there is a very distinct difference in the ease of controlling bituminous versus sub-bituminous coal.

Senator VOINOVICH. Mr. LaCount, do you intend to keep burning coal at your Massachusetts plants?

Mr. LACOUNT. At this time, absolutely. The work that we are doing right now is developing compliance plans for those regulations that were adopted in Massachusetts, and those compliance plans involve significant capital investment in controlling the emissions while continuing to burn coal.

Senator VOINOVICH. Thank you. I think my time is up.

Senator CARPER. Senator Jeffords had to leave the hearing for about 15 minutes and he has asked me to just take over and run it. I was reluctant to do it, but I finally relinquished.

I would ask Senator Chafee to go ahead and ask the next round of questions, and then I will take the next after him.

Senator CHAFEE. Thank you very much. Thank you for your testimony. Very interesting. I have just one question. Do Mr. Anderson, Mr. Sterba, or Mr. LaCount wish to comment on Mr. Smith's testimony? It seemed a little bit in contrast to the previous three testimony. Any of the three of you wish to comment on Mr. Smith's?

Mr. ANDERSON. I could start by echoing the comments around mercury, which is that of the three elements this is the one that gives us the most concern. The technology is the least developed. From what I have seen, from what our technologists have told me, the 70 percent is a very optimistic figure at this point in technology development. I echo Mr. Sterba's comments about consistency. Results at one facility oftentimes have no approximation to results at another.

I would add one other comment, and that goes back to my testimony about allowing enough time to let technology and technological innovation occur. As we approached this round of NOx reductions, the ones we are currently involved with, and we are spending $630 million on NOx removal, we looked at a technology known as Power Span that offered the promise of removing not only NOx, but SO_2 and mercury as well. At that point it was in a 5 megawatt test phase being expanded to a 50 megawatt test phase, and we had about a year to decide whether we thought that was well enough developed for us to apply it to a 3,000 megawatt power plant. With everything that was bearing on that decision, we in the end decided not only not to invest in the technology, but not to invest in the company, because we had considered an equity position in the company. Given more time, that technology might have proven itself and might have dealt with a number of the issues that we are here talking about today.

I think if we want to deal with this issue efficiently from an economic perspective, we need to give technology the time it needs to emerge and address these issues. A 2-year, 3 year timeframe that we would have to commence construction to meet this set of requirements would by no means be enough time for those sorts of technologies to emerge.

Senator CHAFEE. Before Mr. Sterba answers, Mr. Smith, maybe you would care to comment on that. Is he accurate, in your opinion?

Mr. SMITH. Well, he is certainly accurate in saying he agrees with me that mercury is the most difficult pollutant of the three that I talked about to control. You know, it is an arms, legs, knees issue, Senator Chafee, where are you going to draw the line. As I said, the most critical element in spurring technical innovation is the existence of a business market, which in this industry is brought about by legislative mandate. So it is a bit of a chicken and egg thing. I am a CEO of a company wondering whether I am going to allocate scarce dollars into R&D in my air pollution control technology business, and without that legislative mandate I may be considerably less skeptical to do that. Because the industry, as I said in my written testimony, is like nature herself, very competitive, and dollars are scarce.

Senator CHAFEE. Thank you, Mr. Smith. Mr. Sterba?

Mr. STERBA. Yes, Senator Chafee. We have talked about mercury. Relative to the others, I think it is not just an issue of technical viability, it is also an issue of economy and equity. When you have power plants that are emitting one-third per unit of heat input of what the average is for SO_2, I question the logic of imposing the same level of additional reduction on those resources as resources that are emitting three times that amount. So I think there is an equity issue that is really an issue that we are concerned about, because our customers have already paid for scrubbers, they have already paid for more recent power plants that are removing a level of emissions. So I think that needs to be taken into account.

On this issue of certainty, there is no doubt that certainty is necessary for a market to operate efficiently. I would differ, though, that that means it requires a mandate. Let me give you one brief example involving my company. We have a 1,500 megawatt coal-fired power plant that we just recently finished investing over $80 million in to upgrade the scrubbers, not because there was a legislative mandate, not because there was a regulatory requirement, but because it made good sense and because we had a trading emissions mechanism that exists that incented us to go above and beyond what is required so that we could effectively increase the level of removal by over 20 percent of the sulfur dioxide in the flue gas.

So I do not believe that you have to have a mandate for increasing, ratcheting, and particularly overlapping elements of regulation. You do have to have certainty around the regulatory construct, and I think in that element I would agree with Mr. Smith.

Senator CHAFEE. Thank you, Mr. Sterba. Mr. LaCount?

Mr. LACOUNT. One of the key messages I heard in Mr. Smith's testimony is the ability for his industry to ever increase both performance and cost of control technologies and pointing out that there are certain ways new requirements can be constructed that provide even more drivers for that innovation and other ways that the technologies that are required can be more of a static compliance with the program and not a continual driver. From an industry side, having that pressure for that industry, for the control technology industry, to continue to improve cost and performance is something that we would like to see. We think to do that it is important to have a market-based program in place to continue to apply that driver. Because as a competitor lowers their compliance costs, we continue to want to do the same. And many times that also means better environmental performance.

I would also extrapolate from his testimony and think about not only in terms of three emissions, but four. We think those same drivers are the same things that we are talking about by having a cap and having that regulatory construct that we are talking about, but then having the flexibility to achieve those requirements. We think actually all four emissions work in that very similar fashion.

Senator CHAFEE. Thank you, gentlemen.

Senator CARPER. Gentlemen, the bells and whistles you hear going off tells us there is a vote on the Senate floor and you have 15 minutes to get there. We will be voting on the agricultural appropriations bill conference report. But for now, our focus is right here.

A couple of you have mentioned the fact that some States are developing emissions controls, laws, regulations of their own with which you are expected to comply. I do not know how many States have. Let me just ask, what is going to be the impact of trying to deal with what I would call sort of a patchwork quilt of regulations as opposed to a national uniform policy? A couple of you have mentioned this in your testimony. I would like to hear it again.

Mr. ANDERSON. Well, I would comment on that, Senator, that we at EEI and across our industry certainly support a Federal policy here as opposed to State-specific policies. Especially for companies that operate in multiple States, a patchwork quilt creates a very difficult environment for us to operate within. So we are certainly supportive of trying to come up with a broad Federal approach to this, and have stated that clearly not only here but as we make our opinion know in the State environment.

Senator CARPER. OK. Thanks. Mr. Sterba?

Mr. STERBA. I would agree with that. At the same time, though, I would note that the WRAP process in the western United States embraces 12 or 13 States and I think that represents such a strong consensus that has been developed through a very good process that I would hope it would be fully recognized in Federal legislation.

Senator CARPER. You are really into this WRAP stuff, aren't you?

Mr. STERBA. Yes. I try not to do any dances or slip-sliding.

Senator CARPER. If you did, you would sure get our attention. We would never forget this hearing.

Mr. STERBA. Not the kind of attention I would like to get.

Senator CARPER. Maybe not, maybe not. We all know about that. Mr. LaCount?

Mr. LACOUNT. As the air quality manager at PG&E National Energy Group, it is my role to take a very close look at many of those regulations and legislation that is developed, both adopted and proposed, in many States. I can speak more specifically to the States in which we have assets or are currently developing assets. The list pretty much covers most of those States, frankly. If you think about it, Massachusetts has regulations for all four emissions that have been adopted; Connecticut has regulations adopted for SO_2 and NOx; we are waiting to see the new regulations in New York for SO_2 and NOx that all go beyond the acid rain requirements; and we are currently looking at legislation that is being discussed in Illinois and Michigan that includes all four emissions. Frankly, the list goes on.

In each of those cases, we are not only asking how those different requirements impact existing assets in place and how we will comply, but it also brings in an uncertainty about how do we want to continue to plan our investment for future development going off into the future. To take a look at how that system might look, I think it is good to step back and ask how current programs that are being adopted in multi States are currently operating. I think a good example is the NOx budget program currently operating within the northeastern United States, from roughly Pennsylvania on up to New Hampshire, and roughly around the 2004 timeframe we are going to see that program expand southward down to the Carolinas and westward to Illinois.

Senator CARPER. To Delaware?

Mr. LACOUNT. Delaware is currently in the program. One of the keys of this program, even though it was designed to sort of link up and provide the ability for emissions trading between the different States, many of the aspects of that program were developed within each State. So, for instance, the development of the budgets were done consistently but how those allocations for different sources were designed and adopted are done differently for each State. So even though we are trying to comply with a market-based system that is designed to lower cost, the fact that it was independently done in multi States means that there is a much higher transaction cost for us; meaning that the efficiency that we want to capture from the market are being much more reduced than we currently find within say the national SO_2 trading program where it is a consistent set of rules across the country.

Senator CARPER. Mr. Smith, I do not know if you want to comment given that you wear a somewhat different hat than these fellows. But if you want to jump in, fine. If not, I will go ahead to my next question.

Mr. SMITH. Go ahead.

Senator CARPER. OK. Mr. Sterba spent a fair amount of time talking about the WRAP process, it developed the consensus that he spoke of earlier. Mr. LaCount, you were good enough to present us with some information about a comprehensive approach that you think makes sense. Could you just talk a little bit about the process that you folks followed to develop that kind of proposal?

Mr. LACOUNT. Absolutely. First of all, the key driver I think was important for us to point out, and that really then laid in place the next steps that we took in the process. Our key driver was the development opportunity to create regulatory certainty for not only regulations currently on the books or currently being adopted, but those regulations and programs that are expected to be implemented over the next ten to 15 years. In addition to that, we took a look at what other requirements and environmental concerns are being discussed. We think that to get that regulatory certainty, and if we are asking for ten to 15 years of certainty, we have to also at the same time be willing to accommodate what environmental concerns would be addressed over that time period. Having identified then those different areas of environmental concerns, ranging from primarily the NOx emissions, the SO_2, and the mercury being driven by the mercury MAC process within EPA, it is also clear to us that for CO_2 that is happening. As I said, many of the State actions we are already seeing are covering CO_2. So that is why we think it is very important to cover all four.

As far as exactly what levels and timeframes, we took a look at the existing processes in place and said how can we coordinate those so that we do not have the mercury requirement 1 year and then 2 years later an SO_2 requirement in place. That is a lost opportunity for co-benefits of investment between the two. So we have tried to line them up so that we have best matched the current process but at times moved things up and back a little bit, which primarily has resulted in a two-step process—a 2008 first step in our program, and then a later step in 2012. As far as the exact levels for that, it again looked at existing programs and a balance between economics and environmental concerns.

Senator CARPER. If we had time, what I would do is ask Mr. LaCount to just briefly go back through the highlights of his proposal and I would ask the others at the table to critique it. We have heard from some folks within our own State, the Connective

Power Delivery, which is our major utility, and they seem to find some favor in what you are suggesting.

Rather than ask you to go through and highlight again your recommendations, Mr. Anderson, Mr. Sterba, Mr. Smith, would you care to comment on any aspect of what Mr. LaCount has proposed that you find especially endearing or not endearing?

Mr. ANDERSON. Endearing or not endearing. I guess I would start by saying we have not analyzed this proposal in detail, but we have analyzed numerous other proposals with timeframes like these. As he mentioned, regulatory certainty is very important to us. It is also important to get that certainty at a cost that our fleets can bear so that we do not unduly impact the mix and viability.

A quick reaction to the timeframes and levels would suggest to me that the costs would probably for us be of an order that I would recommend to our board that a substantial part of our fossil fleet not be in operation in the not too distant future. As we evaluate these, we are trying to lay the importance of getting certainty with the need to get it at a cost that can be borne. Without having analyzed the specifics of this, I can only give you that as a general answer.

Senator CARPER. That is fair. Mr. Sterba, any comment?

Mr. STERBA. Yes. I think the add-on comment I would make is that regardless of the levels that are set, then the question is how they are allocated. I would once again——

Senator CARPER. Say that again.

Mr. STERBA. Regardless of what levels are set for national removal standards, the question is then how are they allocated amongst either the States, regions, or power plants. To me, I do not understand the equity argument that would apply the same percentage reduction to resources that are only emitting one-third per unit the level of emissions that other plants are. So there is really a two part question and I really cannot answer it without understanding the second part. The limited understanding I have is that they are across the board reductions that have been proposed. In that instance, I do not understand why that would be an appropriate policy position to take.

Senator CARPER. Fair enough. Mr. Smith, last word.

Mr. SMITH. Yes, just to answer to your threshold issues. First, is technology available to achieve that within the timeframes set out? Clearly, yes, and guaranteed. Everything that we supply, technology that we supply we have to guarantee. Second, would the cost be less than the business as usual approach? Clearly, yes. We would sell a lot less technology under this approach or under the Jeffords bill than we would with business as usual approach.

Senator CARPER. All right. Good.

Senator Voinovich, Senator Chafee, any last parting words before we go vote?

Senator VOINOVICH. The only thing that I would like one comment about, and that is for Mr. Anderson, you are a leader in renewable fuels. If you look at the chart and go down and look at 2025 in terms of the energy needs of this country, there is a large area there where we currently are not, if you look at our projections, are not going to be able to produce the energy that we are going to need for this country. There are some people that say that the answer to that is renewables. My statistics say that renewables provide about one-tenth of 1 percent of the energy in this country today. I would just like you to respond to where do you think that is going in terms of taking the place of coal, gas, oil.

Mr. ANDERSON. Senator, I individually and our company are big supporters of renewable energy. We have a fleet of 35 power plants that are fired by renewables. So I support making the maximum use we can of those resources.

That said, I would be forced to concur with your assessment that the long term prospects for renewables taking a significant slice of production in this country is not very positive. I think that we can look for it to play a role long term of a couple of percent. But given the ongoing growth in demand for energy in this country, we are simply going to need to resolve the roles of coal, nuclear, hydro, and other more traditional resources in order to be able to move forward.

Senator CARPER. Good. It has been most illuminating. We are grateful that you are here, grateful for the time you put into preparing your testimony. We look forward to working with you.

We are going to vote on a compromise that has been hammered out between House and Senate appropriators on agriculture, what we should be spending on agriculture this year. That is an example of where we work together to reach a consensus. So that is an important area. The one that we are discussing here is important as well. Knowing that people like Senator Voinovich, Senator Chafee, and even myself are the kind of people who like to hammer out consensus and have worked on a lot of things, and we are going to work on this together as well.

The committee is going to stand in recess for about 10 minutes, then Senator Jeffords will reconvene us at that time. Thank you all.

[Recess.]

Senator JEFFORDS. The committee will come to order.

Thank you all for being here. As usual, we always run into votes and we have more votes coming up. So I want to get started again and make sure we do not have to interrupt again. You all have statements I am sure.

We will start with Mr. Hawkins.

STATEMENT OF DAVID HAWKINS, PROGRAM DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL, WASHINGTON, DC

Mr. HAWKINS. Thank you, Senator Jeffords. I would like to make five points about the carbon dioxide control provisions in your Clean Power Act. The first is that further delay in controlling CO_2 emissions will threaten huge disruptions not only to our climate, but to our economy. The second is that controlling carbon under the Clean Power Act will improve our economy, not harm it. Third, that the bill will help consumers, not hurt them. Fourth, that the bill will reduce electric generators reliance on natural gas compared to business as usual. Fifth, refusing to control carbon is not going to help the viability of coal as an energy resource in our country. To the contrary, refusing to control carbon will only delay the investments needed to modernize the use of coal in our energy system.

So turning to each of those. Let me just summarize where the Planet is on carbon. We now have levels in the atmosphere about 30 percent above pre-industrial levels. Those are the highest in over 400,000 years. Over the last couple of centuries, humans have put about 300 billion tons of carbon into the atmosphere, carbon that was stored over tens of millions of years and we put it back in a couple of centuries. That is one-third of the amount of carbon cumulatively that the Planet can put back into the atmosphere if we want to stabilize concentrations at something like 60 percent above pre-industrial levels. Not a guaranteed safe level, but anything above that is very risky.

The bad news is that if we do nothing, in the next 30 years we will put another third back into the atmosphere. So we are rapidly denying ourselves the opportunity to stabilize concentrations at anything resembling safe levels. If we delay, we are going to face the American public with two very bad choices—either live for hundreds of years with an unstable climate and elevated CO_2 concentrations, or adopt wrenching changes to achieve very rapid reductions and very rapid changes in our energy system.

Now the impact of the Clean Power Act on the economy has been the subject of a lot of misleading discussion. But let me just clarify some of the things that were in EPA's October 31st analysis. What it showed, contrary to what was emphasized in Mr. Holmstead's testimony, is that the gross domestic product of the United States would actually be better under the Clean Power Act than without it. EPA has also submitted analyses to the Congress showing that controlling three pollutants now and then adding carbon later would actually cost the economy an additional $7 billion or more per year than doing the control program together.

Turning to impact on consumers, both EIA, the Energy Information Administration, and EPA studies show that the Clean Power Act emission caps, when combined with the efficiency programs and the renewable energy programs that are also in the Clean Power Act, actually save consumers money compared to business as usual.

Why is this? Because under the Clean Power Act, the efficiency and renewable programs do double duty. First, those programs cut pollution and thereby lower the cost of meeting the Clean Power Act's emission caps. Second, the efficiency and renewable programs cut the growth rate in demand for electricity and for natural gas. That reduces the upward pressure on prices for those commodities, also helping to lower consumers' bills.

Fourth, let me turn to the impact on natural gas. Again, the arguments about fuel diversity are misplaced. Under the Clean Power Act, again due to the integrated program of efficiency and renewable energy sources, the electric sector's demand for natural gas will be less than it will be under business as usual. EPA's calculations were that under business as usual in the year 2010 there would be 8.3 quads, that is quadrillion BTUs, of natural gas used in the electric power sector, and under the Clean Power Act the number would be lower, 7.7 quads. EIA has made similar analyses. In fact, they analyze what will happen in the economy as a whole, and there the economy-wide reductions in natural gas use would be 2 quads compared to business as usual. That will help lower prices not only for electricity consumers, but for all natural gas consumers.

Fifth, the role of coal. Coal is the biggest fuel source for electric generators today. Under the Clean Power Act coal would still be the biggest fuel source for electric generators. The role of coal is going to be made viable in a climate regime not by delaying action on this, but by taking action. The longer we wait to face up to the fact that carbon needs to be managed, the longer we send signals to investors to not make investments in technology that could be both friendly to climate and friendly to coal. In my testimony I give several examples, but I see the light is on so I will just touch on a couple in concluding.

Enhanced oil recovery. We put over 20 million tons of CO_2 a year into the ground to recover oil in the southwestern United States. Most of that does not come out of power plants, it comes out of other holes in the ground. We are pulling CO_2 out of the ground in order to pipe it hundreds of miles and stick it back in the ground. Why are we doing it that way? Because we can dump CO_2 for free from combustion sources and there is no economic incentive to separate it out and use that source of CO_2.

Enhanced coal bed methane is another coal market opportunity that is not being pursued, again because of the lack of an economic signal. In the new power market, most investors are putting their money into natural gas plants, not into coal plants. Why? Because of uncertainty and because of the competitive advantage that the current prices give to natural gas.

Hinally, coal gasification technologies. There is something that had the potential to be both environment friendly and coal friendly. But they are not being pursued at anything like the pace they need to be in order to move this technology ahead, and therefore coal is missing that market opportunity as well.

That concludes my summary, Mr. Chairman. Thank you very much.

Senator JEFFORDS. Thank you, Mr. Hawkins.

Mr. Tipton?

STATEMENT OF RONALD J. TIPTON, SENIOR VICE PRESIDENT FOR PROGRAMS, NATIONAL PARKS CONSERVATION ASSOCIATION, WASHINGTON, DC

Mr. TIPTON. Thank you, Mr. Chairman. I am here on behalf of the National Parks Conservation Association, which is the nation's only organization that is dedicated specifically to the health and welfare of our national parks. I am here to testify in strong support of the thrust of S. 556, and I really appreciate that this committee has taken the time to look at the impacts on our National Park System from declining air quality.

We have tried for three decades to struggle with a series of air quality problems in this country. One of them is the quality of our air in our national parks. Today, however, our great national parks—where we had 287 million visits to our national parks last year and the places that are expected to feature some of the best air quality and some of the most spectacular vistas—have in many cases experienced declining air quality.

I think it would surprise most Americans to know that some of our national parks have some of the highest levels of air pollution in the country. Visibility impairment is widespread throughout the park system. But scenic views are not the only resource at risk. The same pollutants that reduce visibility also contribute to thousands of premature human deaths each year. Acid deposition hurts natural and cultural resources. Ground level ozone, or smog, threatens the health of park visitors and workers, and the health of park vegetation. It goes on and on.

In fact, the authorizing legislation for numerous national parks specifically mentions scenic vistas as among the reasons for the park's establishment. We have provided for the record a compilation of excerpts from legislative history for specific national parks that demonstrate that.

Now in 1977, in the first set of amendments to the Clean Air Act, Congress decided to declare a total of 158 areas, including all national parks over 6,000 acres, of which there are 48, and wilderness areas over 5,000 acres that were in existence at that time as Class I areas "deserving of the greatest protection under the Clean Air Act. Congress declared as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution."

Regrettably, we are almost 25 years later and many national parks throughout the country suffer from deteriorating air quality caused in large part, not exclusively, by emissions from old, dirty power plants, and from the fact that many of those facilities impacting visibility operate under a loophole in the 1977 Act that exempted them from complying with modern pollution emission control requirements. We were led to believe at the time that those plants would be phased out or they would be retrofitted with scrubbers or whatever the latest technology was to control particularly SO_2 emissions. In many cases, that has not happened. In fact, according to EPA, the average visibility in eastern Class I areas is 15 to 25 miles, when the natural visibility is about 90 miles. There are similar numbers in the West.

Just to highlight the problem at one park I know very well, I want to quote from a very recent letter from Senator Fred Thompson to President Bush, as follows: "Most shocking to me is that, according to Park officials, air quality in the Smokies is so poor during the summer months that hiking our backcountry trails is more hazardous to your health than walking along city streets." If Americans expect clean air anywhere, it is in our national parks. We are seeing some of the same problems at Shenandoah National Park. As you may know, Mr. Chairman, the ozone levels in Acadia can be as high as the ozone levels in Boston. The Grand Canyon has many of the same problems, Yosemite, Mesa Verde, Rocky Mountains. They are not all declining, but in some cases they are. In some places the situation has been pretty bad for a long time.

We believe America's national parks cannot be protected without significant reductions in the sulfur and nitrogen pollution that form regional haze and acid rain, and we also must deal with the ozone as well. We believe the need to reduce emissions is not a regional problem, it is a national problem. We endorse the four-pollutant approach for the national parks because we are concerned about the impacts of mercury and of climate change, that is global warming, on our park system.

I just want to make a couple other points. I only have a little bit more time.

It is important to think about the economics involved in this debate as well. Obviously, the national parks are important to the country and to the world. They are a vital resource for many communities and metropolitan areas around the country. A report issued in 2000 called "Out of Sight: Haze in our National Parks," by Abt Associates, which was commissioned by Clear, the air coalition, found that, "increases in visibility could raise park visitation by as much as 25 percent which could yield approximately $30 million in increased fee collection and $160 million in additional concession sales. This would in turn add nearly $700 million in retail sales to the economies around the park, $53 million in local tax revenue, and create 15,896 jobs."

In closing, I want to emphasize that it is important to use what we call effects-based monitoring or look at the impacts, to say it another way, of emissions on the things, the values, the places that the Clean Air Act and the subsequent amendments to the 1970 Act were intended to address. We think that emission-based multi-pollutant strategies must be linked to specific results. There is a lot of talk about a cap-and-trade program, but that in itself will not offer specific protection to Class I areas.

We must have cleanup of power plants that are producing sulfur dioxide and nitrous oxide and helping create ozone in our great national parks. While emissions nationwide have been reduced under implementation of the Clean Air Act Amendments of 1990, emissions affecting some Class I areas have increased. For example, the largest polluter that affects the Great Smokey Mountains National Park is the Tennessee Valley Authority. It emitted approximately 700,000 tons of sulfur dioxide last year, which is 300,000 tons above their allocation under the 1990 amendments. That is an impact on the park due to the trade system that has occurred there.

Finally, Mr. Chairman, enactment of S. 556 would provide a critical step to protect America's national parks. Our national parks and wilderness areas, our Class I areas deserve and demand the protection that S. 556 would provide, that the American public expects to see when they visit their national parks.

Thank you.

Senator JEFFORDS. Thank you very much.

Mr. Kirkwood?

STATEMENT OF JOHN KIRKWOOD, CHIEF EXECUTIVE OFFICER, AMERICAN LUNG ASSOCIATION, NEW YORK, NEW YORK

Mr. KIRKWOOD. Thank you, Senator. I am John Kirkwood. I am the chief executive officer of the American Lung Association. The mission of our organization is to prevent lung disease, and in this capacity we are here today to support S. 556. We support the emission targets and timetables in this legislation because power plants are one of the largest single sources of industrial pollution, emissions from power plants can seriously damage public health and the environment.

Pollution from power plants risk the lives and health of millions of Americans. These pollutants contribute to the formation of smog and fine particles, with well-documented and dangerous consequences to human health. There are more than 141 million Americans living in areas where the air is unhealthy because of ozone pollution. Power plants contribute to the problem, especially in the eastern part of the United States. The Environmental Protection Agency estimates that some 82 million people live in areas with unhealthful levels of fine particles. Let me briefly outline the human toll.

The most serious problem is premature death. According to a study conducted last fall by Abt Associates, emissions from coal-fired power plants contributed to an estimated 31,000 premature deaths each year, a figure that was referred to earlier today by Senator Campbell. Based on other recent research, we know that the lives of these 31,000 people were shortened, not by days, and not by months, but in many cases by years.

The causative factor is the emissions of sulfur dioxide and nitrogen oxides, which are transformed into ultra fine particles in the air. These small particles are less than one-tenth the diameter of a single human hair. They are so small that they bypass our normal defense mechanisms and lodge deep within the lung, where they can adversely affect human health. Studies demonstrate that infants and children, especially asthmatic children, the elderly, and people with heart or lung disease are especially sensitive to fine particle pollution.

In addition, fine particle pollution is responsible for an estimated 20,000 hospital admissions each year from respiratory and cardiac illness. This was a determination that was also made by a study done by Abt Associates.

Nitrogen oxides are a key ingredient in the formation of ozone, or smog, that blankets many parts of the United States during the summer months. Ozone caused an estimated 7,000 emergency room visits due to asthma and other breathing difficulty. That same ozone also triggered an estimated 600,000 asthma attacks.

Recent research underscores the need to move forward to clean up these power plants. Dozens of new short-term studies confirm the effects of particle pollution on premature death, hospitalization, emergency room visits, and respiratory and cardiac affects. I have cited these studies in footnotes that are attached to my testimony. They present a compelling case for taking action as soon as possible.

Power plants also produce a number of other hazardous pollutants besides sulfur dioxide and nitrogen oxide. Of most concern is mercury, known for inflicting permanent damage on the nervous and kidney systems, and especially threatening to fetal development and children's mental health.

The weight of evidence against these pollutants is solid and increasing. These new studies lend a profound urgency to the national effort to reduce emissions from power plants. It is difficult to deny the need for dramatic additional reductions from these sources. For example, there are maps, which are also attached to my testimony that was submitted to the committee, which demonstrate the convergence between the location of power plants and high levels of fine particles. These power plants are shown on the map as black and white dots, and the corresponding high levels of fine particles are also shown on the map, a map that was produced by the Environmental Protection Agency. Preliminary fine particle monitoring data show many of these areas may violate the new $PM_{2.5}$ standard.

The American Lung Association supports S. 556 because it targets levels of pollutants that must be reduced from power plants and it leaves the other provisions of the Clean Air Act in place. These two components ensure that power plants become cleaner and local air quality is protected.

The American Lung Association also supports including carbon dioxide as part of the reduction package. Many of the fossil fuel combustion processes that contribute carbon dioxide to the problem of global climate change also contribute to other forms of pollution.

The explicit recognition of S. 556 of the sanctity of the Clean Air Act is the cornerstone of our support. The American Lung Association opposes replacing the new source review provisions or any other provisions existing in the Clean Air Act with a power plant emissions cap-and-trade program. This can be an addition, but it should not be a replacement. I think we will all agree that the Clean Air Act has worked very well for 30 years. It should continue to work well.

The American Lung Association is committed to ensuring that Americans can breathe clean air. Frankly, the efforts under existing provisions of the Clean Air Act are moving too slowly. The new ambient standards for ozone and $PM_{2.5}$ set in 1997, as you well know, are still tied up in litigation and remain unimplemented.

We now need to address the stationary source side of the problem. This legislation will allow us to do that in a comprehensive way, requiring a major source of industrial air pollution, coal-fired power plants, to do their share to help us all breathe easier.

Thank you for the opportunity to share our views with the committee this morning.

Senator JEFFORDS. Thank you, Mr. Kirkwood.

Mr. Banig.

STATEMENT OF BILL BANIG, DIRECTOR OF GOVERNMENTAL AFFAIRS, UNITED MINE WORKERS OF AMERICA, FAIRFAX, VIRGINIA

Mr. BANIG. Mr. Chairman, members of the committee, on behalf of the United Mine Workers of America, I appreciate the opportunity to provide our views on efforts to reduce emissions from coal-fired power plants. The UMWA supports additional reductions of SO_2, NOx, and mercury, provided that the reductions are designed in a way that preserves coal miners jobs. However, we do not support reduction schemes that force or encourage utilities to switch away from coal, thereby causing economic harm to coal miners and their communities.

Before getting to my comments on S. 556, let me say at the outset that coal miners did not fare well under the Clean Air Act Amendments of 1990. Utilities engaged in substantial fuel switching in response to Title IV and UMWA members and high sulfur coal producing regions were displaced by the thousands. Overall, major eastern coal producing States lost over 113 million tons of production from 1990 to 2000, and employment was down by over 30,000 jobs. Having gone through that experience, we view with a skeptical eye any legislative proposal that sets emission reduction targets and timetables that surpass our technological capabilities.

We believe that S. 556 falls into that category. Indeed, it appears from Government analyses that S. 556 may threaten to disrupt coal mining communities far more than Title IV. Analyses by EIA and EPA show that emission reductions called for in the bill would be achieved in large part by utilities switching away from coal, resulting in as much as a 50 percent reduction in coal use in electric utilities. Much of the loss in coal production stems from the bill's mercury and carbon caps. As a result of these two requirements, the utilities are expected to engage in substantial fuel switching away from coal.

The United States currently produces about 1.1 billion tons of coal annually. In its analysis of S. 556, EIA found that the implementation of the reductions would cause the loss of 506 million tons of coal production nationwide from its reference case in 2010, rising to a loss of 657 million tons in 2020. Such coal market disruptions far exceed the coal switching that resulted from Title IV. These losses are likely to have a negative economic impact on all coal producing States. EIA projects a loss of 190 million tons in 2010 from eastern coal producing States, and a loss of 316 million tons from the western States.

What would be the economic cost of this loss of coal production? Tens of thousands of coal miners would lose their jobs in areas of the country that have little or no comparative alternative employment. Using conservative economic multipliers from the U.S. Commerce Department, we estimate that the loss of 506 million tons of coal in 2010 would mean the loss of $7.7 billion annually in direct coal mining revenue, $14.4 billion per year in lost economic output in all industries, $3.9 billion in lost household earnings, and the loss of more than 135,000 jobs in all industries. In addition, over a hundred thousand retired coal miners look to the coal industry for lifetime retiree health benefits that were earned during their working lives. If we wipe out half the coal industry, where are the retirees going to get their health care? Who will finance those life-saving benefits when we have removed $7.6 billion of revenue from the coal industry?

The UMWA believes that the burdens that would be placed on coal miners and their communities by S. 556 are unacceptable. They should not be asked to give up their jobs, their health care, and their economic futures because of arbitrary deadlines and reduction targets that cannot be reasonably met with available technological controls.

The UMWA supports appropriate additional reductions in SO_2, NOx, and mercury. We do not support inclusion of carbon dioxide in the committee's emission reduction bill. Inclusion of carbon dioxide in this bill, in our opinion, force utilities to switch away from coal and will unnecessarily delay, and possibly prevent, its enactment.

We believe that a properly designed plan could provide the electric utility industry with greater certainty for planning and investments, lead to the simplification of regulatory programs, and create significant job opportunities for the construction and operation of pollution control devices. At the same time, such a strategy would allow coal miners and their communities to retain the high paying jobs they so desperately need.

EIA's analyses suggests that a 50 to 65 percent reduction in SO_2 and NOx could be achieved without severe loss of coal markets and coal mining jobs. We believe these reductions should occur in one phase, with appropriate deadlines to ensure that utilities will have enough lead time for the orderly installation of technology. In addition, the committee should consider the compliance deadlines with an eye toward the financial condition of the Nation's electric utilities, particularly the medium-sized utilities.

In terms of mercury, we are concerned that the technology for reducing mercury emissions are in a very early stage of commercial development. Setting an overly ambitious target for controlling mercury could be harmful to coal mining communities and be at odds with the larger national energy policy debate. Therefore, we recommend that mercury controls occur in two or more phases. It is likely that a more modest reduction could be achieved at substantially lower costs through available technologies. In all events, it would be desirable to postpone setting a final mercury target until the co-benefits through NOx and SO_2 controls are demonstrated through a first phase control program.

A target for annual NOx emissions of about 2 million tons should be feasible with the use of selective catalytic reduction and other NOx control equipment. Based on a variety of studies that have been done, we see a somewhat more modest SO_2 reduction target, roughly in the range of 3 to 4 million tons, as representing both a technically achievable and cost-effective control level.

An SO_2 and NOx control plan along these lines could be implemented as a first step in a longer-range plan to reduce mercury emissions. The experience in mercury co-benefits achieved by the first phase controls for these emissions would be vital in assessing the feasibility of ultimate mercury reduction targets.

In summary, Mr. Chairman, the UMWA is prepared to work with the proponents of additional reductions in SO_2, NOx, and mercury emissions in coal-fired power plants, provided that the reduction provisions are designed in such a way that preserves coal miners' jobs. We look forward to working with you to achieve these goals.

Senator JEFFORDS. Thank you very much, Mr. Banig.

For the three of my environmental friends, do you have any words you would like to express with respect to the previous panel, not Mr. Banig, but the previous panel we had, anything that you would like to clear up?

Mr. Hawkins?

Mr. HAWKINS. Yes, Mr. Chairman. In response to a question about the new source review provisions, Mr. Anderson from Detroit Edison answered that a turbine project at their Monroe plant was responded to by EPA with EPA saying that the new source review program would apply to that efficiency program. That is not correct. I think it is important to correct the record because that misstatement continues to be made as a criticism of the new source review program. In fact, the May 2000 letter that EPA sent to Detroit Edison explicitly said that, based on the facts that Detroit Edison provided to them, the project was not subject to the new source review program.

Perhaps the confusion arises about whether this was what is called a routine maintenance operation versus whether that routine maintenance operation has to apply for a new source permit. What the agency concluded was that buying new turbine blades that would allow increased production would not qualify as routine maintenance, which would seem logical even without the help of a lawyer, but that because the project would not increase emissions, the facility did not need a permit to undertake that project. So I just wanted to correct the record in that regard.

Senator JEFFORDS. Mr. Tipton?

Mr. TIPTON. I think the only point I would add to what David Hawkins said is that this whole question about when a plant has undergone a major modification that requires it to clean up has been debated now for the extent of the Clean Air Act Amendments. That affected the national parks and the regional haze provisions. The fact is that we have come to the year 2001 and we still have many, many power plants that have avoided what I think was a clear intent of the 1977 amendments, that have been, in our opinion, in some cases modified in a major way. We have gotten the energy benefits but we have not gotten the environmental benefits that would help our national parks.

Senator JEFFORDS. Mr. Kirkwood?

Mr. KIRKWOOD. Just a brief comment, Senator. I heard the word "certainty" used several times in the earlier testimony. I think that is a very important concept for the committee to consider, and also the need for uniformity throughout the country. I recently came to my position at the American Lung Association after 25 years in Illinois at the American Lung Association in metropolitan Chicago. In fact, last year I was working in the Illinois General Assembly with respect to emission requirements for older power plants. If the industry is faced with a patchwork of requirements around the country as States take the initiative in the absence of some type of Federal action, then there is this patchwork and there is also this lack of certainty which I think is important.

I think those comments were well taken this morning, that the industry needs to have certainty, they need to know what they are faced with in the future, and that it needs to have some uniform characteristics around the country. Otherwise, what I think you will see is State legislatures beginning to take the initiative, which then could create even more problems and more uncertainty.

Senator JEFFORDS. Mr. Banig?

Mr. BANIG. I agree, the utility industry desperately needs certainty. But we also have to recognize that how effective the control technology is varies plant to plant. It might work well in one plant and not so well in another. So we have to look at this on a plant-by-plant basis.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. Thank you, Mr. Chairman.

Mr. Banig, in addition to the lost coal jobs that you think would result in the passage of S. 556 as it is currently constituted, would you like to comment on the impact that it would have on Appalachia, which runs through several States, in terms of that economy?

Mr. BANIG. Well, as I stated in my testimony, the enactment of S. 556 would probably lead to about 135,000 jobs being lost. That is not just in the coal industry. For every mining job, conservatively, another three jobs are created in the community. As these mining jobs disappear, those jobs disappear along with them. Unfortunately, when you are looking at Appalachia and other coal producing regions of the country, for example the Illinois Basin, these are the jobs that are in those communities. There are not other employment opportunities for an unemployed miner or an unemployed grocer to turn to. So it has a very devastating impact. We have seen that in Appalachia, in the midwest with the passage of the 1990 Clean Air Act Amendments. I can speak from personal experience. I come from southeastern Ohio. The mines have closed. New industry has not come into southeastern Ohio. So it has a very, very devastating impact.

Senator VOINOVICH. There was some testimony that going forward with this legislation would produce new cleanup equipment. I get from your testimony that you doubt whether those jobs of cleaning up would be coming to southeastern Ohio or Appalachia.

Mr. BANIG. It is a question of whether or not the utilities actually install the pollution control technology in the utility plants. If technology is installed, jobs are going to be created; coal mining jobs are going to be preserved, construction jobs are going to be created, jobs are going to be created in the utility plant to maintain this equipment. But our experience in dealing with the 1990 Clean Air Act Amendments is, quite frankly, that has not happened.

Senator VOINOVICH. Well, your bottom line is that if S. 556 passes, in all likelihood what will happen is that they will fuel switch.

Mr. BANIG. Most definitely.

Senator VOINOVICH. I would like the other witnesses to comment on this question. I have pressed the utilities, I have had people come to my office to talk about clean coal technology and the Texaco coal gasification and so forth, and have said to them, well, you know, there is some new technology out there where you could burn coal and pulverize it and so forth. The answer that I get back is that, first of all, it would require in some instances just tearing down the facilities they have right now and building new facilities to take their place. But faced with the reality of that, their response is that what they would do is fuel switch. Any of you have any comment on that?

Mr. HAWKINS. I will start, Senator Voinovich. I think the way to ensure that they will fuel switch is to pursue kind of a piecemeal approach to the problem of air pollution from electric generation, including air pollution from coal. I think that if you put an integrated program together, you will deliver a market signal to the vendors of advanced technology that there is something to value from technology that actually controls all of these pollutants.

In my testimony I referenced a technical presentation by Chevron-Texaco that basically said you can build a new integrated gasification coal-fired unit and put carbon capture technology onto it for less than a 4 percent increase in capital cost and less than a 2 percent impact on efficiency. But that is not happening today. Instead, most new plants are gas fired.

I think as long as there is no value to being able to advance technology that will capture all of these pollutants, you are going to see people take the cheapest short-term route, which will tend to be fuel switching. The way to change that is to send a signal to the market as a whole that these clouds of uncertainty that face future use of coal and other fuels with higher carbon content are going to be managed and there is a program to do so. But not engaging in this issue is a way of delaying investments in that technology, in my view.

Senator VOINOVICH. Would you suggest any incentives in this legislation that would encourage companies to not fuel switch?

Mr. HAWKINS. I think that there is value in an integrated approach that will promote a wide range of techniques. I would point out that efficiency and renewables are a technique for controlling carbon and minimizing the impact on coal production. Basically, you get twice as much carbon reduction per impact on coal production if you use efficiency and renewables. Because if you switch to gas, then you have got one ton of carbon left for every two tons that you avoided by switching away from coal. If you go to an efficiency program, then you do not have double the hit on coal.

So I think there are a variety of things that can be done. Basically, those who want to preserve a certain amount of coal in our nation's energy supply should be advocating efficiency programs, should be advocating renewable energy programs, and should be advocating sending the market a signal that it makes sense to invest in technologies that will cleanup carbon from coal and remove the cloud of uncertainty that faces that fuel.

Senator JEFFORDS. Senator Lieberman?

Senator LIEBERMAN. Thanks, Mr. Chairman. Thanks to the witnesses.

Mr. Hawkins, in my opening statement I referred to the EIA, EPA testimony at the first of this committee's hearings on the Clean Power Act which I found misleading or mistaken, I say respectfully. One of the conclusions of it was that the resource cost to industry from the Clean Power Act went down as a result of the legislation but electricity prices went up. That is the way I read it anyway. I wonder if you could help explain that disparity.

Mr. HAWKINS. Sure. As an example, the EPA analysis of the Clean Power Act, with the efficiency and renewable programs called for by the legislation, concluded that there would be essentially a $3 billion saving in production costs of electricity compared to business as usual but that the prices charged to consumers would go up. Now how did they reach that conclusion? Well, basically, they assumed that the permits for emitting carbon would be given to the companies for free, but then their accountants would say, well, there is a value to these carbon permits and it is the marginal price of controlling carbon for the most expensive ton in the system, so every ton that we use in generating electricity we are going to charge to consumers, and it will not reflect our actual cost of production, it will reflect what we could have gotten on the market if we had not generated that electricity and sold the permit to someone else.

They assume that the Congress in its wisdom is going to let the utility generators pocket about $50 billion that rightfully belongs to the public. We do not think that is a sensible assumption and it is not consistent with the provisions in the Clean Power Act. But that is what they assumed. So, if you think Congress is going to pass a bill that will allow basically the carbon permit profits to be kept by the utilities and passed on to consumers, then you conclude that there will be a price increase. But if you assume that Congress will find a way to avoid that kind of a windfall profit rip-off, then consumer bills will actually be lower because they will have smarter ways of using energy and reduce their household consumption.

Senator LIEBERMAN. I could not have said it better myself.

[Laughter.]

Senator LIEBERMAN. I appreciate that analysis very much. I have too high an opinion of Congress to think that the result would be other than the one you have foreseen.

Mr. HAWKINS. Same here, Senator.

Senator LIEBERMAN. Thank you. Mr. Tipton, you testified that the levels of reduction in the Clean Power Act are a critical step toward protecting our national parks. Others obviously have said they are too strict. I wonder whether there is a way in which you can help us, particularly as we go into the next phase of consideration and head toward markup, what levels are necessary to protect our national parks? To put it more directly, is there much room to move from the levels that we have posited in the Clean Power Act as it exists now?

Mr. TIPTON. Let me answer that this way, Senator Lieberman. First of all, one of the provisions of the Jeffords-Lieberman-Collins bill that we really like is the fact that it says that the aging coal-fired power plants that were exempted 1977 will no longer be exempted under this date, the so-called birthday provision which would require those plants, once they reach the age of 30 or 5 years after this act was passed, would have to be cleaned up.

The total pollution reduction that is necessary to protect national park vistas, national park air quality and the health of park visitors, it varies park by park. The EPA and the National Park Service are now looking hard at the Great Smokey Mountains, Shenandoah, and other parks. But they believe that the ultimate reduction from both existing sources and also new sources may require in some cases a 90 percent reduction in NOx and SO_2. That is not uniform by any stretch. The Navajo plant, which is a coal-fired plant near Grand Canyon National Park, was cleaned up under a court order and the reduction was in excess of 90 percent. But in that case, of course, we are talking about very pristine air quality and highly valued air quality. So it would not be the same for every park.

Senator LIEBERMAN. Thank you. That is a helpful answer. I hope that we will stay in dialogue as we go forward.

Mr. Kirkwood, in July of last year the EPA put out an analysis of another piece of legislation aimed at reducing power plant pollution, S. 172. Very interesting. Based solely on the benefits of further reductions in NOx and SO_2, EPA found that the bill would result in tremendous environmental and public health benefits, this is the EPA analysis, including more than 10,000 avoided premature deaths annually, more than 5,000 avoided new cases of chronic bronchitis, and more than 3,000 avoided respiratory/cardiovascular hospital emissions annually, more than 17,000 avoided cases of acute bronchitis, 2,000 fewer asthma emergency room visits, and so on. Has there been any similar analysis done thus far, I know it has not been done by EPA, but, for instance, by the Lung Association, regarding the Clean Power Act?

Mr. KIRKWOOD. No, Senator, we have not done anything ourselves. But there are other studies that have been done by the Health Effects Institute, the studies that Joel Schwartz did. There is a building body of evidence that now supports the adverse health effects, most of it is epidemiological data that extrapolates out into the population the number of deaths, the number of hospital admissions and so forth. I think in recent years that body of knowledge has increased substantially and that is really information that I think needs to drive the decision before this committee.

Senator LIEBERMAN. I agree. I hope we can get it either from organizations like yours or from the EPA.

Mr. KIRKWOOD. I appended to my testimony that was submitted citations on a lot of studies that we have looked at that support these kinds of conclusions.

Senator LIEBERMAN. Great. My time is up. I think I am going to have to submit a question to you, Mr. Banig, in writing. Basically, it is to ask whether caps on carbon dioxide—obviously, I understand your concern and respect it as to the impact of legislation on coal miners—but whether it is not possible that the caps on carbon dioxide such as those involved in this bill would drive technology in a way that would actually in the long run be a boost to the utility of coal or the degree to which coal is used in our country. I happen to cosponsor with Senator Bird a bill which is aimed at creating funding to create breakthrough technologies that will let coal survive, and I wonder whether the cap would do the same.

Mr. BANIG. The problem with carbon—a little history. Going back to the acid rain days in the 1980's, UMWA with Senator Mitchell came up with a compromise, what we thought was very good legislation to actually install pollution control devices, scrubbers, in about 25 or 30 large utility plants in this country. Part of that was putting a fee on utilities, coal generation, that would help pay for this technology. We wanted to devote then a part of that money for carbon research. That goes all the way back to 1988.

The problem that we have with carbon today is quite simply that the technology does not exist. It takes time to develop this technology. As was said earlier today, you could put technology on a 5 megawatt plant, it is a little bit different putting it on 1,000 megawatt plant. We strongly support Senator Bird's legislation; I am glad that you are cosponsoring it. But quite frankly, that technology needs time to be developed. The timeframes that we are looking at with this legislation do not allow that to happen.

Senator LIEBERMAN. Thanks for that answer. I would like to continue that conversation. Thanks, Mr. Chairman.

Senator JEFFORDS. Mr. Banig, according to a May report from the National Coal Council, there is commercially available technology, IGCCC, integrated gasification coal combined cycling, that could repower old coal plants and reduce carbon dioxide emissions by as much as 20 percent, sulfur dioxide and nitrogen dioxide 95 percent, and mercury by 50 percent. This is available right now as I understand. Were you aware of this report? It seems like that should reduce your concern about job losses. Do you believe the National Coal Council on that?

Mr. BANIG. I am vaguely aware of that report. On certain plants that might be the case. But again, as I alluded to earlier, we have to look at this on a plant by plant basis. For some plants it is not feasible to put in technology, particularly peaking plants. Again, we have to look at that on a case by case basis.

I would also like to point out that what we have recommended includes some pretty progressive steps in reducing SO_2 and NOx and mercury. And through repowering, if we increase the efficiency of the plant, yes, we are going to reduce the carbon at the same time. But to do the scale of carbon reductions that we are talking about in this bill will require the installation of technology to sequester or remove carbon from coal gases. It quite simply does not exist today on the scale that we need it in this country.

Senator JEFFORDS. Any response from anyone else?

[No response.]

Senator JEFFORDS. All right. Senator Voinovich?

Senator VOINOVICH. Mr. Kirkwood, in your testimony you say the State and local governments support the continuation of the new interpretation on the guidance of new source review. It is my understanding that the National Governors Association has called for the new source review program to be reformed and to achieve improvements that enhance the environment, increase energy production capacity while encouraging energy efficiency, fuel diversity, and the use of renewable resources. Is that different than your understanding?

Mr. KIRKWOOD. Yes, Senator. Perhaps I should clarify what I said. I do not think that State and local governments support that. What I was saying is that initiatives have been taken in the legislature, for example in Illinois where legislation was introduced that was not passed, but there have been initiatives taken in the legislatures to move this forward. But I am not so sure there is local and State government support it, as witness the fact that the legislation did not pass in Illinois. But I see that developing over time because of pressure at the State level.

Senator VOINOVICH. I can tell you from my observation that unless some resolution of that issue occurs, we are going to be in limbo in terms of getting anything done. The utilities are not going for it and doing many things because they are concerned that it would trigger new source review. So you are not getting too much done in terms of the environment, and you are not getting much done to improve the efficiency of these plants.

Mr. KIRKWOOD. Right.

Senator VOINOVICH. One of the things that I am really interested in, and Mr. Kirkwood, you referred to the health aspects of this, Senator Lieberman in his comments talked about the EPA statistics, I have always been interested in just how reliable that information is. If we were to just shut down all of the coal-fired plants in the United States, what impact would that have on the public health statistics that you are talking about? And for Mr. Tipton, too. We know there are other sources of pollution that exist in this country today. And the question is, how much of the harmful effects that we are talking about today, you are talking about 31,000 deaths, that is pretty serious stuff, how much of that is attributable to power plant emissions, and how much of it is attributable to mobile sources that exist in a lot of these areas where you see this high ozone level?

Mr. KIRKWOOD. That is a tough question, Senator. There are confounding variables that are involved in all of this and to isolate them one at a time becomes difficult. There are attempts being made to do that. I think the recent studies trying to correlate mortality with power plant emissions are an attempt to get at the question that you have raised, and there is some data that does make that correlation. Whether or not you shut down every power plant in the country, if that would eliminate all of these deaths, I cannot answer that because there are so many other variables. However, the more recent studies, the Abt study, there was a Harvard study done about a year ago that attempted to make the kind of a correlation that you are addressing that did quantify mortality with respect to power plant emissions, and, in fact, specific power plant emissions. Those studies I quoted in my testimony for further review.

Senator VOINOVICH. I would like you to submit them to me. I would be interested in them.

Mr. KIRKWOOD. I have them on the record, sir.

Senator VOINOVICH. That is the other thing, Mr. Tipton, is I hear about the letter that Senator Thompson wrote that walking through the parks now is more dangerous than walking down the street of New York City in terms of one's health.

Mr. TIPTON. Well, one of the reasons that I think, and you have to ask Senator Thompson about this, one of the reasons I believe that he said what he said in that letter is that what we are starting to see in the Great Smokies, and people have told me this who have done this, is not only have people lost the aesthetic value of a 70-mile view from the top of Klingman's Dome, but they are beginning to worry about the health impacts of a vigorous hike on a summer's day with a late afternoon high ozone level and people are starting to switch to hike in the winter rather than the summer. And this is more than anecdotal evidence, it is what the Park Service is hearing. I am sure that both Senator Thompson and Senator Frist who visit the park frequently are aware of that.

Two years ago, the Great Smokey Mountain Park had 52 violations in 1 year of the Federal ozone standard. They had violations in March and as late as late October. In year 2000, I was in western North Carolina in early November and there were two violations of ozone standards. Now the weather was very warm, unseasonably warm, and it was very humid. But you did not see this kind of thing historically in the Smokies. You did not see it in the 1970's or the 1980's.

It is not all coming from power plants, nor, I should say very clearly, are we as an organization saying that all coal-fired plants should be shut down or that fuel switching is necessary in all cases. We suspect it is a case by case approach. We know that coal-fired power plants in the southern Appalachian region are having a major contribution to sulfur dioxide levels and to a lesser extent nitrous oxides that are going into the park.

Senator VOINOVICH. The point is this, that you believe that if this bill passes with all of the numbers in it and the timelines that it is going to have a dramatic impact on the environment in the Smokies?

Mr. TIPTON. We believe that if the best available retrofit technology regulations go ahead, which can be done under current law, and if this bill would assure that would happen, and if this bill's standards were imposed for NOx and sulfur dioxide, we believe it would greatly improve the air quality in the Great Smokies.

Senator VOINOVICH. The problem that I think we have is to try and weigh these environmental benefits that are attributable to this legislation against the cost involved in implementing it and its impacts on the health of the economy. That is the real tough thing to try and reach. I think if we are going to get anywhere with this legislation, one group has got to recognize the health benefits, and I think the people on the health benefits side of it, the environmental side of it have to look at it also on the economic impact that this would have on the economy of places like my State, my region, and of the impact on the economy of the United States. Because if we just go to fuel switching and we drive up our costs, it will impact certainly on our manufacturing because one of the reasons why we are competitive in the global marketplace is because we have reasonable energy costs.

Then to take it one step further and you go the global route, if we lose the jobs here and they go someplace else, what kind of environmental restrictions are they going to have in China or Russia or wherever else these jobs will go? In terms of global warming or whatever the case may be, have we enhanced the situation or have we made it worse?

Maybe I am taking it to a much larger level, but I think these are some of the considerations that we need to grapple with if we are going to come out with something that is reasonable and fair and that really makes a difference.

Senator JEFFORDS. Mr. Kirkwood?

Mr. KIRKWOOD. I was interested in your comment earlier, Senator, about incentives. I do not know whether that issue has been looked at by the committee, but there may be incentives for the installation of control technology, tax incentives, accelerated depreciation or whatever, that might be blended in with this legislation that would help to mitigate against the problem that you have just outlined in terms of jobs and costs and things like that. I just raise that as a consideration.

Senator VOINOVICH. I am cosponsoring a couple of pieces of legislation with Senator Bird to do that.

Senator JEFFORDS. Mr. Hawkins, there do not seem to be serious technological, economic obstacles to achieving the reduction levels in the Clean Power Act. What would you say is preventing us from moving more swiftly toward enactment?

Mr. HAWKINS. Well, I think that there are interest groups that are focusing on short-term economic issues, and that is understandable. And it is the job of Congress to basically listen to those concerns but then to represent the greater public interest. And it is the job of groups like ours and others to present the clearest information possible. I think, frankly, part of this is just people getting geared up to fight with kind of old assumptions about what is possible, and once they get geared up to do the battle that way it takes a while for them to look over the horizon and figure out that, gee, there is a way to address our concerns and address the concerns that the environmental and public health community have as well. I think that is what we need to do.

We need to recognize the power of energy efficiency, of renewable energy programs. We need to recognize the power of sending a market signal that controlling these pollutants actually adds value to an investment. As I was saying before, coal gasification, which you mentioned, right now it is not competitive with just building a new gas-fired power plant. Why? Well, in large part it is because the carbon capture potential of that technology is not valued by the marketplace. You can dump carbon for free, so why would anyone spend a dollar more to come up with a technology to reduce emissions.

That is why we have to continue this discussion and try to get those facts out there so the people understand it, and then look for some leaders in the industry. The Clean Energy Group is a good example of a group of companies that has stepped forward and said, yes, we understand that for good business reasons controlling all four of these pollutants makes sense, we cannot do sensible business planning without it.

Senator JEFFORDS. Mr. Tipton, you are nodding your head.

Mr. TIPTON. Well, I cannot say what David said better than he said it. But I can say something a bit different on the same point. And that is, it is kind of irrational to have a law, the 1977 Amendments, which set up a prevention of significant deterioration, PSD, program for Class I areas and yet we allow this large number of coal-fired power plants that were built in the 1950's, 1960's, and 1970's to continue to operate without observing the same kind of level of emission control that we require today. That is itself the single biggest factor that is resulting in loss of visibility and some significant health detriments, and detriments to trees and plants and animals as well in our National Parks. That is not rational. We should have a system that requires everyone to attain a certain level of cleanup. The benefits would be tremendous to the National Parks and to our society.

Senator JEFFORDS. Thank you.

Mr. Banig, I just want to thank you for giving me a real good perspective on the impact in the coal industry. This committee is very concerned about that impact.

I want to thank all of you for very excellent testimony. I have to run over for another vote, my exercise for the day. So, thank you all.

[Whereupon, at 12:56 p.m., the committee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF HON. HARRY REID, U.S. SENATOR FROM THE STATE OF NEVADA

Mr. Chairman, I want to begin by thanking you for holding this important hearing. We need to take a serious look at controlling all emissions from power plants.

The health effects of polluted air range from asthma to lung cancer to heart disease and worse. Mercury deposited in lakes and rivers can bioaccumulate in fish. Each year about 60,000 children may be born in the United States with neurological problems as a result of their mothers' consumption of contaminated fish and seafood during pregnancy.

Emissions from power plants also contribute to environmental degradation: power plants release one-third of nitrogen oxides and three-quarters of sulfur dioxide emissions in the US, and both pollutants cause acid rain. Some Senators would like to exclude carbon dioxide from caps on power plant emissions. However, carbon dioxide is one of the greenhouse gases contributing to global warming, and electric utilities account for one-third of U.S. carbon dioxide emissions. Mr. Chairman, global warming is already occurring.

Seven of the ten warmest years in the 20th century occurred in the 1990's, and warming in the 20th century is greater than at any time during the past 400–600 years. The environmental consequences of this warming are becoming obvious. Mountain glaciers around the world are receding, the Arctic ice pack has lost 40 percent of its thickness, and there is evidence that plants and animals are changing their behavior in response to shifts in climate.

The human consequences of global warming may include: disruptions in agricultural production; more wind, flood, and drought damage; greater range of disease-carrying insects; and increases in respiratory illnesses and heat stress. These consequences will have real effects on public health and the U.S. economy.

Mr. Chairman, we cannot ignore the impact of air pollution on our quality of life. I look forward to working with you and the committee to develop 4-pollutant legislation dealing with reducing air emissions, including carbon dioxide, from power plants.

STATEMENT OF HON. HOWARD DEAN, M.D., GOVERNOR OF THE STATE OF VERMONT

Thank you Mr. Chairman and members of the committee for this opportunity to share my thoughts regarding multi-pollutant legislation. I would like to applaud Members of Congress, especially the chairman and ranking member, for their leadership in tackling this issue of great importance for public health, the environment, and the economy of Vermont, other States in the Northeast and elsewhere. This is a good bill, and I appreciate the opportunity to speak about why the goals to be achieved through the bill are so important.

While we have made great strides reducing air pollution since Congress enacted the Clean Air Act of 1970, much remains to be done. Power plants remain one of the largest sources of air pollution in the country. Electric utilities account for approximately one-third of all man-made emissions of mercury and particulate matter in our nation, one-third of all emissions of nitrogen oxides and carbon dioxide, and nearly three-quarters of all U.S. emissions of sulfur dioxide.

As a doctor, I am particularly concerned about the fact that many areas of our nation still violate the health-based 1-hour standard for ozone and that many more will violate the new 8-hour ozone standard. This is occurring at the same time that a growing body of scientific evidence clearly demonstrates the many and varied adverse health effects associated with exposure to fine particle air pollution. Similarly, the long-term consequences of a continued buildup of toxic metals in the environment also represent a demonstrable health threat. For example, the threat posed by mercury deposition to pregnant women and their babies is both serious and preventable. In recognition of this threat the New England Governors and Eastern Canadian Premiers have embarked on an aggressive campaign to dramatically cut mercury emissions in our region. Our ultimate goal is the virtual elimination of manmade mercury emissions.

Like public health, the environment also remains at risk from air pollution. Despite significant progress under the Federal Acid Rain Program, forests and aquatic ecosystems throughout much of the Northeast continue to suffer damage from acid rain. Recent findings from the Hubbard Brook Research Forest, the nation's oldest acid rain research effort, and parallel studies conducted by researchers in Vermont and other regions of the United States and Canada, demonstrate that we have a great deal of work left to do. Fifteen percent of the lakes in New England and over 40 percent of Adirondack lakes are either chronically or seasonally acidic. These conditions negatively affect fish and other aquatic life. Nearly one-quarter of Adirondack lakes surveyed in one study no longer support fish. In Vermont, 35 lakes have been deemed sensitive and impaired by acidification. On Camels Hump, one of Vermont's tallest peaks and the State symbol engraved on the new Vermont State quarter, researchers have studied the impact of acid rain for decades. Here, the red spruce canopy has been extensively damaged, and new growth red spruce is showing signs of acidic damage. Power plants are also the primary cause of regional haze, which reduces average visibility in the Northeast to only about one-third of the visual range typical of natural conditions.

It is essential that your deliberations result in defining "multi-pollutant" as a minimum of four pollutants. Climate-altering gases such as carbon dioxide represent a significant long-term global threat. The possible impact of global climate change include widespread coastal flooding, immense changes in habitat for plants and animals, an increase in weather-related natural disasters, and, in Vermont, possible crippling impacts to our ski areas and maple sugar industry—potential devastating blows to our State's economy and culture. Scientifically and politically, it is clear that climate change is an issue that will not go away. As a nation, it is important that we both hold the line against future emissions increases and begin to actually decrease our contribution to the global burden of climate-changing pollutants. The New England Governors and Eastern Canadian premiers expect to achieve reduction in greenhouse gases to 10 percent below 1990 levels by 2020. This bi-national regional plan adopted by the Governors and Premiers in August of this year, further established a long-term goal of achieving reductions of 75 to 85 percent below current levels to eliminate any dangerous threat to the climate. I have attached a copy of the adopted plan for your consideration.

One way Vermont intends to meet its obligations under the bi-national regional climate action plan, and at the same time address energy issues in Vermont, is through my recently unveiled long-term energy initiative for Vermont. That plan promises to help Vermont meet its future electric energy needs by developing a clean, reliable and renewable energy infrastructure. In recent debates over national energy policy, some have questioned whether renewable generation, conservation and small-scale power can meet future electric power needs. Analysis of Vermont's particular needs and opportunities shows that renewable forms of energy, together with wise and efficient energy use do have the potential to meet our future demand—at low cost to consumers.

Our initiative addresses issues that will be pressing on Vermont in the coming years. Although New England does not face an energy supply crisis right now, we have recognized for some time that increasing electric demand in Vermont will eventually require expanding supply. At the same time, Vermont utilities serve more than two-thirds of the State's electric demand with power from two electric energy sources: Hydro Quebec and the Vermont Yankee nuclear power plant. Both of these sources of energy are non-carbon based, however, both are time-limited and face uncertain futures. Not only are these sources of power both renewable and not carbon based, both are provided through long-term contracts, which provide power stability and cost certainty to consumers.

New England as a whole is addressing its growth through the construction of large-scale natural gas-fired plants, with advanced air pollution control systems, concentrated in the high demand areas of southern New England. These plants are less carbon intensive than other thermal generation plants and they will protect the region from shortages resulting from lack of capacity—and from the kinds of consequences we saw in California. I am not convinced however that reliance on one fuel source makes sense for a variety of reasons, not least of which are possibilities of price spikes and supply disruptions. Consumers do not benefit from a speculative, single fuel approach to supplying power.

In addition to these issues of supply, Vermonters have long placed a priority on environmental quality. Thus any solutions to Vermont's future power needs must take into account the large impact of electric generation on environmental quality, both at home and nationally.

For these reasons I have made a commitment to meet increased electric consumption in Vermont by developing three Vermont-based alternatives to large-scale generation or purchased power. First, developing new sources of renewable energy. Second, expanding Vermont's already successful energy conservation efforts. And third, fostering small-scale, clean and efficient generation, particularly advanced technology combined heat and power projects at Vermont businesses and institutions.

I will ask our legislature to appropriate funds this year for renewable energy incentives. These funds represent a step in a period of public support that is needed so the market for renewable resources can ultimately stand on its own. Policy initiatives such as a Renewable Portfolio Standard (a requirement that utilities include at least a threshold amount of renewables in their supply mix) will aid in moving from a period of subsidy to a fully functioning market that no longer requires public subsidy.

The economic costs of our initiative may well be less than the cost of energy purchased in the market. When environmental and local economic benefits are taken into account, the economic analysis becomes even more favorable. For example, individuals and businesses participating in efficiency programs in Vermont have done so at a cost of approximately 2.6 cents per kilowatt-hour at a time when wholesale electricity supply costs about 5.2 cents per kilowatt-hour. And the carbon dioxide emissions avoided by these efficiencies equals taking 2,100 cars off the road.

Realizing this achievable vision strengthens our State and our country through diversification of our energy resources, significant economic benefits, and a reduction in the environmental consequences associated with meeting our electric power needs.

Given that the Northeast is downwind from the rest of the nation, pollutants from many of our nation's most industrialized regions find their way to our corner of the country. Therefore, effective national legislation is essential to adequately protect the health of citizens and our environment.

For all of these reasons, Vermont strongly supports the committee's efforts to draft comprehensive, meaningful legislation to reduce power sector emissions of NOx, SO_2, mercury and carbon. Only a comprehensive approach addressing all four pollutants can give industry the investment and planning certainty it needs, while ensuring a reliable electricity supply and promoting a smooth transition to the mix of resources and technologies needed to sustain environmental progress and improve public health despite continued demand growth.

Control programs for other pollutants, if they result only in the addition of smokestack controls will not achieve the needed reductions in CO_2 emissions. Any program that excludes carbon cannot, at this point, provide industry with meaningful longer-term investment certainty they need, nor will it provide impetus for the new generation of renewable and advanced technologies that are needed in a carbon-constrained world.

I believe that setting a cap on the amount of a pollutant that may be emitted and allowing trading of emissions between polluters as a means of controlling power plant emissions can have merit. Any so-called "cap-and-trade" program however cannot be a "gimmick." It must be meaningful. In my view a meaningful program would provide a stringent cap, utilize market forces to achieve reductions, be based upon an open process and an informed public, include strong emission tracking and data reporting mechanisms, and be subject to strict compliance oversight and significant penalties in the face of noncompliance. To keep such a program relevant over time it would need to contain a review and revise provision to push the cap downward. This could be accomplished by authorizing the U.S. Environmental Protection Agency to adopt rules.

I also believe it critical to include in a multi-pollutant power plant bill some of the fundamental cornerstone provisions of the Clean Air Act, such as requirements for the best available emission control technology on new sources. This particular provision carries out the adopted philosophy of Congress "when building new, build clean." This policy has served the nation well since incorporated into the Clean Air Act of 1977 and must be upheld.

It is absolutely essential to establish an emissions cap that requires deep reductions in the emissions of all four pollutants from the large number of grandfathered power plants that continue to operate in this country. These grandfathered power plants account for more than two-thirds of the carbon dioxide, three-quarters of the nitrogen oxides and mercury, and 80 percent of the sulfur dioxide emitted by all fossil fuel-burning utilities in the United States today. There is no compelling reason to continue exempting high-emitting power plants from applying proven control technology. I urge you to correct the faulty assumptions of the 1970 Clean Air Act that these plants would be retired by now and remove the exemptions that continue to allow these facilities to spew massive amounts of pollutants into the atmosphere—and ultimately into the lungs of our citizens. The time has come for these facilities to upgrade to current standards or close.

In crafting a national policy for controlling power plant emissions, it is important that Congress remember that for every measure of pollution reduction there is a benefit to society. This notion is embodied in the Bi-National Toxic Strategy, which our government has entered into with Canada. This agreement states that for some pollutants the goal must be "the virtual elimination of the contaminant." Power plant emissions contribute to many of the major environmental issues before us: mercury, fine particulate matter, global climate change, ozone pollution and regional haze. To address these threats to our environment and health, we must have a sound goal and sound policy direction. Virtual elimination is the right goal—a long-term goal—and new technologies and renewable sources of energy will provide the solutions for achieving this goal.

I appreciate very much the work of this committee on this issue, I support this bill and I thank you again for this opportunity to speak with you.

STATEMENT OF GERARD M. ANDERSON, PRESIDENT AND CHIEF OPERATING OFFICER, DTE ENERGY RESOURCES, ON BEHALF OF THE EDISON ELECTRIC INSTITUTE

Good morning Mr. Chairman and distinguished members of the Senate Environment and Public Works Committee, and thank you for inviting me here today. My name is Gerry Anderson and I am President and Chief Operating Officer of DTE Energy Resources, one of three major business units of DTE Energy Company. I am responsible for the company's more than 11,000 megawatts of generation and the associated fuel supply organization. I am also responsible for the company's subsidiaries focused on energy projects and services (DTE Energy Services), energy trading (DTE Energy Trading), non-regulated power generation (DTE Generation), coal marketing and transportation (DTE Coal Services), and biomass energy (DTE biomass Energy).

DTE Energy Company is a Detroit-based, diversified energy company involved in the development and management of energy-related businesses and services nationwide. Its combined electric and natural gas utilities create a premiere regional energy provider.

DTE Energy has regulated and unregulated subsidiaries involved in a wide range of energy-related businesses. The subsidiaries sell electricity, steam, natural gas, landfill methane gas, coal and metallurgical coke, and are involved in the management and development of energy-related businesses and services. In addition, DTE Energy affiliates are developing electric fuel cells for homes and automobiles, and other cutting-edge energy technologies. The company's growth strategy is focused on continued excellence of its core utility businesses, the development of non-regulated, energy-related ventures and investment in and development of emerging technologies.

I appreciate the opportunity to address the committee on this important issue on behalf of the Edison Electric Institute (EEI). EEI is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI's U.S. members serve more than 90 percent of all customers served by the shareholder-owned segment of the industry, generate approximately three-quarters of all of the electricity generated by electric companies in the country, and serve about 70 percent of all ultimate customers in the nation.

I. EEI Supports The Concept Of Integrated, Comprehensive Multi-Emissions Legislation

Let me state at the outset that EEI supports an integrated, multi-emissions approach that includes reform of the new source review (NSR) program that, if designed properly, can achieve important environmental, energy, and economic goals. Because of multiple, uncoordinated, and overlapping existing and proposed emission control requirements from Federal and State, and even neighboring countries (See Appendix A–1), the electric power industry faces enormous uncertainty as it tries to develop appropriate plans to develop new generation capacity, upgrade plants and add pollution controls. In lieu of the current regime, a reasonable, sound, and integrated multi-emissions strategy would streamline the regulatory process, accomplishing meaningful air quality benefits at a much lower cost, while protecting electric reliability. To achieve these results, EEI developed a set of criteria that must underlie a well-designed multi-emissions approach to accomplish important air quality objectives:

- Each and every element of a comprehensive multi-emissions approach, beyond just amounts and timing of emission reductions, must be resolved in order to achieve a balanced package.
- Emission reductions must be cost-effective and overall costs must be reasonable. Costs and cost-effectiveness are influenced by timing, flexibility, emissions reduction goals, and incentives.
- Maximum flexibility must be provided to achieve reductions. This must include unconstrained cap-and-trade programs to provide the greatest flexibility.

• Adequate time for compliance must be provided, with a timescale that should allow for orderly implementation of emission reduction measures. To the extent possible, the timing of reductions should accommodate development and deployment of new technologies.

• Regulatory certainty and stability are essential. A safe harbor provision is necessary to assure certainty. Multiple regulatory requirements and different schedules for SO_2, NOx, and mercury should be eliminated, as well as uncertainty caused by NSR.

• Proper incentives should be provided to help facilitate emission reductions and to promote research, development, and deployment of technologies.

• Forced premature plant retirements are to be avoided as severe emission reductions can make some coal-fired plants uneconomic. Retirements can represent stranded investments.

• Fuel diversity must be maintained. In addition to other fuel sources, coal should continue to be a viable source for generating electricity.

With respect to this last point, I want to emphasize that EEI believes fuel diversity—including the use of coal, natural gas, nuclear energy, oil, hydropower and other renewables, to generate electricity—must be maintained as a matter of national energy policy and national security. See Appendix A–2. A diverse fuel mix protects consumers and electric companies from fuel unavailability, price fluctuations, and changes in regulatory practices. Diverse fuel and technology options contribute to a stable, reliable and affordable energy supply over the long term.

We need a national energy policy that takes advantage of energy resources available within our country. One of the most plentiful energy resources is coal, and more than 90 percent of U.S. coal usage is the generation of electricity. This valuable but underutilized asset can meet the nation's energy needs for about 250 to 350 years.[1] Nuclear power can also be a plentiful resource with a virtually unlimited supply potential. On the other hand, according to EIA, the known supply of natural gas reserves looks adequate only for 40 years, based on current consumption (and much less given anticipated increased consumption levels). And when one considers the multiple beneficial uses for natural gas, especially for residential heating, it is reasonable to examine its use for central station power generation when electricity from coal is available to do the same work. Coal-based capacity additions, which already look attractive, will look even better as technology drives down their costs.

New technology puts coal-based plants in position to clear today's environmental hurdles. The lower emissions and higher efficiency of new coal-based plants exceed current environmental requirements for SO_2 and NOx. Clean coal technology also addresses greenhouse gases. Because of increased efficiency, new technology coal plants produce significantly less carbon dioxide (CO_2) per megawatt hour than old plants.

I also want to return to a point mentioned in the criteria discussed above. The concern is with the new source review program. NSR is one of the most complex programs of the Clean Air Act. NSR presents a significant challenge to the safe, reliable, and affordable operations of the nation's current fleet of electric generating power plants. The NSR program generally has been successful in assuring that major new emission sources install the best available control technology (BACT). However, EPA's current reinterpretation of NSR, a departure from how the program had been understood and implemented for decades and contrary to the existing regulations, would prevent power plant operators at existing plants from making necessary improvements and undertaking routine maintenance and repair activities that allow reliable electricity generation, increase plant efficiency, and provide more electricity to meet our nation's energy demands. For example, due to the need to make safety and reliability maintenance repairs to units at our Monroe Power plant, we have the opportunity to increase the efficiency of those units and produce more electricity with the same fuel input, something good for the environment and our customers' costs. However, because of the present reinterpretation by EPA of the NSR regulations, as demand for electricity increase, we will have to limit the use of these units to the levels they have been used in the recent past and serve that increased demand with less efficient units. This does not help our customers or the environment. Therefore, while administrative changes are needed to address problems with the NSR program in the short term, a comprehensive multi-emissions legislative package must also include necessary long-term reforms of the NSR program.

[1] Energy Information Administration (EIA), Annual Energy Review 1999, T, 11.2, T, 11.3.

II. Specific Comments On S. 556

As I have stated, EEI supports the concept of a well-designed multi-emissions bill provided it satisfies the criteria outlined above. S. 556, however, fails to do so, and thus EEI does not support the legislation. We are not alone in this respect. Other representatives of the electric power industry oppose S. 556. Many other industry sectors have expressed their strong opposition as well. The Bush Administration, in recent testimony before this committee, also has registered its opposition.

A. S. 556 Should Recognize Progress That Has Already Been Made

The electric utility industry has made remarkable progress in reducing air emissions. While coal use tripled between 1970 and 1999 due to increasing demands for electricity, emissions from electricity generation from coal declined significantly—and will continue to decline—as a result of current emission reduction programs.

Control programs for NOx (in 1996, 2000, and 2004) and SO_2 (starting in 1995 and concluding later this decade) will reduce both emissions by about half from their highest levels.[2] Meanwhile, the SO_2 emission rate[3] will drop 80 percent, and the NOx emission rate will decline about 70 percent. In other words, only one-fifth as much SO_2 and one-third as much NOx will be produced with each kilowatt of electricity. Perhaps more importantly, these programs already cap future power plant emissions. Additionally, existing control technologies at power plants reduce mercury emissions by an average of 40 percent. Since 1974, DTE emissions of SO_2 have been reduced by 61 percent, NOx by 41 percent, particulate matter by 89 percent, and mercury by 4 percent. During this same period, DTE's annual system generation rose 44 percent or more than 15 billion kilowatt hours.

These advancements in the control and minimization of electric power emissions have resulted from significant capital investment in control technologies and a strong record of utility compliance. Over the past 25 years, the electric power industry has invested approximately $40 billion (capital) in technologies to reduce these air emissions. In addition, utilities spend $3 billion to $5 billion annually in operations and maintenance related to environmental performance. As we speak, DTE Energy, similar to many other companies, is spending approximately $630 million on NOx reductions to address ozone transport issues.

B. S. 556 Will Compromise Electric Reliability

According to a recent analysis conducted by the Energy Information Administration (EIA) of the U.S. Department of Energy,[4] coal-based electricity generation is predicted to decline 38–42 percent on a national scale if S. 556 is enacted. In turn, natural gas-based generation is projected to increase 60 percent. The rapid fuel switching—in this case the substitution of natural gas for coal—that would occur as a result of S. 556 could produce short-term power supply interruptions. According to EIA, "[T]he annual increases in production [of natural gas] required between 2005 an 2010 would be near record levels, representing a serious challenge for the industry—it is far from certain that the power sector would be able to move from dependence mostly on coal to dependence on natural gas and renewables in a relatively short time period without encountering supply problems."

EIA also cautions that stringent emissions reductions like those proposed in S. 556 would require large amounts of pollution control equipment to be installed at power plants around the country over a very short period of time. Consequently, "system reliability could be of particular concern during the period when a large amount of emissions control equipment would have to be added." In effect, construction, operation, and maintenance of these new control technologies will mean more "down time" for existing power plants, and in some cases multiple power plants in the same region severely impacting the availability, cost, and reliability of electric power. Consumers could face electricity shortages during the lag between the closing of these facilities and the siting and construction of new generation, resulting in increased prices and reduced reliability.

Furthermore, due to regional electric transmission constraints, it will be difficult, and in some areas impossible, to import the electric power necessary to meet demand while coal-based generation is fitted with new emission controls, or replaced with gas-based generation. The strain of re-routing electric power to serve areas impacted by the shutdown, restoration, and maintenance of power plants could further

[2] Based only on EPA's acid rain program and the so-called NOx State Implementation Plan (SIP) Call regulations.

[3] Measured by the pounds of emissions per thousand kilowatt-hours generated by coal.

[4] All references to EIA in this section are taken from its October 2001 report, Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plans with Advanced Technology Scenarios.

compromise the reliability of the nation's electric power grid. This is a particular concern in Michigan where due to our peninsula nature there is already limited external transmission access that the State is trying to address.

S. 556 does not allow sufficient time for the major construction activities associated with installing necessary control technologies. The Clean Air Act Amendments of 1990 gave the utility industry 10 years to comply with the acid rain requirements for SO_2 and NOx. S. 556 calls for much more stringent reductions for SO_2, NOx, and mercury over a much shorter time period. Many of the plants will also be forced to apply the most advanced technologies over this short timeframe, even though many of the technologies are yet unproven and still in the introductory phases of development. As EIA observed, "[T]he evolution of new technologies is unpredictable, and Hg [mercury] emissions control technologies are relatively new and untested on a commercial scale." Mercury is a particular concern to DTE Energy because we are such a large burner of western low sulfur sub-bituminous coal. Mercury emissions from such coal is lower and in an elemental form which minimizes environmental impact. However, elemental mercury is extremely difficult to remove. With a 90 percent reduction requirement by 2007, we do not know how we could continue burning this fuel.

In addition, the short timeframes for compliance mandated by S. 556 will drive manpower and material shortages, unnecessarily increasing compliance costs and further impact reliability. In fact it now appears that short timeframes, manpower and material availability, and other factors have greatly increased compliance costs. For example, earlier estimates of $60/kW for SCR capital costs have been overshadowed by publicly announced costs above $100 kW. It is notable that these much higher costs are being incurred for various company's' first SCR installations, which are being undertaken at facilities where SCR would be most cost-effective. SCR applications in less-optimal circumstances are costing well above $100/kw.

C. S. 556 Will Result In Significant Adverse Economic Impacts To Both Industry and Consumers

While claims have been made that the reductions called for in S. 556 will be cost-effective with available technology, a closer look at the numbers reveals that enormous costs will be imposed on the utility industry and its customers. In its October 2001 report (referenced earlier), EIA estimates that the cumulative costs (2001 through 2020) for S. 556 will be $177 billion. EIA estimates that the price of electricity will be 33 percent higher in 2020. EIA also noted that electricity prices could be substantially higher if natural gas prices turn out to be higher.

Because of the integral role that low-cost and reliable energy plays in our economy, and our lives, the influence of S. 556 goes well beyond the utility industry. In the case of S. 556 the combination of increased costs of production and decreased household income will lead to significant impacts on the production of non-energy goods, extending the effects of S. 556 well beyond the electricity sector. Energy-intensive industries will be especially hard hit by the rise in energy costs. A broad cross-section of service industries will absorb a large loss in output, although in percentage terms such industries are less affected than other industries due to their relatively low energy use. In addition, exports of goods will fall as U.S. firms lose competitiveness internationally as a result of higher costs of production.

All regions of the country would bear economic losses if S. 556 becomes law. However, the economic losses are not expected to be distributed evenly across the regions within the U.S. The economic burden of S. 556 will vary across States/regions in the U.S. because the industries most likely to be most affected (coal mining, oil and gas extraction, and the energy intensive industries) are not evenly spread across the country. Thus, those regions where these industries make up a disproportionate share of the economy, relative to the U.S. as a whole, will be likely to incur a disproportionate share of the losses. The impact of S. 556 on energy prices would have important implications for the manufacturing base of the U.S. economy that is unevenly distributed across the nation. Some regions like the East North Central, and individual States within regions (e.g., Michigan), will shoulder a significant portion of the burden on manufacturing firms.

D. S. 556 Mercury Reduction Targets May Be Impossible to Meet

There is no single control technology that can effectively remove all forms of mercury. Mercury control options are highly dependent on the existing power plant's design and operating characteristics and the fuel used. Potential mercury emission reductions are unique to each unit.

The characteristics of the coal-based plant that most greatly affect emissions of mercury and the type of control technology used include: the mercury content and other chemical aspects of the coal, the design of the particulate collection devices, and the design of the flue gas treatment systems. For some plants, mercury emissions reductions from 70 to 90 percent may be impossible to achieve. As indicated earlier, this is a particular concern to DTE Energy because of our large reliance on western low sulfur sub-bituminous coal. The only full-scale demonstration of mercury control on a coal-based utility boiler lasted just 7 days and produced sustained mercury reductions of only 80 to 85 percent under well-controlled and supervised conditions. Long-term testing may reveal coal-type and plant operation restrictions with this technology. There exists no proven technology to control mercury emissions from oil-based power plants. Also, since no reliable monitoring technology for mercury has been developed, there is still considerable uncertainty in the measurement of mercury emissions and/or reductions.

Research is ongoing to improve the understanding of mercury combustion chemistry and physics, and to find ways to reduce mercury emissions in the most efficient and cost-effective manner possible. Other technologies (including advanced coal washing, the use of alternative sorbents, systems to recycle activated carbon for reuse, and systems to control NOx, SO_2, and mercury emissions together) are in various stages of research and development. In fact, full-scale demonstrations of mercury control technologies at individual power plants are just beginning and will not be completed for 2 to 3 years.

Requiring a 90 percent mercury emissions reduction by 2007, as required by S. 556, would cause significant fuel switching from coal to natural gas. This is inconsistent with national energy policy objectives because it will limit fuel choices, impede the construction on new power plants, and increase the cost of electricity. The excessive reduction requirements and short timeframe also would lead to the installation of a large amount of mercury retrofit control technologies and other pollution control equipment, the actual mercury emissions reduction potential of which is as yet still unclear.

Notwithstanding the practical problems with S. 556's requirement of 90 percent mercury reduction from current emissions levels will be very expensive to attain. Economic analysis by EIA and the electric utility industry show that the mercury component of S. 556 would cost more than both the NOx and SO_2 components combined. Best current estimates by the Department of Energy are about \$5-\$8 billion annually, in addition to the cost of other emission controls. Again, these costs are based on emerging control technologies, which are relatively new and untested on a commercial scale.

Compounding these problems is the fact that S. 556 does not allow trading for mercury emissions. Opposition to mercury emissions trading centers on concerns about potential hot spots, where mercury emissions might not be reduced or could even increase as a result of emissions trading However, there are several reasons why this should not be concern:

- Based on 5 years of real world experience, studies of the SO_2 allowance trading program by EPA, the Environmental Law Institute, and Resources for the Future demonstrate that trading did not significantly change where SO_2 reductions actually occurred.
- A July 2001 EIA report found that controlling mercury emissions through a cap-and-trade program does not affect the regional distribution of emissions.
- Electric power generation in the United States currently accounts for about 20 percent of the mercury emitted from anthropogenic sources in the United States, northern Mexico, and southern Canada. If power generation sources reduced their emissions by 50 percent from current levels, then the utility contribution would be about 10 percent. If trading then changed the power generation contribution in a region from 10 percent to 8 percent, or from 10 percent to 12 percent, the difference would be environmentally insignificant.

Rejecting mercury trading simply does not make sense and in fact can result in adverse consequences:

- It eliminates the significant cost savings that would be realized from mercury emissions trading. An analysis conducted for the EEI on behalf of the electric utility industry indicates cost savings from mercury trading of approximately \$5 billion through 2020 (comparing the same mercury cap levels, with and without trading).
- It creates a major compliance problem for sources that have already cut mercury emissions through past actions (e.g., fuel use or emissions control equipment). S. 556
- requires every source to reduce mercury by 90 percent from 1999 levels. S. 556 would not allow a source that has already reduced mercury to buy credits to meet the 90 percent target.
- It can erase the benefits of SO_2 trading. The unit-by-unit 90 percent mercury reduction requirement outlined in S. 556 can force plants to install a scrubber or

switch to natural gas (in contrast to S. 556 allowing SO_2 compliance through both low-sulfur coal and SO_2 emission trading).

- It can reduce the incentive for utilities and vendors to innovate. A prohibition on trading will force today's technology to be installed throughout the industry, even though it will be in a rather early state of development as of the S. 556 2007 compliance deadline.

E. S. 556's "Modernization" Program Is Counter To The Clean Air Act

S. 556 takes a step backward in terms of the need for regulatory flexibility and efficiency in achieving air quality goals. In addition to the stringent emissions caps mandated in the bill, S. 556 also introduces a new concept, "modernization," which would require every single power plant to install the most stringent controls, while producing little marginal environmental benefit. Many power plants would, in all likelihood, be forced to shut down due to the cost of emission control retrofits, even though those units are critical to a reliable and diverse electric supply. The "modernization" concept is currently not part of the Clean Air Act.

The "modernization" program is a response to claims concerning "grandfathered" power plants, the popular definition of which is older plants that are uncontrolled or exempt from the CAA. However, there are no power plants in the United States that are exempt from the CAA. The CAA regulates power plants through State Implementation Plans (SIPs) to meet national ambient air quality standards (NAAQS). For decades, States have evaluated what emission reductions are needed to meet the NAAQS and then included these reductions in permits. In addition, the 1990 CAA amendments required all electric plants to address their SO_2 and NOx emissions related to acid rain. Further, other new initiatives (NOx SIP call, ozone and fine particle standards, mercury, regional haze) will further reduce the gap between the emissions levels of new and older units. In reality, these programs are dramatically reducing all emissions everywhere. As indicated earlier over the last 26 years DTE Energy has reduced its particulate emissions by approximately 89 percent, SO_2 approximately 61 percent, and NOx approximately 41 percent with additional ongoing extensive further reductions. There has been no "grandfathering."

The "modernization" program would effectively supersede the already stringent S. 556 emission caps for SO_2 and NOx because:

- Most existing power plant facilities would be subject to "modernization" early in the program:
  - 80 percent of coal-fired units generating capacity will be 30 years old in 2007.
  - 92 percent of coal-fired units generating capacity will be 30 years old in 2012.
  - EPA's current interpretation of a modification could bring most units into the program almost immediately.
- The sources to be modernized would be subject to strict new source performance standards (NSPS), best available control technology (BACT), or lowest achievable emission rate (LAER) requirements.

Other problems with the "modernization" provision that I would like to note include:

- "Modernization" is a clear example of reductions for reductions sake, since health and environmental benefits are in no way linked to emission reductions by scientific studies, etc.
- To require "modernization" of many older plants, which have already been retrofitted with expensive emission controls to meet the requirements of programs like Title IV and SIPs but that do not meet the current definition of NSPS, BACT or LAER, would create small emission reductions while being cost prohibitive.
- Many small, older units would be likely to shut down due to the cost of emission control technology retrofits or due to site-specific physical limitations, even though these units are critical to a reliable and diverse U.S. electricity supply.
- The "modernization" program included in S. 556 is a return to an inefficient, costly, command-and-control approach to achieving emissions reductions, will effectively negate the market-based approach that has worked so well under Title IV, and will render moot the trading provisions included in the bill.

F. Legislation Must Not Include Mandatory CO_2 Reductions

EEI opposes regulation of carbon dioxide (CO_2) and other greenhouse gases as pollutants under the Clean Air Act or other statutes. Because there is currently no cost-effective control technology for greenhouse gas emissions, compliance with stringent, mandatory targets and timetables such as those contained in the Kyoto Protocol would cause massive fuel switching in the electric utility industry from coal to natural gas,[5] which would be very expensive and increase electricity prices.[6] It also would further exacerbate EEI's concerns, noted above, about fuel diversity.

On March 13, 2001, President Bush wrote to four Senators stating his preference for an appropriate multi-pollutant strategy addressing SO_2, NOx and mercury emissions but also stating that the Federal Government should not "impose on power plants mandatory emission reductions for carbon dioxide, which is not a 'pollutant' under the Clean Air Act." In testimony before this committee several weeks ago, U.S. EPA Assistant Administrator for Air Jeff Holmstead reiterated the Administration's strong opposition to including CO_2 reductions in any multi-emissions bill. In his testimony Mr. Holmstead stated that greenhouse gas emissions "should be addressed in the context of climate change, which is being undertaken by the President's Cabinet level working group." EEI agrees with the President's CO_2 policy and believes it to be sound from policy, legal and scientific perspectives.

Instead of mandatory regulation of CO_2, the government should consider working with industry to develop successors to the highly successful, voluntary Climate Challenge program. The utility Climate Challenge program reduced, avoided or sequestered 124 million metric tons of CO_2-equivalent ($MMTCO_2E$) greenhouse gases in 1999, and according to the Department of Energy (DOE), utilities were projected to reduce, avoid or sequester 174 $mmtCO_2E$ greenhouse gases in 2000.

A robust, enhanced, national voluntary climate initiative should consist of these major elements:

- The program should complement overall U.S. energy policy and the Framework Convention on Climate Change. It should include all sectors of the economy.
- In the near term, the climate initiative should further an appropriate national policy objective, such as reducing greenhouse gas/carbon intensity. The Federal Government would facilitate the initiative by policies, laws and incentives, including those that encourage full flexibility for offsets, emission credits and trading programs.
- Further mitigation of greenhouse gases in the medium to long term would result from the development and application of more energy-efficient, cost-effective technologies for energy and electricity supply, transmission and distribution, and end use that supports a reliable and affordable energy supply.
- A climate technology research, development, demonstration and deployment (RDD&D) program is needed to ensure that cost-effective technologies are developed over the long term. Most experts believe that higher levels of funding and greater international cooperation are needed over at least the next two decades in order to address long-term technology RDD&D needs properly. America needs both a long-term climate technology strategy—which focuses on greenhouse gas emission reductions and offsets—and a long-term energy technology strategy that addresses energy supply and demand issues as well as helps to reduce or offset greenhouse gases. Long-term climate technology strategies and long-term energy technology strategies are contained in both S. 1294—sponsored by Senators Murkowski, Craig, Hagel, Domenici, Roberts and Bond, and S. 1008—sponsored by Senators Byrd and Stevens.

Among the advantages of a national voluntary program are that: 1) it would address all sectors of the economy, not just the electric utility industry (which comprises about ⅓ of U.S. emissions); and 2) it would facilitate trading and offsets projects with other sectors of the economy, such as forestry and farming.

In addition to the Federal Government incentivizing and facilitating the enhanced voluntary program by initiating new policies and regulations, Congress will likely need to enact legislation establishing:

- National goals in terms of an appropriate national policy objective, such as reducing greenhouse gas/carbon intensity, with a long lead-time sufficient to avoid the premature turnover of capital stock. A national policy objective of reducing greenhouse gas/carbon intensity would be consistent with the President's National Energy Policy, which has a priority recommendation "to improve the energy intensity of the U.S. economy as measured by the amount of energy required for each dollar of eco-

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[5] Under a Kyoto Protocol-type scenario, coal would decline from 50 percent of electric generation to as low as 13 percent in 2010, while natural gas would rise from 25 percent to 50 percent in the same timeframe. Research Data International, Inc., U.S. Gas and Power Supply under the Kyoto Protocol, Vol. I at 1–9 (Sept. 1999).

[6] A recent EIA report (which actually understates costs because mercury had not yet been analyzed) found that reductions in sulfur dioxide, nitrogen oxides and CO_2 consistent with recent legislative proposals would increase electricity prices by 17–33 percent in 2005, and by 30–43 percent in 2010. EIA, Analysis of Strategies for Reducing Multiple Emissions from Power Plants: Sulfur Dioxide, Nitrogen Oxides and Carbon Dioxide xvii, 27 (Dec. 2000). The bulk of the cost increases are due to CO_2restrictions.

nomic productivity." National Energy Policy (May 2001), App. One. Reducing greenhouse gas/carbon intensity would also be consistent with S. 1294. Importantly, reducing greenhouse gas/carbon intensity would be consistent with economic growth, which will required additional electric generation facilities as well as additional transmission lines and capacity.

- Mandatory reporting of greenhouse gas emissions annually, as well as a national registry based on the U.S. national inventory and the mandatory reports.
- Baseline protection and safe harbor protection.
- Realignment of the current Federal R&D budget ($50 billion) and capital infrastructure spending ($120 billion) affecting climate change, including: 1) long-term climate technology RDD&D and 2) incentives for voluntary commitments by industry (i.e., participation incentives) and incentives for industry greenhouse gas actions (i.e., greenhouse gas action incentives).

With regard to timing, as previously noted, long lead times are needed for the electric utility industry to avoid the premature retirement of capital stock. In addition, any national goal or policy objective embodied in legislation should be based on an appropriate baseline, such as the year of enactment of legislation or some future year, not a historical artifact such as 1990.

With regard to technology, climate change is a long-term issue that, as previously noted, will require a transition in the medium to long term for cost-effective climate technology RDD&D to develop. There is no technological "silver bullet" or "magic bullet," such as a carbon scrubber, for CO_2. The Department of Energy and other government agencies, as well as private firms, are currently engaging in RD&D of carbon capture, storage and disposal of CO_2 from stacks. We support this R&D effort, but believe that the government should be budgeting as much as $500 million annually for 10 years of R&D and 5 years of deployment in order to jump start the implementation of cost-effective and feasible technology.

Ultimately it may take a menu of technological options to address greenhouse gases in the long term. The government has supporting and partnership roles to play, but it should not put all of its technological eggs in one basket, regardless of whether the technology is integrated gasification combined cycle (IGCC); carbon capture, storage and disposal; clean coal technologies; etc. In the medium to long term, any number of cost-effective technologies may emerge, including clean coal technologies; IGCC (particularly in the 2012–2018 timeframe); renewables; nuclear; forestry and soils offset projects; hydrogen and fuel cells; and technologies that we are not now even aware of. The nation's energy needs and security are well served by fuel diversity in electric generation supply, and that statement is true in the greenhouse gas context as well as other contexts.

At DTE Energy we strongly support continued research and technology development to facilitate a good long-term policy/program to address the global climate issue. We support EPRI research, we are a member of the PEW Center on Global Climate Change Business Environmental Leadership Council and we recently joined the Chicago Climate Exchange to develop a GHG trading program. We support distributed generation and have made significant investments in fuel cell development through the partnership formation of Plug Power and believe that hydrogen based energy is a likely long term solution. In the short term, we strongly support taking reasonable steps that make sense to address the issue. We support preservation of rainforest in Belize, in conjunction with the Michigan Department of Natural Resources we have planted nearly 20 million trees in Michigan and with the strong operation of our Fermi nuclear plant we avoid further emissions of carbon dioxide. Finally, we have a subsidiary, DTE Biomass, that develops landfill methane gas to energy projects across the country (approximately 35 presently in service and others under development). Methane is approximately 21 times more potent a greenhouse gas than carbon dioxide. All of these voluntary efforts have allowed us to significantly offset our increasing CO_2 emissions as a result of increasing electricity demand.

III. Conclusion

If designed properly, a multi-emissions approach can meet important environmental, energy, and economic goals without threatening electric reliability or driving up electricity prices unreasonably. Such an approach would impose reasonable emissions reduction targets and timetables for SO_2, NOx, and mercury, and would allow the industry to continue, on a parallel course, to reduce CO_2 emissions voluntarily through flexible, cost-effective, and market-based programs.

A well-designed multi-emissions approach that regulates SO_2, NOx, and mercury would:

- Accomplish meaningful air quality benefits;

- Maintain fuel diversity; Replace the current uncoordinated regulatory approach;
- Provide business certainty by establishing specific and reasonable emissions reduction requirements that remain unchanged for a definite period of time;
- Provide long term reform the NSR program;
- Allow flexible, market-based approaches (e.g., emission trading) to emissions reductions; and
- Substantially reduce compliance costs.

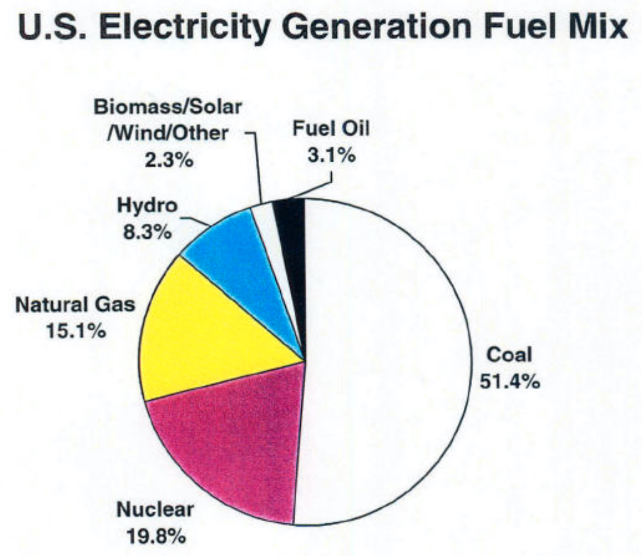
S. 556 simply cannot deliver these results. A well designed, coordinated, and comprehensive integrated approach to the development and implementation of environmental regulations offers a better way to achieve air quality goals. With adequate time and flexibility, the electric power industry can continue to reduce emissions, provide affordable and reliable electricity, and meet the goals of energy and environmental policy. The electric utility industry and DTE Energy specifically is committed to working with the committee, and the Administration, to design multi-emissions legislation that fulfills these criteria.

Major Air Quality Programs for Electric Utilities[+]

Current	
Ozone NAAQS (1-hour) / SIPs	1970
SO_2 NAAQS / SIPs	1970
NO2 NAAQS / SIPs	1970
Total Suspended Particulates NAAQS / SIPs **	1970
Carbon Monoxide NAAQS / SIPs	1970
New Source Review	1970
Citizens' Suits	1970
Prevention of Significant Deterioration	1977
Class I Areas	1977
LAER and Offsets for Nonattainment Areas	1977
Visibility - Section 169A	1977
PM_{10} NAAQS / SIPs	1978
Lead NAAQS / SIPs	1978
Title V Permitting	1992
Continuous Emission Monitors for SO_2 and NO_X	1995
Flow Monitoring	1995
Title IV (acid rain) permits	1995
Title IV SO_2 Phase 1	1995
Compliance Assurance Monitoring	1995
Credible Evidence	1995
Periodic Monitoring	1995
Title IV NO_X Phase 1	1996
NO_X NSPS	1997
Mercury Emission Reporting	1999
TRI	1999
NSR Enforcement Initiative	1999
Title IV NO_X Phase 2	2000
Title IV SO_2 Phase 2	2000

The Future	
TRI – Mercury	2001
NSR Reform Rule	2002?
Revised $PM_{2.5}$ NAAQS	2002
NO_X 126 State Petitions *	2003
U.S./Canada NO_X Treaty	2003
NO_X SIP Call *	2004
Ozone (8-hour) NAAQS *	2005
Mercury Standards	2007
Possible short-term SO_2 NAAQS SIP's *	2007?
Possible Title IV SO_2 Phase 3	2007?
Kyoto Protocol	2008?
$PM_{2.5}$ NAAQS *	2009
Regional Haze *	2009
Future NAAQS revisions	Every five years
Clean Air Act Reauthorization	?
Possible TMDL (water-based) NO_X controls	?
Possible TMDL (water-based) Mercury controls	?
Generation Performance Standards	?
Renewable Requirements	?
Labeling and Disclosure Requirements	?
Air Quality Related Values	?

* In litigation
** Phased out after PM_{10} standard
\+ Dates reflect actual or potential implementation of emission controls.



STATEMENT OF JEFF STERBA, CHAIRMAN OF THE BOARD, PRESIDENT AND CHIEF EXECUTIVE OFFICER, PUBLIC SERVICE COMPANY OF NEW MEXICO

Good morning Chairman Jeffords, Senator Smith, and distinguished members of the Committee on Environment and Public Works. Thank you for inviting me here today. My name is Jeff Sterba, and I am chairman of the board, president, and Chief Executive Officer of the Public Service Company of New Mexico. PNM is an investor-owned utility primarily engaged in the generation, transmission, distribution, and sale of electricity and in the transmission, distribution, and sale of natural gas within the State of New Mexico. Our electric generation is a mix of natural gas, coal, and nuclear. PNM's San Juan Generating Station, a coal-fired plant, is an ISO 14001 certified facility and is a charter member of EPA's Performance Track Program which recognizes a commitment to environmental excellence at the plant.

I appreciate this opportunity to address the committee on behalf of PNM and the Edison Electric Institute (EEI). Today, I will provide the committee with PNM's views on multi-emission reduction proposals, emphasizing the need to consider the differences in air quality issues and power plant emissions in the West. PNM supports a streamlined power plant emission reduction program that improves air quality, provides the industry with regulatory certainty, and eliminates duplicative and ineffective regulatory programs. We believe that multi-emission reduction legislation is an opportunity to address the myriad of duplicative and ineffective environmental regulations that in some instances prevent us from even improving the efficiency of our power plants. Consequently, we support legislation that requires utilities to reduce emissions of SO_2, NOx and mercury, and provides the operational certainty we need to meet growing demand for electricity.

There are several reasons, however, why PNM cannot support a uniform, "one size fits all" emission reduction program as proposed in S. 556. First, and most importantly, the emission reduction levels mandated in S. 556 appear to be a policy response to environmental conditions that simply do not exist in our region of the country. Second, S. 556 would reduce fuel diversity and operational flexibility, thereby jeopardizing system reliability and our ability to provide the power needed for continued regional (and national) economic growth. Third, S. 556 would impose all of these costly requirements on top of all of the existing Clean Air Act authorities. It would not grant industry any relief from the overlapping, burdensome requirements of the Clean Air Act or provide industry with the flexibility and certainty that are necessary to meet the country's growing energy demands.

I. Air Quality Issues Are Different in the West

The main air quality challenge in the West related to power plant emissions is visibility impairment in National Parks and Wilderness Areas. There is not a single non-attainment of National Ambient Air Quality Standards for ozone or fine particles ($PM_{2.5}$) resulting from power plant emissions. The pollutant of interest for visibility protection is SO_2. Western power plants are already well controlled for SO_2 with emission rates much lower than the emission rates from power plants in other regions of the country. Figure 1 indicates the SO_2 emission rate in the West and the national SO_2 emission rate.

Additionally, in response to the recently promulgated regional haze rule, new regional SO_2 emission limits have been developed as part of a collaborative, regional, stakeholder-based consensus process known as the Western Regional Air Partnership (WRAP). The WRAP, consisting of State air regulators, environmental groups, Federal land managers, EPA, industrial sources and power companies, developed SO_2 emission limits that responded to real-time air quality conditions we face in the western United States. It is PNM's view that any Federal multi-emission reduction proposal should embrace the WRAP's work with respect to SO_2 as opposed to overlaying additional reductions to respond to issues in other regions of the country.

With respect to NOx, again the emissions from Western power plants are much lower than emissions from other power plants. Figure 2 indicates the NOx emission rate in the West and the national NOx emission rates. What is more, according to work done by the Grand Canyon Visibility Transport Committee (GCVTC), NOx emissions from power plants have very little impact on visibility impairment in the western National Parks and Wilderness Areas. Finally, with the exception of California—which does not have a single coal-fired power plant—the western States have very few areas that are in non-attainment status for ozone. Ozone non-attainment areas in the country are shown in Figure 3. In western non-attainment areas, the non-attainment results from transportation sources and not power plant emissions. Simply put, the ozone non-attainment issues in other parts of the country that are a major factor justifying further NOx emission reductions from power plants are not present in the West. PNM strongly believes that electricity consumers in the West should not be required to pay for the installation of expensive retrofit controls to reduce NOx emissions that would result in no meaningful environmental benefit.

Concerning mercury, it is important to note first that there are no demonstrated health problems in the West associated with mercury emissions. Western coal-fired power plants burn primarily sub-bituminous coal that has a lower mercury content than coal burned in other regions. In addition, mercury emissions from western sub-bituminous coal are extremely low to begin with, and are primarily elemental mercury as opposed to particle-bound mercury or ionized mercury. Figure 4 shows mercury emissions nationwide and in the West. In considering mercury control requirements, please keep in mind that while scrubbers are effective in controlling some forms of mercury, they are not effective in controlling elemental mercury. Thus, it cannot be assumed that mercury emission reductions achieved by the application of technology to eastern (bituminous) coal also will be achieved by use of the same technology on western (sub-bituminous) coal.

The West does not differ from other parts of the country with respect to carbon dioxide emissions in the same way that it does with respect to SO_2, NOx and mercury. However, since 1990, the West has enjoyed substantial growth, most of which has been supported by increased generation of electricity from fossil fuel plants. Similarly high rates of growth in demand for electricity are projected for the west looking out to 2010. Thus, requirements to reduce Western greenhouse gas emissions to levels existing a decade or more ago will be particularly punitive for the West.

II. Multi-Emission Legislation Must Take Western Differences Into Account

PNM generally supports multi-emission legislation that will set a cap and allow trading beneath this cap. Our experience has shown that this type of cap-and-trade system encourages innovation and allows companies maximum flexibility in achieving environmental goals cost-effectively. In a cap-and-trade system, allocations of emission allowances are critical. It is not enough to propose caps and let the allocations be determined though the political process. It is our view that multi-emission legislation needs to prospectively define how emission allowances are to be allocated.

Concerning the individual pollutants, western considerations can be taken into account by:

1. Building on the recommendations of the successful WRAP stakeholder process for SO_2 reductions. Legislation should respect both the magnitude and the timing of the WRAP SO_2 emission reductions. We define this as the West receiving SO_2

allocations in the amount of, and timed to correspond with, the WRAP's SO_2 milestones.

2. Insuring the costs associated with NOx emission reduction requirements are reasonably proportional to the potential benefits from those controls. An appropriate NOx emission level should be achievable with aggressive combustion controls, and should not require widespread deployment of expensive SCR technology. The schedule of reductions should be synchronized with the WRAP schedule for NOx reductions when the schedule is developed.

3. Developing a mercury control program that accounts for the difficulty in reducing elemental mercury emissions with presently available control technologies and allows time for the development and demonstration of new technologies.

4. Eliminating the overlapping and burdensome programs of the existing Clean Air Act such as NSR.

With respect to carbon dioxide, PNM supports a voluntary program to minimize greenhouse gas emissions as part of a multi-pollutant bill. This program should build on the successes of the Energy Policy Act section 1605 reporting provisions, but should be strengthened and made even more credible. In the longer term, more steps may be needed to move the nation toward lower levels of greenhouse gases. The following principles should guide any such future steps :

- all sectors of the economy that produce greenhouse gas emissions, including the utility sector, should be covered;
- reasonable time to make emission reductions should be provided, so as not to disrupt electricity supply and harm our economy, rather than basing emission caps on some arbitrary past date;
- all varieties of flexibility mechanisms (such as trading, offsets, international projects, and the like) should be allowed in order to broaden compliance options and thus reduce costs; and
- broader technology research, development, and deployment that lowers or offsets greenhouse gas emissions must be pursued and factored into efforts to minimize greenhouse gas emissions.

III. S. 556 Would Impose Emission Reduction Requirements That Are Too Severe and Fail to Take Western Differences Into Account

In a little more than 5 years from now, January 1, 2007, S. 556 would require 75 percent reductions of SO_2 and NOx emissions from power plants. Carbon dioxide emissions from power plants could be no higher than levels in 1990. Finally, S. 556 would require a 90 percent reduction in mercury emissions at each power plant, regardless of a plant's existing level of mercury emissions. These requirements are simply "too much, too soon." The costs would be extremely high. In some cases, (for example, mercury control requirements) it would be impossible for PNM's plants to comply with the bill's requirements given the present and near-term state of demonstrated control technology.

S. 556 also fails to recognize the fundamental distinctions between the West and the rest of the country with respect to current emission levels in the West and air quality issues in the West.

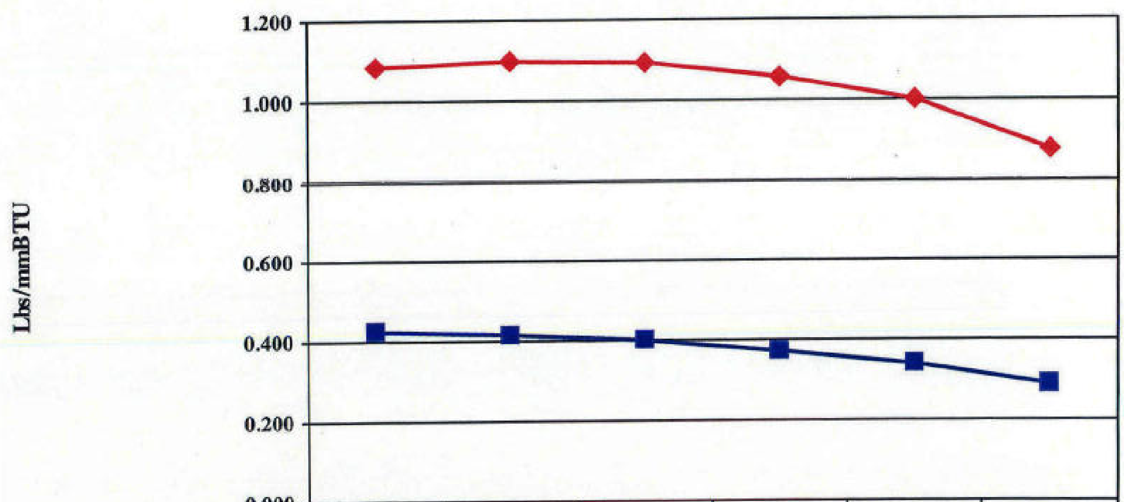
For these reasons, PNM cannot support S. 556.

Conclusion

As a participant in the WRAP, PNM firmly believes that it is possible, through collaboration and hard work, to develop a plan for emission reductions that meets both air quality and energy needs. PNM pledges to work with this committee to develop multi-pollutant legislation that also can meet our objectives of a cleaner environment, and reliable, affordable electricity supplies.

Figure 1

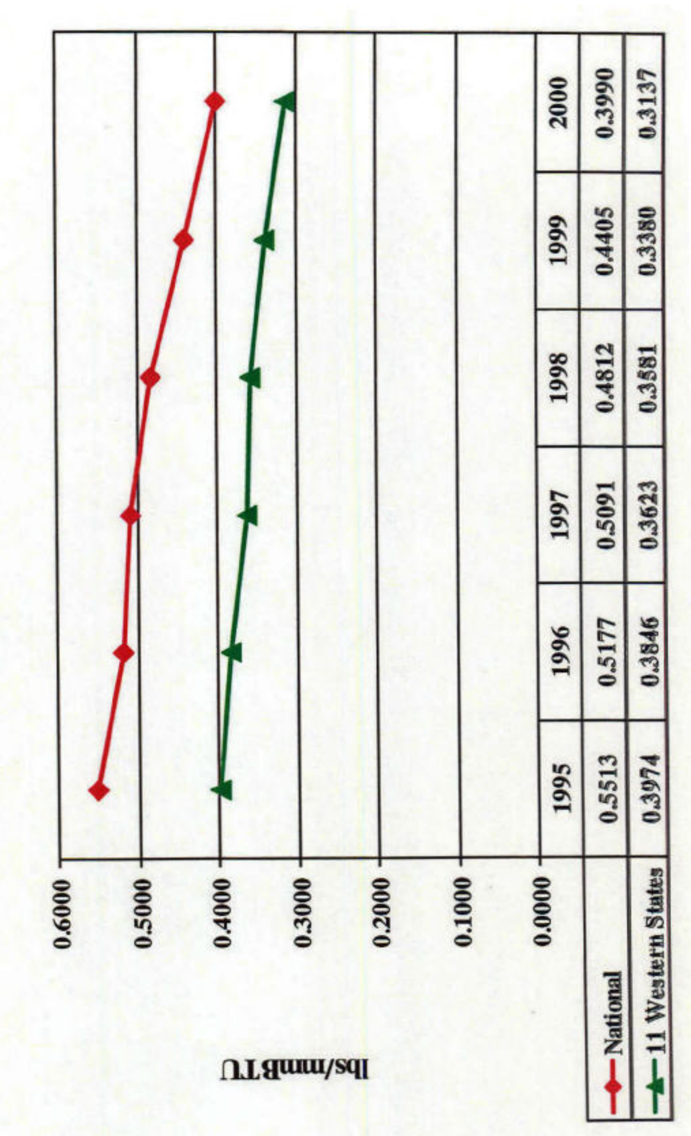
SO_2 Emissions Rate



	1995	1996	1997	1998	1999	2000
National	1.086	1.096	1.093	1.058	1.000	0.875
11 Western States	0.421	0.414	0.400	0.370	0.341	0.290

Figure 2

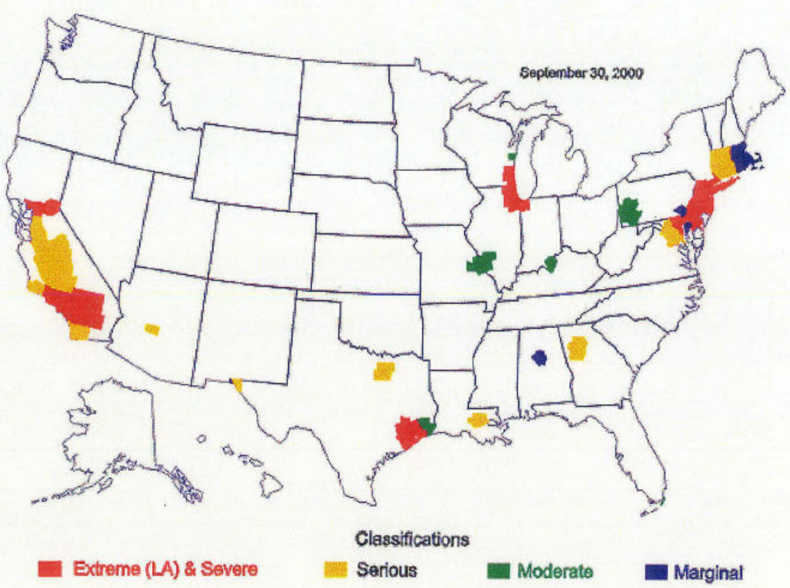
NOx Emissions Rate



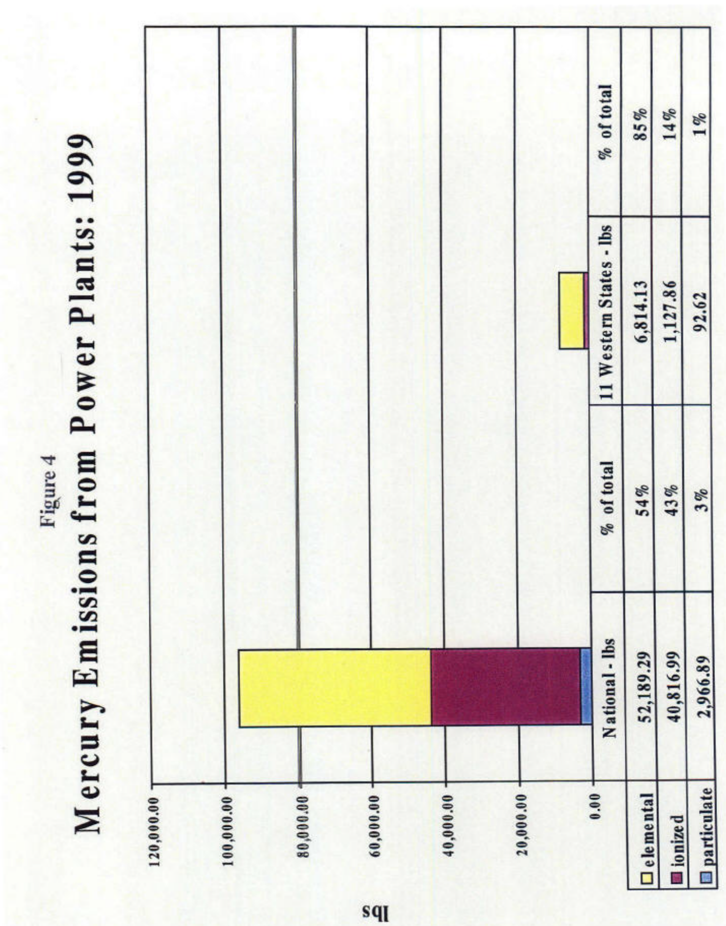
	1995	1996	1997	1998	1999	2000
National	0.5513	0.5177	0.5091	0.4812	0.4405	0.3990
11 Western States	0.3974	0.3846	0.3623	0.3581	0.3380	0.3137

Figure 3

Ozone Non-Attainment



Source: EPA Air Quality Trends Report



RESPONSES OF JEFFRY E. STERBA TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Please find enclosed a copy of the chart that EPA Assistant Administrator Holmstead brought with him to the committee's hearing on November 1, 2001. It shows the numerous regulations that the power sector will face in coming years. Has the Administration presented any of you with an estimate of the projected costs of industry compliance with those regulations? If so, what was it?

Response. EPA staff has estimated, using modeling and policy assumptions with which we disagree, that what it calls "business as usual" (BAU) will cost approximately $12 billion annually in 2020.

Question 2. Assuming EPA or industry has or can come up with a reasonably accurate baseline cost of those regulations, wouldn't it be most appropriate to subtract that baseline cost from the EPA analysis (done for the committee) to get an incremental cost estimate for S. 556?

Response. Yes, if a reasonable accurate estimate could be generated. However, estimating the required reductions is virtually impossible. The outcome of future rulemakings is impossible to predict. Moreover, stakeholders who are dissatisfied with the outcome of rulemakings are likely to contest those results in the courts, likely resulting in delays.

I believe that EPA staff's current estimate of BAU is not supportable. EPA has assumed emission reduction requirements and implementation dates for SO_2 and NOx that are not supportable as an accurate representation of BAU. EPA's analysis also greatly overstates the future costs to industry of BAU. EPA's modeling approach appears to exaggerate the costs of the BAU case by assuming utilities have no foresight in how they decide to meet the numerous regulations facing them under the BAU scenario.

Question 3. Out of all the emission reduction requirements that Mr. Holmstead identified (the mercury rule, the NOx SIP Call, the fine particulate standard, etc.) as probable in the next 2–5 years, which ones do you believe will be implemented, whether or not a multi-pollutant bill is enacted?

Response. The NOx SIP Call is a final regulation that will be implemented in the next few years. The mercury MACT is scheduled to be proposed and finalized by December 2004. Compliance with the final regulations is currently scheduled for December 2008; however, the details regarding implementation have not been established. Reductions associated with a particulate matter or ozone National Ambient Air Quality Standards are uncertain and likely to occur much later than the next 2–5 years.

Question 4. Could you tell us approximately how efficient are your current fleet of plants, by fuel type? How has that changed over the last 15 or 20 years?

Response.

Plant	Fuel	Current Heat Rate	Heat Rate 15 Years Ago	Percent Change
San Juan Generating Station.	Coal	10,700 BTU/kwh	12,100 BTU/kwh	11 percent decrease
Four Corners Units 4&5	Coal	9,956 BTU/kwh	9,956 BTU/kwh	No change
Reeves	Gas	11,300 BTU/kwh	11,300 BTU/kwh	No change

Public Service Company of New Mexico has ownership in Palo Verde Nuclear Generating Station. Since 1992, the capacity factor of the station has increased from 79 percent to 92 percent. This increase is due primarily to a decrease in the average annual refueling time which has gone from 125 days to 31 days.

Question 5. Based on the EPA analysis from last week, it seems that company revenues could rise significantly under a 4-p future. For example, EPA said that the standard technology scenario with the 4-pollutant bill (Scenario A) would show electricity revenues of $84.5 billion more than the reference case with no new controls. But, the incremental cost of the 4-P controls would only be $16.5 billion. That seems to leave a profit of $68 billion for the industry. Do you have any comments on those numbers? These numbers are based on the enclosed chart prepared by the national Wildlife Federation.

Response. I am unfamiliar with this chart and its referenced source, and therefore I do not know the assumptions used to develop the information. I am concerned that one of the assumptions used is the out-of-date belief that utilities will be able to recover their capital costs associated with these new controls. This is most definitely not the case and furthermore is contrary to how the utility industry is moving forward. Finally, it is unfathomable to me how a costly control program would ever be a profit generator for my company or the industry generally.

Question 6. The Clean Energy Group's position is that a flexible compliance approach to achieving an industry-wide CO_2 cap at 1990 levels by 2015 is not overly costly or burdensome. What are your specific concerns about some type of CO_2 cap in a 4-p bill with such an approach?

Response. The Public Service Company of New Mexico is not a member of the Clean Energy Group, so I do not fully understand why that group believes a cap at 1990 levels by 2015 would not be overly costly or burdensome. However, such a cap would be costly and burdensome to the electric utility industry as a whole. The Clean Energy Group only represents a small number of companies in my industry. In addition, there is a clear distinction between the fuel mix of the members of the Clean Energy Group and my company particularly with respect to the percentage of coal-fired generation.

I have several specific concerns about a CO_2 cap in a four-emissions bill (CO_2 is not a pollutant under the Clean Air Act). First, CO_2 emissions and the need for reductions are not issues that are unique to the electric utility industry, and therefore single industry legislation is inappropriate. All sources of CO_2 emissions must be considered in the formulation of any legislative proposal that effectively and fairly addresses CO_2. Second, President Bush has stated that while he is in favor of a three-pollutant proposal under certain conditions, he is opposed to mandatory reductions in CO_2 emissions from the electric utility industry. Third, recent studies by the Department of Energy (DOE) Energy Information Administration and the Environmental Protection Agency (EPA) have shown that the costs of CO_2 control—for which there is no "magic" or "silver" bullet—would be greater than the costs for controlling SO_2, NOx or mercury. Fourth, the only way to obtain co-benefits from controlling CO_2 is by shutting down coal plants or via massive fuel switching to natural gas, which I do not favor.

Question 7. Mr. Anderson of DTE mentioned the need for mandatory reporting of greenhouse gas emissions. I'm working on legislation with Senator Corzine and other members of the committee to establish such an inventory or registry. Do you have a view on how that should be structured?

Response. The electric utility industry is already subject to mandatory reporting off CO_2 emissions under the Clean Air Act and engages in voluntary reporting of greenhouse gas emission reductions, avoidances, and sequestrations under the Energy Policy Act. Any future legislation that includes mandatory reporting of greenhouse gas emissions must be carefully structured. First, the overall context or "package" of legislative provisions is very important. Mandatory reporting of greenhouse gases cannot be viewed in isolation. For example, I do not favor a mandatory cap on greenhouse gas emissions, so I would have to oppose a bill that included a mandatory reporting requirement in furtherance of a binding target and timetable.

Second, the agency selected to oversee a national inventory or registry (or both) is critical. The Department of Energy (DOE) and the Energy Information Administration (EIA) have had longstanding, key roles in publishing annual inventories under section 1605(a) of the Energy Policy Act (EPAct) and in recording reductions, avoidances and sequestrations of greenhouse gases under section 1605(b) of EPAct. In fact, those agencies have 7 years of experience with such inventory and reporting functions. EIA is the logical place to house a national inventory or registry (or both) due to its independence, non-regulatory nature, and experience.

Third, the voluntary reporting program of EPAct section 1605(b) must be an integral part of any national registry. Annual recognition of reductions, avoidances and sequestration reported in the 1605(b) program—as exemplified in S. 1294—must be part of any national greenhouse gas emissions registry. Concepts of "recognition" are essential for baseline protection purposes, and they provide a concrete link between 1605(b) reports and any national registry.

Finally, I urge you and other members of the committee to consider carefully whether a program based on guidelines and voluntary reporting could be more appropriate than one that relies on regulations and mandatory reporting. For example, S. 1766 has a threshold for reporting of 1,000 metric tons of carbon dioxide-equivalent greenhouse gases which would require most small businesses and organizations to report.

Question 8. Given the enormous market changes in the power generation business, it seems that certainty in terms of environmental regulations is very important. How important is certainty, and what kind of savings can your businesses gain from it?

Response. The desire for certainty is one of the primary reasons that my company and others in the utility industry are interested in multi-emission legislation.

Currently, coal-fired power plants are subject to over 20 major Clean Air Act requirements and face the possibility of many additional new requirements. These requirements are duplicative, piecemeal and unnecessarily expensive. Multi-emission legislation could correct these problems and further environmental goals. However, these reductions must be reasonable. Multi-emissions legislation should provide regulatory certainty and stability while increasing compliance flexibility through market-based approaches. Coal-fired generation must be maintained as an important part of the electricity supply mix. Designed properly, such legislation would be a more efficient way to achieve economic, energy and environmental goals. A single set of reduction requirements with achievable deadlines and market-based mechanisms should be the cornerstone of this legislation.

The savings associated with regulatory certainty are difficult to quantify. The electric sector models account for regulatory certainty through their ability to account for multiple constraints (both emissions and years). The models estimate the least cost solution for the sector as a whole taking into account all known constraints.

Question 9. Have you seen the EPA straw proposal that was circulating early this year? If you have, what comments did you provide any Federal agency regarding it?

Response. There have been numerous published reports of various EPA straw proposals. Attached are two documents prepared in the September/October timeframe by the Edison Electric Institute that comment on the EPA straw proposal available at that time.

STERBA ATTACHMENT I

MAJOR PROBLEMS WITH EPA'S "MULTI-EMISSIONS STAFF PROPOSAL"

During a period of time when demand for electricity has increased significantly and coal use has tripled, electric utilities have continued to make major emissions reductions. Within a decade, utilities will have reduced SO_2 emissions by more than 50 percent compared to levels in the early 1970's. By 2010, national SO_2 emissions will be at their lowest level in one hundred years. NOx emissions have been cut by well over two million tons and will be reduced by another one million tons in the 2003/2004 timeframe after which the utility industry will represent less than 20 percent of NOx emissions.

Besides the reductions already committed to, the utility industry is ready to commit to substantial additional reductions. However, these reductions must be reasonable. They should increase compliance flexibility through market-based approaches. They should also maintain coal-fired generation as an important part of the electricity supply mix and facilitate the building of new coal-fired plants.

The following summarizes the major problems with the EPA multi-emission staff proposal:

- EPA's "regulatory business as usual" (BAU) case is unrealistic and, by greatly overstating the BAU cost to industry, EPA makes its proposal appear "inexpensive" in comparison.
  - EPA has assumed extreme emission reduction requirements and implementation dates for SO_2 and NOx that are not supportable as accurate representations of BAU. Thus, their analysis greatly overstates the future costs to industry of BAU. While it is possible that SO_2 reductions associated with a $PM_{2.5}$ NAAQS might be required as early as 2012, the extreme emission reduction level EPA assumes is mere conjecture and the more likely scenario is a delay well beyond 2012.
  - The modeling approach also artificially exaggerates the costs of the BAU case by assuming utilities have no foresight at all (EPA runs, then locks down the results in 2-year increments from 2008 through 2012).
  - This overstatement of the BAU case masks the unreasonable nature of the EPA proposal in an attempt to convince others that it is not extreme.
- The EPA proposal is inconsistent with the goals of the Administration's national energy policy and reduces U.S. energy security by erecting barriers to the use of domestic natural resources.
  - The stringency of the proposed caps and emission rates will discourage or even eliminate the possibility of new coal-fired generation. See page entitled "Stringency of the EPA Staff Proposal."
  - Industry analysis shows that the EPA proposal will result in at least a 9 percent reduction in coal-fired generation in 2020 beyond the decreases expected in the baseline and an additional 9 percent increase in natural gas use for electricity generation in 2020.
  - Industry estimates that, under the EPA proposal, by 2020 there will be an additional 10 quads of natural gas used annually to generate electricity (compared to 4 quads currently). It is uncertain whether the natural gas infrastructure will be able to support these projected increases.
- EPA's technical analysis has critical technical flaws regarding the costs and impacts of its proposal. Taken together these flaws result in a significant underestimate of costs.
  - Electricity demand—EPA assumes low increase in electricity demand (1.2 percent annually) based upon Clinton Administration climate change policy, compared to EIA's 1.8 percent rate.
  - Natural gas prices—EPA assumes low natural gas prices. DOE observes, "EPA predicts optimistic (low) natural gas prices. Most other experts predict slowly rising prices."
  - Mercury costs—Costs could be significantly higher than EPA assumes because of: lower SO_2 and NOx mercury co-benefits, higher costs for activated carbon, and the need for fabric filters. EPA assumes high mercury co-benefit SO_2 and NOx reductions based on limited data from tests at two plants while having no data on more common combinations of fuels and control equipment.
  - SCR costs—EPA and EEI both estimated selective catalytic reduction (SCR) capital costs too conservatively. It now appears that short timeframes, manpower

and material availability, and other factors have greatly increased compliance costs.

- The economic impact is likely to be significant, and especially difficult for small and mid-sized companies.
  - The capital investments and operating costs associated with EPA's stringent caps are estimated to cost the electric utility industry over $14 billion per year which makes this proposal the most expensive environmental proposal in history.
  - EEI estimates that costs could be 90–120 percent higher than the EPA estimates if 40 percent higher natural gas costs are assumed.
- The economic impact is likely to be shouldered disproportionately by the Midwest and Southeast.
  - These areas have the highest percentage of generation from coal.
- EPA, relying on an incomplete and controversial analysis related to the "NOx SIP call," assumes no reliability impacts due to installing a very large amount of controls over a short period of time.
  - Many plants will be forced to apply the most advanced, but yet unproven, technologies. Since the great majority of coal units will have to install FGD for SO_2, SCR for NOx, and probably activated carbon injection and fabric filters for mercury, there would be a level of plant outages that compromise reliable electric generation.
  - Installing multiple controls is more complicated than installing only one type of controls.
  - DOE states, "EPA's proposal will result in massive retrofits, which will remove capacity for extended time periods."
  - There could be labor and materials bottlenecks and unexpected operational problems.
  - Delays can also result from permitting of air pollution controls and from siting and permitting of solid waste disposal facilities.
- The EPA staff proposal would provide minimal real flexibility and eliminate meaningful opportunities to reduce compliance costs through trading.
  - Including all controls installed previously and those required by the EPA staff proposal, the vast majority of coal capacity would have these controls:
- SO_2 scrubbers (FGD) on 70–90 percent of coal capacity.
- SCR for NOx on 70–80 percent of coal capacity (or greater, according to DOE analyses).
  - The mercury cap explicitly limits trading. Contrary to EPA's analysis, the DOE and EEI analyses indicate that a large amount of mercury technological controls will be necessary, suggesting that even the potential trading opportunities under the EPA proposal would be severely limited.
  - EIA found "controlling mercury emissions through a MACT rather than a cap-and-trade program does not affect regional distributions of emissions." EEI modeling found that mercury trading could lower compliance costs by as much as $5 billion through 2020.
- EPA's cost-effectiveness "demonstration" is unpersuasive.
  - EPA has used unrealistic assumptions and a simplistic, pollutant-by-pollutant spreadsheet technique to support the reasonableness of its selected levels. However, its approach ignores the synergies inherent in multi-emissions strategies and the intricacies of modeling and thus does not give an accurate picture of how costs escalate.
  - EPA's approach is based on an "ordering" of electric generating units on the basis of each unit's "cost per ton" to control the individual pollutant under consideration. This "ordering" for a given pollutant will vary, depending on what is assumed about control of the other pollutants. The "cost per ton" ordering is also likely to be different for SO_2, NOx, and Hg.
  - The EPA approach also ignores the fact that actual cost will depend on the dispatch order of the units. The dispatch order is determined by each unit's total variable cost, not just the emission control cost.
  - When these realities are taken into account, it is highly likely that the true marginal cost for each of the pollutants will be above EPA's estimated "knee in the curve."
- The EPA cost estimates do not include the estimated annual $1 billion cost of disposal of additional coal combustion products (CCPs).
  - There will be a significant amount of CCPs generated by the installation of SO_2 scrubbers needed to meet the proposed SO_2 cap. Non-hazardous disposal costs of CCPs can range from $15 to $20 per ton. There will also likely be an adverse impact on the ability to reuse CCPs. An additional complicating factor is the need for additional landfill capacity.
- There has been no thorough, open peer or external review of the EPA analysis.

- EPA staff have yet to provide many of the details of their analysis, limiting others' ability to analyze and understand it.
- EPA has greatly overstated the potential particulate matter (PM) health benefits of its proposed emission reduction levels.
  - EPA's estimates of health benefits are based on epidemiological studies that fail to control for pollutants other than particulate matter. Consideration of additional air pollutants typically reduces the strength or magnitude of the association between PM and health endpoints.
  - Many in the scientific community, including the National Academy of Science PM panel, agree that the size and chemical composition of the potential "bad actor" is unknown. They also agree that all particulate matter is not equally toxic.
- Some new scientific evidence suggests that the sulfate and nitrate constituents of fine particles—those formed from SO_2 and NOx emissions—may not be associated with mortality.
  - Thus, there is no assurance regarding the assumed health benefits resulting from reductions of SO_2 and NOx emissions from power plants.
  - Ambient $PM_{2.5}$ is a mixture of chemical compounds. Sulfates and nitrates are a variable amount of that mixture. Recent data suggest they frequently constitute a smaller fraction of urban $PM_{2.5}$ than do carbon based compounds, even in the East.
- The mercury health benefits are even more tenuous.
  - Power plant emissions are responsible for about one-third of the mercury emitted to the air from industrial sources in the United States.
  - Research has shown that no more than 20 percent of the mercury emitted by power plants is deposited in local environments (within 30 miles of the source), and only 1–3 percent of the amount deposited remains in water bodies, with the remainder moving rapidly into sediments.
  - Routine mercury exposure in the United States is low. It comes almost exclusively from methylmercury via fish consumption, and does not appear to pose a health threat for the general public.

Stringency of the EPA Staff Proposal

- The amount of controls forced by the EPA Staff Proposal over the next 10 years or less will dwarf the total amount of control equipment over the past 35 years:

	Through Title IV & NOx SIP Call*	New—EPA Staff Proposal
SO_2—FGD	90,000 (DOE)	135,000 (EPA) 139,000–201,000 (EEI)
NOx—SCR	80,000 (EPA)—98,000 (EEI) [all during 2000–2004].	140,000 (EPA) 109,000—146,000 (EEI)
Hg—ACI	0	35,000 (EPA) 241,000—265,000 (EEI)
Hg—FF	20,000 (DOE)	0–35,000 (EPA) 225,000—246,000 (EEI)

* Through 2000 for Hg—ACI and Hg—FF

- The EPA Staff Proposal emission caps lead to extremely low beginning emission rates:
- The SO_2 cap dictates an initial emissions rate of 0.18 lb/million Btu, which is difficult for new plants to meet with high sulfur coal.
- The NOx cap dictates an initial emissions rate of 0.11 lb/million Btu, which is much more stringent than the NOx SIP Call.
- These emissions rates are well below NSPS for SO_2 and NOx.
- These emissions rates go far beyond addressing claims about "grandfathering."
- The mercury cap reduction of 90 percent (about 1lb/trillion Btu) would be difficult, maybe impossible, to achieve even with maximum controls.
- These already stringent emissions rates would shrink over time:
- As more generation is needed (to meet increasing demand for electricity) and as new facilities come on line (and are likely given some of the existing pool of allowances), these emission rates would shrink.
- This causes installation of even more control technology or fuel switching.

• Electric utility systems in rapidly growing parts of the United States are experiencing much higher than the anticipated 1.8 percent annual increase in electricity demand (per EIA) and would see their effective emissions rate plummet.

STERBA ATTACHMENT 2

Draft

Multi-Emission Proposals—Emissions Levels

Emission	Units	Historical High	1999 (actual)	S. 556	EPA
Sulfur Dioxide	Million tons	17.2 (1973)	12.7	2.2 (2007)	2.0 (2010)
Nitrogen Oxides	Million tons	7.0 (1970)	5.7	1.5 (2007)	1.87 (2008) 1.25 (2012)
Mercury	Tons	*	45	4.5 (2007)	24 (2008) 7.5 (2012)

• Approximately 75 tons of mercury currently in fuel used to generate electricity. Existing control equipment and fuel processing activities reduce emissions by approximately 40 percent to 45 tons.

EPA STAFF MULTI-EMISSION PROPOSAL—STRINGENCY

1. More stringent than S. 556 for Sulfur Dioxide (SO_2) and Nitrogen Oxides (NOx).
2. The EPA Staff Proposal will require far more substantial reductions than the 1990 Clean Air Act amendments (1990 CAAA) plus the NOx SIP Call:

SO_2:			
	1990 CAAA (TITLE IV)	ABOut 50 percent reduction	(from 1980)
	EPA Staff Proposal	About 78 percent reduction	(beyond 1990 CAAA)
NOx:			
	1990 CAAA & NOx SIP Call	About 40 percent reduction	(from 1980)
	EPA Staff Proposal	About 70 percent reduction	(beyond 1990 CAAA & NOx SIP Call)

3. The EPA Staff Proposal will require substantially more control equipment for compliance than all prior Clean Air Act requirements:

SO_2	Flue gas desulfurization (FGD or scrubbers).	
1990 CAAA (Title IV)	10,000 MW	(EPA estimate)
1990 Title IV plus other thru 2000	90,000 MW	(DOE data)
EPA Staff Proposal (incremental)	135,000 MW	(EPA estimate)
EPA Staff Proposal (incremental)	139,000–201,000 MW	(EEI estimate)
NOx	Selective catalytic reduction (SCR).	
1990 CAAA & NOx SIP Call	80,000 MW	(EPA estimate)
1990 CAAA & NOx SIP Call	98,000 MW	(EEI estimate)
EPA Staff Proposal (incremental).	140,000 MW	(EPA estimate)
EPA Staff Proposal (incremental).	109,000—146,000 MW	(EEI estimate)
Mercury	Activated Carbon Injection.	
1990 CAAA & NOx SIP Call	0 MW	(EPA estimate)
EPA Staff Proposal (incremental).	35,000 MW	(EPA estimate)
EPA Staff Proposal (incremental).	241,000—265,000 MW	(EEI estimate)
Mercury	Fabric Filter.	
All thru 2000	20,000 MW	(DOE data)

EPA Staff Proposal (incremental).	0–35,000 MW	(EPA estimate)
EPA Staff Proposal (incremental).	225,000—246,000 MW	(EEI estimate)

4. Including all controls installed before and because of the EPA Staff Proposal, the vast majority of coal capacity would have these controls (MW):

	SO_2 FGD	NOx SCR	Mercury Activated Carbon (ACI)*	Mercury Fabric Filter (FF)*
EPA	225,000	220,000	35,000	20,000–55,000**
EEI	229,000-291,000	207,000-244,000	241,000-265,000	245,000-266,000

* EIA, DOE, EPRI and EEI all believe that EPA's prediction of the amount of mercury controls is underestimated, perhaps dramatically, because EPA assumes (based upon 2 limited tests) that SO_2 and NOx controls will lead to a high level of mercury controls. This is a controversial and unproven assumption.

**EPA has indicated, alternatively, that no fabric filters are needed with ACI and that an equal amount of fabric filters to ACI are needed

- 70–90 percent of coal capacity would have FGD, initially (assuming about 320,000 MW of coal capacity)
- 65–75 percent of coal capacity would have SCR, initially.
- 10–80 percent of coal capacity would have ACI, initially.
- 5–80 percent of coal capacity would have FF, initially.

5. The EPA Staff Proposal emission caps lead to extremely low emission rates:

- The SO_2 cap dictates an initial emissions rate of 0.18 lb/million Btu, which is lower than that required in recent years at new coal units.
- The NOx cap dictates an initial emissions rate of 0.11 lb/million Btu, which is more stringent than the NOx SIP Call.
- These emissions rates are well below New Source Performance Standards for SO_2 and NOx. and go far beyond that needed to address environmental claims about "grandfathering."
- The mercury cap reduction of 90 percent (about 1lb/trillion Btu) would be difficult, maybe impossible, to achieve even with maximum controls.

6. These already stringent emissions rates would shrink over time, as more generation is needed to meet increasing demand for electricity:

- This causes installation of more control technology or fuel switching to meet the shrinking emissions rates.
- Some electric utility systems in rapidly growing parts of the United States are experiencing much higher than the anticipated 1.8 percent annual increase in electricity demand (per EIA) and would see their effective emissions rate plummet.

7. The EPA Staff Proposal provides minimal flexibility and allows little trading:

- The shrinking emissions rates require increasing amounts of control technologies and fuel switching.
- The SO_2 cap initially requires FGD on 70–90 percent of coal capacity and, thus, limits opportunities for trading.
- The NOx cap initially requires SCR on 70–80 percent of coal capacity (or greater, according to DOE analyses) and, thus, limits opportunities for trading.
- The mercury cap explicitly limits trading. All analyses except EPA's indicate a large amount of mercury technological controls.

8. A new analysis of the EPA Staff Proposal by ECAF shows that the EPA Staff Proposal is too stringent:

- EPA has not taken into account the beneficial emission reductions of new regulations affecting mobile and other sources.
- The EPA Staff Proposal plus other regulations require far greater emissions reductions for SO_2 and NOx than EPA has previously claimed in its own regulatory analyses are needed to meet the 8-hour ozone standard, the fine particle standard and the regional haze program.

EPA Staff Multi-Emissions Proposal—Cost

Annual costs (billion $1999)

EPA Staff Proposal Cost	2015	2020
EPA Estimate	$9	$10
EEI Estimate	$14	$15

Significance:

- Most expensive environmental legislative proposal in history.
- EEI estimates costs to be about 50 percent higher than EPA's estimates.
- EEI estimates that costs could be 90–120 percent higher ($17 and $22 billion in 2015 and 2020, respectively) than EPA's estimates if higher natural gas costs are assumed (40 percent higher).
- EPA and EEI both estimated selective catalytic reduction (SCR) capital costs too conservatively. It now appears that short timeframes, manpower and material availability, and other factors have greatly increased compliance costs. For example, earlier estimates of $60/kW for SCR capital costs have been overshadowed by publicly announced costs above $100/kW. It is notable that these much higher costs are being incurred for various company's first SCR installations, which are being undertaken at facilities where SCR would be most cost-effective.

EPA Staff Multi-Emissions Proposal

Energy Assumptions & Technical Issues

	EPA Staff Proposal	Industry Analysis
Electricity demand growth	Assumes low increase in electricity demand (1.2 percent annually) based upon Clinton Administration climate change policy.	EPA fails to account for EIA's electricity growth projection (1.8 percent annually), which is the basis for the Bush Administration National Energy Plan. EPA underestimates future electricity generation by 11 percent over 10 years.
Impact on natural gas	DOE observes, "EPA predicts optimistic (low) natural gas prices. Most other experts predict slowly rising prices.".	This may lead to unrealistically low costs. Due to increased demand, the price of natural gas, including for residential and other markets, could increase.

EPA Staff Multi-Emissions Proposal—Continued

Energy Assumptions & Technical Issues

	EPA Staff Proposal	Industry Analysis
Reliability of electric supply	EPA assumes no adverse impact on reliability.	EPA, based upon a cursory analysis relying on an incomplete and controversial analysis related to the ''NOx SIP call,'' assumes no reliability impacts. DOE states, ''EPA's proposal will result in massive retrofits, which will remove capacity for extended time periods. EPA has not addressed this point.'' Since the great majority of coal units will have to install FGD for SO_2, SCR for NOx, and probably activated carbon injection and fabric filters for mercury, there could be a level of plant outages that compromises reliable electric generation. There could also be labor and materials bottlenecks as well as unexpected operational problems. Transmission (due to grid constraints) is not a viable solution to these challenges. Industry-wide, there are presently few SCR's and combined FGD/SCR systems on which to base assumptions regarding outage times during construction and installation. Further, installing multiple controls is more complicated than installing only one type of controls. Delays can also result from permitting and from siting and permitting of solid waste disposal facilities.
Fuel mix	4 percent decrease in coal consumption and 4 percent increase in natural gas consumption.	9 percent decline in coal and 9 percent increase in natural gas use.

EPA Staff Multi-Emissions Proposal—Continued

Energy Assumptions & Technical Issues

	EPA Staff Proposal	Industry Analysis
Mercury (Hg) controls	50 percent of all mercury reductions are expected to be achieved at no cost as co-benefits of SO_2 and NOx controls. Remaining reductions of only about 11–14 tons are achieved through use of activated carbon treatments on about 35,000 mW of capacity. EPA assumes no need for fabric filters/baghouses.	EPA survey of industry's data (the ''ICR'') showed wide variability in Hg control levels for the same equipment. This demonstrates that we have a poor understanding of Hg chemistry and the abilities of current control technologies to reduce mercury. Technology demonstrations are several years from completion. Costs could be significantly higher than EPA assumes because of: lower SO_2 and NOx co-benefits, higher costs for activated carbon, and the need for fabric filters. EPA assumes high co-benefit SO_2 and NOx reductions based on limited data from tests at two plants while having no data on more common combinations of fuels and control equipment. There are indications that such assumptions do not hold up after SCR catalyst ages. To replace catalyst much earlier would probably be a very expensive option to control mercury. Also to be considered is the potential for hazardous waste disposal costs for byproducts. Both activated carbon injection and fabric filers could be required on well over 200,000 mW of capacity.
Mercury trading	EPA would only allow mercury trading after 70 percent controls at each plant.	EIA found ''controlling mercury emissions through a MACT rather than a cap-and-trade program does not affect regional distributions of emissions.'' EPA's ''Comprehensive Approach to Clean Electric Power Generation'' shows no difference in the distribution of mercury emissions with full trading. EEI modeling found that mercury trading could lower compliance costs by as much as $5 billion through 2020.
Federal budget impacts	not available	Increased demand for energy assistance funding. Higher Federal energy expenditures. Impacts for fossil fuel resources on Federal lands.
Optimized control levels	EPA has performed ''knee in the curve'' analyses, trying to determine at which point costs rise dramatically.	EPA analyses are based on simplistic assumptions and can be misleading. It is important to realize that the ''knee'' for any single emissions cost curve is greatly influenced by assumptions about fuel prices, electricity demand and controls of other emissions. The validity of these analyses is questionable.

EPA Staff Multi-Emissions Proposal—Continued

Energy Assumptions & Technical Issues

	EPA Staff Proposal	Industry Analysis
Other environmental/energy policy goals	not available	DOE observes, ''All 3-P related activity must be considered in the context of their implications on CO_2 related issues, or they could unnecessarily restrict policy choices to address the climate change issue. Once firms invest in Phase II and III controls, it becomes increasingly difficult to squeeze out carbon reductions, such as through a voluntary program.'' Complicating mercury controls is mercury in solid waste and the impact of activated carbon on reuse of coal combustion byproducts. Complicating SCR are concerns regarding ammonia and catalyst as waste and effects on reuse of coal combustion byproducts. Complicating FGD is the large amount of scrubber sludge that would need to be landfilled.
Regulatory Certainty	DOE states, ''EPA's proposal does not clearly indicate which existing and nascent air quality programs would be replaced or modified by proposal.''.	DOE states that EPA should look at ''all major SO_2, NOx, MACT, BART, etc. rules.'' EPA does not address crucial components of a multi-emissions strategy: safe harbor period and regulations to be replaced or modified, especially New Source Review.

EPA Staff Multi-Emissions Proposal—Continued

Energy Assumptions & Technical Issues

	EPA Staff Proposal	Industry Analysis
Health and environmental benefits	EPA assumes $154 billion in health benefits, all related to avoided fine particle health impacts.	Fine particle health impacts are a matter of active debate by EPA's CASAC and others. Recent studies raise questions about the impact of SO_2 emissions and associated secondary particulate formation on human health. DOE observes that there is "Substantial uncertainty over what types of PM 2.5 (or other pollutants) may be responsible for adverse health effects. For example: vehicular PM 2.5 is implicated in many new studies, which could suggest limited role of power plant emissions." In addition, there is the question of what are the marginal benefits associated with the most stringent end of the control requirements. DOE states in its critique of the EPA Staff Proposal, "No environmental justification offered for such a stringent level of Hg removal." A new analysis of the EPA Staff Proposal by the ECAF shows that the EPA Staff Proposal is too stringent. EPA has not taken into account the beneficial emission reductions of new regulations affecting mobile and other sources. The EPA Staff Proposal plus other regulations require far greater emissions reductions for SO_2 and NOx than EPA has previously claimed in its own regulatory analyses are needed to meet the 8-hour ozone standard, the fine particle standard and the regional haze program. This is especially true for NOx where EPA has previously found that the NOx SIP call would solve nearly all 8-hour ozone nonattainment concerns and that NOx is not a significant contributor to fine particle levels.

STATEMENT OF ROBERT LACOUNT, JR., AIR QUALITY MANAGER, PG&E NATIONAL ENERGY GROUP

Mr. Chairman and members of the committee, I am pleased and honored to appear before you this morning to represent my company, PG&E National Energy Group (NEG), and our coalition, the Clean Energy Group (CEG).

The Clean Energy Group members are Consolidated Edison, Inc., KeySpan, Northeast Utilities, Exelon, PSEG Power, Sempra Energy, Conectiv, and my company, PG&E National Energy Group. We share a commitment to providing clean energy and promoting environmental policies that are sustainable from both environmental and economic perspectives. We believe the best way to accomplish this goal is by working cooperatively with government, industry, consumers, labor, and the environmental community.

First, I want to thank you and the members of the committee for your leadership in tackling a complex but important set of issues. We are fully aware of the very pressing issues facing the country and the Congress at this moment. We want to thank you for taking the time to engage in discussions that can lead to a meaningful consensus on a question of national importance—how best to foster energy security, reliability, and economic growth, while protecting the environment and improving air quality. We believe that the time to begin discussions on these critical issues is now, because our industry is facing a series of regulations that could be more efficiently and economically addressed in an integrated and comprehensive manner. By developing an integrated program to improve air quality and begin to address climate change, CEG believes that not only the environment will benefit, but industry and consumers will, as well. This is because the power sector will be able to plan investments in a way that maximizes efficiencies, minimizes costs, and provides greater benefits for the environment, in which we all live.

Our industry is in the process of a fundamental change: not only regulatory changes impacting the environment, but changes impacting the very manner in which the electricity marketplace functions. CEG supports and embraces the transformation of the electric power industry into a competitive marketplace—one that is not confined by the boundaries of a service territory or a State line. We also recognize that the generation of electricity has a significant impact on the environment (both air quality and climate change)—again, one which is not confined by the boundaries of a service territory or a State line. We agree with those who believe this impact must be reduced if the nation is to achieve its air quality and environmental protection goals. We also share a common concern that the economic benefits of a competitive energy marketplace, and the public health benefits of improved air quality, will not be achieved unless the relationships among national energy policy, air quality and climate change are rationalized.

While CEG has supported several of EPA's past regulatory initiatives, such as the NOx SIP Call, to reduce emissions traditionally associated with the industry, we also share concerns that compliance delays and litigation during a period of such unprecedented change and challenging economic times has contributed to, and continues to contribute to, significant business uncertainty. We also recognize that uncoordinated, regulatory emission reduction programs greatly increase compliance costs and reduce operational flexibility.

The Clean Energy Group believes there is a common sense policy solution—an integrated air quality strategy—to control and reduce emissions of nitrogen oxide (or NOx), sulfur dioxide (or SO_2), as well as, mercury, and carbon dioxide (or CO_2). We believe that a coordinated approach will deliver significant and timely emissions reductions and provide members of our industry regulatory certainty about the amount of and timetable for these reductions, which can be factored into investment decisions and emission control strategies.

Mr. Chairman, we commend you and Senator Lieberman for developing and introducing legislation that addresses air quality and climate change in an integrated manner. Although CEG is in general agreement with the scope of the emissions addressed in S. 556, and the integrated manner in which reduction targets are set, we are not in agreement with the levels of emissions reductions, the timelines for achieving these reductions, and the limits placed on flexibility in meeting the specified targets. Also, we believe that the "birthday" provision is unnecessary and that an integrated air quality program must address some of the current deficiencies in the New Source Review program. CEG has spent considerable time in analyzing how to balance these key provisions so that both environmental and economic results may be optimized. In that regard, we look forward to working with you in the coming months on development of an effective integrated air quality approach.

Toward this end, CEG has developed what it believes is an effective proposal to improve air quality, begin to address climate change and modify the NSR program, and to do so in a way that results in reasonable cost and resource impacts versus a piecemeal approach. The basis of our approach is that it sets defined targets for emissions reductions on a national basis and uses a market-based approach to achieve these reductions. We believe that only a national program implemented under authority of legislation enacted by Congress will provide the scope and compliance certainty necessary to facilitate a fair competitive market, achieve necessary environmental objectives, and provide our industry with the regulatory certainty essential for sound business planning and rational investment decisionmaking.

We in the power sector are trying to plan for promulgated Federal regulations (including Phase II Acid Rain and the NOx SIP Call), current regulatory initiatives authorized under the existing Clean Air Act (including Mercury, $PM_{2.5}$ and Regional Haze regulations), as well as initiatives we predict will occur over the next ten to 15 years (carbon regulations and additional SO_2 and NOx requirements). By coordinating emissions reduction targets, encouraging early reductions, and providing a phased approach to achieving ultimate reduction targets, the Clean Energy Group believes that its proposal will exceed the environmental benefits of individual programs and do so at a lower cost.

The emission reduction targets and timelines set out in our proposal are shown in the attached chart. Essentially, the schedule was established to maximize the co-benefits associated with implementing emission reduction technologies, to provide the industry adequate time to make investment decisions, and to allow time for the commercialization of new technologies. The first level of reductions, starting in 2008, builds off of the existing NOx SIP Call and Acid Rain Program, coincides with the compliance schedule for EPA's mercury regulations, and complements the expected timelines associated with $PM_{2.5}$ and regional haze rules. We believe it is important to (1) build off of existing, proven programs, (2) allow time for current compliance schedules to be fully implemented, and (3) rationalize future emissions reduction programs by coordinating timetables and implementation approaches.

With regard to carbon dioxide, CEG believes that comprehensive legislation must include all four emissions in order to achieve the necessary business certainty for our industry. To this end, CEG advocates a unique approach, one that we believe will lead to reasonable cost and resource impacts, while encouraging renewable development and energy efficiency investments, and maintaining fuel diversity. Our program is based on three underlying principles: (1) timelines for reductions must be reasonable; (2) flexibility is required; and (3) verification of reductions is essential. In short, the program established by the CEG proposal provides for early reduction credits, creates a process for developing verification standards, builds upon EPA's successful Acid Rain Trading Program, encourages investments in renewable development and energy efficiency programs, allows for both on-and off-system reductions, and can be easily adapted to any future multi-sectoral or international program. CEG does not believe it is necessary to wait for an economy-wide greenhouse gas reduction program to be in place for the power sector to take advantage of reductions that can be achieved both within and outside of the power sector now. Instead, we believe it is important for this industry to play a leadership role in spearheading a greenhouse gas reduction program because of our significant contribution to U.S. greenhouse gas emissions, and because of the strategic advantages gained by providing time for a gradual transition to a less carbon-intensive electric generating fleet.

With regard to NSR, the Clean Energy Group proposal does not advocate eliminating the NSR program. As a matter of principle, CEG supports the goals and objectives of NSR. However, CEG believes that the existing NSR program must be changed to ensure that it complements the integrated program by facilitating expedient emissions reductions, promoting clean energy sources, and encouraging efficiency improvements without imposing unnecessary costs and delays.

I stated before that we believe our proposal will impose reasonable cost and resource impacts on the power sector and the economy, as a whole. CEG is currently finalizing an analysis of our proposal using one of the models that EPA employs to assess impacts of various air and climate programs on the industry and the economy. The analysis compares the economic and emissions impacts of our proposal with a business as usual scenario. We believe this analysis differs from the EPA and EIA analyses presented at the previous hearing, in two main ways. First, the CEG analysis employs a business as usual scenario that accounts for both current regulations as well as those authorized under the Clean Air Act for future implementation. And, second, the CEG analysis includes significant flexibility for complying with carbon requirements including the use of offsets generated outside of the power sector. This provides dramatic cost-savings compared to the other analyses that only modeled CO_2 reductions within the power sector.

In terms of impacts on national average residential energy prices, our proposal would result in price increases on the order of 5 percent by 2010 and less than 6 percent by 2015. This translates into an increase of about $5 per month in the average residential customer's bill by 2015. With regard to fuel mix, the CEG proposal would result in a shift of about 5 percent from coal to natural gas use, while the impact on natural gas prices would be an approximate increase of 6 percent over the 2005 to 2015 period. In terms of coal production under both our business as usual and policy cases, Rocky Mountain and Midwestern coals become more economically competitive and gain market share as many coal-fired units install scrubbers to comply with new SO_2 and mercury limits. So, essentially, under the CEG proposal, significant emissions reductions can be achieved in reasonable timeframes and our industry can begin transitioning to less carbon-intensive operations for reasonable cost and infrastructure impacts, beyond what are already expected to occur.

The Clean Energy Group believes that taking a national, coordinated, and comprehensive approach to addressing air quality and climate change now is the most responsible course of action that Congress can take. Again, our industry is facing serious regulatory challenges that will continue over the course of the next decade while, at the same time, additional challenges are being placed on our industry in terms of competitiveness, reliability, and security. And these challenges are not just occurring as a result of Federal activities. In fact, some of the greatest pressures are coming from States, in terms of environmental initiatives and market dynamics.

For example, Massachusetts has already imposed regulations requiring emissions reductions in SO_2, NOx, mercury and CO_2, while Illinois passed legislation setting in place a framework by which to do so; New Hampshire and Michigan also proposed legislation to do the same. Legislation is pending in North Carolina to significantly reduce emissions of SO_2 and NOx, while Connecticut has adopted regulations requiring significant reductions in SO_2 and NOx. New York has draft regulations pending. New Jersey is moving forward with programs related to mercury, while Wisconsin is currently debating rules on mercury reduction. The Texas Natural Resources Commission recently suggested that the State should implement its own multi-emissions approach, which would address CO_2, while Oregon has a CO_2 mitigation fund in place. The point is that States are moving and will continue to move in the direction of requiring additional cuts in emissions from power plants. Although environmental benefits will result from these various State actions, we believe that only a coordinated, national approach will maximize environmental benefits and minimize costs. The worst result for the industry, and the nation, would be to have in place fifty different programs, with fifty different sets of rules, and fifty different trading regimes.

This is particularly true for companies such as PG&E National Energy Group that have operations in multiple States (we currently operate generating assets over a dozen States and will operate assets in approximately a half-dozen more by 2005). In fact, we operate two large coal-fired facilities in Massachusetts. We will be meeting some of the toughest emissions standards in the country for all four emissions (SO_2, NOx, mercury, and CO_2) at these facilities. However, we believe that if a national program were in place, we would have been able to do so more efficiently and cost-effectively.

As we have stated, in order to achieve this sort of efficiency, programs must pay attention to the timing of emissions reductions required as well as the sequencing of these reductions. We have heard discussions about this in past hearings and debates. There is truly a continuum of legislative options with regard to air quality and climate change policies. CEG understands this and has crafted what it believes is a program that carefully weighs and balances economic and environmental impacts. Drilling down too quickly or too far on any one environmental concern, while not addressing another, is not sustainable and inserts extreme uncertainty into our planning and investment processes—that is where we believe we are headed now. At the same time, drilling down too far and too quickly inserts significant uncertainty into the reliability and security of the system. However, there is a happy medium along that continuum where we can achieve both significant air quality and climate change benefits, provide industry with the certainty it requires, and do so at minimal cost and resource impacts. That is why we believe that it is imperative that Congress enact legislation that sets a balanced framework for reducing emissions of SO_2, NOx, mercury and CO_2.

Again, I am honored by the opportunity to make this statement and I would like to thank the committee for moving forward in a thoughtful manner on such an important issue. An integrated and coordinated approach will inject certainty and rationality into business planning and investment decisions and maximize environmental benefits. I look forward to responding to your questions.

Thank you.

CEG Pollutant Caps and Schedule

Pollutant	National Tonnage Cap	Reduction Target	Schedule
NOx	2.11 million tons	Roughly a 50 percent reduction from current commitments (including implementation of the NOx SIP Call in the eastern United States), resulting in an average emission rate of roughly 0.15 lbs/mmBtu.	2008
SO_2	4.5 million tons 3.6 million tons	50 percent reduction beyond Phase II Acid Rain requirements, resulting in an average emission rate of between 0.3 and 0.4 lbs/mmBtu.. 60 percent reduction beyond Phase II Acid Rain requirements, resulting in an average emission rate of between 0.2 and 0.3 lbs/mmBtu.	2008 2012

CEG Pollutant Caps and Schedule—Continued

Pollutant	National Tonnage Cap	Reduction Target	Schedule
Mercury	Roughly 26 tons .... Roughly 5–16 tons	65 percent reduction (from mercury present in as-delivered coal). 79 percent to 93 percent reduction (from mercury present in as-delivered coal).	2008 2012
CO_2		Stabilization at 2000 emission levels (plus specified flexibility mechanisms). Stabilization at 1990 emission levels (plus specified flexibility mechanisms). Stabilization at 1990 emission levels (plus specified flexibility mechanisms/internationally agreed upon flexibility measures).	2008 2012 2015

RESPONSES BY ROBERT LACOUNT TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Please find enclosed a copy of the chart that EPA Assistant Administrator Holmstead brought with him to the committee's hearing on November 1, 2001. It shows the numerous regulations that the power sector will face in coming years. Has the Administration presented any of you with an estimate of the projected costs of industry compliance with those regulations? If so, what was it?

Response. The Administration has not presented my company with information about the costs of complying with the regulations presented in the attached chart.

Question 2. Assuming EPA or industry has or can come up with a reasonably accurate baseline cost of those regulations, wouldn't it be most appropriate to subtract that baseline cost from the EPA analysis (done for the committee) to get an incremental cost estimate for S. 556?

Response. In the absence of multi-pollutant legislation, pollutant-by-pollutant regulation of power plant emissions will continue and will unquestionably become more stringent. It is appropriate to include any cost estimates associated with these "business-as-usual" (BAU) activities in the baseline against which all proposals, including S. 556, are judged. For any baseline estimate of future industry compliance costs, the Clean Energy Group (CEG), of which we are a member, believes it is appropriate to include further reductions in emissions of nitrogen oxide (NOx), sulfur dioxide (SO_2) and mercury beyond levels required under existing regulatory programs. As I mentioned in my testimony before the committee on November 15, CEG is in the final stages of completing an economic analysis of its own multi-pollutant proposal. For its BAU case, CEG chose conservative emission reduction assumptions in the absence of multi-pollutant legislation: for NOx, the requirements of EPA's State Implementation Plan (SIP) Call; for SO_2, a 50 percent reduction beyond Phase II acid rain program levels; and for mercury, a 70 percent reduction.

To provide a better sense of the impact of CEG's multi-pollutant case, CEG also modeled a Minimum Base Case. This case simply evaluated existing regulatory programs including EPA's NOx SIP Call and Phase II of the Acid Rain Program with no reduction requirements for mercury or carbon. CEG's analysis indicates that costs associated with even a conservative BAU case are significant when compared to the cost of existing regulatory programs. In fact, the modeling shows that in a multi-pollutant program that includes maximum trading flexibility for carbon as proposed by CEG, it is the mercury and SO_2 reduction requirements, not CO_2 requirements, that will have the largest impact on the cost of emission reductions. This result further highlights the importance of comparing multi-pollutant proposals against reasonable BAU scenarios so that the true costs of various proposals may be illuminated.

It is also important to note that in a perfect world, analysis of a comprehensive BAU case would not only include imminent Federal programs such as EPA's NOx SIP Call and mercury standards, but it would also assess the variety of State initiatives currently in place or under development. Many of these new State programs, including promulgated regulations in Massachusetts and Connecticut, represent emission reduction requirements that go far beyond what CEG modeled in its BAU case. As the trend for additional State action continues in the absence of multi-pollutant legislation, compliance costs will continue to mount for this patchwork of individual State regulatory programs. Although it may not be practicable to assess the economic impact of these State actions within a BAU baseline, the conservative nature of any BAU case should at least be recognized in their absence.

Question 3. Out of all the emission reduction requirements that Mr. Holmstead identified (the mercury rule, NOx SIP Call, the fine particulates standard, etc.) as probable in the next 2–5 years, which ones do you believe will be implemented, whether or not a multi-pollutant bill is enacted?

Response. Compliance with EPA's NOx SIP Call is currently scheduled for May 2004, with the Ozone Transport Commission's NOx Budget Program requiring May 2003 compliance. The majority of State regulations that are necessary to implement this program are finalized at this time. In addition to the NOx requirements, EPA is also preparing to propose new mercury Maximum Achievable Control Technology (MACT) standards by December 2003. The agency is operating under a court ordered mandate to finalize these regulations by December 2004 with a compliance deadline expected by 2008.

In terms of SO_2, the timelines for future requirements under a multitude of Clean Air Act authorities, including those for fine particulate matter and regional haze, are less clear. What is clear, however, is that many States are no longer willing to wait for further Federal action. For example, PG&E National Energy Group operates two large coal-fired facilities in Massachusetts. We will be meeting some of the toughest emissions standards in the country for all four emissions (SO_2, NOx, mercury, and CO_2) at these facilities. And Massachusetts is not alone, actions have been finalized or are under development in a growing list of States including Connecticut, Illinois, Michigan, Wisconsin, New Hampshire, New York, North Carolina, and Texas.

Even for plants operating in locations that will not be directly impacted by State or Federal actions to further control SO_2 emissions within the next 2 to 5 years, operators will still be forced to plan for future SO_2 requirements as compliance decisions are made concerning other pollutants. With the amount of capital that is required to effectively control any pollutant, a plant operator is forced to consider an overall compliance strategy for multiple pollutants even if only one must be controlled in the short-term. In many cases, such as for SO_2, the horizon for future control requirements is ambiguous at best. In these situations, the plant operator is forced to guess the most likely compliance scenarios so that the most robust capital investment decisions may be made for the plant and the operator's overall portfolio of plants.

This uncertainty even exists where there are regional programs in place or under development to address specific regional air concerns. For example, the Western Regional Air Partnership, a group consisting of nine western States, tribal governments and various Federal agencies, has developed a specific proposal to address the impact of SO_2 emissions on regional haze. Although this program may prove to be an effective tool for addressing this specific environmental concern, generators located throughout the region still have to comply with a series of other regulations including New Source Review, mercury and even possibly NOx requirements to further address regional haze concerns. Again, even for those generators that believe they understand what is required of them for SO_2 in terms of regional haze requirements, their actions to comply with WRAP will be greatly impacted by other regulations. By continuing to apply additional programs in a piecemeal approach, operators will continue to be faced with significant ambiguity in terms of how to invest in existing generation as well as in new generation, particularly coal-fired facilities.

Question 4. Could you tell us approximately how efficient are your current fleet of plants, by fuel type? How has that changed over the last 15 to 20 years?

Response. While PG&E National Energy Group is a member of the Clean Energy Group, with regard to fleet and specific plant information, I have access to only data on our company. PG&E NEG, with assets in every region of the country, has ownership and management interests in a generation portfolio of over 7,500 MW in operation, and over 10,000 MW in either construction or advanced development. Our generating fleet includes coal-fired facilities, developed both prior to and after enactment of New Source Performance Standards (NSPS), natural gas-fired facilities, waste coal facilities, as well as wind, hydroelectric, and pumped storage. With the exception of our Brayton Point Generating Station (on-line date 1974), Salem Harbor Generating Station (on-line date 1952) and our hydroelectric and pumped storage facilities, the rest of our operating assets have either come on-line or been repowered since 1990.

Specific information regarding heat rates by facility is considered proprietary information by PG&E National Energy Group. However, in general terms, new natural gas-fired combined-cycle facilities represent the most fuel-efficient fossil fuel-fired plants in the country. In terms of coal-fired facilities, plants that are fully controlled with state-of-the-art emission control technologies tend to be less efficient than comparable plants that are not operating similar controls. This characteristic exists because the emission control technologies require a significant amount of energy to operate and therefore, reduce the net amount of electricity that a plant may send to the transmission grid for sale. As a plant's efficiency goes down, the amount of carbon dioxide (CO_2) emissions per megawatt of electricity generated goes up. This is an important reason why CO_2 emissions should be addressed through comprehensive legislation at the same time other emissions are addressed. By applying a cost to CO_2 emissions through a market-based program and by revising the New Source Review requirements to promote efficiency improvements, comprehensive air legislation will enable plant operators to develop balanced compliance strategies for all four emissions.

In terms of environmental performance, the record at PG&E NEG's facilities has been, and will continue to be, notable. For example, PG&E NEG was the first company in the country to install SCR on a natural gas plant and on a coal-fired plant, and also the first to install SNCR on a coal-fired plant. Currently, our hydroelectric facilities located in Vermont have received the Governor's Award for Environmental Excellence in Pollution Prevention. Our hydro generating facilities on both the Connecticut and Deerfield Rivers are also charter members in EPA's National Environmental Achievement Track Award Program, and are the only hydroelectric facilities in the United States so designated. Our coal-fired facilities in New Jersey and waste coal-fired facilities in Pennsylvania have been recognized by their respective State agencies for their environmental performance over the years. Examples of awards these facilities have received include two State of New Jersey Silver Track I Awards from the Department of Environmental Protection, an Excellence in Reclamation Award for the Department of Interior (for our waste-coal facilities), and Pennsylvania's Governor's Award for Environmental Excellence.

Question 5. Based on the EPA analysis from last week, it seems that company revenues could rise significantly under a 4-p future. For example, EPA said that the standard technology scenario with the 4-pollutant bill (Scenario A) would show electricity revenues of $84.5 billion more than the reference case with no new controls. But, the incremental cost of the 4-p controls would only be $16.5 billion. That seems to leave a profit of $68 billion for the industry. Do you have any comments on those numbers? These numbers are based on the enclosed chart prepared by the National Wildlife Federation.

Response. In general, I do agree that under certain scenarios, asset values and company revenues could rise for many companies. But the ratio of revenues to costs will not always resemble these numbers under a multi-pollutant scenario. The amount by which asset values and revenues will change depends on how the program is implemented, including the timelines and emissions reduction targets selected, the allocation method used to provide allowances to sources, and the flexibility provided the industry in meeting specified emission reduction targets.

Question 6. Could you elaborate on your remarks regarding New Source Review?

Response. First, I would like to reiterate hat the Clean Energy Group proposal does not eliminate the New Source Review (NSR) Program. As a matter of principle, the Clean Energy Group supports the goals and objectives of NSR. However, CEG believes that the existing NSR program must be changed to ensure that it complements the integrated program we recommend by facilitating expedient emissions reductions, promoting clean energy sources, and encouraging efficiency improvements without imposing unnecessary costs and delays.

Under the Clean Energy Group proposal, Section 165 of the Clean Air Act would be amended such that the New Source Review (NSR) and Prevention of Significant Deterioration (PSD) applicability criteria for affected units and the requirements for new units are revised. The proposed changes to NSR, coupled with the emission reduction targets proposed, would benefit both new and existing plants without negatively impacting the environment. The NSR process is altered and streamlined and would expedite capital additions to existing facilities and the development of new generation.

Physical changes or changes in the method of operation at existing units will not be subject to NSR/PSD review if the project is not a "reconstruction" under EPA regulations and does not result in an increase of the unit's emission rate on a pound/megawatt hour basis. By using a unit's emission rate in terms of emissions per power output as a metric for NSR applicability, operators will have greater flexibility for improving energy efficiency at their plants, while still being subject to the overall emissions caps established under the legislation. Furthermore, projects, both large and small, that increase a unit's emission rate will be subject to the NSR rules as they exist today.

The NSR regulations shall continue to apply to new units. New sources will be subject to existing state-of-the-art control technology requirements and will also be subject to the existing siting and impact analyses currently conducted prior to approving a new plant. The technology requirements will be revised, however, so that the definition of Lowest Achievable Emission Rate (LAER) technology includes limited economic considerations as well as the existing technical feasibility criteria. This change in definition will avoid situations in which costly incremental investments are required in control technologies with minimal improvements in emissions control performance.

The NSR regulations will also be revised so that new sources will not be required to obtain emission offsets. By maintaining the existing siting and impact analyses coupled with the national tonnage caps on SO_2, NOx, mercury, and CO_2, the burdensome offset requirements may be eliminated without adversely impacting air quality. By eliminating the offset requirement while maintaining the other NSR safeguards, clean new sources will be positioned to provide ever-increasing competition against more polluting generating sources.

Question 7. Mr. Anderson of DTE mentioned the need for mandatory reporting of greenhouse gas emissions. I'm working on legislation with Senator Corzine and other members of the committee to establish such an inventory registry. Do you have a view on how that should be structured?

Response. At a national level, a greenhouse gas registry provides value if it assures consistency across jurisdictions in the methodology and format in which greenhouse gas emissions (both historic and future) are reported. A properly designed registry should also provide a mechanism that allows project-based reductions from any sector to be measured, verified and reported in a consistent and transparent manner.

Question 8. Given the enormous market changes in the power generation business, it seems that certainty in terms of environmental regulations is very important. How important is certainty, and what kind of savings can your businesses gain from it?

Response. Understanding what is going to be expected of a business in terms of capital expenditures is very critical to our industry. The power generation sector is in the midst of transition from a regulated to a competitive marketplace. According to the Electric Power Supply Association, for example, in 1997, competitive power suppliers accounted for only about 8.5 percent of the nation's installed generating capacity, but as of the end of 2001, their share is likely to be about 36 percent. This percentage will only increase.

The implications of this shift from regulated to competitive power supplies from a regulatory certainty aspect are enormous. Competitive power suppliers must make long-term investments (anywhere from 15 to 25 years) and rely on the market to recoup these investments, not captive ratepayers. Therefore, competitive power suppliers base investment decisions on the best available information in terms of current and future regulations and market dynamics. To mitigate risks, competitive power suppliers will undertake a number of activities, including selecting technologies that are proven and positioned to respond to potential changes in, for example, environmental regulations. It is not by accident that of the 68 GW that will be added to the system, 61 GW are natural gas-fired. The uncertainty of future regulations with regard to SO_2, NOx, mercury and CO_2 requirements are factored into technology selection, just as are future power and fuel prices.

In terms of the exact savings, the Clean Energy Group has not modeled what it would cost the industry to move forward with a program that sets national standards for three pollutants now and then sets standards for carbon at a later date. However, the EPA apparently conducted that analysis as part of a larger assessment of multi-pollutant strategies that it performed within the last 2 years. In January 2001, EPA presented findings of this analysis at the Electric Utility Environmental Conference in Tucson, Arizona. EPA indicated that the cost savings from implementing a comprehensive strategy versus implementing comparable requirements in a piecemeal fashion would be on the order of 30 percent per year.

Question 9. Have you seen the EPA straw proposal that was circulating early this year? If you have, what comments did you provide any Federal agency regarding it?

Response. EPA did not provide my company with a copy of its straw proposal, therefore we did not provide any Federal agency with comments.

STATEMENT OF JEFFREY C. SMITH, INSTITUTE OF CLEAN AIR COMPANIES

Good morning, Mr. Chairman. I am Jeff Smith, Executive Director, Institute of Clean Air Companies ("ICAC" or "the Institute"). The Institute is the nonprofit, national association of companies that supply air pollution control and monitoring technology for all types of stationary sources, including coal-fired power plants that are the subject of this hearing. Members supply the complete spectrum of competing control technologies for emissions of mercury, sulfur dioxide (SO_2) and nitrogen oxide (NOx), along with all other criteria pollutants and the 189 hazardous air pollutants identified to-date. Thus the Institute speaks for the entire industry, not just one technology. We do not, however, supply technology for CO_2 control and I will therefore not address CO_2. For more on the Institute, see www.icac.com. I have submitted detailed testimony for the record, but in the few minutes I have here this morning, I will begin with the "bottom-line."

I. Summary

The air pollution control technology industry has the technology to achieve the NOx, SO_2, and mercury reductions contemplated by Sen. Jeffords' bill (S. 556), and the resources to deliver that technology within the timeframes the bill contemplates. Of course there will be site-specific issues, but in the 31-year history of the Clean Air Act the air pollution control technology industry has always delivered on the charge this committee has given it. There is no reason to believe this time will be any different. A multi-pollutant approach makes sense both technically and cost-wise. And experience strongly suggests that a multi-pollutant bill will be the committee's one chance to achieve the twin goals of an adequate energy supply and clean air. Here is why we feel this way.

II. Discussion

Well-Demonstrated, Conventional Control Technologies Exist to Reduce SO_2, NOx, and $PM_{2.5}$ Emissions.—There is no real debate that reliable, demonstrated-in-practice control technology exists for coal-fired power plants to remove 95 percent of sulfur dioxide (SO_2) emissions, 99.9 percent of particulate matter (PM) emissions, and 90+ percent of nitrogen oxide emissions (NOx). Members of our industry are guaranteeing these removal levels today. The harder question is what can be done to control mercury emissions, and I will focus my testimony on that question.

Air Pollution Control Technology Markets Have Worked Well.—The 31-year history under the Clean Air Act shows that clear, enforceable standards yield cost-effective compliance options. Study after study shows a strong link between establishment of regulatory drivers and technical performance and cost improvement. This is true even when control options have been limited or untested at the time the rules were introduced. The advanced state of technologies for controls of sulfur dioxide (SO_2) and nitrogen oxide (NOx) emission was reached after (not before) regulatory drivers were adopted. Total costs (capital and O&M) fall dramatically as control technology moves from research and development to full-scale commercialization. In the case of selective catalytic reduction—widely used to remove NOx emissions from coal-fired boilers—the costs in $/ton removed fell 80–90 percent from 1989 to 1998. See, e.g., Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers, Northeast States for Coordinated Air Use Management, Boston, September 2000.

Technology users (e.g., electric utility industry) and suppliers have proven to be more innovative than one may expect at the outset of a regulatory program. Electric utility users are outstanding in their ability to use control technology effectively. The air pollution control technology industry, like nature herself, is extremely competitive, "red in tooth and claw." This is good for technology users and government regulators, because it yields increasingly cost-effective solutions; if your competitor discovers a way to reduce emissions more cost-effectively, you will be out of business quickly if you do not improve as well. And many have exited our industry for that reason.

The key to well-functioning markets is regulatory certainty. If the goal is technological innovation, then issue a clear, certain, performance-based mandate

Dollars spent on compliance with clean air mandates, such as S. 556, are not lost down a black hole, either. They are recycled in the economy, generating jobs in construction and materials fabrication, in addition to jobs in air pollution control technology companies. Indeed, compliance with the NOx SIP Call alone is creating 25,392 person-years of employment a year during 1999–2005, less than 10 percent of which is in the air pollution control technology industry. (Appendix III).

Although we do not have expertise in macroeconomic models, we note that just last month the utility industry's own North American Electric Reliability Council

(NERC) reported that generating capacity margins in the United States will increase markedly over the next 5 years, peaking at more than 20 percent in 2004. NERC says 138,000 MW of the 245,000 MW of proposed new merchant generation will come on-line by 2005, far outstripping a projected 63,800 MW increase in electricity demand. (For more details, go to www.nerc.com). Whatever the relevance of the NERC report, however, we believe as discussed below that control technology exists to allow this nation to continue to burn coal and cost-effectively achieve the NOx, SO_2, and mercury emission reduction goals of S. 556.

Development of Mercury Removal Technologies Will Be No Different.—It is reasonable to assume that the traditional, successful workings of the air pollution control market will apply to the development and enhancement of mercury emission controls. The technology supplier industry is more competitive that ever. Utilities are increasingly sophisticated as customers of technology, and more demanding of cost-effectiveness in a deregulated environment. The development focus for mercury controls is in many areas on optimizing controls already demonstrated for other pollutants (e.g., SO_2, PM, NOx), so the learning curve is not as steep. Financial incentives for our industry are sufficient to invest in research and development, particularly once a clear, certain regulatory goal is set. Even in the absence of a legislative directive, there are a large number of mercury control demonstrations underway along with significant investment by both technology suppliers and end-users (Appendix II). Indeed, we have already seen cost estimates of mercury-and multi-pollutant control by the U.S. Environmental Protection Agency (EPA) and others fall dramatically.

A Multi-Pollutant, Performance-Based Approach Is Sensible from a Technology-Development Standpoint.—The Institute applauds and confirms S. 556's approach. It allows both utilities and technology suppliers like ourselves to develop integrated compliance plans and maximizes incentives for innovation and competition.

ICAC also supports performance-based approaches, which harness market mechanisms. As Sen. Smith noted at the committee's recent hearing on November 1st, original estimates of the cost of removing SO_2 in the acid rain program were $7 billion, but the actual cost was about $1 billion. This is a dramatic example of the market's power, as well as the positive effects of regulatory certainty on cost and performance improvements of air pollution control technology.

A Multi-Pollutant, Performance-Based Approach Is Sensible from Policy and Cost-Effectiveness Standpoints Too.—This multi-pollutant approach has the potential to lead to simultaneous compliance with numerous regulatory programs, including acid rain, ozone attainment (both the 1-hour and 8-hour), regional haze, and fine particulate ($PM_{2.5}$). We feel insufficient attention has been given to the benefits of $PM_{2.5}$ reductions that S. 556 would achieve by lowering SO_2 and NOx levels (which contribute to $PM_{2.5}$ formation in the atmosphere). Indeed, by default $PM_{2.5}$ is the fifth pollutant controlled in this bill.

The effect of this multi-pollutant approach is to lower the evaluated cost for each individual pollutant that may otherwise be addressed in a separate regulatory program. For example, if a scrubber is installed to control acid rain and $PM_{2.5}$, but it reduces mercury emissions as well, only a portion of its cost should be attributed to compliance with the mercury reduction requirements. Cost estimates for mercury controls should therefore be scrutinized carefully for how they allocate technology costs among various regulatory elements of a multi-pollutant bill.

Conventional Emissions Controls Are Removing Mercury Without Even Trying.—As EPA's data shows (see Appendix I), existing controls are already removing mercury, and in some cases large amounts of mercury, as a side-benefit of the removal of other pollutants. For example, controls to remove SO_2 may significantly reduce mercury and $PM_{2.5}$ (precursor) emissions as well. Mercury removal efficiencies depend on numerous factors. Among the biggest is whether the coal burned is bituminous or sub-bituminous.

Control Technology Demonstrated Today Can Achieve Mercury Removal of 90 percent on Bituminous Coals, and 70 percent on Sub-Bituminous Coals.—Of course there may be site-specific issues, but in general the industry believes technology available today can achieve total mercury reductions of 90 percent on bituminous coals, and 70 percent on sub-bituminous coals. This conclusion is supported by measurement programs the electric utility industry conducted for EPA (Appendix I). What is the most cost-effective approach will differ for site-specific reasons, such as the type of control equipment currently being used.

Research on mercury control technology has been underway in the United States for a decade, and the enactment of a multi-pollutant bill will, as discussed above, stimulate more R&D and results. Appendix II is a partial list of on-going R&D projects. They are in general designed for 50–70 percent mercury removal by 2005, and 90 percent removal by 2010, with the additional objective of cutting costs by

50–75 percent by 2010. The important point here is that the R&D is maturing to the point of full-scale demonstrations today and covers a wide range of coal types and existing equipment configurations. Note that many of these project teams include utility end-users as well as technology developers, which indicates the wide-ranging, cooperative effort underway. By the required compliance deadline, therefore, we believe this R&D, along with already-demonstrated technology, will yield a variety of increasingly cost-effective options for achieving the NOx, SO_2 and mercury removal requirements of S. 556.

(A question for the committee, however, is whether it makes sense to base the level of required control on what can be guaranteed today, or rather what history and other factors show will likely be available in seven or ten or 12 years when compliance is required. This is particularly appropriate since as discussed below it is not likely that this program will be amended mid-stream, and indeed the premise of certainty in this multi-pollutant approach is that the rule will not be amended. An answer is suggested by hockey great Wayne Gretsky, who said a reason for his success was that he skated to where the puck was going to be, not to where it was.)

The committee does not have to pick technology winners and losers; the marketplace is adept at doing so. The course of technology development is too unpredictable to say what the best approach will be in 7 or 10 or 12 years for each unique application. Industry experience strongly indicates that there will not be one universal approach. We suggest you must simply have a reasonable assurance that technology markets are working and that you have provided an incentive for development. As I have said, these markets will continue to work well, and S. 556 provides the requisite incentives for technology development by providing clear goals without specifying the precise compliance technology.

This Is Likely the Committee's One Chance to Assure Twin Objectives of Adequate Energy Supply and Clean Air.—For now and the near future, an adequate energy supply arguably depends on burning coal. Coal-burning electric utilities are the largest industrial source of air pollution, with adverse health effects well-documented by scientific and medical authorities. Fortunately, air pollution control technology, if required, can allow coal to be consistent with human health and environmental imperatives. This, it should be noted, is likely the committee's one chance to assure these goals are met. The history of the Clean Air Act shows that it is not easily amended, and indeed the premise of certainty in this multi-pollutant approach is that the law will in fact not be amended mid-stream.

III. Conclusion

The multi-pollutant, performance-based approach reflected in the Jeffords bill (S. 556) makes sense from a technical and cost viewpoint. The required reductions for NOx, SO_2, and mercury are achievable assuming, in the case of sub-bituminous coals, continued technological progress with control technology, which is a reasonable assumption. Control technology markets have worked well and will continue to do so, yielding progressively more cost-effective compliance solutions. Therefore, the issue of control technology should not determine whether the NOx, SO_2, and mercury removal requirements in this bill, or a similar one, are enacted. History under the Clean Air Act suggests strongly that consideration of a multi-pollutant bill is likely to be the committee's one chance to assure our Nation's twin goals of adequate energy and clean air over the foreseeable future.

Thank you for this opportunity to testify. I look forward to your questions.

APPENDIX I

The Mercury Reductions Conventional Controls Can Achieve on Coal-Fired Power Plants (Without Even Trying) (average mercury control, percentage)

Technology*	Bituminous Coal	Sub-bituminous Coal
CS-ESP	29 (18)	3 (9)
HS-ESP	11 (9)	0 (12)
1FF	89 (6)	73 (6)
SDA+ESP	45 (3)	0 (9)
SDA+FF	93+ (9)	23 (9)
CS-ESP+Wet FGD	78 (6)	16 (9)
HS-ESP+Wet FGD	39 (9)	8 (9)
FF+Wet FGD	97 (6)	——

*CS-ESP=cold-side ESP; HS-ESP=hot-side ESP; SDA=dry scrubber; FGD=wet scrubber
Source: USEPA, ICR Control Data Summary, 4/24/01,

www.epa.gov/ttn/atw/combust/utiltox/utoxpg.html. Parenthetical number denotes number of tests. I Technology* Bituminous

HS-APPENDIX II

Research on Mercury Emissions Control Technology

A great deal of research is currently underway regarding the capabilities of technology to remove mercury from coal-fired power plants. Much of this R&D focuses on enhancements of conventional technology, that is, technology that would be used anyway to remove SO_2, NOx, and/or $PM_{2.5}$ to achieve compliance with programs such as acid rain, regional haze, and attainment of the one-and 8-hour ozone and fine particulate ($PM_{2.5}$) ambient standards. For example, R& D is underway to assess the ability of the most widely used high efficiency NOx control technology, selective catalytic reduction (SCR), to oxidize mercury so that it can be removed by other control technology that might already be in-place or installed for other purposes. Other private R&D will demonstrate (full-scale) the conversion of a technology that has been successfully applied to control mercury emissions at waste combustors to coal-fired power plants.

Since, however, private research is to some extent just that, i.e., private, for competitive reasons, we have supplied the following non-exclusive list of ongoing public research projects funded by the U.S. Department of Energy. These projects are nearly all in advanced development stages. They are in general designed for 50–70 percent mercury removal by 2005, and 90 percent removal by 2010, with the additional objective of cutting costs by 50–75 percent by 2010. Many of these technologies would tie-in mercury controls with processes that reduce other air pollutants such as SO_2 and NOx. This partial list illustrates the wide-range of on-going research based only on an expectation of a legislative directive. Note that many of these project teams include utility end-users as well as technology developers, which indicates the market forces driving development. (For more information, go to the press releases dated June 18, 2001 and October 16, 2001, at www.fe.doe.gov/).

McDermott Technology, Alliance, Ohio

Project Summary: The goal is to commercialize a method for enhanced control of mercury emissions from Michigan South Central Power Agency's 55 MW Endicott Station and Cinergy's 1,300 MW Zimmer Station (OH) equipped with wet FGD systems. The two specific objectives are demonstration of 90 percent total mercury removal (stack emission versus mercury in the coal burned) and annual levelized costs 50–75 percent less than commercial available, activated carbon mercury removal technologies.

ADA-Environmental Solutions, Littleton, CO

Project Summary: This project involves testing on a plant owned by Alabama, a plant owned by Wisconsin Electric power company, and two PG&E sites. The company's technology requires minimal equipment and minimal downtime for installation. Flue gas is injected with a sorbent of activated carbon which combines with the mercury so that it can be removed with a filter.

The Energy & Environmental Research Center at the University of North Dakota, Grand Forks, ND

Project Summary: The Energy & Environmental Research Center at the University of North Dakota, Grand Forks, ND, will develop an advanced hybrid particulate collector (AHPC) that promises to remove 90 percent of all mercury emissions at a price lower than today's estimates. The AHPC combines the best features of electrostatic precipitators and baghouses in a configuration that boosts efficiency between particulate collection and dust disposal. By doing so, the problem ESPs generally have in collecting excessive fine particulates is solved as is re-collecting dust in conventional baghouses. The system is to be bench-scale batch tested so that new work is tied to earlier results; the AHPC would also undergo larger, pilot-scale testing on a coal-fired combustor. The technology could be retrofitted to ESP-equipped plants, installed in a new plant or applied to industrial boilers requiring mercury control. Partners are W.L. Gore & Associates, Elkton, MD, and the Otter Tail Power Company, Fergus Falls, MN, which will host field tests.

URS Group, Inc., Austin, TX

Project Summary: URS Group, Inc., Austin, TX, will pilot test mercury-oxidation catalysts already identified as being effective through earlier, smaller-scale research funded by DOE. The project's pilot tests, conducted at plants using wet flue gas desulfurization systems and particulate collection systems, are on a larger scale and will be conducted for longer periods to provide data for future, full-scale designs. Mercury-oxidation potential will be measured continually to provide longer-term catalyst life data. The project is applicable to about 90,000 megawatts of generation capacity. Project partners are the Electric Power Research Institute, Palo Alto, CA, which will co-manage and co-fund the pilot tests, and two utilities.

CONSOL, Inc., Library, PA

Project Summary: CONSOL, Inc., Library, PA, will construct a pilot-plant facility producing flue gas from a coal-fired utility to test technologies that remove not only mercury, but will reduce nitrogen, sulfur and carbon dioxide emissions as well. The facility will be composed of an air preheater, an electrostatic precipitator (ESP) to collect fine particulates, and an alkaline-sorbent injection system to control sulfur condensation. An alkaline additive is injected into the air heater, which will operate at 200–250° F, to neutralize the sulfur. Mercury will be collected with the fly ash in the ESP. The work addresses several utility issues: mercury removal at lower-than-normal temperatures, using spray cooling to lower temperatures, and the additive's effects on specific plant components performance.

Southern Research Institute, Birmingham, AL

Project Summary: Southern Research Institute will test the effectiveness of calcium-based sorbents and oxidizing agents in controlling mercury from coal plants by using a technique that combines mercury oxidation with adsorption. Incorporating mercury oxidation along with lime and silica lime additives produces more efficient sorbents that remove sulfur dioxide in addition to mercury. Pilot-scale studies will be performed on a coal-combustion system using a recirculating fluidized bed for multi-pollutant control. Lime and silica lime sorbents will be tested because they are chemically similar to wastes produced by dry scrubbers. Using calcium-based sorbents could lower mercury removal costs by almost 50 percent from current estimates. Project partners are ARCADIS Geraghty & Miller Inc., Denver, CO; Southern Company Services, Birmingham, AL; and the Tennessee Valley Authority, Knoxville, TN.

Powerspan Corp., Durham, NH

Project Summary: Powerspan Corp. will pilot test a multi-pollutant technology that converts mercury into mercuric oxide, nitrogen oxide to nitric acid and sulfur dioxide to sulfuric acid from coal-fired flue gas streams with gas flow rates up to 4,000 cubic feet/minute. Fine particulates will also be collected. Mercury capture is to exceed 90 percent, and an understanding of what influences mercury removal is to be investigated. The project will be conducted at FirstEnergy Corporation's R.E. Burger Generation Station in Akron, OH.

Apogee Scientific Inc., Englewood, CO

Project Summary: Apogee Scientific Inc. will assess up to a dozen carbon-based and other sorbents that are expected to remove more than 90 percent of mercury and cost 40 to 75 percent less than commercial sorbents because they feature inexpensive precursors and simple activation steps. Six to 12 sorbents will undergo fixed-bed adsorption tests with the most promising three to six being further evaluated by injecting them into a pilot-scale electrostatic precipitator and baghouse. Commercial flue gas desulfurization activated carbon will provide the baseline for comparisons. A portable pilot system will be constructed and would accommodate a slipstream ESP or baghouse at minimal cost. Tests will be conducted at Wisconsin Electric's Valley power plant in Milwaukee, WI, and Midwest Generation's Powerton Station in Pekin, IL. The project team consists of URS Radian, Austin, TX; the Electric Power Research Institute, Palo Alto, CA; the Illinois State Geological Survey, Champaign, IL; ADA Environmental Solutions, Littleton, CO; and Physical Sciences Inc., Andover, MA.

CONSOL Energy Inc, South Park, PA

Project Summary: CONSOL will demonstrate a multi-pollutant system to reduce NOx, SO_2, mercury, acidic gases, and fine particles from smaller coal plants for less money than it costs to control NOx and SO_2 separately. Among the innovations CONSOL plans to install at the AES Greenridge Power Plant near Dresden, NY, is a catalytic NOx reduction technology that works inside the plants ductwork, a low-NOx combustion technology that burns coal mixed with biomass, and a flue gas scrubber that is less complex and half the cost of conventional systems.

The Energy and Environmental Research Center at the University of North Dakota, Grand Forks, ND

Project Summary: The project addresses the impact that SCR, SNCR, or flue gas conditioning systems have on total mercury emission and on the speciation of mercury. The completion date for the final report is June 30, 2002.

APPENDIX III

A. Employment Created by NOx SIP Call Controls Alone

Category	Person-Years ('99–05)	Average No. of Jobs per Year
Direct Labor		
System Design, Manufacture, Supply	16,495	2,356
Construction/Installation	16,915	2,416
Component/Auxiliary	8,750	1,250
Other Technology-specific—Raw Materials, Outside A/E and Consulting Firms, Testing (Performance, Startup)	3,090	442
Other Direct—Additional Utility Support Staff, R&D, Sales Reps, Consults./Services	14,000	2,000
Subtotal Direct Labor	59,250	8,464
Indirect Labor	118,500 ***16,928***	
Total SIP Call NOx-related Labor	177,750	25,392

Assumptions / Comments

• This table shows employment created directly from the NOx SIP-call and Section 126 Petitions over the 7-year period 1999–2005. It does not include effects from other market influences such as new gas turbine/combined cycle plants, new coal-fired units, refinery/process heaters, industrial boilers, IC engines, and other industrial sources (e.g., cement, steel), which would substantially increase the labor figures given. Also not included are effects from other regulatory drivers such as ozone attainment controls outside the SIP Call region (e.g., California, Texas), new source review, regional haze, and multi-pollutant.

• The figures are based on assumptions and analysis from a March 1994 study prepared by H&W Management Science Consultants (co-sponsored by ICAC) for the U.S. EPA entitled, "Employment Created by NOx Control and Continuous Emission Monitoring Requirements of Title IV of 1990 Clean Act Amendments." This study developed labor factors associated with specific NOx-control technologies in terms of labor hours per kW based on in-depth interviews with air pollution control industry stakeholders. These factors were applied to projections of affected megawatts.

• The above table assumes that the SIP Call will generate 110 GW of SCR, 24 GW of SNCR/Reburn, and 34 GW of low NOx burner (LNB) and other activity from 1999–2005. These assumptions are consistent with ICAC and H&W's "Air Pollution Control Equipment Market Forecasts," Issue No. 20, September 2001. After applying the labor factors, in terms of labor hours, SCR, SNCR, and LNB account for 84 percent, 6 percent, and 10 percent respectively.

• This analysis assumes 2,080 person-hours in a year. It further assumes the technology costs from the March 1994 study, i.e., $60/kW for SCR, $20/kW for SNCR/Reburn, and $20/kW for LNB/Other combustion modifications. Higher (lower) costs will inflate (deflate) employment figures proportionately.

• Economists frequently multiply the number of direct person-hours by two, and sometimes three, to estimate indirect employment. The purchase power associated with goods and services provided by direct labor is called "the multiplier effect." To be conservative, we applied a ratio of two indirect jobs for each direct job in this analysis.

B. Employment in the Air Pollution Control Technology Industry

Dollars spent on compliance are recycled in the economy, generating jobs in construction and materials fabrication, in addition to jobs in air pollution control technology companies. According to the U.S. Department of Commerce, in 1997 air pollution control equipment firms employed over 111,000 men and women, with companies and jobs arrayed throughout the United States, as shown in Table 1.

Table 1. Employment in the Air Pollution Control Equipment Sector (1997)* (States Represented by committee members, Total)

State	Number of Jobs	Revenues (millions of dollars)
California	13,107	1,848.1
Colorado	993	139.9

Table 1. Employment in the Air Pollution Control Equipment Sector (1997)* (States Represented by committee members, Total)—Continued

State	Number of Jobs	Revenues (millions of dollars)
Connecticut	1,681	237.0
Delaware	707	99.6
Florida	3,235	456.1
Idaho	235	33.2
Missouri	2,862	403.5
Montana	225	31.7
Nevada	218	30.7
New Hampshire	334	47.1
New Jersey	6,736	949.7
New York	7,204	1,015.8
Ohio	6,569	926.2
Oklahoma	2,235	315.1
Oregon	1,025	144.4
Pennsylvania	9,841	1,387.5
Rhode Island	259	36.4
Vermont	140	19.7
Virginia	2,012	283.7
TOTAL	111,560	15,730

*All figures taken from U.S. Department of Commerce, International Trade Administration, Environmental Technologies Exports, Environmental Industry of the United States, January 1999, Washington, DC.

RESPONSES OF JEFFREY C. SMITH TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Out of all the emission reduction requirements that Mr. Holmstead identified (the mercury rule, the NOx SIP Call, the fine particulate standard, etc.) as probable in the next 2–5 years, which ones do you believe will be implemented, whether or not a multi-pollutant bill is enacted?

Response. As Yogi Berra reportedly said, “Predictions are tough, especially about the future.” The answer to your question depends on assumptions about the future actions of the Bush (and subsequent) Administrations. But for the reasons stated below, it seems clear that numerous regulatory actions will be implemented in the near future whether or not a multi-pollutant bill is enacted.

The NOx SIP Call will be implemented. Legal challenges to this action have been exhausted, and back-up regulatory drivers (the so-called section 126 petitions) are available if for some reason enforcement of the NOx SIP Call lags. In addition, a lot compliance has already occurred, and planning for compliance is far along everywhere. All this provides substantial momentum. Finally, atmospheric modeling continues to show that full implementation of the NOx SIP Call is necessary to achieve attainment of the 1-hour ozone national ambient air quality standard in the eastern half of the United States.

NOx reductions outside the NOx SIP Call region will be implemented. The reason for the NOx SIP Call is that NOx is a precursor of ozone, and NOx is also transported across State lines interfering with the ability of downwind States to attain the 1-hour standard. Beyond the NOx SIP Call region, many States (e.g., Texas, California) are requiring significant reductions of NOx emissions from electric utilities. These NOx reductions outside the SIP Call region are certain to continue. In addition, EPA plans to re-propose NOx rules next month for two States (Georgia and Missouri) whose original NOx limits were invalidated by the U.S. Court of Appeals for the District of Columbia Circuit in the judicial challenge to NOx SIP Call. This proposal will lead to compliance within the next 5 years.

The fine particulate standard (the so-called $PM_{2.5}$ standard) will be implemented. These 1997 standards have withstood judicial review through the U.S. Supreme Court. Epidemiological studies since 1997 have confirmed the health reasons to regulate these pollutants. EPA several years ago deployed a fleet of monitors (we think the total number was 1,500) around the country to gather 3 years of data. In the face of this data, it seems unlikely that any Administration would not implement the $PM_{2.5}$ standards. In order to achieve compliance with a $PM_{2.5}$ standard, States would need to further reduce emissions of SO_2 and NOx, as well as primary particles. S. 556 would go a long way to achieving these needed reductions. This is why in my testimony I called $PM_{2.5}$ "by default the fifth pollutant controlled in this bill [S. 556]." The principle issue remaining is timing, and here we are less comfortable predicting the Administration's actions. Efforts to control $PM_{2.5}$ and its precursors seem certain; whether controls are implemented in the next 2–5 years is less certain.

The 8-hour ozone standard will be implemented. EPA re-proposed these 1997 standards several weeks ago in response to a partial remand by the U.S. Court of Appeals for the District of Columbia Circuit. Fundamentally, these rules have been upheld by the U.S. Supreme Court. As with the $PM_{2.5}$ standards, it seems clear that the 8-hour ozone standards will be implemented, although how much progress will be made over the next 2–5 years is difficult to say. EPA's current schedule is to propose the new 8-your rules by mid–2002, finalize them by mid–2003, call for attainment/nonattainment designations by mid–2004, and call for attainment 3–10 years after designation(depending on the severity of the nonattainment), i.e., by 2007–2014. To attain these standards, considered somewhat more restrictive than the 1-hour ozone standard, States are likely to among other things require NOx reductions from electric utilities.

EPA is required to reduce emissions of mercury from power plants by 2007 under section 112 of the Clean Air Act. EPA is currently developing rules to require power plants to reduce mercury emissions. There is a work group of the Clean Air Act Advisory Committee that is assisting the agency (ICAC is a member of this work group). The next work group meeting is December 18, 2001. At present, it is unclear what mercury reduction requirements EPA will propose, and exhaustive litigation is expected. Nevertheless, the Clean Air Act is clear that these rules must be promulgated. Moreover, as discussed below, several States are developing their own mercury reduction requirements for the electric utility industry. Although it is unclear which if any of these State approaches will be implemented over the next 2–5 years, it seems certain that public and State interest in cutting mercury emissions will remain due to the high number of lakes across the country that are subject to fish consumption advisories due to mercury deposition and the highly toxic and well-publicized human health effects of mercury.

Regional haze rules will be implemented beyond the next 2–5 years. Although compliance with the regional haze rules will occur beyond the next 2–5 years, it is worth noting that S. 556 would go a long way toward achieving compliance with the Clean Air Act's goal of preventing and remedying visibility impairment. This is because anthropogenic visibility impairment is caused in large part by fine particles which preferentially scatter light. These fine particles come from emissions of SO_2 and NOx, which would be reduced under S. 556.

State concerns about acid rain and mercury are likely to require further reductions of these pollutants. For example, Massachusetts has imposed SO_2, NOx, mercury and CO_2 emission reduction requirements. Illinois has passed a bill putting in place a framework for multi-pollutant legislation, and New Hampshire and Michigan have proposed multi-pollutant legislation. North Carolina has legislation pending to control SO_2 and NOx, and Connecticut has adopted SO_2 and NOx rules. New York has draft multi-pollutant rules pending. New Jersey and Wisconsin are debating mercury reduction. It is unclear if all these States will require in-state power generators to achieve further emissions reductions over the next 2–5 years, but it seems clear that in the absence of Federal legislation a haphazard hodgepodge of State rules will emerge. This will be especially inefficient for companies that have operations in multiple States. From an air pollution control industry/technology development standpoint, conflicting, sporadic State rules would not provide the certainty that a national rule would provide. And as I stressed in my testimony, certainty is the No. 1 driver of technological innovation in our industry.

In sum, most of the potential emission reduction requirements Mr. Holmstead identified are likely to occur even in the absence of a multi-pollutant bill. But multi-pollutant legislation is a more efficient mechanism for reducing emissions across the board while providing regulated industry the certainty it needs to be productive and comply with environmental objectives. If a multi-pollutant bill is enacted it is likely that other potential emission reduction requirements will largely rely on implementation of the multi-pollutant bill, then fine tune emission reductions to meet localized and regional objectives. Part of that fine-tuning process will likely involve evaluating the need for additional emission reductions and include sources and industries not directly impacted by a multi-pollutant bill.

Question 2. I am glad to hear that you're so optimistic about the technologies that will help achieve the 4-p requirements. Your companies are going to make them possible to implement. How many new jobs do you think will be created in your industry if the Clean Power Act becomes law?

Response. A precise assessment of the jobs that might result from enactment of The Clean Power Act (S. 556) requires an extensive, detailed analysis beyond the scope of ICAC's current resources. Important in such an analysis would be careful attention to the synergistic effects of individual and multiple pollutant control technologies together with simultaneous regulatory program compliance.

We have, however, estimated the jobs that would likely be created by The Clean Power Act. This estimate excludes consideration of the effect of the CO_2 provisions (since as noted in my November 15 testimony we do not provide technology for CO_2 control). Our estimate is based on a variety of assumptions which we have identified; obviously, different assumptions would yield different results. Finally, this estimate is of jobs created, and does not include jobs lost (if any) due, e.g., to higher electricity prices that could result.

As shown in the following table, we predict that S. 556 would create a total of 362,850 1-year jobs, or on average 60,477 1-year jobs per year over the timeframe 2005–2010. This estimate relates to control of SO_2, NOx, and mercury (Hg). CO_2 effects were not included; considerably more jobs would likely result from capital and labor-intensive CO_2 control approaches. Reduction measures might include improvements in electrical generation and transmission, fuel switching, cogeneration, repowering, plant upgrades, Demand Side Management, CO_2 capture, and tree planting. Effects from other regulatory drivers, e.g., NOx SIP-call, regional haze, and NAAQS were also not included. We attempted to avoid double-counting jobs created by installing one-type of technology (e.g., scrubbers) that inherently reduces other pollutants (e.g., Hg and $PM_{2.5}$).

Direct labor given in the SO_2, NOx, and Hg rows of the table below include system design, manufacture and supply, construction and installation, component and auxiliary labor, and other technology-specific labor related to raw materials, outside architect/engineering and consulting firms, and testing for performance/startup. The control technology is evolving; once a bill is enacted, there will be a greater incentive to improve performance while reducing cost. This may reduce the number of jobs created.

Jobs Created by S. 556's NOx, SO_2, and Hg Reduction Provisions

Category	Person-Years (2005–10)	Jobs Per Year (avg.)
Direct Labor		
SO_2 RELATED (1)	62,500	10,417
NOx related (2)	21,490	3,582
Hg related (3)	16,800	2,800
Other Direct (4)	21,160	3,360
Subtotal Direct Labor	120,950	20,159
Indirect Labor (5)	241,900	40,318
Total CPA-related Labor	362,850	60,477

Notes and Assumptions

(1) For SO_2 control, we assumed wet or dry flue gas desulfurization systems (''FGD,'' also called ''scrubbers'') would be the predominate control, along with purchasing SO_2 allowances. In a study by H&W Management Science Consultants (H&W) for ICAC in 1982, ''Employment in the Air Pollution Control Industry,'' the labor content for various air pollution control technologies was tracked for specific projects from inception to completion. For dry FGD, 396 person-years were expended while wet FGD consumed 458 person-years. The DOE in a November 1999 report, ''Clean Coal Technology—The Investment Pays Off,'' indicated that a typical retrofit pollution control project employs 100–200 construction workers and an advanced power generation project can require thousands. Adding design, engineering, operating and other associated jobs increases these figures. But technology improvements, experience and market forces have driven costs down in recent years. Therefore, we use a conservative assumption of 250 person-years per FGD system. Since about two-thirds of the existing 301,500 (NERC-reported) MW of coal-fired power plant generating capacity have no FGD, and assuming one-half of these will install FGD due to S. 556, approximately 100,000 MW of FGD systems will result. Assuming an average plant size of 400 MW, then 250 FGD systems will result and create 62,500 person-years of employment over the 6-year period of 2005–2010, or an average of 10,417 jobs per year.

(2) For NOx control, we assumed that S. 556 will trigger 80 GW of air pollution control equipment split 65 percent selective catalytic reduction (52 GW), 15 percent selective non-catalytic reduction (12 GW), and 20 percent low NOx burners (16 GW) over the 2005–2010 timeframe. Applying labor factors (in terms of labor hours/kW) for each of these technologies from the H&W/ICAC study, ''Employment Created by NOx Control and Continuous Emission Requirements of Title IV of 1990 Clean Air Act Amendments,'' prepared for the US EPA in March 1994, and then dividing by 2,080 person-hours/year (assumed) yields 21,490 person-years shown in the above table.

(3) For Hg control, we assumed that S. 556 would lead to 150 GW (or 50 percent of reported utility coal-fired capacity) to install Hg control technology as an add-on or integrated part. Technologies will vary from combinations of conventional technologies to newer approaches including activated carbon injection, advanced hybrid particulate collectors, mercury-oxidation catalysts, and use of novel sorbents. To estimate mercury control jobs, the labor factor (in hours/kW) for SNCR (an injection technology) from the 1994 Employment Study mentioned in note ''(2)'' above, was applied to the affected GW. About 16,800 person-years of labor will be created from 2005–2010.

(4) Other Direct Labor encompasses additional utility support staff, R&D personnel, sales representatives, consultants and services. An additional 20 percent of the total technology-related direct labor figure was assumed to account for the other direct labor component. This is consistent with results from the March 1994 study.

(5) Indirect Labor represents the multiplier effect from direct labor. Economists often multiply the number of direct person-hours by two, and sometimes three, to estimate indirect employment. The purchase power associated with goods and services provided by direct labor is called ''the multiplier effect.'' To be conservative, we applied a ratio of two indirect jobs for each direct job in this analysis.

As noted, the preceding analysis looks at employment created and not jobs lost. However, history has shown that clean air legislation has not caused significantly negative macroeconomic impacts, and may even have created some positive ones. Consider:

- Numerous, rigorous studies conclude that environmental protection is compatible with and can even aid economic growth (Goodstein, E.B., Jobs and the Environment, Economic Policy Institute, 1994, pp. 7–12; Meyer, S., Environmentalism and Prosperity: Testing the Environmental Impact Hypothesis, MIT, 1992; Meyer, S., Environmentalism and Prosperity: An Update, MIT, 1993; Templet, P.H., The Complementary Nature of Environment and Economy, Environmental Science & Technology (American Chemical Society), vol. 27, 1993; Wendling, R.M. and Bezdek, R.H., Acid Rain Abatement Legislation: Costs and Benefits, OMEGA International Journal of Management Science, vol. 17, 1989).
- Environmentally regulated industries do better than others (Repetto, R., Jobs, Competitiveness, and Environmental Regulation: What Are the Real Issues?," World Resources Institute, 1995).
- Studies speculate that investing in clean air technology stimulates investment in more productive technology generally (Business Week, Do Pollution Regs Cost Jobs? November 16, 1998.).
- In fact, improved environmental performance can increase a firm's stock value from 5 percent to as much as 10 percent (Dow Jones Newswires, KPMG Survey on Environmental Reporting, September 1, 1999).
- From 1990–1995, there was a net gain of 2.2 million jobs in nonattainment areas (which must achieve the greatest air quality improvements), and 63 percent of those areas had average annual employment growth rates greater than that of their region of the country (U.S. Environmental Protection Agency, Urban Air Toxics Strategy Briefing Document, September 1, 1998).
- Even in Los Angeles, site of the most costly air pollution control rules in the nation, researchers found the rules caused a slight net positive effect on employment (Business Week, supra).
- Nationwide, from 1970–1997, emissions of the six criteria pollutants declined 31 percent, while U.S. population increased 31 percent, gross domestic product increased 114 percent, and vehicle miles traveled increased 127 percent (U.S. Environmental Protection Agency, National Air Quality Trends Report, 1997, December 1998).

Question 3. Can you elaborate further on the concern that you expressed about the cost estimate for mercury controls and how those related technology costs are allocated?

Response . Our concerns are two-fold. The first flows from the comments we made in answer to your first question. Controls to remove SO_2, NOx, and/or mercury may help achieve compliance with more than one Clean Air Act program. For example, controls to remove SO_2 may significantly reduce mercury and $PM_{2.5}$ precursor emissions too. If the cost of a SO_2 control technology is $100, for example, then only part of that the $100 should be allocated to the cost of mercury control; some of $100 should be allocated to attainment of the $PM_{2.5}$ standards. S. 556 is not only a multipollutant bill, it is a "multi-benefit" bill.

In addition, it is important to use accurate assumptions about the performance of air pollution control technology in developing overall cost estimates. For example, a NOx control technology known as "selective catalytic reduction" is routinely achieving (and being guaranteed at) 90+ percent removal efficiency on coal-fired power plants. In testimony delivered on November 1, 2001, however, the Energy Information Administration witness noted that EIA had assumed far less than 90 percent control. This assumption causes the cost estimates to be too high, other things being equal.

STATEMENT OF DAVID G. HAWKINS, DIRECTOR, NRDC CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Mr. Chairman and members of the committee, thank you for providing the Natural Resources Defense Council (NRDC) the opportunity to present its views on S. 556, the Clean Power Act of 2001. The Natural Resources Defense Council is a national, non-profit organization of scientists, lawyers, and environmental specialists, dedicated to protecting public health and the environment. Founded in 1970, NRDC serves more than 500,000 members from offices in New York, Washington, Los Angeles, and San Francisco.

NRDC strongly supports enactment of S. 556; the comprehensive clean-up program for electric power plants contained in the bill is vital to reduce the health and environmental toll from the continuing air pollution released by these plants.

Electricity has brought us an unequalled quality of life and a thriving economy but it continues to be produced in ways that also bring us large and unnecessary harm to human health and to the environment. The electric generating sector remains the largest single polluting activity in the United States. Electric generators are responsible for two-thirds of America's sulfur dioxide pollution, nearly one-third of its nitrogen oxides, forty percent of carbon dioxide and more than one-third of remaining mercury emissions.

Together these "four horsemen" of power plant pollution cause tens of thousands of premature deaths each year and hundreds of thousands of respiratory illness cases. They also kill lakes and threaten forests, contaminate fish, and fill the skies over national parks with haze. Carbon dioxide from the electric generating industry traps heat in the atmosphere, leading to disruption of the climate that we all depend on to maintain life as we know it on this planet.

There is broad recognition that the time has come to reduce pollution from this industry. We have the means to do so and the job is affordable. Indeed, when pollution caps are integrated with expanded reliance on energy efficiency and renewable energy sources, as called for in S. 556, we can save consumers money while reducing the damage electricity production does to health and the environment.

Opponents of S. 556 have raised a number of issues but I'd like to focus in this testimony on two topics: the bill's requirements for control of the global warming pollutant, carbon dioxide (CO_2); and issues relating to control requirements for western States.

MANAGING CARBON POLLUTION

S. 556 calls for the electric generating sector to return its CO_2 emissions to 1990 levels. The power industry often argues for voluntary approaches to CO_2 control, but it is now abundantly clear that voluntary measures alone do not work. In fact, despite widespread participation in the voluntary "Climate Challenge" program, CO_2 from electric power plants grew over the PAST decade by a rate triple the growth rate of other energy consuming sectors: 26.5 percent compared to 8.9 percent. This huge increase occurred even while the industry was claiming to have made millions of tons of CO_2 "reductions" under the Climate Challenge program's creative but ineffective accounting rules. I am attaching NRDC's recent report "Reported 'Reductions,' Rising Emissions" for the record.

It is not surprising that voluntary programs have failed to reduce CO_2 pollution. As long as CO_2 can be dumped for free into the air, competitive pressures will reward behavior that increases this pollution.

S. 556 would cap CO_2 from the power sector at its 1990 levels—a target consistent with our pledge in the 1992 Framework Convention on Climate Change signed by the first President Bush and ratified by the Senate. It should be noted that this is not the level specified in the 1997 Kyoto Protocol, which the current Administration has rejected. But the current Administration apparently opposes capping CO_2 at any level. In testimony on November 1 of this year, EPA Assistant Administrator Holmstead set forth the Administration's reasons for its opposition to any requirement to control CO_2 from power plants. The Administration claims that CO_2 controls will cost consumers too much and make generation too dependent on natural gas. The Administration also asserts that decisions to control CO_2 should be made as part of broad climate change policy.

Contrary to the Administration's claims, S. 556 will save consumers money, will reduce growth in consumption of natural gas and will lay the groundwork for broader efforts to combat climate change.

The Costs of Delay

The Administration states that it takes the issue of climate change very seriously. But its opposition to controlling power plant CO_2 is a serious mistake. This past weekend, the world's other industrialized countries agreed to take steps to significantly limit global warming pollution over the coming decade. In response, the President's spokesman is quoted as saying the President "agrees with the need to reduce greenhouse gas emissions. His Cabinet review is under way, to determine a way that can be done without forcing America into a deep recession."

The fact is that the October 31 analysis of S. 556 submitted by Mr. Holmstead for the Administration demonstrates that controlling CO_2 from power plants will help the economy, not harm it. That analysis concludes that US gross domestic product would be higher under S. 556, not lower.[1]

To take climate change seriously, one must look at the costs of delay in taking action. The assumption of many is that by delaying action to limit global warming pollution we will reduce costs. That assumption is wrong and ignores the nature of the global warming problem. Today's atmospheric concentrations of CO_2 are 30 percent above pre-industrial levels, higher than they have been in over 400,000 years. They have reached that level in a geological blink of an eye due to our burning of fossil fuels. By burning these fuels we are returning to the atmosphere heat-trapping gases that were isolated over a period of about 75 million years. The speed at which we are reversing the earth's geologic history is astounding: each year we put back into the atmosphere an amount of CO_2 that took 100,000 years to store in fossil fuels. CO_2 stays in the atmosphere hundreds of years once it is released, so each year we allow CO_2 emissions to grow, we are committing many generations to the consequences of the resulting change in climate.

The only way to limit the extent of the climate change we inflict on future generations and ourselves is to limit, or stabilize, atmospheric CO_2 concentrations and to do that we must act to reduce emissions. The longer we wait to start, the more expensive we make it to achieve any particular stabilization target. To stabilize CO_2 levels in the atmosphere, we must limit the total cumulative tons of CO_2 we release. For example, to limit the atmospheric buildup of CO_2 to a level about 60 percent higher than pre-industrial levels (today it's 30 percent higher), cumulative global manmade carbon emissions up to the year 2100 must be kept below 950 billion metric tons. We have already released about one-third of this budget. But the real problem lies immediately ahead: at current emission rates we will consume half of the remaining budget in less than 30 years.

Imagine you are on a supertanker so close to a reef that you will cover half the remaining distance in the next 20 minutes. There is time to avoid the reef only if the tanker alters course immediately. Our economy can grow without increasing carbon emissions but only if Congress acts now to signal the market that these emissions can no longer be dumped for free. Unless we act now to lower the business as usual growth in CO_2 emissions, we will eliminate our ability to stabilize concentrations at more protective levels or force later action that is wrenching and expensive, requiring extremely rapid reductions in these gases.

The other feature of the climate problem is that energy systems cannot turn on a dime. While some may use this fact to argue against S. 556, the opposite is true. To establish the market signals needed to promote cleaner and smarter energy technologies we need to adopt policies now to limit CO_2 emissions. As long CO_2 can be dumped for free, the market will discourage the investments needed to modernize our energy technologies.

Let me give an example of how the status quo distorts decisions away from climate friendly actions. In the United States today, there is much talk about the need for energy security. While energy efficiency will give us the largest, most secure additional domestic supply, investments in efficiency continue to be undervalued, in large part because there is no value assigned to the pollution that efficiency prevents, particularly carbon emissions. As I discuss below, investments in energy efficiency make it possible to implement S. 556 while saving consumers money. But it is unlikely the market will spur adequate efficiency programs as long as carbon emissions are ignored in calculating the value of efficiency improvements.

Energy production choices are also distorted. For example, there are potentially more than 2 billion barrels of domestic oil in current producing fields that could be developed using enhanced oil recovery (EOR) techniques. In today's EOR operations companies are injecting 20 million tons a year of CO_2 into depleting wells to increase production. But nearly all that injected CO_2 comes not from power plants or other industrial sources. Rather, the CO_2 is pulled out of natural reservoirs and piped hundreds of miles to the oil fields.

EOR operators enjoy a 15 percent tax credit for expenses, including the cost of the CO_2 they buy. So today American taxpayers are subsidizing businesses to pull new CO_2 out of the ground when that CO_2 could be supplied instead by the nation's huge combustion sources—while at the same time keeping it out of the atmosphere. But as long as CO_2 can be freely dumped into the air, the economics favor pulling CO_2 out of the ground. And it gets worse. Much more oil could be produced through EOR but for the "shortage" in CO_2 for injection. Aging coal-fired power plants could be repowered with integrated coal-gasification combined cycle technology to provide

[1] USEPA, October 31, 2001, "Economic Analysis of a Multi-Emission Strategy," at 24–28. ("EPA J-L Study")

that CO_2 while making electricity at competitive prices.[2] But when it costs electric generators nothing to dump their CO_2 in the air, they have no incentive to invest in capture equipment. Rather, under the status quo, investments are being made instead in developing new CO_2 reservoirs to meet demand by pulling more CO_2 from the earth rather than capturing what we are releasing to the atmosphere. Nowhere is this more striking than in Arizona, where Tucson Electric is applying for permits to build two new coal-fired units at Springerville while Ridgeway Petroleum is planning to extract CO_2 from a natural reservoir that is literally underneath the power plant.

The Costs of S. 556

Adopting the CO_2 caps in S. 556 would change the incentives and promote investments in efficiency, renewable energy and CO_2 capture and avoidance measures. But the Administration says it would cost consumers too much, with Mr. Holmstead's testimony claiming that the bill would cause a 30–50 percent increase in electricity prices. This committee heard similar claims in the 1980's when industry and the Reagan Administration claimed that enacting acid rain controls would raise electric rates by 30 percent or more. Of course, nothing like that happened, nor will it under S. 556.

Two assumptions affect forecasted costs of S. 556 more than any others: what is the predicted growth in electricity and natural gas demand, and will Congress adopt revenue recycling provisions to prevent windfall profits to electric generating companies? One can calculate high costs for controlling carbon emissions only if one assumes little is done to improve energy efficiency and use of renewable energy and if one assumes that Congress will let electric generators retain $50–100 billion in windfall profits. Mr. Holmstead's testimony makes both these assumptions in predicting large price rises for electricity.

However, according to the full EPA study of S. 556, U.S. gross domestic product would actually be higher under S. 556 than under business-as-usual as a result of the stimulus-producing programs for energy efficiency and renewable energy promoted by the bill. As for natural gas dependence, the S. 556 program of efficiency and renewable energy would actually reduce natural gas use for electricity generation compared to the Administration's energy plan. With the S. 556 emission controls and advanced energy efficiency and renewable energy programs implemented, expenditures on electricity generation would actually be $3 billion per year less in 2015 than under the Administration's energy plan.

The Role of Energy Efficiency and Renewable Energy

EPA's underlying report documents the power of the integrated strategy of emission caps, improved efficiency, and greater renewable energy sources that is called for in S. 556. By improving efficiency and increasing the share of renewable energy sources, we can reduce the rate of growth in demand for electricity and for natural gas, thereby allowing the emission reductions required by S. 556 to be achieved without diminishing economic growth. The tools to accomplish this smarter energy future have been documented in the November 2000 report by the Department of Energy's principle research labs. "Scenarios for a Clean Energy Future" shows that an integrated program of efficiency and renewable energy policies can save consumers money and help achieve reduced emissions, including CO_2 emissions at much lower costs.

The Energy Information Administration (EIA) has criticized the Clean Energy Futures (CEF) policies as not being realistically achievable. But EIA has not supported its criticism with any real analysis—rather EIA merely asserts that this rapid deployment of energy efficiency and renewable power technology is unlikely It is important to understand the relative competencies of these two different institutions within DOE. EIA's expertise is in retrospective analysis of energy market statistics, so it is not surprising that its projections forward are heavily colored by its familiarity with the past trends. In contrast, the National Energy Labs that prepared the CEF report are expert in the engineering and economics of conventional and advanced energy efficiency and renewable energy technologies. The CEF experts have prepared a rebuttal to EIA's criticism that adds further support to the CEF report's

[2] Chevron, Texaco and General Electric report that they can build a new IGCC generator with carbon capture for less than the cost of a new conventional pulverized coal plant and that the carbon capture equipment increases the project's capital cost by about 4 percent with only a 2 percent efficiency penalty. O'Keefe, et al, 2001, "A Single IGCC Design for Variable CO_2 Capture." Presented at EPW Staff Briefing, October 17, 2001.

findings.[3] I have attached this to my testimony and ask that it be included in the record.

An examination of the CEF report demonstrates the reasonableness of the National Energy Labs' view that we have a large untapped potential to improve efficiency and save money. The measures called for in the CEF report are not dream technologies, waiting to be invented; they are common-sense initiatives designed to increase the use of technologies that already exist. The CEF measures include improved appliance efficiency, through labeling, standards, and financial incentive programs. They include similar measures for buildings, calling for less wasteful heating, cooling and lighting systems and weatherization and rebate programs to reduce gas and electric use in existing buildings.

EIA claims the CEF's projected rate of deployment for these technologies is unreasonable. But in only 6 months, Californians were able to reduce their electricity consumption by 6 percent during the summer of 2001, with no deprivation. This experience should encourage us not to sell short our ability to be smarter about energy use, given the appropriate policy support.

The Administration asserts the goal of its energy plan is to reduce demand and greenhouse gas emissions to levels well below EIA's business as usual (BAU) forecasts.[4] These are laudable goals but the Administration's use of BAU forecasts to critique S. 556 is inconsistent with those goals. The Administration needs to frame specific policies to achieve appropriately ambitious goals for energy efficiency and renewable energy. When it does so, it will conclude, as DOE's experts have, that S. 556 will help, not hurt consumers.

When policies to promote efficiency and renewables are combined with emission caps the cost of meeting S. 556's pollution targets is dramatically reduced compared to BAU assumptions. Under BAU, EPA calculates S. 556 would increase costs of electric generation by $17 billion per year in 2015; with very modest efficiency efforts the cost drops to under $13 billion; with the CEF moderate policies the costs drop to $500 million; and with the CEF advanced policies called for in S. 556 there is a savings of $3 billion a year in electric generation costs. We can cleanup power plants and save consumers money through smart policies to reduce waste and increase renewable energy supplies.

Who Profits—Polluters or Consumers?

EPA's analysis makes another unstated assumption that drives up costs for consumers. Mr. Holmstead blamed S. 556 for these consumer cost increases but the real blame lies with the policy chosen by EPA. Even though EPA's study shows changes in generating costs under S. 556 range from a maximum increase of $17 billion per year to a savings of $3 billion per year, the study calculates consumers' bills would go up by $50 to $100 billion per year. EPA reaches this conclusion by assuming that the law you will enact will let generators retain windfall profits from the value of carbon permits under a cap-and-trade program. EPA's approach assumes a large transfer of wealth from consumers to shareholders of generating companies, by grandfathering the value of carbon permits to the polluters themselves.

S. 556 does not call for any such result. With more sensible approaches to carbon allowance allocation than the Administration assumes, households will have lower net costs under S. 556. There are a number of approaches to deny windfall profits to generators and recycle revenue to consumers and S. 556 encourages EPA to adopt such approaches in designing the cap-and-trade program for carbon.

The Role of Natural Gas

The Administration also claims that S. 556 will endanger energy security by requiring too much natural gas for electric generation. But large increases in natural gas use do not occur if the integrated CEF efficiency and renewable policies called for in S. 556 are implemented. Under either the moderate or advanced CEF policy programs, EPA's study confirms that natural gas use in electric generators will be less than under BAU growth with no emission controls.[5] There is no reason to oppose limits on carbon pollution in order to avoid excessive dependence on natural gas or any other single fuel for electricity generation. Smart policies that harness the largely untapped potential of efficiency and renewable energy do a better job of

[3] Koomey, et al., October 18, 2001, "Assessment of EIA's statements in their multi-pollutant analysis about the Clean Energy Futures Report's scenario assumptions."

[4] Kahn, "Bush is Revising Energy Policy to Address Global Warming," New York Times, June 12, 2001, at 32.

[5] EPA J-L Study, Table 3. BAU gas use is 8.3 quads in 2010 and is 8.2 quads with CEF moderate measures and 7.7 quads with CEF advanced measures.

promoting fuel diversity and attack the problem of global warming at the same time.

The Role of Coal

Mr. Holmstead states the Administration's goal of preserving our ability to use coal as a major fuel source for electricity. It bears emphasis that under all analyses of S. 556, coal would continue to provide the largest single share of fuel input for electricity. NRDC is neither for nor against an expanded role for coal or any other fuel for its own sake. We do believe that the public health and environmental harm caused by coal has not been adequately addressed, including the harm from global warming. But we do not agree that refusing to address global warming will help keep coal viable. To the contrary, if Congress fails to adopt requirements to limit CO_2, it will send a signal to the market that delay in perfecting techniques to manage carbon from coal is a smarter course than moving forward with investments to modernize coal use.

Our nation and others do face a challenge in addressing the future role for coal in the carbon-constrained world of the future. But the way to meet that challenge is not to deny the need for action now to limit global warming pollution. Contrary to some claims, there is technology to separate and capture CO_2 from coal and other fuels. Like many technologies, current processes were not developed for pollution control purposes and are not optimized for that purpose today.

There is reason for optimism that we can both fight global warming and continue to rely on coal as a major fuel in the decades ahead. Systems that separate CO_2 from fossil fuels, both in pre-combustion and post-combustion configurations, have been commercially demonstrated. For new applications, vendors are offering quotes for IGCC plants with only modest additional costs for carbon capture. Current systems to capture CO_2 from existing units have high economic and energy penalties. That is not surprising since there has been almost no market reason to invest resources to improve these systems.

On the storage side of the carbon management issue, as I mentioned above, commercial operators are currently injecting large amounts of CO_2 into oil fields for enhanced oil recovery. But, as mentioned, nearly all of that CO_2 comes not from fossil-fired plants,[6] but from natural underground CO_2 reservoirs. The pipelines that carry CO_2 from these reservoirs in Utah and New Mexico run close to much larger man-made sources of CO_2 at coal-fired power plants but as long as those plants can dump their CO_2 for free, investors will not turn to those sources to meet the growing demand for CO_2 for oil recovery. Coal industry supporters should be looking at every ton of CO_2 that is pulled out of natural reservoirs as a lost market opportunity for plants that use coal but they appear to be stuck in the position of delaying policies that would stimulate use of their CO_2 in this market.

Other markets, such as enhanced coal bed methane recovery, are likely to emerge for captured CO_2, if S. 556 is enacted. Enhanced coal bed methane involves injecting CO_2 into coal beds to drive off methane, which we know as natural gas. There is a thriving conventional coal bed methane industry in Wyoming and Montana today. Unfortunately, short-sighted operators have chosen to dump massive amounts of production water on the ground rather than managing these wastes responsibly but these problems can and should be solved if we want to use this resource. Other coal seams suitable for enhanced coal bed methane are located in eastern coal provinces.

As our country struggles with concerns about energy security, increased focus will be placed on developing alternatives to petroleum for transportation sources. Coal can play a role here as a feedstock for production of liquid fuels and hydrogen to fuel transportation systems. But this will not happen if the plants to produce such fuels are not designed to capture and safely store the CO_2 from coal. It will not happen because of environmental opposition and because of investor uncertainty of the viability of such plants in a world where carbon emissions are likely to be regulated.

So, it is hard to see that the status quo is good for coal's future. Most new electric generating plants are being built to use gas, not coal. Potential markets for CO_2 from coal-fired plants to recover oil and coal bed methane are being ignored. New markets for transportation fuels from coal gasification plants are not being developed. This state of affairs is likely to continue until Congress takes steps to limit carbon emissions and signal the market that deploying advanced coal systems makes good business sense.

[6] The government-supported coal gasification plant in Beulah, North Dakota, is a notable exception. It is capturing CO_2 and piping it to Canada to enhance oil recovery there.

POWER PLANT POLLUTION IN THE WEST

Some have argued that the requirements for power plant clean-up for plants located in western States should not be as strict as for the rest of the country. NRDC disagrees with this argument. Air pollution from electric generation in the west continues to contribute to adverse health and environmental effects. There is no compelling case that control of pollution from these plants is uniquely difficult or expensive to achieve.

On good days the air quality in the western United States is a resource that is unparalleled in the industrialized world. Visitors from around the world come to marvel at the landscapes of the west and the crystal blue skies that are still present in many places on many days. Great cities in the west have grown in part due to the attraction of clean air and the quality of life provided by unspoiled surroundings.

But air pollution has come to the west as well. Sulfur dioxide pollution is acknowledged to be a major contributor, particularly in the summer, to regional haze that degrades visibility. SO_2 also leads to elevated fine particle concentrations in metropolitan areas of the west, contributing to significant health threats; and SO_2 damages sensitive species and other air quality related values in parks and wilderness areas.

To address regional haze, the Western Regional Air Partnership (WRAP) has recommended a schedule for western regional SO_2 reductions. Some have proposed that any new Federal law to cut power plant pollution limit the requirements for western plants to the level and schedule recommended by the WRAP. As we understand it, the timetable for cutting SO_2 under the WRAP recommendations is much slower than under S. 556 (compliance by 2018 instead of 2007). The emissions remaining at western plants may also be higher than under S. 556.

Given the special resource that western air quality represents, it is important to assure that an SO_2 trading program does not result in a level of actual emissions in the west greater than that recommended by the WRAP. A regional cap on western SO_2 emissions as part of a national SO_2 trading program is needed to assure that the full emission reductions recommended by the WRAP are in fact realized in the west.

It is not entirely clear but it appears that representatives of some western generators are arguing that they should be allocated a greater share of the national cap on emissions than a national uniform formula would provide. The WRAP process is one of many facts that contending interests will no doubt bring to bear to support particular advantageous allocation formulas during the legislative process. While it deserves consideration, we see no reason why it deserves a presumptive priority over other competing arguments for different allocation approaches.

Some have argued that the west does not have a significant NOx problem. We disagree with that claim. Of course, California's NOx-driven smog problem is legendary and still with us. But turning to the ten States in the western power grid outside California, the problems posed by NOx are also significant. Consider the following information assembled by the Clean Air Task Force and Environmental Defense:

- Nitrogen oxide emissions have been climbing in nearly every western State in the past 30 years.
- Between 1997 and 1999, there have been unhealthy ozone days (based on the 8 hour ozone standard) in Phoenix, Denver, Las Vegas, Medford (OR), Salt Lake City, Provo (UT), Seattle, Tacoma, Albuquerque, and Tucson. Ozone is getting worse at a number of national parks in the region, including Grand Canyon NP, AZ, Mesa Verde NP, CO, Canyonlands NP, UT, Great Basin NP, NV, Rocky Mountain NP, CO, Yellowstone NP, MT & WY, Craters of the Moon NM, ID.[7]
- In winter months, nitrates make up a larger contribution of $PM_{2.5}$ than in the summer months. Nitrates accounted for 21 percent of the $PM_{2.5}$ mass in Denver in the winter of 1997 and 32 percent at more rural Colorado sites.[8] Elevated nitrate levels contribute to the winter Brown Clouds over Denver, Albuquerque, Phoenix and Salt Lake City. A Columbia University study has linked the nitrate fraction of inhalable particulates to asthma mortality.[9]
- As one of the components of fine particulates, nitrates play a role in visibility impairment. In western States, on an annual basis, nitrates account for an average

[7]USEPA, 2001. Air Trends, Office of Air and Radiation. Ozone Air Quality at National Parks, http://www.epa.gov/oar/aqtrnd00/pdffiles/natpark.pdf

[8]Colorado State University, 1998 Northern Front Range Air Quality Study http://www.nfraqs.colostate.edu/Files/Final/Rep2Gov.pdf

[9]Carlson, Barbara. 2001. Goddard Institute for Space Studies, Columbia University. http://icp.giss.nasa.gov/outreach/newsletter/v3i1/rsedv3i1—aerosols.pdf

of 7–12 percent of the light extinction.[10] However, in a given month the number can be much higher. Over a 3-year monitoring period, nitrates were responsible for much greater shares of aerosol light extinction in specific months: 32 percent in the Badlands National Park in March; 23 percent in Bryce Canyon National Park in December; 19 percent in Glacier National Park in December and January; and 42 percent in Lone Peak Wilderness Area UT in December.[11] Year-round nitrate-related visibility impairment is an increasing problem in three Class 1 airsheds: Badlands, NP, Mesa Verde NP and Weminuche NP.[12] In the winter of 1998–99, Denver's urban visibility standard was exceeded on about 70 days.

- High elevation areas are particularly impacted by the acidity from increased nitrates and the over-fertilization that comes from both nitrates and ammonium. Extensive research in the Colorado Front Range of the Rocky Mountains has shown that this region is experiencing the highest levels of wet and dry nitrogen deposition in the ten-State (not including California) region.[13],[14] Data from two high elevation Front Range watersheds show surface water nitrate concentrations that reflect both stage 1 and 2 nitrogen saturation,[15] levels comparable to the advanced stages of nitrogen saturation in watersheds in eastern North America that receive twice as much atmospheric nitrogen deposition.[16] Episodic acidification, the pulses of acid entering waters after snowmelt and heavy rains, has been widely reported in the waters of the Front Range.[17] Nitrates are frequently associated with episodic acidification, and their role in these watersheds is under study.
- Many of the desert soils of the Colorado Plateau region are protected by soil crusts made up of a living ground cover of lichens, algae, mosses, and fungi that have adapted to low nitrogen conditions. Atmospheric deposition of nitrogen shifts the balance of these well-adapted systems. Increasing available nitrogen can changes these crusts, and in doing so, can compromise the protective qualities of these soils.[18]
- Power plants produce nearly 20 percent of the region's NOx emissions.[19] From 1997 to 1999, the power plant contribution of NOx in the region increased by nearly 2 percent.[29] During the same period, contributions from other sources decreased by 1.5 percent. Power plant contribution to NOx in the region will continue to increase significantly over the next 10–20 years due to increasing emissions from growth in electric generation.

In sum, NOx causes significant problems in the west; power plants are a significant source; and their contribution to western NOx problems will grow unless they are cleaned up.

Turning to mercury, some have claimed that western power plants need special treatment for that pollutant as well. Again, we do not agree. Power plants west of the Mississippi emit over 16 tons of mercury—33 percent of the national mercury total from power plants.[21] Nine of the 11 States in the western power grid have issued fish consumption advisories for some waterbodies due to mercury contamination.

Western power companies argue that it is not possible to achieve high levels of mercury control from sub-bituminous coal and lignite. These claims are not well-

[10]Malm, et al. 2000. Spatial and Seasonal Patterns and Temporal Variability of Haze and Its Constituents in the United State, May; CO Dept. of Public Health and Environment

[11]IMPROVE 2000, Monthly Light Extinction Budget http://vista.cira.colostate.edu/DatawareHouse/IMPROVE/Data/SummaryData/ReconBext—month.txt

[12]IMPROVE 2000, Map summarizing trends in nitrate mass concentration.

[13]National Atmospheric Deposition Program, 2000. National Atmospheric Deposition Program 1999 Wet Deposition. NADP Data Report 2000–02. Illinois State Water Survey, Champaign, IL.

[14]Sievering, H., Rusch, D., and Marquez, L., 1996. Nitric acid, particulate nitrate and ammonium in the continental free troposphere: nitrogen deposition to an alpine tundra ecosystem: Atmospheric Environment

[15]Williams, M.W., and Tonnessen, K.A., 2000, Critical loads for inorganic nitrogen deposition in the Colorado Front Range, USA: Ecological Applications. 10:1648–1665.

[16]Stoddard, J.L., 1994, Long-term changes in watershed retention of nitrogen, in Baker, L.A., ed., Environmental Chemistry of Lakes and Reservoirs: ACS Advances in Chemistry Series No. 237, American Chemical Society, Washington, DC.

[17]Williams, M.W., and Tonnessen, K.A., 2000, Critical loads for inorganic nitrogen deposition in the Colorado Front Range, USA: Ecological Applications. 10:1648–1665.

[18]National Park Service, 1999. Nitrogen deposition and UV stressor impacts in Canyonlands National Park as affected by climatic pulse events, http://www.2.nature.nps.gov/ard/prime/belnap.htm

[19]USEPA, 2000, 1999, 1998,1997. National Air Quality and Emissions Trends Reports. http://www.epa.gov/oar/aqtrends.html/

[20]USEPA, 2001. Emission Scorecard, from years 1995 through 2000. http://www.epa.gov/airmarkets/emissions/score00/index.html

[21]USEPA, June 2001, Emissions of mercury by State (1999) based upon reported fuel use and mercury tests. http://www.epa.gov/ttn/atw/combust/utiltox/utoxpg.html

supported. Sub-bituminous coals do contain a higher proportion of elemental mercury relative to oxidized mercury, when compared to bituminous coals. Nonetheless, according to data collected from power plants by EPA (ICR data), power plants burning sub-bituminous coals can capture 75 percent or more of the mercury in stack gas with conventional controls. Fabric filters in combination with other controls have the highest capture rate (> 70 percent). The capture efficiencies vary depending on a number of factors, including the boiler type, SO_2 controls, NOx controls, and coal-type. For example, based on stack tests conducted in 1999, higher capture efficiencies range from:

- 75 percent (Public Service Co. of Colorado, burning sub-bituminous coal in a tangential-fired boiler with a low NOx burner and fabric filter (FF))
- 79 percent (TX-NM Power Company, burning lignite in a FBC boiler with limestone injection and a FF)
- 84 percent (Intermountain Power Agency, UT, burning sub-bituminous & bituminous in a wall-fired boiler with a low NOx burner, FGD, and FF)

EPA data also demonstrate that the fraction of mercury that is elemental or oxidized varies widely from plant to plant, and even between units at the same plant. No generalizations about western plants as a category are appropriate.

Emerging technologies will improve mercury capture from western coals. Sorbent technology, including carbon injection, is capable of capturing a high percentage of mercury in stack gas. In the 2007–2008 timeframe, EPA estimates that activated carbon technology will be capable of capturing up to 85 percent of total mercury from sub-bituminous coals (presentation by Jim Kilgroe to MACT Working Group, August 1, 2001. Washington, DC). In addition, significant research is underway to develop more cost-effective sorbents and to optimize the oxidation of mercury upstream of the control device. DOE's goal is to develop mercury technologies that will achieve 90 percent reduction by 2010. Finally, S. 556' integrated strategy of improved energy efficiency and increasing use of renewable energy will enable sharp cuts in mercury emissions throughout the United States.

A second claim made by western generators is that their mercury is innocuous because most of it is not deposited locally. This argument too lacks merit. Mercury deposition varies depending on a number of factors, including stack height, mercury species and precipitation. While EPA modeling does show that within a 30-mile radius of the plant, mercury deposition is less in an arid climate than in a humid climate, deposition is nonetheless still occurring. It would be wrong to assume that mercury from western power plants doesn't deposit locally or regionally. Elemental mercury can be oxidized (and deposited) anywhere from a few days to a few years, with deposition ranging from a few miles to a few thousand miles. Also, atmospheric chemistry and the chemistry of stack gas can change the form of mercury, causing reactions to change elemental to oxidized, and vice versa, thereby affecting deposition.

One deposition study underway by U.S. EPA and Tetra Tech is investigating the sources of mercury in two reservoirs in Colorado.[22] Given that mercury fish consumption advisories have already been issued in many western States, it is apparent that mercury in the atmosphere is making its way into these aquatic environments.

In addition, to the extent mercury emissions from western power plants is not deposited locally, it is deposited further downwind, including eastern States. Allowing western plants to emit more mercury means more mercury gets dumped in States that lie to the east of these plants.

Western mercury emissions also add to the global pool of mercury. The primary way people are exposed to methylmercury is through the consumption of fish, and the majority of this exposure (for the general population) is from eating marine fish. Atmospheric deposition of mercury to the open ocean from the global pool of mercury is the cause of this contamination. Western power plants, like all other sources of elemental mercury, contribute to the mercury burden in the oceans, which comes back to us when we eat ocean fish.

The fundamental fact about mercury in coal is that for millions of years this source of mercury has been isolated from living things. By burning these mercury-containing fuels we are adding significant amounts of this poison to environments where humans and other species are exposed through a continuing accumulation in the food-chain. Once released from fossil fuels this mercury does not disappear; rather it builds up continuously. Prudent policy demands that we minimize the additional buildup of this toxin in the environment from all controllable sources.

[22] USEPA & Tetra Tech, Inc, 2001 Draft. Technical support for developing a total maximum daily load for mercury in McPhee and Narraguinnep reservoirs, Colorado.

Mr. Chairman and members of the committee, this concludes my testimony. I am happy to answer any questions you may have.

[FROM THE ERNEST ORLANDO LAWRENCE BERKELEY NATIONAL LABORATORY]

October 18, 2001.

TO: Skip Laitner
FROM: Jonathan Koomey, Alan Sanstad, Marilyn Brown, Ernst Worrell, Lynn Price
RE: Assessment of EIA's statements in their multi-pollutant analysis about the Clean Energy Futures Report's scenario assumptions
CC: Mark Levine, Walter Short, Steve DeCanio

At your request, we examined the following statement from the Energy Information Administration's report on multi-pollutant strategies (US DOE 2001):

These policies are due to assumed changes in consumer behavior that are not consistent with historical behavior patterns, result from research and development funding increases that have not occurred and for which there is no analytical basis for the impacts of the funding on technological improvements, and voluntary or information programs for which there is also no analytical basis for the impacts.

This quotation summarizes EIA's view of the Clean Energy Futures (CEF) study (Interlaboratory Working Group on Energy-Efficient and Clean-Energy Technologies 2000), but it reflects an incorrect interpretation of the intent and methodology of CEF and a fundamental misunderstanding of how to conduct analysis of alternative energy futures.

1) The purpose of the CEF was to assess the impacts of a specified set of programs and policies that were assumed to be undertaken in the face of a national commitment to tackle a variety of energy-related challenges. The fact that the analysis assumes R&D "funding increases that have not occurred" is not surprising, since we were not modeling the business-as-usual (BAU) world, but one in which there is an increased sense of urgency to deal with energy-related challenges. In such a world, R&D spending and other policy efforts would (by definition) vary from those found in a BAU world.

2) EIA states that the estimated effects of CEF "policies are due to assumed changes in consumer behavior that are not consistent with historical behavior patterns." This statement is both misleading and wrong. It is misleading because the point of a scenario planning exercise is to model a world in which there are changes in historical patterns (if our goal were to model historical patterns, we would be analyzing a BAU world, not an alternative policy scenario). It is wrong because there have been historical periods when rates of change in energy use per unit of GDP have equaled or exceeded those analyzed in the CEF study, and these periods correspond to those where there was an increased sense of national urgency for dealing with energy-related challenges (Koomey et al. 1998). It is also critical to recognize that, in the past, history has not been a good guide to future energy market trends, and that unforeseen technological improvements have resulted in higher levels of aggregate energy efficiency than have been projected by modelers (Sanstad et al. 2001b).

3) EIA's statements that there is no analytical basis for estimating the impacts of R&D, voluntary programs, or information programs are incorrect. The CEF chapters on each sector summarize the references and analytical basis for the assumptions we made. The whole point of the analysis was to produce a fully documented, defensible, and transparent assessment of the impacts of specific policies. In some cases we needed to make judgments based on previous program experience, but this approach is more accurate than assuming that these programs can (by definition) have no impact, which is EIA's implicit position. EIA's attitude is reflected throughout the document, for example in the following quotation from the EIA report:

It is difficult to quantify the impact of increased funding on specific improvements in technology development . . . because funding increases are questionable and the link between funding and technology development is tenuous, the technology improvements in CEF based on these [R&D] policies are also questionable.

A recently completed study by the National Academy of Sciences (National Research Council 2001) concluded that significant technological improvements have resulted from past Federal investments in energy efficiency R&D, and that these technological improvements were cost effective for society. The exact return on investment is not known with precision, but it is clear that significant paybacks in terms of energy savings have resulted from past R&D programs. We agree with EIA that it is difficult to quantify the impacts of R&D and other policies, but this difficulty does not imply that their impacts should be assumed to be zero in a scenario analysis. Instead, we made the best judgments we could after consulting the relevant literature and experts in the field, and carefully documented those judgments so that others could evaluate them on a case-by-case basis.

4) Contrary to what the EIA argues in their report, it is well established that historical patterns of consumer demand for energy-efficient technologies do not reflect full information optimizing behavior (DeCanio 1993, DeCanio 1998, Howarth and Andersson 1993, Huntington et al. 1994, Sanstad and Howarth 1994). The literature is full of examples of implicit discount rates vastly exceeding the risk-adjusted cost of capital to consumers and businesses (EPRI 1988a, EPRI 1988b, Gately 1980, Hausman 1979, Howarth and Sanstad 1995, Koomey 1990, Koomey et al. 1996, Meier and Whittier 1983, Ruderman et al. 1987, Sanstad et al. 1995, Train 1985). Furthermore, the program evaluation literature shows that efficiency programs and policies can change behavior and reduce energy demand at a total cost to society that is less than the cost of preserving the status quo (Eto et al. 1994, Eto et al. 1995, Greening et al. 1997, Koomey et al. 1999, Koomey et al. 1996, Krause et al. 1993, Krause et al. 1995, Krause et al. 1989, Levine et al. 1992, Webber et al. 2000). In other words, the high hurdle rates (and thus the market failures and barriers that cause-them) are reducible by appropriate policy actions, and these policy actions result in greater economic efficiency.

EIA appears to be confused on this point:". . . many of the presumed 'market failures' are actually rational, efficient decisions on the part of consumers given current technology, expected prices for energy and other goods and services, and the value they place on their time to evaluate options . . ." The words "rational" and "efficient" are not equivalent. Consumers' decisions may very well be rational given their availability of information and the presence of transaction costs, but rational decisions by individual actors do not necessarily result in 'efficient' market outcomes from society's perspective, given the complexities surrounding information costs and asymmetries, increasing returns to scale, and multiple equilibria (Arthur 1990, Sanstad et al. 2001a). EIA's statements on this point are inconsistent with the research over the past two decades by economists on decisions regarding energy efficiency. Econometric, not 'engineering', studies have long shown a high rate of implicit discounting, and this finding has been recognized by economists as an anomaly requiring explanation. No conclusive explanation has to date been advanced, and EIA errs by implying otherwise.

5) The EIA analysis largely ignores the endogenous effect of prices on technological change. For example, energy price increases of the magnitude considered in the EIA analysis would surely cause consumers and businesses to develop and deploy new energy efficiency and supply technologies. Both theory and the current evidence demonstrate that this effect is real (Goulder and Schneider 1999, Newell et al. 1999, Nordhaus 1999, Popp 2001, Sanstad 2000), and that the EIA results are likely to be biased by omitting it. More complete analyses attempt to overcome this omission (despite measurement difficulties) by making reasoned and documented assumptions related to such changes.

In summary, EIA's statement reflects their misunderstanding of the purpose of scenario exercises, of the relevant economic literature, and of the CEF study itself, and it does not hold up under scrutiny. Without analytical support for the statements contained in the above quotation, they should be considered no more than unsubstantiated allegations. The CEF study stands on its own as the most carefully documented and complete analysis of U.S. energy futures that has ever been funded by the U.S. Government.

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[From the Natural Resources Defense Council, November 2001]

Reported "Reductions," Rising Emissions

THE FAILURE OF VOLUNTARY COMMITMENTS AND REPORTING TO REDUCE U.S. ELECTRIC INDUSTRY CO_2 EMISSIONS

(By Project Manager Daniel Lashof)

EXECUTIVE SUMMARY

Electric power plants generate more carbon dioxide (CO_2) than any other source in the United States, and are therefore the leading contributors to global warming. Despite the dangers associated with CO_2, power plants do not yet have mandatory limits on how much they can emit. Some members of the energy industry say that non-binding emissions reduction programs provide the best way to limit CO_2. In fact, voluntary programs, such as the Department of Energy's Climate Challenge, have failed to achieve their goals.

The Department of Energy launched the Climate Challenge program in 1993 in an effort to reduce electric sector CO_2 emissions to 1990 levels by the year 2000. Despite significant industry participation and reporting of emissions "reductions," actual electric industry CO_2 emissions increased by 20 percent between 1990 and 1999. Estimates based on Energy Information Administration (EIA) generation data indicate that the increase was 25 percent by 2000.

The Climate Challenge program is one of many domestic and international voluntary efforts to reduce global warming pollution that the United States has adopted during the last decade.[1] Unfortunately, these programs have failed to reverse the trend of rising emissions. In fact, total U.S. carbon dioxide emissions from fossil fuel combustion increased by more than 15 percent during the last decade.[2]

By enabling companies to calculate and report emissions "reductions," while actual emissions were increasing, the Climate Challenge program stimulated artful emissions accounting procedures, but did little to alter electricity industry business practices or reduce emissions. Major shortcomings of the program include:

- Most commitments and "reductions" are calculated using theoretical reference cases that have no basis in reality.

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[1]For examples of other voluntary programs that have not been effective at reducing emissions see: NRDC, Voluntary Greenhouse Gas Reduction Programs Are Not Enough, June 2001. http://www.nrdc.org/globalWarming/avoluntary.asp.

[2]Energy Information Administration, U.S. Carbon Dioxide Emissions from Energy Sources: 2000 Flash Estimate. June 2001. http://www.eia.doe.gov/oiaf/1605/flash/sld001.htm.

- Emissions “reductions” reported under the program are paralleled by emissions increases from other activities that are not reported.
- The vast majority of reported emissions “reductions” are simply business-as-usual activities. In 1999:
- Seventy percent of all emissions “reductions” reported were based on the standard operation of nuclear power plants. The entire output of at least three nuclear power plants—Browns Ferry (TVA), Watts Bar (TVA), and Comanche Peak (TXU)-were reported as CO_2 emissions reduction projects, accounting for about 45 million tons, or over 30 percent of reported “reductions.”
- Ten percent of reported “reductions” were attributed by the reporting companies to “routine maintenance” at fossil fuel power plants.[3]
- Demand side management programs that were funded by ratepayers and initiated well before the Climate Challenge are reported as energy efficiency “reductions” under the program.
- Commitments for participation in a number of industry technology and research programs, as well as forestry and sequestration projects, look good on paper, but provide very little benefit compared to the emissions increases occurring in the electric industry.

The lesson from the Climate Challenge program is that enforceable emissions reduction requirements are needed to make real progress in reducing global warming pollution. Voluntary commitments are not sufficient because they do not significantly alter business planning or investment decisions. As a result, power plants continue to increase their contribution to global warming.

REPORTED “REDUCTIONS,” RISING EMISSIONS

In 1992 the United States ratified the United Nations Framework Convention on Climate Change, committing to adopt national policies aimed at returning emissions of global warming pollution to 1990 levels. Acting on this commitment, President Clinton announced in 1993 the U.S. Climate Change Action Plan (CCAP), which established specific (mostly voluntary) steps the United States would take to stabilize emissions at 1990 levels by the year 2000. A cornerstone of the president’s plan was the Climate Challenge program for the electric utility sector, which established voluntary commitments from electric utility companies to reduce carbon dioxide (CO_2) emissions to below 1990 emissions levels by 2000.

The program did not come close to meeting this objective. According to EIA, CO_2 emissions from electric power plants increased 20.3 percent between 1990 and 1999, outpacing the overall growth in U.S. greenhouse gas emissions and resulting in an annual emissions increase of over 400 million tons by 1999 (Figure 1).[4] Based on year 2000 EIA generation data, we estimate that CO_2 emissions increased to 2.57 billion tons in 2000, a 25 percent increase over 1990 levels.[5]

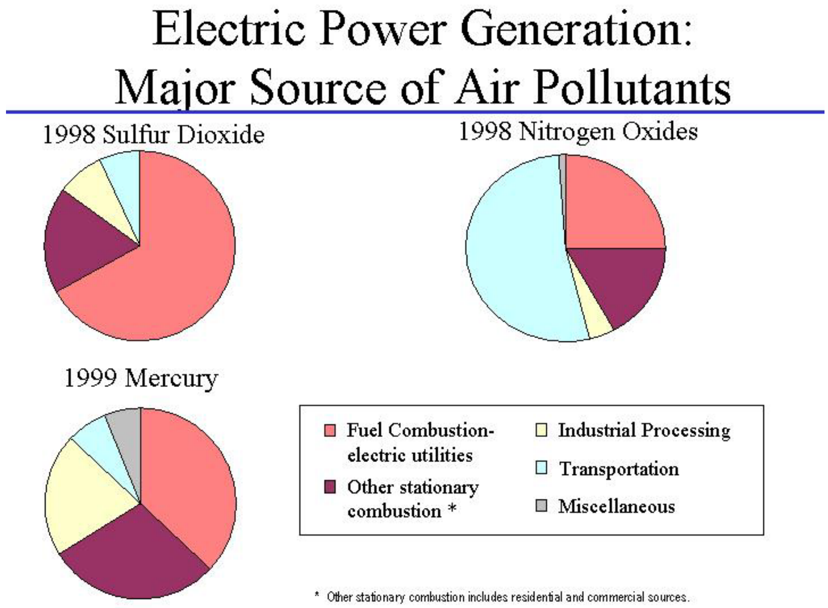
This emissions increase occurred despite significant participation by the industry in voluntary CO_2 emissions reduction programs. By 1999, 124 participation agreements had been signed with electric companies under the Climate Challenge program. Participating companies represented over 70 percent of 1990 CO_2 emissions in the industry. By 1999 one hundred electric power companies reported emissions “reductions” from over 450 voluntary projects under Section 1605(b) of the Energy Policy Act. The “reductions” reported from these projects totaled over 136 million CO_2-equivalent tons.

[3]In an effort to circumvent air pollution control requirements, many power companies have classified a variety of projects as “routine maintenance,” when in fact these projects represented “major modifications” to existing power plants under the Clean Air Act. Regardless of their legal status, these projects often represent business-as-usual investments to maintain or expand capacity at aging units.

[4]Energy Information Administration (EIA) data indicate that between 1990 and 1999 overall U.S. greenhouse gas emissions increased 10.7 percent and U.S. CO_2 emissions increased 13.1 percent. During the same period, electric industry CO_2 emissions increased 20.3 percent. See http://www.eia.doe.gov/oiaf/1605/ggrpt/index.html.

[5]Based on 2000 net electricity generation data from Energy Information Administration (EIA), Annual Energy Review 2000, August 2001, Table 8.2; and average 1999 lbs/MWh emissions rates for coal (2,095), oil (1,969) and natural gas (1,321) from DOE, Carbon Dioxide Emissions from the Generation of Electric Power in U.S., July 2000, Table 1.

Figure 1. Electric Industry CO_2 Emissions by Fuel Type



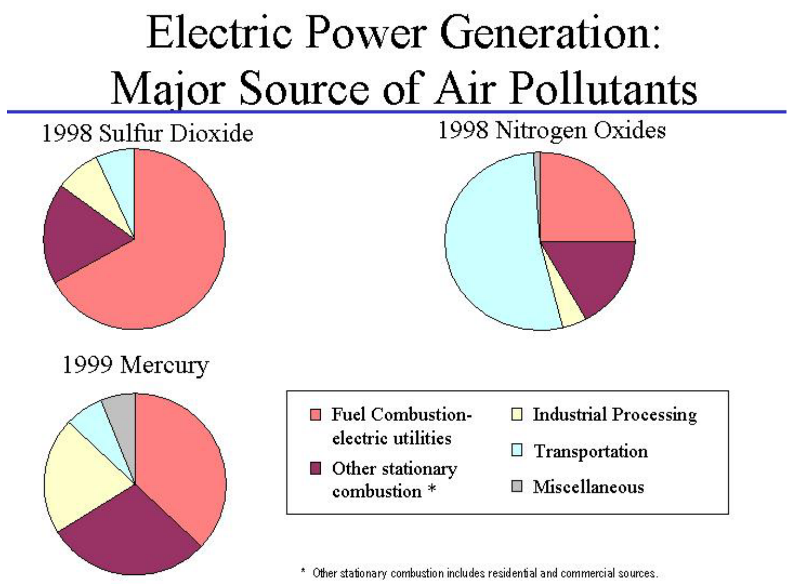
Why have electric industry emissions steadily risen despite voluntary reduction commitments and significant reporting of emissions reduction progress? This report examines this question by taking a closer look at the voluntary commitments made under the Climate Challenge program and by reviewing the "reductions" reported under the 1605(b) program.

INDUSTRY EMISSIONS TRENDS

Growth in electric industry CO_2 emissions in the last decade has closely paralleled the industry's growth in electricity production (Figure 2). As a result, the carbon intensity of electricity generation, expressed as CO_2 emissions per kilowatt-hour of generation, has remained virtually unchanged, decreasing less than 2 percent between 1990 and 1999. This modest change is a strong indication that no fundamental changes have taken place in the industry to improve CO_2 emissions performance as a result of the voluntary programs that have been in place.

Furthermore, if all of the "reductions" reported by the electric industry in 1999 were real and additional to what would have happened without the Climate Challenge program, then emissions would have increased by another 136 million tons in 1999 (above the 420-million-ton increase that did occur) if the program didn't exist. Had this theoretical scenario occurred, the industry's average CO_2 emissions rate would have actually increased 3.5 percent between 1990 and 1999, an unlikely outcome since it would suggest that the industry would have become more carbon-intensive during the decade absent the Climate Challenge program.

Figure 2. Percent Change in CO_2 Emissions and Net Generation from 1990

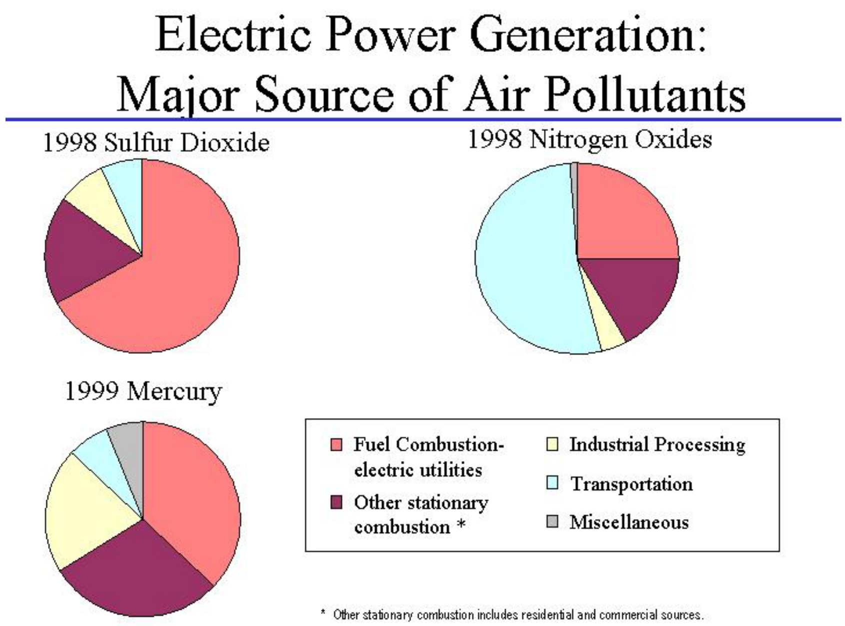


The CO_2 emissions trends shown in Figures 1 and 2 are in sharp contrast to the trend in sulfur dioxide (SO_2) emissions from the industry. Electric industry SO_2 emissions have been on a declining path and are projected to continue on this path as a result of the acid rain emissions trading program. The SO_2 program, which includes firm emissions caps and strong enforcement provisions, has resulted in a 36 percent reduction in average SO_2 emissions per kilowatt-hour of generation in the industry since 1990. Figure 3 provides a comparison of historic and projected changes in electric industry SO_2 and CO_2 emissions since 1990, illustrating the different results achieved by enforceable and voluntary emissions reduction programs.

CLIMATE CHALLENGE COMMITMENTS

By 1999, 124 participation agreements had been signed by electric companies under the Climate Challenge program. These agreements commit the companies to take specific actions to reduce emissions, or to make emissions reduction progress against a specific emissions baseline. Importantly, the commitments are non-binding and not enforceable, stating, "either party may withdraw . . . without penalty and without being subject to remedies at law or equity." Many types of commitments have been made under the Climate Challenge, but most do not involve serious actions to reduce emissions beyond what would be achieved through ongoing business activities. Many of the commitments focus on operating power plants the way the plants were designed to be operated. Many also involve commitments to a variety of industry initiatives and indirect emissions reduction programs, with very limited benefits compared to emissions from the industry. Only four of the agreements reviewed for this analysis include a commitment to reduce emissions back to or below 1990 levels. These companies have had mixed results.

Figure 3. Historic and Projected Change in CO_2 Emissions vs. SO_2 Emissions



Commitments to "Business-as-Usual" Activities

The vast majority of emissions "reductions" committed to under the Climate Challenge relate to ongoing operations of nuclear and fossil fuel power plants. The largest of these are commitments to continue standard operation of nuclear facilities.[6] For example:

• Texas Utilities (TXU) committed to continue to operate its Comanche Peak nuclear plant as a base load facility.

• Tennessee Valley Authority (TVA) committed to operate its Browns Ferry and Watts Bar nuclear plants.

• Duke Energy, Baltimore Gas and Electric, Entergy, and several others agreed to increase generation from their nuclear generating facilities by improving availability of their plants.

Climate Challenge commitments based on nuclear power plant operations, which amount to companies committing to run these plants as profitably as they can, accounted for about 70 percent of the total voluntary emissions "reductions" reported in 1999, including virtually all of the largest "emissions reduction projects" (see detailed discussion on page 6).

Many companies made similar commitments regarding the operations of fossil generating stations. Primarily, the commitments related to heat rate maintenance and improvement programs. As an example of these activities, Figure 4 illustrates General Public Utilities' (GPU) commitment for capital improvement projects at the Shawville power plant. The list is comprised of typical activities that prevent an aging power plant from de-rating over time. Most of the largest fossil plant operators, such as American Electric Power, Southern Company, and Tennessee Valley Authority, made similar heat rate commitments. Like commitments to operate nuclear plants, commitments to invest in fossil plants so they continue to be profitable and operate as designed amount to no more than commitments to conduct business as usual.

[6]Climate Challenge Agreements are available for review at: http://www.eren.doe.gov/climatechallenge /cc—accords.htm.

Figure 4. Heat Rate Maintenance and Improvement Measures at General Public Utilities (GPU) Shawville Unit 3

- Flue Duct Expansion Joints, 1991
- Economizer Inlet Header Replacement, 1994
- High Temperature Reheater, 1994
- Air Heater Cold End Replacement, 1994
- Boiler Control Replacement, 1997
- Condenser Cleaning System Replacement, 1997
- 10A & 10B FWH Replacement, 1999
- Feedwater Heater Replacement, 1999

SOURCE: ENERGY INFORMATION ADMINISTRATION, 1601(B) PUBLIC USE DATABASE.

In addition to commitments focused on energy supply, there are also many relating to demand side management (DSM) programs. These programs, which reduce consumer demand for electricity by helping facilitate the enhanced use of energy-efficient technologies, are an important means of reducing CO_2 emissions. However, it is doubtful many (if any)of them were made in response to the Climate Challenge program. Most of the demand side programs described, such as Wisconsin Electric Power Companies “Smart Money Energy Program” and Southern California Edison’s energy-efficiency program, began years before the Climate Challenge and were built into regulated electricity rates. As described in Southern California Edison’s 1999 1605(b) filing,” most of the savings responsible for the CO_2 reductions are due to ratepayer-funded survey and rebate programs.” Far from increasing its investments in energy efficiency in response to the Climate Challenge program, industry-wide energy-efficiency program expenditures declined by about 50 percent between 1994 and 1999.[7]

Industry and Forestry Programs

Commitments were also made to support industry programs designed to promote climate friendly technologies and research. The most popular were commitments to fund the Utility Forest Carbon Program (funding projects to reduce and sequester greenhouse gases), the National Earth Comfort Program (promoting use of geothermal heat pumps), and EV America (supporting development and use of electric vehicles). Most companies do not specifically report information on the carbon reduction benefits of these programs, but in some cases, companies estimate their proportionate share of “reductions,” and these shares serve to illustrate the small scale of these projects. TVA, for example, estimated its share of “reductions” from the Utility Forest Carbon Management Program to be 50,000 tons of CO_2 annually by 2000. By comparison, TVA’s fleet of power plants emitted an average of over 240,000 tons of CO_2 per day in 1999.

In addition, 43 electric companies sponsored forestry sequestration projects, which included both afforestation and reforestation initiatives. The average emissions “reductions” estimated for all sequestration projects reported under 1605(b) was about 25,000 tons of annual CO_2 sequestration per project. This is approximately equivalent to the CO_2 emissions from operating a single 500-megawatt coal plant for 2 days. While industry technology programs, sequestration projects, and other similar initiatives agreed to under the Climate Challenge should not be completely discounted, they do not begin to offset emissions or emissions growth in the electric industry.

Commitments to Stabilize Emissions at or below 1990 Levels

Of the Climate Challenge agreements reviewed in this analysis, which included over 25 percent of the agreements and all agreements from companies reporting the largest emissions “reductions” under Section 1605((b), four companies were identified as having made commitments to reduce overall corporate emissions back to or below 1990 levels. Of these, at least one company is clearly not on a path to achieve its commitment, one company has made real progress, one company’s commitment is largely irrelevant because it has divested its generating assets, and the progress of one company cannot be determined from data reported. The four commitments identified include:

Cinergy Cinergy’s participation agreement commits the company “to develop and implement a voluntary program of comprehensive and flexible least-cost activities to reduce, avoid, or sequester greenhouse gas emissions to return the Cinergy Com-

[7] Richard Cowart, “Efficient Reliability: The Critical Role of Demand-Side Resources in Power Systems and Markets,” (National Association of Regulatory Utility Commissioners, June 2001) at 12–13.

panies' emissions to 1990 levels by the year 2000." Although Cinergy did not report emissions information under 1605(b)in 1999, by 1998 Cinergy reported total CO_2 emissions that were 40 percent above 1990 levels, suggesting the company would not meet its commitment.

Niagara Mohawk Niagara Mohawk committed to limit company CO_2 emissions to its 1990 baseline level and to maintain that level through 2000. However, as noted in the 1605(b) filing by Niagara Mohawk, the "reduction" reported in 1999 "does not reflect new reduction projects and activities; it is rather a consequence of electric utility restructuring in New York State," which required the company to divest its generating assets. The sale of its power plants has made Niagara Mohawk's "reduction" commitment largely irrelevant.

The Sacramento Municipal Utility District (SMUD) SMUD committed to reduce CO_2 emissions to 30 percent below its 1990 baseline emissions of 3.9 million tons by 2000. As of 1999, SMUD reported emissions that were 21 percent below its reported 1990 CO_2 emissions level, signaling real progress toward meeting its commitment. The progress is based primarily on the purchase of less coal-fired electricity to meet its demand. SMUD points out that this progress represents a 33 percent "reduction" when adjusted for increased electricity sales. However, SMUD's commitment does not mention adjusting for increased electricity sales.

The Salt River Project (SRP) SRP agreed to stabilize its greenhouse gas emissions at 1990 levels by 2000. However, SRP has not been reporting corporate emissions information under the 1605(b) program, making it impossible to assess its progress from publicly reported data.

The commitments of these four companies are the types of commitments that would have been needed across the industry for the Climate Challenge to meet its objective of returning emissions to 1990 levels by 2000. However, as one might expect under a non-binding voluntary program, only a small minority of companies agreed to these types of commitments, and even for these self-selected companies the results were mixed.

1999 "REDUCTIONS" REPORTED UNDER 1605(B)

Section 1605(b)of the Energy Policy Act provides a mechanism for the voluntary reporting of annual reductions of greenhouse gas emissions. Electric companies that made emissions reduction commitments under the Climate Challenge program also agreed to report their emissions reduction progress under the 1605(b)reporting program. The program enables companies to report emissions reductions on a project-by-project basis, as a single corporate entity, or both. Most, but not all, reporting companies provide information on both project and entity level "reductions," which largely overlap.

Table 1

Emissions and Emissions Reductions of 20 Companies Reporting over 20 Million Tons of CO_2 Equivalent Reductions over the Life of the 1605(b) Program

	Program Total CO_2 Equivalent Reductions Reported	Reporting Basis for Program Total	1999 Project Direct CO_2 Reductions	1999 Entity Direct CO_2 Reductions from Stationary Combustion	1990 to 1999 CO_2 Emissions Change
FPL Group	179,591,355	Entity	N/A	18,316,000	24,852,000
Tennessee Valley Authority	149,728,565	Entity	28,398,668	28,389,780	5,880,041
TXU	149,320,163	Project	20,908,112	N/A	N/A
Duke Energy	87,420,473	Entity	14,480,357	14,480,357	10,029,016
KeySpan Energy	53,374,582	Entity	N/A	4,063,200	−1,730,900
FirstEnergy	51,582,962	Entity	11,545,699	11,543,721	−8,674,000
AES	49,667,625	Entity	N/A	N/A	1,655,183
Niagara Mohawk	37,442,511	Entity	2,668,228	10,739,100	−10,739,000
Carolina Power & Light	36,994,932	Project	8,161,891	N/A	N/A
Pacific Gas & Electric	35,346,135	Entity	4,784,977	4,698,673	396,505
Southern Company	34,155,175	Entity	5,939,803	4,973,494	20,901,270
Baltimore Gas & Electric	31,797,949	Entity	5,568,779	5,571,504	6,800,000
Wisconsin Electric Power	30,953,598	Project	3,351,543	N/A	N/A
Reliant Energy	28,861,943	Entity	894,153	3,884,000	5,613,000
Entergy Services	28,161,439	Entity	4,151,247	4,144,288	27,484,683
Florida Power	27,694,761	Entity	N/A	5,555,831	680,448
Southern California Edison	24,953,373	Project	4,348,026	N/A	N/A
GPU, Inc	24,541,630	Project	2,680,450	N/A	N/A

Table 1—Continued

Emissions and Emissions Reductions of 20 Companies Reporting over 20 Million Tons of CO_2 Equivalent Reductions over the Life of the 1605(b) Program

	Program Total CO_2 Equivalent Reductions Reported	Reporting Basis for Program Total	1999 Project Direct CO_2 Reductions	1999 Entity Direct CO_2 Reductions from Stationary Combustion	1990 to 1999 CO_2 Emissions Change
Central Hudson Gas & Electric.	20,483,077	Entity	355,159	802,750	–802,750
Northeast Utilities	20,313,480	Entity	N/A	2,440,000	–940,000
Totals	1,102,385,728		118,237,091	119,602,698	81,405,496

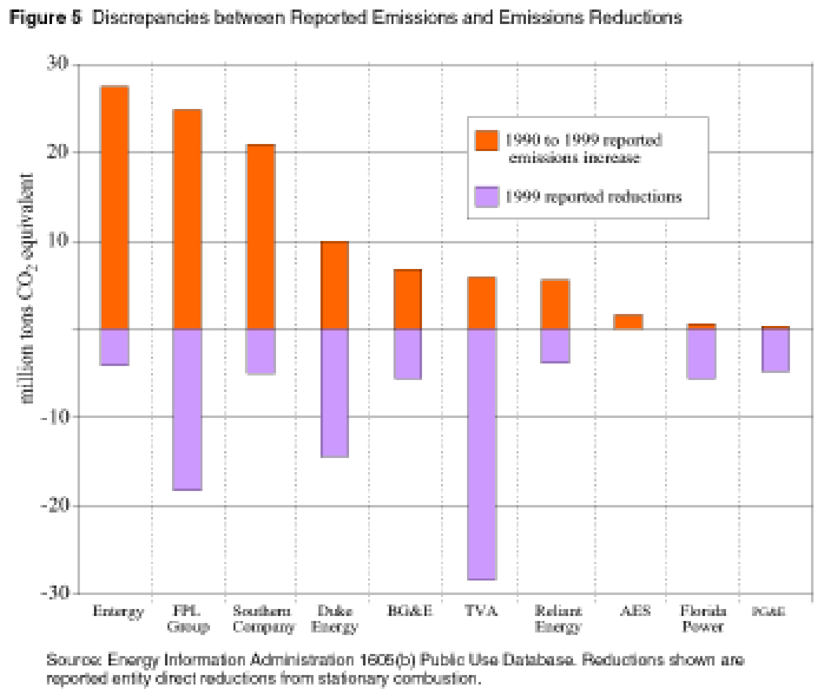
Source: Energy Information Administration (EIA) 1605(b) Public Use Data base. 1999 emissions values for Southern Company are reported incorrectly by EIA. Corrected values supplied by company are used to calculate 1990 to 1999 emissions change. Values for AES represent corporate total based on reporting of three separate entities

In 1999,100 electric companies reported 453 projects, resulting in reported “reductions” of 136 million CO_2 tons. In addition, 42 electric companies reported entity level “reductions” from stationary combustion, totaling 137 million CO_2 tons.

Over the 9 years of reporting under the 1605(b) program, 20 electric companies have individually reported “reductions” exceeding 20 million CO_2 equivalent tons, either on a project or entity basis. The emissions “reductions” reported by these 20 companies account for over 80 percent of electric industry emissions “reductions” reported over the life of the program and 87 percent of “reductions” reported in 1999. Table 1 illustrates the total emissions “reductions” reported by these companies from 1991 to 1999, the “reductions” reported by each in 1999, and their reported change in emissions between 1990 and 1999.

Table 1 indicates that 10 of the 15 companies reporting emissions information reported emissions increases between 1990 and 1999. Most of these 10 companies also reported significant emissions “reductions” in 1999 ((Figure 5). Florida Power and Light (FPL) Group, for example, reported an emissions increase of 24.9 million tons between 1990 and 1999. At the same time, FPL Group reported 18.3 million tons of CO_2 “reductions” from stationary combustion activities. The total discrepancy between the emissions increase and the reported “reductions” was 43.2 million tons. This circum-stance highlights why the Climate Challenge and 1605(b)were ineffective at reducing actual emissions—companies have been able to report significant emissions “reductions” while emissions increased.

Figure 5. Discrepancies between Reported Emissions and Emissions Reductions



At least three related factors account for this seemingly inconsistent reporting: 1) the 1605(b) program allows companies to establish baselines for emission "reduction" calculations using hypothetical scenarios of "what would have happened" that have no basis in fact; 2) the programs allow companies to commit to and report "reductions" for what can only be described as business-as-usual activities; and 3) the programs allow companies to report "reductions," while ignoring emissions increases in other areas.

Hypothetical Baselines

The 1605(b) program enables companies to use so-called "modified baselines" to calculate emission "reductions." Modified baselines are a hypothetical construction of "what would have happened" without the so—called emissions "reduction" activity. All but two of the companies shown in Table 1 that report entity level "reductions" used modified baselines. Modified baselines are also used to calculate the vast majority of project "reductions." Prominent examples of the use of modified baselines include:

- Tennessee Valley Authority (TVA) uses a generation planning model to calculate a baseline of what emissions would have been had it continued to use the set of generating units operating in 1990 at their 1990 capacity factors and heat rates. Since neither the Browns Ferry, nor the Watts Bar nuclear facilities operated in 1990, TVA uses this baseline to calculate emissions "reductions" assuming the total output of these nuclear facilities offsets hypothetical emissions that would have been associated with the 1990 generating fleet. These reported "reductions" totaled 27.6 million CO_2 tons in 1999.
- Texas Utilities (TXU) uses a baseline of what would have taken place if the Comanche Peak nuclear facility had not operated. This baseline assumes additional construction and use of lignite coal plants. TXU calculates 19.4 million CO_2 tons of emissions "reductions" in 1999, assuming the entire 18 million MWh of generation from the Comanche Peak station offsets emissions from hypothetical lignite coal facilities.

• Florida Power and Light (FPL) Group uses a hypothetical baseline to claim "reductions "for building natural—gas-fired generating stations. FPL Group's baseline assumes incremental capacity additions would have been coal-fired, had they not built gas-fired plants. Therefore, when the company built gas-fired plants, emissions increased, but increased less than they would have if coal-fired plants had been built. The new plants lead to an emissions increase, but a reported "reduction." Hypothetical baselines enable companies to commit to and report emissions "reductions" that don't exist in fact. Virtually all companies reporting substantial emissions "reductions" under 1605((b)are using modified baselines.

Business-as-Usual "Reductions"

With modified baselines, companies are able to report emissions "reductions" under 1605(b)for many "business-as-usual" activities. By far the largest of these involve reporting emissions "reduction" projects associated with availability improvements at existing nuclear power plants. Others involve regular maintenance or upgrades at existing fossil plants, shutting down plants, fuel switching, repowering, and other activities. It is not clear that any of these "reduction" activities resulted from changes in business behavior due to the Climate Challenge program. Ten of the companies listed in Table 1 reported "reduction" projects associated with nuclear facilities. These projects accounted for 80 percent of the project direct "reductions" reported by companies in Table 1, and 70 percent of total project direct "reductions" reported by the electric industry under 1605((b)in 1999. Figure 6 illustrates the portion of "reductions" resulting from nuclear projects for the industry and for the companies included in Table 1 reporting nuclear projects.

Most of the nuclear "reductions" reported—aside from the examples of companies reporting "reductions" for a facilities entire output—were associated with availability improvements that increased generation at a facility.[8] Availability improvements are increases in the amount of time a plant operates during the year, which at base load nuclear plants is strictly a function of how well the plants are operated and maintained.

Availability improvements at base load nuclear facilities directly and substantially improve plant profitability, making them a top priority for all nuclear plant operators. Over the past decade, nuclear operators have been successful at improving availability, as the average capacity factor of nuclear power plants (the amount of annual generation as a percent of the plant's total generation capability), increased from 66 percent in 1990, to over 85 percent in 1999.[9] This industry-wide phenomenon is not limited to plants associated with the Climate Challenge commitments or 1605(b) reporting.

Fossil-fuel power plant operation provides another set of reported "reductions." These range from maintaining and upgrading equipment to fuel switching, repowering, or shutting down outdated generating plants. Projects that companies claimed were routine repair and maintenance accounted for by far the largest "reductions" in this category, with 159 projects reported for a total emissions "reduction" of 16 million tons of CO_2 in 1999, or 10 percent of total reported "reductions."[10] As noted above, these "reductions" amount to nothing more than reporting of business-as-usual activities to service aging power plants.

Selective Reporting

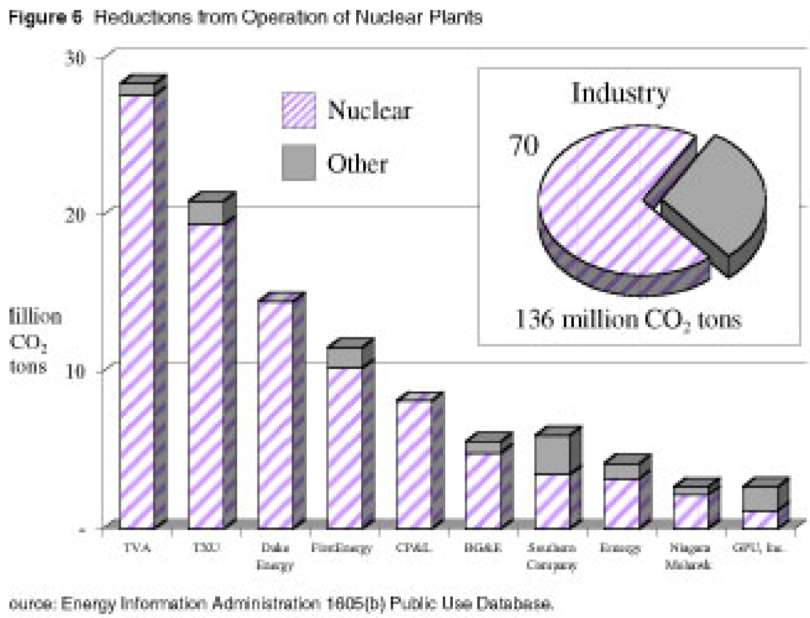
Under 1605(b), companies are able to report emissions "reductions" from one set of activities, while ignoring other activities that increase emissions. For example, Duke Energy reports significant emissions "reductions" associated with increased generation at three of its nuclear power plants, but the company recorded an overall emission increase from its fossil generation fleet of over 26 percent between 1990 and 1999. None of the emissions increases were reported as projects or counted against claimed "reductions." Similarly, Baltimore Gas &Electric reported "reductions" associated with heat rate improvements at three fossil fuel power plants in 1999, but emissions from its fleet increased 50 percent between 1990 and 1999. Allowing for reporting of "reductions" from one set of operations, and simultaneously ignoring emissions increases from other activities is a significant accounting loophole in the 1605(b) program. To achieve real emissions reductions, programs must clearly account for all emissions activities.

[8]Of companies in Table 1, CP&L, Duke Energy, Entergy, FirstEnergy, Niagara Mohawk, and Southern Company reported emissions "reductions" from nuclear plant availability improvements.

[9]Energy Information Administration (EIA), Annual Energy Review 2000, Table 9.2.

[10]See Note 3.

Figure 6. Reductions from Operation of Nuclear Plants



CONCLUSION

The failure of the Climate Challenge program to reduce emissions was arguably predictable. Without binding commitments or enforcement provisions, electric power producers had no incentive to pursue real changes in business practices to reduce CO_2 emissions. Furthermore, by enabling companies to claim "reductions" using hypothetical baselines, report "reductions" from business—as-usual activities, and ignore emissions increases that parallel reported "reductions," the Climate Challenge and 1605(b) allowed companies to essentially print their own emissions "reductions." Real progress in improving electric industry environmental performance must involve enforceable requirements that make global warming pollution reduction an integral factor in business planning and investment decisions.

RESPONSES OF DAVID G. HAWKINS TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. We've heard from EPA and industry that stringent enough caps could obviate the need for New Source Review and a host of other Clean Air Act requirements. What are your views on this position?

Response. NRDC does not believe that a set of national caps on emissions would obviate the need for New Source Review or justify amending other programs in the current Act that address pollution problems caused by electric generating sources. New Source Review programs are designed to achieve two important objectives: first, to assure that when new plants are built or emission-increasing modifications are made to existing plants, that the plants are required to meet modern performance standards to prevent and reduce pollution; second, to assure that impacts on local air quality are assessed prior to construction to prevent an exacerbation of health problems and to protect places where the air is still clean.

Neither of these objectives can be fully achieved only with a program that caps emissions on a national level. Investments in electric generating facilities are particularly long-lived and it continues to make sense that new facilities and major modifications of existing plants incorporate state-of-the-art environmental performance into the project design when these investments are made.

For example, the acid rain program of 1990 capped sulfur oxide emissions but Congress continued to require new plants to meet best performance levels for that pollutant. This was a wise decision because plants built in the last decade will be around for several more decades. By minimizing the emissions from these long-lived plants up front, Congress reduces the costs of achieving additional reduction goals such as those in S. 556. While S. 556 is a comprehensive program, new plants will be operating 50 years from now and S. 556 is unlikely to be the last air pollution program enacted during the next five decades.

A national cap program also will not achieve the second objective, protecting local air quality. National caps will bring down total pollution loads, which is important. But local loadings of pollution will remain important. Major metropolitan areas continue to have air pollution problems that harm public health. A reduction in total loadings nationally will improve air quality in general but will not provide a complete cure for the most polluted places. In addition, achievement of the caps will not occur overnight. For both these reasons, we need to maintain a program that reviews projects with significant emission increases so that localized pollution problems are prevented from getting worse.

National Parks and other places with very clean air also can be damaged by large new projects if emissions are not well controlled. Without a New Source Review program the degradation of clean air in regions like the intermountain west could be rapid and large. Areas experiencing rapid growth in energy generating plants could have very dramatic increases in regional pollution if new plants could be built without modern emission controls. Such a scenario could occur under a national cap bill without a New Source Review requirement for new plant owners could take credit for reductions hundreds or thousands of miles away rather than minimizing emissions from the newly constructed plants. For these reasons a national cap program cannot replace the Act's New Source Review programs.

Other Clean Air Act programs will continue to serve critical purposes if the caps in S. 556 are enacted. The Act's "nonattainment" programs are a structured set of requirements designed to assure the public that public officials will adopt pollution controls sufficient to achieve the health-based National Ambient Air Quality Standards (NAAQS) on a congressionally specified timetable. Both the NAAQS and deadlines for achieving these standards must be preserved to assure timely progress toward public health protection in metropolitan areas where tens of millions of people live.

Included in the Act's nonattainment program are tools, such as petitions under section 126 of the Act, to empower States to force remedial action by EPA to address interstate transport of pollution. The national caps in S. 556 will greatly reduce the number of occasions when State officials might need to petition EPA. To the extent that the caps result in a well controlled fleet of electric generating plants, S. 556 will aid planning efforts both for the generating industry and for State officials. As a practical matter, the caps in S. 556 will allow public officials to focus their efforts on other more polluting sectors. However, these facts do not support creating a special exemption from section 126 for all electric generators. Because there is compliance flexibility in S. 556 as to how, when, and where affected sources must achieve their obligations under the cap, there will likely remain some instances of interstate pollution problems tied to particular sources or groups of sources. States and their citizens should not be deprived of the current Act's remedies to address these situations.

Regional haze problems will also be helped greatly by the caps in S. 556. However, this does not call for an elimination of the Act's current program. Rather, the caps in S. 556 will greatly reduce the burden on the State's of assembling programs adequate to address the remaining problems. In developing their regional haze response plans, States will be able to account for the progress that will be made with the reductions required by S. 556 and focus their attention on the remaining additional actions needed to reduce impairment.

Another area identified by some, are the requirements for MACT controls for mercury. The Act's current program requires hazardous air pollutants to be minimized at each existing and new plant, with reduction implemented on a rapid schedule. While one could, in theory, achieve a consensus for a legislative design that would achieve the same results, that consensus does not appear to have arrived regarding the mercury provisions of S. 556. Accordingly, there is no basis to suggest a change in the statutory requirements to control hazardous air pollutants from electric generating units.

Even with preservation of the Act's current programs, enactment of national caps will provide value for the private sector and consumers. The caps provide a predictable structure for achieving the great bulk of the emission reductions that otherwise would have to be secured only by the much less certain processes of hundreds or thousands of individual rulemaking decisions by numerous State and local agencies. With the caps enacted, individual firms can share their compliance plans with local, State, and Federal authorities, as well as the public. Those authorities can take account of the reductions under the caps in developing their State Implementation Plans and Regional Haze programs, greatly reducing the need for additional rulemaking to produce complete plans and programs. This reduction in the need for rulemaking will dramatically improve the private sector's ability to reduce compliance costs and to plan on a long-term basis. Fewer rulemakings also will reduce the workload on State and local agencies, making their job more manageable.

Question 2. Some of your panel have expressed concern about the local impacts of trading. How do we run a national cap-and-trade program efficiently without jeopardizing local environmental quality and public health?

Response. The Act's 1990 acid rain control program provides the answer to this question. Under that program large reductions in sulfur dioxide have been achieved at great savings in compliance costs compared to pre-enactment estimates. Local environmental quality and public health have not been jeopardized by the compliance flexibility in the national cap-and-trade program because the Act's existing programs to protect local air quality were preserved. Contrary to claims now being made, preserving the Act's local protection programs under the acid rain program has not conflicted with the efficient operation of the national trading system. The compliance cost savings of the flexible national cap program have been achieved while maintaining compliance with the critical local protection requirements of the Act.

For the three pollutants for which trading is permitted under S. 556, NRDC expects that efficient trading systems will prosper while the Act's current requirements protect local air quality. A number of America's remaining air pollution problems, such as fine particles, ozone smog, and acid rain, and regional haze, have a large regional component in addition to the impacts of local sources. The national caps in S. 556 will help reduce the regional component of these pollution problems. By allowing the market an opportunity to select the most efficient pattern of reductions to address the regional contribution to our pollution problems, the national caps will reduce the overall compliance costs of achieving our air quality objectives, compared to a system that relies much more heavily on source-specific emission limits on existing sources to meet those objectives. Of course, for carbon dioxide, there is no local air quality concern from emission sources and S. 556's trading program for this pollutant can operate without the need for additional measures to address.

STATEMENT OF RONALD J. TIPTON, NATIONAL PARKS CONSERVATION ASSOCIATION

Mr. Chairman and members of the committee, I am Ronald J. Tipton, Senior Vice President of Programs at the National Parks Conservation Association (NPCA). NPCA is America's only private, nonprofit advocacy organization dedicated solely to protecting, preserving, and enhancing the National Park System. NPCA was founded in 1919 and today has more than 425,000 members who care deeply about the well being of our national parks, including protection of Class I air quality and related values in 48 national parks. NPCA's president since 1998, Thomas Kiernan, served in the first Bush Administration's Environmental Protection Agency (EPA), and helped craft the agreement to reduce air pollution from the Navajo generating station in order to protect air quality related values in Grand Canyon National Park. Thank you for the opportunity to testify today on S. 556, the Clean Power Act of 2001.

While we greatly appreciate the opportunity to appear before you today, we are compelled to note that the last oversight hearing specifically to address impacts of air pollution on national park units was held 16½ years ago in May 1985 by the House Subcommittee on National Parks and Recreation. We respectfully request that this committee schedule a hearing in the near future dedicated to impacts of air pollution on America's national parks.

For three decades the nation has struggled with how to implement Federal legislation to achieve national air quality goals. The good news is that we have achieved a certain degree of success in this effort; there have been notable and undeniable improvements in air quality for many major metropolitan areas; automobiles are much cleaner and more fuel efficient than before Federal emission limits were improved; and many power plants, factories, and manufacturing facilities have also reduced their emissions.

Air pollution continues to harm national parks

At the same time, however, our great national parks—the places in America that are expected to foster some of the best air quality and most spectacular vistas—have in many cases experienced declining air quality despite the Clean Air Act mandates.

In fact, it would surprise Americans to learn that many of our beloved national parks are suffering from some of the highest levels of air pollution in the country. The 1916 statute creating the National Park System states that the purpose of the National Park Service is to "conserve the scenery and the natural and historic objects and the wild life therein—and leave them unimpaired for the enjoyment of future generations."[1] While visibility impairment is widespread throughout the park system, scenic views are not the only resource at risk. The same pollutants that reduce visibility also contribute to thousands of premature human deaths each year. Acid deposition hurts natural and cultural resources. Ground level ozone, or smog, threatens the health of park visitors and workers, and the health of park vegetation. Mercury deposition threatens fish and wildlife in a number of parks. Finally, global warming impacts parks in many ways, from rising sea level to melting glaciers to reduced biodiversity.

Scenic vistas are key features in many national parks

The authorizing legislation for numerous national parks specifically mentions scenic vistas as among the reasons for the park's establishment. NPCA will submit for the record a compilation of key excerpts from the legislative history of most of the National Park System units in which specific references are made to the vistas that were the purpose for which these areas were established. (Note: Attachment 1 is retained in committee files.)

Recognizing that pristine air quality and scenic vistas are highly valued features of national parks, Congress amended the Clean Air Act in 1977, declaring a total of 158 areas including all international parks, national parks over 6,000 acres and wilderness areas over 5,000 acres and in existence on August 7, 1977 as "Class I areas," deserving of the greatest protection under the Clean Air Act. Congress declared as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which impairment results from manmade air pollution."[2]

Visibility remains impaired in numerous national parks

Regrettably, almost 25 years since enactment of the 1977 Clean Air Act Amendments, many national parks throughout the country suffer from deteriorating air quality caused in large part by emissions from old, dirty power plants, and from the fact that many of the facilities impacting visibility operate under a loophole in the 1977 Clean Air Act Amendments that exempts them from complying with modern pollution emission control requirements. NPCA will submit for the record two National Park Service photos which contrast good and poor visibility at Shenandoah National Park, as representative of the many parks across the country that suffer significant visibility impairment. (Attachment 2)

According to EPA, average visual range in most Eastern Class I areas is 15–25 miles, compared to estimated natural visibility of about 90 miles. In the West, average visual range is 35–90 miles for most Class I areas, compared to estimated natural visibility of about 140 miles.[3] According to the Department of the Interior, "Visibility impairment is the most ubiquitous air pollution-related problem in our national parks and refuges—parks and refuges such as Grand Canyon, Cape Romain, and Great Smoky Mountains have evidenced declining visibility—all areas monitored for visibility show frequent regional haze impairment."[4]

Smokies, Big Bend, and other parks suffer numerous problems

NPCA included Great Smoky Mountains National Park in Tennessee and North Carolina and Big Bend National Park in Texas on its 2001 list of America's Ten Most Endangered National Parks as representative of the many national parks suffering from poor air quality. Millions of Americans who escape urban congestion by visiting national parks are greeted by dim, hazy vistas and unhealthful air instead of the expansive views and scenery that have made these areas our national treasures. In a letter to President George W. Bush dated June 19, 2001, Tennessee Senator Fred Thompson wrote: "Most shocking to me is that, according to Park officials, air quality in the Smokies is so poor during the summer months that hiking our backcountry trails is more hazardous to your health than walking along (city) streets . . ." If Americans expect clean air anywhere, it's in our national parks.

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[1] The National Park System Organic Act of 1916 (16 USC §1).

[2] 42 USC §7491(a)(1).

[3] Latest Findings on National Air Quality: 1999 Status and Trends, U.S. Environmental Protection Agency, August 2000, p.19.

[4] U.S. Department of the Interior to U.S. Environmental Protection Agency, Docket No. A–2000–28, September 17, 2001.

The time is ripe for Congress to act now to fulfill the promises made to America almost 25 years ago, not only to clear the air in our national parks, but in our nation as a whole. NPCA fully supports S. 556 and commends Senators Jeffords and Lieberman for introducing it. The bill's "birthday provision", which phases out the exemption granted in 1977 to older coal-and oil-fired plants, is critical to the cleanup of Class I areas like Great Smoky Mountains National Park, our nation's most-visited national park, with more than 10 million visitors each year. Great Smoky Mountains National Park has recorded the highest level of nitrogen deposition of any monitored site (urban or rural) in North America. Scenic views that historically stretched for more than 60 miles in the summer and more than 90 miles during the rest of the year are typically reduced to 15–25 miles now. In the park, researchers have documented that at least 30 different species of plants are suffering foliar damage from ground-level ozone; an additional 60 species exhibit the same symptoms. The National Park Service has had to issue "unhealthful air" notices to employees and park visitors on 140 days over the last 4 years.

America's national parks cannot be protected without significant reductions in the sulfur and nitrogen pollution that form regional haze and acid rain, and the nitrogen pollution that is also a building block of ground-level ozone. Moreover, the 75 percent reductions in sulfur and nitrogen pollution called for in the Jeffords-Lieberman bill may not be sufficient to protect some of our most threatened national parks including Great Smoky Mountains and Shenandoah, where preliminary modeling analyses indicate that reductions of up to 90 percent may be necessary. At Shenandoah National Park, streams continue to acidify, especially during the winter when native fish are most sensitive. While sulfur deposition has decreased, nitrogen deposition has increased. Intense storms with highly acidic precipitation can kill young of even the most tolerant fish species, brook trout. Acidification is suspected in the loss of the blacknose dace in the park's Meadow Run, and scientists are concerned that high levels of precipitation over short periods of time, combined with the chronic acidity in the streams, could further reduce fish species diversity.

Park pollution remains a national problem

The need to reduce emissions from power plants is not a southeastern problem, however, nor even an eastern problem. Excess emissions from power plants impacts national parks throughout our country; from Acadia in Maine, to Shenandoah in Virginia, Mammoth Cave in Kentucky, Big Bend in Texas, Mesa Verde in Colorado, Canyonlands in Utah, to Mount Rainier in Washington State, Sequoia-Kings Canyon and Joshua Tree in California, and numerous other parks in between.

Americans support clean air

In the mid–1980's, the National Park Service conducted studies at five parks surveying visitors on the importance of various park features to their recreational experience. At all five parks—Grand Canyon, Mount Rainier, Everglades, Mesa Verde and Great Smoky Mountains, "clean, clear air" was ranked among the top four features. Recent polling in Tennessee, New Hampshire and Oregon also demonstrates overwhelming public support for restoring clean air and scenic vistas to our national parks. In the Commonwealth of Virginia, a poll conducted in May 2001 showed that eight out of ten Virginians (77 percent) believed older power plants should meet modern pollution control standards.[5]

Global warming and mercury pollution impacts parks

NPCA is also highly concerned about the impacts of global warming and mercury contamination in our national parks. We fully support the mandatory reductions of mercury and carbon dioxide included in S. 556, The Clean Power Act.

The Energy Information Administration (EIA) of the Department of Energy released on November 9, 2001 a comprehensive official accounting of emissions changes from 1990–2000. According to the report, total U.S. carbon dioxide emissions increased by 16.8 percent during this period, with carbon dioxide emissions from electricity generation increasing 26.5 percent. Mandatory reductions clearly are needed to reduce the impacts we face from global warming. The very real threat of sea levels rising due to human-caused global warming will have a dramatic effect on coastal national seashores and parks such as Cape Cod, Cape Hatteras and Everglades. According to the EPA, the Gulf and Atlantic coasts are likely to rise 1 foot by 2050, and over the next 100 years, could rise 2–4 feet. Imagine the possibility that the $7.8 billion Everglades ecosystem restoration plan—which this committee helped design—could be offset by sea level rise and massive climate alterations in

[5]The Tarrance Group, statewide poll conducted for the League of Conservation Voters Education Fund, May 6–8, 2001, p. 10.

south Florida! At Glacier National Park in Montana, park managers believe that many park species may be particularly sensitive to global warming. The park's largest remaining glaciers are now only about one-third as large as they were in 1850, and one study estimates that all glaciers in the park may disappear completely in 30 years.[6]

Mercury exposure in the United States is widespread, and as a potent neurotoxin that persists in the environment and bioaccumulates in the food chain, mercury pollution demands an aggressive policy response. National parks including Acadia, Isle Royale in Michigan, and Big Bend are studying the effects of mercury contamination on fish and wildlife. Scientists at Acadia have concluded that aquatic resources are at risk from mercury contamination. Scientists at Big Bend believe that above threshold levels of mercury may be causing reproductive failures of the Peregrine Falcon—a species listed as "Endangered" following catastrophic impacts from the pesticide DDT, and de-listed in 1999.

In summary, Mr. Chairman, in order to protect the natural and cultural resources in America's national parks, significantly reducing sulfur, nitrogen, mercury, and carbon dioxide pollution now simply makes sense.

BART provides a needed step toward cleaner air for parks

NPCA is pleased that, in July 2001, the EPA published a draft rule to require Best Available Retrofit Technology (BART) on many of America's old, dirty power plants and industrial facilities that have largely avoided emissions controls due to a loophole in the 1977 Clean Air Act Amendments. In its role as steward of national parks and of many non-park Class I areas, the Department of the Interior filed comments strongly supportive of the most effective final BART rule. Thousands of citizens, including realtors and other business representatives in park gateway communities, submitted oral testimony at public meetings or written testimony in support of an effective BART rule. For the committee's reference, the attachments to NPCA's testimony today include a copy of NPCA's comments (Attachment 3) and of Interior's comments (Attachment 4) on the draft BART rule.

Park protection benefits local economies also

There was much discussion during the 2-day stakeholder meetings in October 2001 and at the November 1, 2001 hearing before this committee about whether requiring older power plants to clean up will hinder or help our nation's economy. I would like to suggest a slightly different perspective. A 2000 report titled, Out of Sight: Haze in our National Parks by Abt Associates, commissioned by the "Clear the Air" coalition found that: "increases in visibility could raise park visitation by as much as 25 percent which could yield approximately $30 million in increased fee collection and $160 million in additional concession sales. This would in turn add nearly $700 million in retail sales to the economies around the park, $53 million in local tax revenue, and create 15,896 jobs."[7] Not only would this legislation improve the condition of park resources and help protect them from future impairment, it would also provide a major boost to park revenues and to the many gateway communities and cities whose economy depends on the well being of these parks.

Moreover, as noted by Interior, "State and local air pollution agencies, as well as affected industries and their consultants, have been applying (a process of assessing feasibility of applying the best of current technology and balancing that with costs and other environmental impacts) for over a decade, without harm to economic development."[8]

National parks measure effectiveness of pollution control programs

In closing, I want to emphasize the imperative to use effects-based monitoring and evaluation of Class I areas as the measuring stick for the efficacy of pollutant-reduction strategies. Emission-based multi-pollutant strategies must be linked to specific results. A simple cap-and-trade program offers no specific protection to Class I areas as required by the Clean Air Act. Strategies must be multi-faceted, and linked to continuous and timely progress toward effect-based goals. The New Source Review (NSR) and Prevention of Significant Deterioration (PSD) programs currently provide the only effect-based monitoring and permitting of stationary sources of sulfur and nitrogen pollution, and we've seen no proposal that provides effect-based monitoring and permitting in the absence of the NSR and PSD programs.

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[6]USEPA website, www.epa.gov/globalwarming/impacts/mountains/index.htm.

[7]Out of Sight: Haze in Our National Parks, Clean Air Task Force for Clear the Air, August 29, 2000.

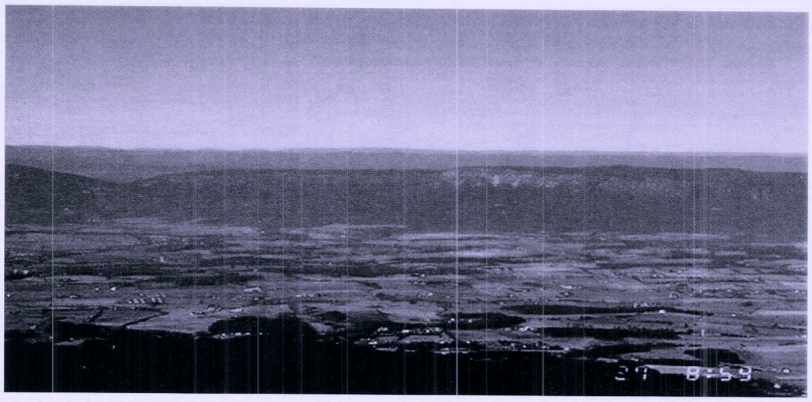
[8]U.S. Department of the Interior to U.S. Environmental Protection Agency, Docket No. A–2000–28, September 17, 2001.

The utilities seek “certainty” by asking for a phased reduction schedule with no measurement of the resulting effects and no accountability for the cumulative impact of the hundreds of proposed new sources. The “certainty” that such a strategy would produce for our national parks is the abandonment of America’s national commitment to our descendants that we have the wisdom to create our future without destroying our past.

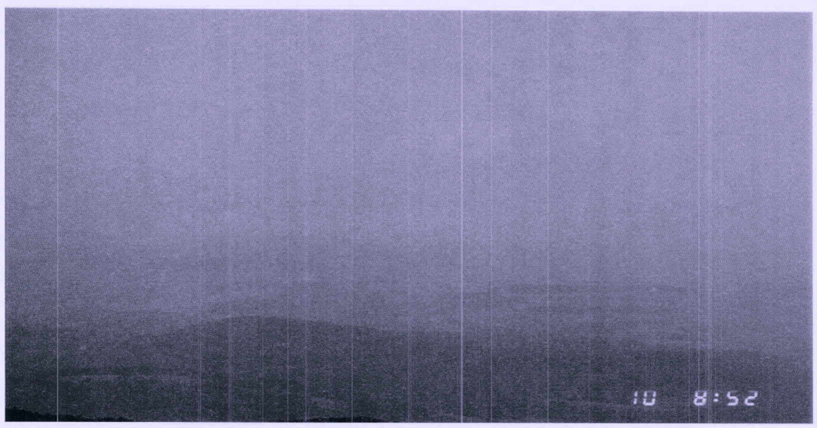
Recent history is instructive. While emissions nationwide have been reduced under implementation of the Clean Air Act Amendments of 1990, emissions affecting many Class I areas actually have increased. Due to the use of emission reduction credits under the national trading program, the Tennessee Valley Authority emitted approximately 700,000 tons of sulfur dioxide last year, 300,000 tons above their Phase II allocation. Accordingly, visibility in and around Great Smoky Mountains National Park is very poor and continues to worsen. With little ability to influence reductions at existing sources, the Federal land managers’ only tools have been new source review.

Enactment of S. 556 provides a critical step to protect America’s national parks. Our national parks and wilderness areas deserve and demand the protection that S. 556 will provide; the American public expects no less. We are eager to work with the committee to fulfill the vision of the Clean Air Act to protect and restore air quality in America’s national parks. We must work together to meet the goals of the 1977 amendments to the Clean Air Act to prevent future impairment and remedy existing visibility impairment in all Class I areas. Thank you for inviting NPCA to appear before you today and for considering our views.

Shenandoah National Park



Shenandoah on a clear day.



Shenandoah on a day with high levels of air pollution.

National Parks and their neighbors are under attack from air pollution. This pollution hurts human health, the park's health, and the state's economic health. To clear the air, older coal- and oil-burning power plants must be required to meet modern emissions standards.

Images provided courtesy of National Park Service

NATIONAL PARKS CONSERVATION ASSOCIATION,
October 5, 2001.

The Honorable Christine Todd Whitman, *Administrator*
U.S. Environmental Protection Agency
Air and Radiation Docket and Information Center (6102)
Attention: Docket No. A–2000–28
1200 Pennsylvania Ave., NW Washington, DC 20460

RE: Proposed Guidelines for Best Available Retrofit Technology (B.A.R.T.) Determinations Under the Regional Haze Regulations; Proposed Rule

DEAR ADMINISTRATOR WHITMAN: As president of the National Parks Conservation Association (NPCA), the only national nonprofit organization dedicated solely to protecting and enhancing America's National Park System, I am writing to you today on behalf of our 425,000 members. Under your leadership, the Environmental Protection Agency has an historic opportunity to take action to achieve the vision of the 1977 amendments to the Clean Air Act, which acknowledged that pristine air quality and scenic vistas are highly valued features of national parks and wilderness areas, meriting the greatest protection under the Clean Air Act. The proposed national park visibility protection guidelines (or Best Available Retrofit Technology rule) could mean significant reductions in sulfur dioxide, nitrogen oxide and particulate matter pollution—improving America's national parks and wilderness areas, and also improving human health. NPCA appreciates EPA's action in moving forward to implement the regional haze program. We urge you to adopt a final rule that will accomplish long-overdue, necessary benefits for parks and people.

NPCA is pleased to be working with an Administration that has made protecting and restoring America's national parks the centerpiece of its conservation agenda. President George W. Bush repeatedly has spoken of his commitment to protect and restore America's National Park System. Adopting and implementing an effective and enforceable final B.A.R.T. rule is essential to fulfilling that commitment.

In many of America's most popular national parks, regional haze threatens park resources and values, as well as the health of park visitors. NPCA included Great Smoky Mountains and Big Bend National Parks on our 2001 list of ten most endangered national parks precisely because of deteriorating air quality in those parks. The scenic vistas that draw millions of visitors annually to these and many other beloved national parks are often shrouded in haze. But if Americans expect clean air anywhere, it's in our national parks.

Air pollution respects neither State boundaries, nor park designations, nor sensitive economies, nor sensitive people. The benefits of cleaning up old, dirty power plants and industry smokestacks transcend the national parks. Residents and economies hundreds of miles away from the parks also will benefit from requiring older, dirty power plants and industrial boilers to meet modern standards. A 2000 report commissioned by the Clean Air Task Force for Clear the Air states:

"Haze comes at no small cost to our national parks. A report by Abt Associates estimates that the value of eliminating power plant haze is over seven billion dollars a year (emphasis added).'"

At EPA's B.A.R.T. public hearing in Arlington, Virginia on August 21", 2001, Ms. Mary Johnson, a realtor who serves on NPCA's Board of Trustees, addressed the impacts of regional haze on real estate values in park gateway communities:

"An informal analysis was conducted in one mountain community outside Great Smoky Mountain National Park in an attempt to discover just how' much a mountain view is worth in real dollars. We found in a multitude of actual listings that the average increased value of a property sold with a mountain view was $25 per square foot above those with no view. That has a cumulative impact of 30–40 percent increase in the sale price of mountain view land, amounting to millions and millions of dollars in the local economies with ongoing property tax support in addition."

An effective final B.A.R.T. rule giving priority consideration to the best available control technologies would result in major reductions in emissions of sulfur dioxide and nitrogen oxide, the pollutants that contribute to regional haze. This has great potential for improving air quality in America's national parks and in neighboring communities. Moreover, the proposed rule provides an extraordinary degree of flexibility for utilities.

In conclusion, NPCA urges you to incorporate the following points in order to finalize an effective B.A.R.T. rule:

1. All States must participate in the B.A.R.T. program.

2. EPA must choose the preferred alternative: reviewing the most advanced technology with the highest removal rate first. State and local air pollution agencies have been using this approach in related programs for the past decade, during which our country experienced record economic growth. Best Available Retrofit Technology should be just that—the best. Any other approach will lead to confusion, inconsistent application, unfair competitive advantage, and

1 Out of Sight: Haze in our National Parks, 2000. A Clear The Air Report.

continued damage to Class I areas and their neighbors.

3.. Sulfur dioxide can and must be controlled at least at levels of 90–95 percent. Weaker restrictions will not protect and restore the resources now being damaged by excess emissions of sulfur dioxide.

4. Nitrogen oxide can and must be controlled at least at a 90 percent level. Weaker restrictions will not protect and restore the resources now being damaged by excess emissions of nitrogen dioxide.

5. B.A.R.T. controls must apply to all sources that affect Class I areas, not just the 750-megawatt utilities.

6. The 250-ton cutoff should not apply only to one pollutant. The 250 tons should be the total tonnage of all pollutants of concern summed together.

7. B.A.R.T.-related reductions should be in addition to other Clean Air Act programs such as the Title IV acid rain program and the NOx SIP call. It should be over and above these limits.

8. If B.A.R.T. applies to any one unit of a utility plant, then it should apply to all. The current proposal could apply to as few as one unit of a facility, a flawed and ineffective approach.

9. EPA must include control technologies that remove more than one pollutant in the "best options" category.

10. EPA must ensure that any Cap and Trade program will significantly improve visibility in America's Class I areas. The national cap-and-trade program for sulfur dioxide under the 1990 Clean Air Act Amendments unfortunately has not benefited many areas suffering the greatest damage from acid deposition.

Thank you for considering our comments. America's national parks deserve and need the protection that an effective, enforceable B.A.R.T. rule will provide. The measure for the regional haze program's effectiveness is the restored health of Class I areas.

Sincerely,

THOMAS C. KIERNAN, PRESIDENT.

RESPONSES OF RONALD J. TIPTON TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. We've heard from EPA and industry that stringent enough caps could obviate the need for New Source Review and a host of other Clean Air Act requirements. What are your views on that position?

Response. The New Source Review (NSR) program is a mechanism for States to maintain National Ambient Air Quality Standards (NAAQS) protecting human health while simultaneously defending national parks and wilderness areas. It encompasses two separate requirements-Nonattainment New Source Review for plants located in designated nonattainment areas, and Prevention of Significant Deterioration for plants sited in attainment areas.

NPCA is very concerned that EPA, in conjunction with the Department of Energy, may change the NSR program in ways that result in more pollution, not less, in America's national parks and wilderness areas. By redefining key provisions, EPA would create loopholes for utilities and industry to increase their emissions. This would set a dangerous precedent as EPA is also developing a multi-pollutant proposal to reduce emissions from power plants. In the name of responding to industry requests for streamlining, EPA risks rendering ineffective programs that now make progress to protect national parks and wilderness areas, and public health.

In the northwest, the Bonneville Power Administration conducted a cumulative analysis on 45 proposed plants. The analysis led park officials to conclude that if all were constructed, Olympic, Mount Rainier, and North Cascades National Parks would be harmed. These situations would be drastically worse if a new NSR program were initiated to permit new sources with fewer pollution controls while simultaneously paving the way for existing sources to avoid reducing emissions under existing programs.

The shortcomings of a national cap without taking into account local impacts is made clear by the implementation of the acid rain program established by the 1990 clean air act amendments. Despite reductions in total national emissions, local emissions have stayed the same or even increased in many areas. If a cap-and-trade program by itself was effective, improvement in visibility should have been evident at Great Smoky Mountains National Park. It is not.

We are very concerned that an EPA briefing to the Edison Electric Institute in September 2001 showed an increase in sulfur emissions nationwide, and an increase in nitrogen emissions in some areas, under the draft Administration 3-pollutant bill.

We are also very concerned that industry is fighting the "birthday" provisions of the Jeffords bill. If the national cap would require all these older plants to meet modern standards anyway, the birthday provision simply provides a deadline.

A strong New Source Review program is a crucial component of the Clean Air Act. Any changes must result in achieving the goals of the 1977 Clean Air Act to protect and restore air quality and related values in Class I areas. Effects-based monitoring, analysis, and decisionmaking is critical to protect parks and wilderness areas. NSR rollback will continue polluted skies in America's national parks.

Question 2. You indicated that the reduction requirements in the Clean Power Act might not be enough to protect some of our most important Parks. Could you elaborate on that concern?

Response. The Clean Air Act (CAA) amendments of 1977 mandated the protection of air quality related values (AQRVs) in Class I areas, which include 156 national parks and wilderness areas. Congress stated that Class I areas are afforded the greatest degree of air quality protection under the CAA, and should have the cleanest and clearest air in the United States. The 1977 amendments to the CAA give Federal land managers the affirmative responsibility to protect the natural and cultural resources of Class I areas unimpaired for the enjoyment of future generations, erring on the side of protection. The AQRVs include such things as visibility, vegetation, healthy streams and soils, and human health. Since emissions of mercury and carbon dioxide have not been previously regulated, there are no current Class I metrics against which to measure the efficacy of the reductions proposed by the Clean Power Act. However, such information does exist for the effects of SO_2 and NOx on Class 1 areas.

It is important to understand that our job is not just to protect Class I areas from future pollution, but to reduce existing (and future) emissions to levels which enhance and remedy the AQRVs of these areas. While ongoing programs such as Title IV have brought about nationwide reductions of some pollutants, these programs have failed to address the protection of Class I areas. For instance, monitoring sites at Great Smoky Mountains National Park (GRSM) have registered the highest level of nitrogen deposition of any monitored location in North America. At least 30, and as many as 90, different species of plants are currently exhibiting foliar injury from ambient levels of ozone pollution in the park. Some species, such as black cherry and yellow poplar, are showing reduced growth rates.

Since measures to protect Class I areas are necessarily effect-based standards, the best way to examine these metrics is by the effects caused by the pollutants of concern. While air pollution chemistry is quite complex, approximations based on the presence of various pollutants helps answer the question before us. An examination of metrics developed for GRSM and Shenandoah (SHEN) National Parks is particularly instructive (see attached).

SO_2 Emissions

The principle effects of SO_2 on the AQRVs of Class I areas are visibility impairment and acidification of soils and streams. For nearly 10 years, the Southern Appalachian Mountains Initiative (SAMI) has sought to develop computer modeling which quantifies the sources and effects of SO_2 on Class I areas. SAMI modeled two different reduction scenarios beyond existing and “on the way” regulatory programs. The more aggressive scenario (B–3) approximates the kind of reductions proposed by the Clean Power Act and, thus, serves as a useful benchmark for evaluating the efficacy of this level of reductions.

Visibility Impairment/Regional Haze

The operative questions seem to be: “What is natural visibility?” “What is visibility in these Class I areas now?” and “Will the emission reductions proposed in the Clean Power Act restore natural visibility to these areas?” The answer is “no.”

About 80 percent of the SO_2 emitted in the 8-State SAMI region comes from utility sources. Accordingly, the Clean Power Act would have a substantial impact on visibility improvement, especially in the Eastern United States. Visibility is reported in units called deciviews, (a 10 percent change in light extinction) or perceptible changes in visibility. EPA’s draft guidance for its Regional Haze rule estimates that GRSM and SHEN need about a 20 deciview improvement on the 20 percent haziest days in order to approach natural visibility in these areas. SAMI’s modeling of its B–3 strategy (which assumes scrubbers on all utilities and large industrial boilers) has tentatively predicted less than half of the necessary improvement. This demonstrates the importance of keeping the current BART rule in place while focusing specific attention on additional, necessary reductions from utility sources.

Acid Deposition

Since acidification of soils and streams is a result of both SO_2 and NOx, we will address it in the following discussion of NOx effects.

Public Health

While the impacts of particulate matter (PM) on human health are well documented (e.g., premature death), particles other than sulfates contribute to our PM problems. Even though these health effects have not been speciated to determine which particles are causing specific health effects, we do know that at GRSM (and rural areas throughout much of the Eastern United States), sulfate particles comprise about 70 percent of the fine particulate matter during the summer season when visitation is highest.

NOx Emissions

The NOx emitted by power plants, mobile, industrial and other sources is a precursor to ground-level ozone, a powerful respiratory irritant that causes breathing problems in people and damages vegetation. When NOx combines with volatile organic compounds (VOCs) in the presence of sunlight, ozone is produced.

Power plants are responsible for about 40 percent of the NOx emitted in the SAMI region. Accordingly, a 75 percent reduction in utility-generated NOx could produce, at best, about a 30 percent reduction in total nitrogen deposition in GRSM.

Visibility Impairment

Nitrate particles are also a significant contributor to visibility impairment.

Acid Deposition

About a 55–70 percent reduction in total deposition of acidity (from all sources) would be necessary just to prevent further loss of ANC (acid neutralization capacity) in the soils of the Class I areas of this region. That means that even further reductions would be necessary in order to reverse the acidification process and see gradual improvement to streams and soils. GRSM currently experiences a total annual nitrogen deposition of about 33 kilograms/hectare/year (kg/ha/yr). While natural condition is estimated to be 0.5 kg/ha/yr, the National Park Service (NPS) has determined that the critical load for nitrogen at GRSM (the level needed for resource protection) is 4.5 kg/ha/yr of total annual nitrogen or about an 85 percent reduction in total annual nitrogen deposition.

Vegetation Impacts

Cumulative seasonal exposures of ozone, measured as a W126 index in ppm-hours, that would avoid the currently observed foliar injury to plants and prevent a 10 percent growth loss to individual species has been determined to be <4 ppm-hours and <6 ppm-hours respectively. Observed data at GRSM show that current W126 levels measure 97 ppm-hours. While the Clean Power Act will make a significant and necessary contribution to the needed reductions, it cannot, in and of itself, solve the problem of foliar injury without similar reductions in the other source sectors.

Public Health

Information continues to emerge about the dire effects of PM and ozone on human health. Again, due to the multiple sources involved in the production of ozone, reductions in all source sectors will be needed to eliminate the exacerbated effects at higher altitudes. Funding has been secured by GRSM to document in detail the effects of ozone on high elevation hikers. The park will also begin monitoring mercury deposition this year.

Nearly 25 years after the passage of the 1977 CAA amendments, many Class I areas continue to be some of the dirtiest places in America. The levels of reduction proposed by the Clean Power Act are even more critical when viewed in the context of the current growth in energy usage and the Administration's proposal for the growth of the energy production industry. Even though these reductions will not completely resolve the current impacts in some Class I areas, NPCA fully supports the legislation as a significant and necessary step forward in the protection of some of America's most valued assets.

Question 3. Some of your panel have expressed concern about the local impacts of trading. How do we run a national cap-and-trade program efficiently without jeopardizing local environmental quality and public health?

Response. Although a national cap-and-trade program will provide utility companies with efficiency and flexibility, it offers no specific protection to Class I areas as required by the Clean Air Act. A simple cap-and-trade program cannot prevent individual plants from increasing emissions and potentially harming local air quality. The Clean Power Act's "birthday provision", which phases out the exemption granted in 1977 to older coal-and oil-fired plants, is critical to the clean-up of Class I areas like Great Smoky Mountains National Park, our nation's most-visited national park, with more than 10 million visitors each year. Due to the use of emission reduction credits under the national trading program, the Tennessee Valley Authority emitted approximately 700,000 tons of sulfur dioxide last year, 300,000 tons above their Phase II allocation. Consequently, visibility in and around Great Smoky Mountains National Park is very poor and has not improved.

The single biggest impediment to siting new power sources is the existing, dirty power sources that produce up to 10 times the pollution to produce the same kilowatts of power as a new plant. It took an agreement crafted during President George Herbert Walker Bush's Administration requiring the Navajo Generating Station to reduce emissions, in order to protect air quality related values in Grand Canyon National Park. A similar, recent collaboration of power plant owners, State and Federal regulatory agencies, and Federal land managers will result in significant emission reductions from Centralia Power Plant in Washington State, near Mount Rainier National Park. Visibility impairment at Mount Rainier National Park is among the highest of all sites monitored in the west.

We must maintain the provisions of the Clean Air Act and subsequent amendments giving Federal land managers the responsibility of protecting Air Quality Related Values (AQRV) in Class I areas. Clean Air Act standards to protect Class I areas are by necessity effects-based. It is also essential that the Best Available Retrofit Technology (BART) rulemaking remains on track. BART provides States with guidelines on how they should control power plant emissions that cause regional haze problems in national parks and wilderness areas.

STATEMENT OF JOHN L. KIRKWOOD, CHIEF EXECUTIVE OFFICER, AMERICAN LUNG ASSOCIATION

Good morning. I am John Kirkwood, Chief Executive Officer of the American Lung Association, the nation's oldest voluntary health association. Our mission is to prevent lung disease and promote lung health. The American Lung Association supports S. 556, the Clean Power Act. This comprehensive legislation will reduce and cap emissions of all four major air pollutants from power plants. We support the emission targets and timetables in S. 556. Power plants are the largest single source of industrial pollution, emissions that seriously damage public health and the environment.

Pollution from power plants puts at risk the lives and health of millions of Americans. These pollutants contribute to the formation of smog and deadly fine particles, with well-documented and dangerous consequences to human health. More than 141 million Americans live in areas where the air is unhealthful to breathe because of ozone pollution.[1] Power plants contribute significantly to the problem, especially in the Eastern United States. The Environmental Protection Agency estimates that some 82 million people live in areas with unhealthful levels of fine particles.[2] Let me briefly outline the human toll we are forced to pay.

The most egregious harm is premature death. According to a study conducted last fall, the coal-fired plants produce pollution that results in the premature deaths of an estimated 31,200 Americans each year.[3] Based on other recent research, we know that the lives of these 31,200 people were shortened, not by days, but by anywhere from months to years.[4] The causative factor is the emissions of tons of sulfur dioxide and nitrogen oxides, which are transformed into ultra fine particles in the air. These tiny particles are less than one-tenth the diameter of a single human hair. They are so tiny they bypass the body's natural defenses and lodge deep within the lung, there to adversely affect human health. Studies demonstrate that infants and children, especially asthmatic children, the elderly, and those with heart or lung disease, are especially sensitive to the effects of fine particle pollution.[5]

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[1]American Lung Association. State of the Air 2000. May 2001.

[2]EPA, map presented at Stakeholders' Conference, October 2001.

[3]Abt Associates, Inc. with ICF Consulting, and E.H. Pechan Associates, Inc. Prepared for Clean Air Task Force. The Particulate-Related Health Benefits of Reducing Power Plant Emissions. October 2000. Used to develop: Clean Air Task Force. Death, Disease, and Dirty Power: Mortality and Health Damage Due to Air Pollution from Power Plants. October 2000.

[4]Schwartz, Joel. Is There Harvesting in the Association of Airborne Particles with Daily Deaths and Hospital Admissions. Epidemiology, Vol. 12, No. 1, pp 56–61, January 2001; Brunekreef, Burt. Air Pollution and Life Expectancy: Is There a Relation? Occup Environ Med 1997 Nov; 54(11):781–4; Pope, C.A. III, Epidemiology of Fine Particulate Air Pollution and Human Health: Biological Mechanisms and Who's at Risk? Environ Health Perspect 108 (suppl 4):713–723 (2000).

[5]Many studies show children, the elderly, and persons with respiratory and/or coronary disease as particularly vulnerable to PM. The following are a few of the most recent: Goldberg, M.S., Bailar, J.C. III, Burnett, R.T., Brook, J.R., Tamblyn, R., Bonvalot, Y., Ernst, P., Flegel, K.M., Singh, R.K., and Valois, M-F. Identifying Subgroups of the General Population That May be Susceptible to Short-Term Increases in Particulate Air Pollution: A Time-Series Study in Montreal, Quebec. Health Effects Institute, Research Report Number 97, October 2000; Delfino, R.J., Murphy-Moulton, A.M., Burnett, R.T., Brook, J.R., and Becklake, M.R. Effects of Air Pollution on Emergency Room Visits for Respiratory Illnesses in Montreal, Quebec. Am J Respir Crit Care Med 1997; 155:568–576.; Zanobetti, A., Schwartz, J., and Gold, D. Are There Sensitive Subgroups for the Effects of Airborne Particles? Environmental Health Perspectives Vol. 108, No. 9, pp. 841–845, September 2000.; Gauderman, J.W., McConnell, R., Gilliland, F., London,

Death is not the only harm caused by these pollutants. They are responsible for an estimated 20,000 hospital admissions annually from respiratory and cardiac illnesses. Nitrogen oxides are a key ingredient in the formation of ozone, or smog, that blankets much of the United States during the summer months. Ozone created by emissions from these power plants caused an estimated 7,000 emergency rooms visits due to asthma and other breathing difficulties. That same ozone also triggered an estimated 600,000 asthma attacks. We also pay an economic price: these power plants caused the loss of an estimated 5 million work days, and forced people to curtail their routine activities for a total of another estimated 26 million days.[6]

Recent research underscores the need to move forward to clean up these power plants. Six dozen new short-term studies confirm the effects of particle pollution on premature death, hospitalization, emergency room visits, respiratory and cardiac effects.[7] I have cited them in the attachments to my testimony. Recently, more research has focused on the effect of long-term, repeated exposures to high levels of ozone. Three of these studies that are summarized below focused on the impact of the natural development of children's lungs.

- A study of college freshmen found that lifetime ozone exposure was linked to a reduced ability to breathe.[8]
- A 3-year study of 1,150 children suggests that long-term ambient ozone exposure might hinder the natural development of their lungs to function normally.[9]
- A 10-year study of 3,300 school children found that girls with asthma, and boys who spent more time outdoors, suffered reduced ability to breathe in association with ozone.[10]

These studies present a compelling case for taking action as soon as possible.

Power plants also produce a number of other hazardous pollutants beyond sulfur dioxide and nitrogen oxides. Of most concern is mercury, known for inflicting permanent damage on the nervous and kidney systems, and especially threatening to fetal development and children's mental health. Although emitted to the air, mercury most often is ingested when people eat fish from rivers and lakes where high levels of this toxic substance have settled in the water. Mercury accumulates in the fish, becoming increasingly toxic.[11] Women of childbearing age and their children who eat such fish are the ones most at risk. A recent CDC study showed that 10 percent of such women have blood levels of mercury that already places them and their unborn children at risk.[12]

The weight of evidence against these pollutants is solid and increasing. These new studies lend a profound urgency to the national effort to reduce power plant emissions. Outside of the electric utility industry itself, few people would deny the need for dramatic additional reductions from power plants. For example, the attached maps demonstrate the obvious convergence between the location of power plants and high levels of fine particles. Preliminary fine particle monitoring data show many areas may violate the new $PM_{2.5}$ standard.

S., Thomas, D., Avol, E., Vora, H., Berhane, K., Rappaport, E.B., Lurmann, F., Margolis, H.G., and Peters, J. Association between Air Pollution and Lung Function Growth in Southern California Children. American Journal of Respiratory and Critical Care Medicine, Vol. 162. pp 1383–1390, 2000.

[6] Abt Associates, Inc.

[7] See the complete listing of current studies in the attached bibliography.

[8] Kunzli, N., Lurmann, F., Segal, M., Ngo, L., Balmes, J., and Tager, I.B. Association between Lifetime Ambient Ozone Exposure and Pulmonary Function in College Freshmen—Results of a Pilot Study. Environmental Research, Vol. 72, pp. 8–23, 1997.

[9] Frischer, T., Studnicka, M., Gartner, C., Tauber, E., Horak, F, Veiter, A., Spengler, J., Kuhr, J., and Urbanek, R. Lung Function Growth and Ambient Ozone: A Three-Year Population Study in School Children. Am J Respir Crit Care Med, Vol. 160, pp. 390–396, 1999.; Gauderman, J.W., McConnell, R., Gilliland, F., London, S., Thomas, D., Avol, E., Vora, H., Berhane, K., Rappaport, E.B., Lurmann, F., Margolis, H.G., and Peters, J. Association between Air Pollution and Lung Function Growth in Southern California Children. American Journal of Respiratory and Critical Care Medicine, Vol. 162. pp 1383–1390, 2000.

[10] Peters, J.M., Avol, E., Gauderman, W.J., Linn, W.S., Navidi, W., London, S.J., Margolis, H., Rappaport, E., Vora, H., Gong, H., and Thomas, D.C. A Study of Twelve Southern California Communities with Differing Levels and Types of Air Pollution. II. Effects on Pulmonary Function. American Journal of Respiratory and Critical Care Medicine, Vol. 159, pp. 7680775, 1999.

[11] Agency for Toxic Substances and Disease Registry. Toxicological profile for mercury. 1999; National Research Council, Toxicological Effects of Methylmercury, 1999

[12] Center for Food Safety and Applied Nutrition, Food and Drug Administration. US Environmental Protection Agency. National Energy Technology Laboratory, Dept of Energy. National Marine Fisheries Laboratory, National Oceanic and Atmospheric Administration. National Center for Health Statistics; National Center for Environmental Health, CDC. Bood and Hair Mercury Levels in Young Children and Women of Childbearing Age—United States, 1999. CDC, MMWR, March 2, 2001

The American Lung Association supports S. 556 because it targets levels of pollutants that must be reduced from power plants and leaves the other provisions of the Clean Air Act in place. These two components ensure that power plants become cleaner and local air quality is protected. Reducing power plant emissions alone will not bring many areas in the country into compliance with the 8-hour ozone or the fine particle standard. Under S. 556, reductions we know we need from power plants will occur expeditiously.

The American Lung Association supports including carbon dioxide as part of the reductions package in S. 556. Many of the fossil fuel combustion processes that contribute carbon dioxide to the problem of global climate change also contribute to other forms of air pollution.

Indeed, it is our hope that S. 556 would promote new momentum toward increasing energy efficiency and use of renewable energy sources that reduce or eliminate all four pollutants regulated under the bill. Instead, we are seeing hundreds of new power plants proposed throughout the nation. Even if these plants were built to use natural gas with state-of-the-art pollution controls, they still will add to air pollution unless they replace older dirtier plants.

The rush for new power plants also demonstrates why we need to maintain the existing provisions of the Clean Air Act. Under the current law, these plants would be subject to "New Source Review" requirements that would ensure their emissions did not increase local levels of air pollution. To ensure that no one adds to the burden of air pollution in a community, companies seeking to build or expand in a non-attainment area must obtain offsets from nearby pollution sources. If these plants were proposed in areas that meet the standards, other provisions of the Act would ensure that the air quality does not significantly deteriorate. In this way, local air quality can be protected. Under the approach advocated by Assistant EPA Administrator Holmstead, the Clean Air Act's protective measures would be eliminated. As long as a new power plant had purchased sufficient emissions reduction "allowances," no matter how distant the source that generated them, it would be immune from the requirements that currently protect the health of the local community.

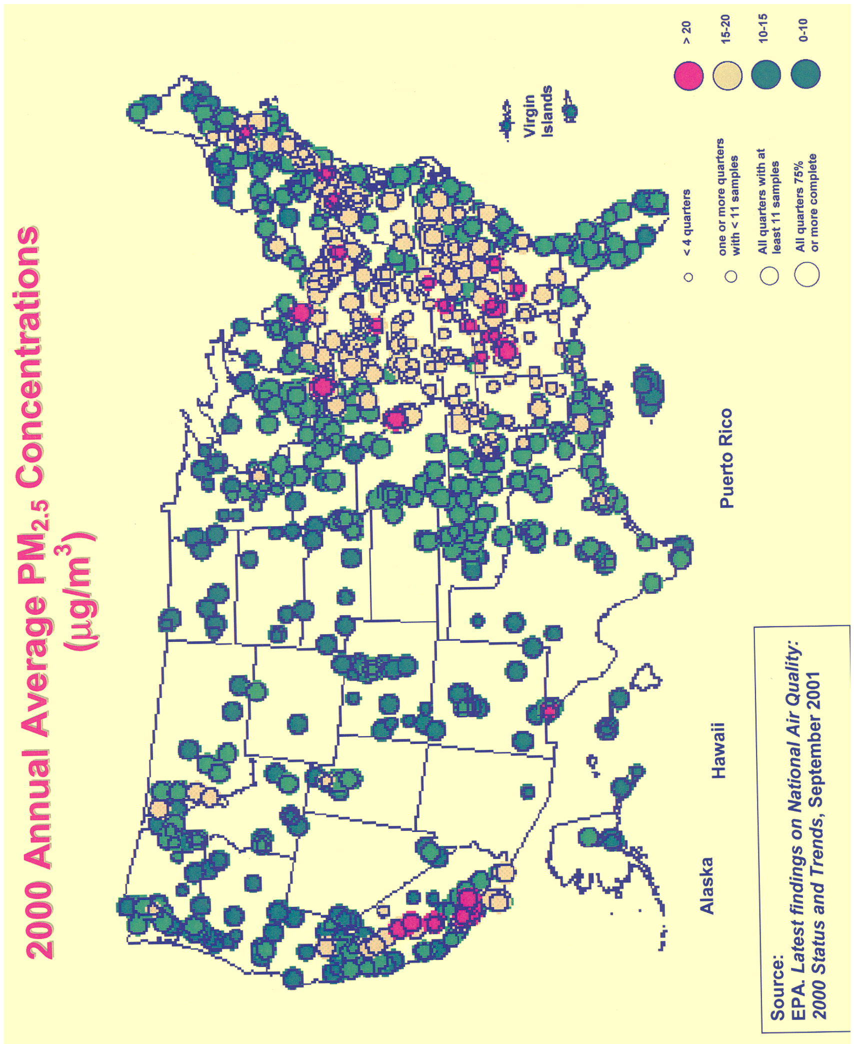
The explicit recognition by S. 556 of the sanctity of the Clean Air Act is the cornerstone of the American Lung Association's support. Subsection 132 (e) states, "This section does not affect the applicability of any other requirement of this Act." The American Lung Association opposes replacing the New Source Review provisions or any other provisions of the existing Clean Air Act with a power plant emissions cap-and-trade program.

Currently, Title IV, the Acid Rain Program, supplements the other Clean Air Act requirements. Any new program to reduce power plant emissions should also supplement the Clean Air Act. That is exactly what S. 556 does. We note that State and local air regulators supported the continuation of New Source Review. In their comments to the EPA, they remarked, "we believe that the NSR requirements under the Clean Air Act are an essential tool, critical to State and local air pollution control agencies' ability to attain and maintain the health and welfare standards mandated in the Act."[13]

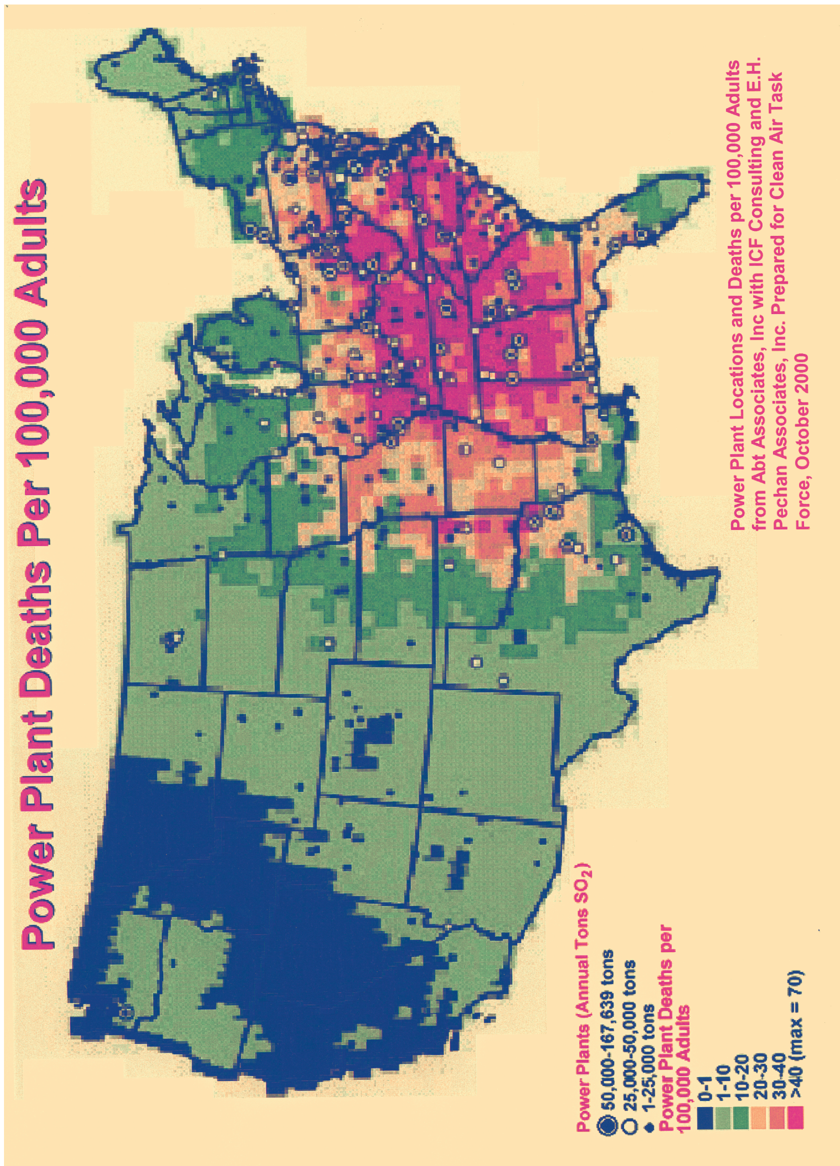
The American Lung Association is committed to ensuring Americans can breathe clean air. Frankly, the efforts under existing provisions of the Clean Air Act are moving too slowly. The new national ambient air quality standards for ozone and $PM_{2.5}$ set in 1997 are still tied up in litigation and remain unimplemented. Despite that, in recent years, landmark regulations that cleanup cars, SUVs, and heavy-duty diesel vehicles and their fuels have been finalized. When implemented, these regulations represent important progress on the mobile source side of the air pollution equation. EPA should also move ahead to clean up non-road diesel vehicles, such as construction equipment.

We now need to address the stationary source side of the problem. S. 556 will allow us to do that in a comprehensive way, requiring the No. 1 source of industrial air pollution, coal-fired power plants, to do their share to help us all breathe easier.

[13] Paul, J., on behalf of State and Territorial Air Pollution Program Administrators, and O'Sullivan, W., on behalf of Association of Local Air Pollution Control Officials. Letter entered as comments in EPA Docket No. A–2001–19, New Source Review 90-Day Review Background Paper, June 27, 2001.



2000 Annual Average PM2.5 Concentrations
(µg/m3)
< 4 quarters
one or more quarters with < 11 samples
All quarters with at least 11 samples
All quarters 75% or more complete
> 20
15-20
10-15
0-10
Virgin Islands
Puerto Rico
Hawaii
Alaska
Source:
EPA. Latest findings on National Air Quality: 2000 Status and Trends, September 2001



[From the American Lung Association, March 5, 2001]

Selected Key Studies on Particulate Matter and Health: 1997–2001

NEW STUDIES CONFIRM THAT CURRENT LEVELS OF PARTICULATE AIR POLLUTION ARE HARMFUL TO HUMAN HEALTH

The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to review and update the National Ambient Air Quality Standards for major air pollutants every 5 years, in light of the latest scientific evidence.

More than 800 new scientific studies related to the effect of airborne particulates on human health have been published since 1996, when EPA last reviewed the standards for particulate matter. The new studies validate the earlier research and address the most important arguments raised by industry critics. Taken together, the studies confirm the relationship between particulate air pollution, illness, hospitalization, and premature death. The major themes of the new research are that the:

- Major long-term studies have been fully validated.
- New short-term studies from across the United States and around the world confirm the mortality effects.
- New analyses show that lives may be shortened by months or years, rather than days.
- Recent studies of laboratory animals and humans have identified cardiac responses to particles, thus elucidating possible biologic mechanisms for mortality.
- New studies demonstrate that infants and children, particularly asthmatic children, are especially sensitive to the effects of fine particle pollution.

In 1997 when EPA announced the establishment of new NAAQS for fine particles, the President directed EPA to complete a review of the standards by July 2002.

The National Academy of Sciences (NAS) has issued several reports recommending research priorities to increase scientific understanding of particle pollution. To address the scientific issues raised by the NAS panel, EPA increased funding for research on particulates to more than $50 million per year. As part of this effort, the Health Effects Institute, jointly sponsored by industry and EPA, has committed substantial resources to research on PM.

As a result of this infusion of research funds, hundreds of scientific papers and research reports have been published since EPA last issued its "Air Quality Criteria for Particulate Matter" in 1996.

This annotated bibliography presents the findings of some of the most significant new research studies that advance our understanding of the harmful health effects of particulate air pollution. The peer-reviewed papers cited here represent a small sample of the scientific articles on the health effects of particulate air pollution published since 1996. This bibliography does not attempt to be comprehensive: exclusion does not imply that a study is unimportant; inclusion does not imply endorsement.

LONG-TERM STUDIES OF MORTALITY

Prospective Cohort Epidemiological Studies Are Validated in Independent Reanalysis

Two landmark prospective cohort studies reported that chronic exposure to particulate pollution increases the risk of premature mortality. In the 1993 Six Cities Study, Harvard University researchers followed the health of more than 8,000 people in six small cities that fell along a gradient of air pollution concentrations for a period of 14 to 16 years. As particle concentrations increased, there was an almost directly proportional increase in the death rate in the residents studied. Residents of the most polluted city in the study, Steubenville, Ohio, had a 26 percent increased risk of premature mortality, compared to the residents of the cleanest city studied, Portage, Wisconsin. The increased risks were associated with a difference in ambient fine particle concentrations of 18.6 micrograms per cubic meter.

The 1995 American Cancer Society study reported an association between fine particle air pollution and premature death by cardio-pulmonary and other causes in a study group of over half a million people in 151 U.S. cities. All cause mortality increased by 17 percent with a 24.5 microgram per cubic meter difference in fine particle pollution between the cleanest and dirtiest city studied.

These original studies used statistical techniques to adjust for age, and to control for the effects of smoking, diet, and occupational exposure.

Health Effects Institute funded researchers, led by Dr. Dan Krewski of the University of Ottawa, undertook a reanalysis of the original studies and a quality audit of the underlying data. Researchers performed an extensive sensitivity analysis using alternative statistical methods, and considering the role of 20 potential confounders such as other pollutants, climate, and socioeconomic factors on study results. The sensitivity analysis largely confirmed the original results of the Harvard Six Cities Study and the American Cancer Society Study. In addition, the sensitivity analysis identified higher educational status as a factor associated with reduced risk to air pollution exposure, and reported an association between sulfur dioxide pollution and mortality.

- Krewski, D., Burnett, R.R., Goldberg, M.S., Hoover, K., Siemiatyeki, J., Jerrett, M., Abrahamowicz, M., White, W.H, and Others. Reanalysis of the Harvard Six Cities Study and the American Cancer Society Study of Particulate Air Pollution and Mortality. Health Effects Institute, July, 2000.

• Dockery, D.W:, Pope, C.A., Xu, X., Spengler, J.D., Ware, J.H., Fay, M.E., Ferris, B.G., and Speizer, F.E. An Association Between Air Pollution and Mortality in Six U.S. Cities. New England Journal of Medicine, 1993:329:1753–9.

• Pope, C.A., Thun, M.J., Namboodiri, M.M., Dockery, D.W., Evans, J.S., Speizer, F.E., and Heath, C.W. Particulate Air Pollution as a Predictor of Mortality in a Prospective Study of U.S. Adults. American Journal of Respiratory Critical Care Medicine, 1995:151:66974.

Chronic Exposure to Particulate Pollution Shortens Lives by One to Three Years

There have been two recent attempts to quantify the extent of life shortening predicted by the long-term epidemiological studies. Dutch scientist Dr. Burt Brunekreef made such an estimate in a paper prepared for the World Health Organization's consideration of revisions to the Air Quality Guidelines for Europe. Using risk ratios reported in the Harvard Six Cities Study and the Study of the American Cancer Society cohort, Brunekreef conducted a life table analysis to estimate the effect of particulate air pollution on the survival rate of 25 year-old Dutch men. An extrapolation based on U.S. life tables yields an estimated diminished life expectancy of 1.31 years due to ambient pollution.

Dr. C. Arden Pope III, of Brigham Young University, analyzed reductions in life expectancy in the U.S. population due to chronic exposure to particulate matter. He applied relative risks for premature death derived from the prospective cohort studies, and estimated loss of life expectancy ranging from one to 3 years, depending upon assumptions about the age at which susceptibility to the effects of air pollution begins.

• Brunekreef, Burt. Air Pollution and Life Expectancy: Is There a Relation? Occup Environ Med 1997 Nov;54(11):781–4.

• Pope, C.A. III, Epidemiology of Fine Particulate Air Pollution and Human Health: Biological Mechanisms and Who's at Risk? Environ Health Persect 108 (suppl 4):713–723 (2000).

DAILY MORTALITY STUDIES

90-City National Morbidity, Mortality and Air Pollution Study (NMMAPS) Shows that Contemporary Levels of Air Pollution are Killing People

The Health Effects Institute, which is jointly funded by EPA and industry, commissioned an original nationwide study of the short-term effects of air pollution on human health, known as the National Morbidity, Mortality and Air. Pollution Study, or NMMAPS. A team of investigators led by Dr. Jonathan Samet of the Johns Hopkins University School of Public Health developed and applied a standardized methodology for examining pollution effects across many cities. Investigators from Johns Hopkins University and Harvard University developed and applied state-of-the-art statistical techniques to examine the effects of multiple pollutants, the extent of lifeshortening; and the degree of "exposure measurement error" due to reliance on centrally located air quality monitors.

In its study of the 90 largest U.S. cities, NMMAPS found strong evidence linking daily increases in particulate pollution to increases in death. On average, overall mortality increased by 0.5 percent for every 10 microgram per cubic meter increase in PM_{10} measured the day before death. The effect was slightly greater for deaths due to heart and lung disease than for total deaths. This risk ratio is somewhat lower than reported by earlier meta-analyses, perhaps due to certain methodological assumptions such as a 1-day lag.

Samet et al. report that the relative increases in daily mortality partly reflect life shortening on the order of months. The association between particulate matter and mortality persists even when other pollutants are included in the statistical model. Their analyses also provide evidence against arguments that exposure measurement error could explain the associations between particulate matter and adverse health effects.

In addition, in a study of 14 U.S. cities, NMMAPS found strong and consistent associations between particulate air pollution and hospital admissions among the elderly. Hospital admissions data was obtained from the Medicare program. The cities were selected for study because they had daily PM_{10} measurements.

For each 10 microgram per cubic meter increase in PM_{10}, there was approximately a 1 percent increase in hospital admissions for cardiovascular disease, and about a 2 percent increase in admissions for pneumonia and chronic obstructive pulmonary disease. Cities studied were Birmingham, AL, Boulder, CO, Canton, OH, Chicago, IL, Colorado Springs, CO, Detroit, MI, Minneapolis/St. Paul, MN, Nashville, TN, New Haven, CT, Pittsburgh, PA, Provo/Orem, UT, Seattle, WA, Spokane, WA, and Youngstown, OR

Investigators concluded that the complementary analyses of mortality and morbidity provide "new and strong evidence" linking particulate air pollution at current levels to adverse health effects.

Some of the results from the NMMAPS study were published in an article in the New England Journal of Medicine. Samet, et al. examined the effect of five of the most widespread outdoor air pollutants—particulate matter, ozone, nitrogen dioxide, sulfur dioxide, and carbon monoxide in 20 of the largest cities in the United States. The study was specifically designed to address many of the criticisms of earlier single-city studies. The study found consistent evidence that relatively small daily increases in particulate pollution were followed by daily increases in death rates, particularly from heart-and lung-related causes. Study authors noted that other analyses have demonstrated that the amount of life lost due to particulate pollution goes beyond just a few days. The study investigators also reported an association between summertime ozone levels and mortality.

The New England Journal of Medicine article concludes, "there is consistent evidence that the levels of fine particulate matter in the air are associated with the risk of death from all causes and from cardiovascular and respiratory illness. These findings strengthen the rationale for controlling the levels of respirable particles in outdoor air."

- Samet, J.M., Dominici, F., Zeger, S.L., Schwartz, J., and Dockery, D.W. The National Morbidity, Mortality, and Air Pollution Study. Part I: Methods and Methodologic Issues. Health Effects Institute Research Report 94, Part 1, May 2000.
- Samet, J.M., Zeger, S.L., Dominici, F., Curriero, F., Coursac, I., Dockery, DW, Schwartz, J., and Zanobetti, A. The National Morbidity, Mortality, and Air Pollution Study. Part II: Morbidity, Mortality and Air Pollution in the United States. Health Effects Institute Research Report 94, Part II, June 2000.
- Samet, J.M., Dominici, F., Curriero, F.C., Coursac, I., and Zeger, S.L. Fine Particulate Air Pollution and Mortality in 20 U.S. Cities, 1987–1994. New England Journal of Medicine, Vol. 343, No. 24, pp. 1742–1749, December 14, 2000.

Air Pollution Effects Persist for Several Days, Increasing the Overall Risk of Exposure

Epidemiological studies have used different assumptions about the number of days following exposure to air pollution that effects will occur. Some studies have assumed that effects occur the day after exposures. However, toxicological evidence suggests that effects of exposure may be observed over several subsequent days. In an analysis using data from New Haven, Birmingham, Pittsburgh, Canton, Detroit, Chicago, Minneapolis, Colorado Springs, Spokane, and Seattle, Dr. Joel Schwartz, of the Harvard School of Public Health, has shown that statistical models that assume a 1-day lag, such as NMMAPS, grossly underestimate the effect of PM_{10} on mortality. Assuming that effects continue over several days, as demonstrated by this analysis, roughly doubles the relative risk of premature mortality.

- Schwartz, Joel. The Distributed Lag Between Air Pollution and Daily Deaths. Epidemiology 2000;11:320–326).

$PM_{2.5}$ from Motor Vehicles and Coal Combustion is Linked to Increased Mortality

Investigators from Harvard Medical School used data on the elemental composition of size-fractionated particles to identify the sources of fine particles in six eastern U.S. cities that have been the subject of a long-term air pollution study: Watertown, MA, Kingston-Harriman, TN, St. Louis, MO, Steubenville, OH, Portage, WI, and Topeka, KS. For example, lead was used as a tracer for motor vehicle exhaust, selenium for coal combustion, and silicon for soil and crustal matter. Each of these fractions was examined in association with daily mortality rates in each city. The study reported that a 10 μg/m3 increase in $PM_{2.5}$ from mobile sources accounted for a 3.4 percent increase in daily mortality, while the equivalent increase in fine particles from coal combustion sources accounted for a 1.1 percent increase. Fine particles from crustal sources were not associated with mortality. The study concludes that "the results indicate that combustion particles in the fine fraction from mobile and coal combustion sources, but not fine crustal particles, are associated with increased mortality."

- Laden, F. Neas, L.M., Dockery, D.W., and Schwartz, J. Association of Fine Particulate Matter from Different Sources with Daily Mortality in Six U.S. Cities. Environmental Health Perspectives 108:941–947, October 2000.

Daily Mortality Studies Pour In From Cities Around the World

Studies in new locations and by additional investigators with consistent results help strengthen the case for a causal relationship.

EPA's 1996 review of the PM standards cited over two dozen short-term epidemiological studies. Since then, time series studies reporting an association between short-term exposure to particulate matter and early mortality have been published for these U.S. cities: Philadelphia; Ogden, Salt Lake City, and Provo/Orem, Utah; Seattle; Santa Clara County, California; and Buffalo. Additional studies have been published for these major cities all over the world: Toronto; Mexico City; London; Edinburgh; Birmingham, UK; Rotterdam; Helsinki; Madrid; Rome; Milan; Brisbane; Sydney; Delhi; Bangkok; and Seoul and Ulsan, Korea. Many of the new studies have evaluated the sensitivity of the estimated PM effects to the inclusion of other pollutants in the statistical model. Overall, the associations of PM with adverse effects continue to be consistently observed, and sometimes, effects of other air pollutants such as ozone, sulfur dioxide, nitrogen dioxide, and carbon monoxide are also reported.

A multi-city study of the short-term health effects of air pollution on mortality and hospital emergency admissions was initiated by the European Union Environment Programme. The study, known as Air Pollution and Health: A European Approach or APNEA, investigated the effects of several pollutants on mortality in 12 European cities. The study reported positive associations with sulfur dioxide and PM_{10}, and daily increases in mortality, with stronger and more consistent associations observed in western European cities.

A quantitative meta-analysis by Jonathan Levy et al. of the Harvard School of Public Health set out to compare mortality estimates from over 20 daily time series studies. Their analysis estimated that mortality rates increased by approximately 0.7 percent per 10 microgram per cubic meter increase in PM_{10} concentrations. Investigators reported “our model finds compelling evidence that the PM_{10}-mortality relationship is stronger in locations with higher $PM_{2.5}/PM_{10}$ ratios, supporting the hypothesized role of fine particles.”

- USEPA, Office of Research and Development. Air Quality Criteria for Particulate Matter. EPA/600/P–99/002b, Oct. 1999, External Review Draft.
- Katsouyanni, K., Touloumi, G., Spix, C., Schwartz, J., Balducci, F., Medina, S., Rossi, G., Wojtyniak, B., Sunyer, J., Bacharova, L., Schouten, J.P., Ponka, A., and Anderson, H.R. Short Term Effects of Ambient Sulphur Dioxide and Particulate Matter on Mortality in 12 European Cities: Results From Time Series Data From the APNEA Project. British Medical Journal 1997; 314:1658 (7 June).
- Levy, J. I., Hammitt, J.K., and Spengler, J.D. Estimating the Mortality Impacts of Particulate Matter: What can be Learned from Between-Study Variability? Environ Health Perspect 108:109–117(2000).

“HARVESTING” THEORY DISPROVEN

Mortality Reported in Short Term Community Health Studies is Not Due to “Harvesting”

Numerous short-term epidemiological studies have reported that short-term increases in air pollution are followed by an increased number of deaths. Some have argued that the associations between day to day variations in mortality and air pollution represent a “harvesting” effect, that is, the advancement of death by a few days in people already about to die from other causes. If air pollution advances death of the very frail by only a few days (the “harvesting” hypothesis), then you would expect that an increase in daily deaths would be followed by a decrease in deaths within a few days.

Professors Scott Zeger and Francesca Dominici of the Johns Hopkins School of Public Health developed a statistical technique to examine harvesting using data on total suspended particulate matter (TSP) and total mortality in Philadelphia. They found that removing the shortest term fluctuations from their time series increased rather than decreased the estimates of pollution effects. This is the opposite of what would be expected if “harvesting” accounted for all the deaths.

As part of the NMMAPS study, Dr. Joel Schwartz of the Harvard School of Public Health studied this issue using data from Boston. He reported that for chronic obstructive pulmonary disease and ischemic heart disease, most of the deaths seem to be advanced by a few months on average. The statistical approach did not allow estimates of life shortening beyond 2 months. In contrast, for pneumonia, the analysis showed that some deaths are brought forward by a few days, consistent with the harvesting hypothesis. Effect estimates increased when examining longer time periods, suggesting that cumulative exposures are more harmful than daily exposures. Overall, these results suggest that the short-term epidemiological studies underestimate the number of early deaths.

- Zeger, S.L., Dominici, F, and Samet, J. Harvesting-Resistant Estimates of Air Pollution Effects on Mortality. Epidemiology 1999 Mar;10(2):171–5.

Schwartz, Joel. Harvesting and Long Tenn Exposure Effects in the Relation between Air Pollution and Mortality. Am J Epidemiol 2000;151:440–8.

Most Air Pollution Related Deaths Are Being Advanced By Months to Years

While the association between particulate air pollution and mortality is generally acknowledged to be causal, critics have claimed that the public health impact is minor, because people are dying just a few days early. This theory is sometimes called "harvesting." This study is based on an examination of daily deaths and hospital admissions in Chicago for the years 1988–1993. If people are dying a few days early, then the death rate should drop a few days after the air pollution event. The analysis shows that this is not the case. The results confirm findings previously reported for Boston and Philadelphia, using a different methodology. The author concludes that the results indicate that air pollution may be increasing the overall number of people at risk of death, and that most of the deaths are being advanced by months to years.

- Schwartz, Joel. Is There Harvesting in the Association of Airborne Particles with Daily Deaths and Hospital Admissions. Epidemiology, Vol. 12, No. 1, pp 56–61, January 2001.

PM-MORTALITY RELATIONSHIP IS LINEAR, WITH NO THRESHOLDS

No Threshold is Evident for the Effect of PM_{10} on Daily Deaths

In the Schwartz and Zanobetti study, Harvard University researchers applied a statistical method to examine the shape of the dose-response relationship between air pollution and daily deaths in ten U.S. cities. The cities studied were New Haven, Birmingham, AL, Pittsburgh, Detroit, Canton, OH, Chicago, Minneapolis-St. Paul, Colorado Springs, Spokane, and Seattle. Simulation studies demonstrated that the method used can detect threshold and other nonlinear relationships in epidemiologic studies. But when used to analyze the association between PM_{10} and mortality, no evidence of a threshold was found, and the associations appeared to be linear down to the lowest levels studied. This is consistent with earlier results.

An analysis of data for the 20 largest U.S. cites from 1987–1994 from the NMMAPS study also reported that a linear model, without a threshold, was most appropriate for assessing the effects of particulate air pollution on daily mortality for total mortality and for mortality from cardiovascular and respiratory causes, but not for other causes of mortality. Daniels et al conclude:". . . the continued demonstration of adverse effects of air pollution over recent decades, even as concentrations of pollutants have declined, suggests that exposures have not yet gone below no-effects thresholds, if such exist."

- Schwartz, Joel and Zanobetti, Antonella. Using Meta-Smoothing to Estimate Dose-Response Trends across Multiple Studies, with Application to Air Pollution and Daily Death. Epidemiology, Vol. 11, No. 6, pp. 666–672, November 2000.
- Daniels, M.J., Dominici, F., Samet, J.M., and Zeger, S.L. Estimating Particulate Matter-Mortality Dose-Response Curves and Threshold Levels: An Analysis of Daily Time-Series for the 20 Largest U.S. Cities. American Journal of Epidemiology, Vol. 152, No. 5, pp. 397–406, September 1, 2000.

EXPOSURE MEASUREMENT ERROR CRITICISM REFUTED

Air Quality Monitors Can Be Used to Track Exposure to Fine Particles

Epidemiological studies generally rely on centrally located air quality monitors to assess exposure to ambient air pollutants. Some have argued that these monitors do not represent actual exposures, because people spend a large portion of their day indoors.

A study by Dutch scientist Nicole Janssen et al., of 10—12 year old school children in Wageningen, The Netherlands compared personal exposure to fine particles with classroom concentrations, and with ambient measurements at an outdoor location. Researchers found that personal fine particle concentrations were highly correlated with ambient concentrations. This finding supports the use of ambient monitoring measurements as an indicator of exposure to fine particles in epidemiological time series studies.

Dr. David Mage, of U.S. EPA's Office of Research and Development, and colleagues, demonstrated that human exposure to fine particles of ambient origin is highly correlated in time to ambient PM concentrations measured at monitoring stations within the communities being studied.

The NMMAPS study discussed above also addressed the issue of measurement error, through the development of a model to systematically test what effect the relationship between personal exposure and ambient exposure might have on the observed increase in mortality associated with PM. While data to test the model is limited, "theoretical and actual analyses generated appear to refute the criticisms that exposure measurement error could explain the associations between PM and adverse health effects."

- Janssen, N.A.H., Hoek, G., Narssema, H., and Brunekreef, B. Personal Exposure to Fine Particles in Children Correlates Closely with Ambient Fine Particles. Archives of Environmental Health, March/April 1999, Vol. 54, No., 2, 95–101.
- Mage, D., Wilson, W., Hasselblad, V., Grant, L. Assessment of Human Exposure to Ambient Particulate Matter. J. Air & Waste Manage. Assoc. 49:1280–1291, Nov. 1999.
- Zeger, S.L., Thomas, D., Dominici, F., Samet, J.M., Schwartz, J., Dockery, D.W., and Cohen, A. Exposure Measurement Error in Time-Series Studies of Air Pollution. In: The National Morbidity, Mortality, and Air Pollution Study, Part I: Methods and Methodologic Issues. HEI Research Report 94, May 2000.

Criteria for Asserting Causality Have Been Met

In responding to an article by Dr. John Gamble, Epidemiologist for Exxon Biomedical Sciences, Dr. David Bates, Professor Emeritus of Medicine at University of British Columbia, has reevaluated the recent evidence health evidence regarding particulate matter and mortality. Determination of causality does not rest on any one study. Instead, a weight of evidence approach is used to evaluate the scientific literature across a series of criteria such as coherence, consistency, strength of association, temporality, analogy, and biologic plausibility. Dr. Bates asserts that all of these criteria have been met by an avalanche of new data that strengthen the case for a causal relationship.

- Bates, D.V. Lines that Connect: Assessing the Causality Inference in the Case of Particulate Pollution. Environ Health Perspect 108: 91–92: 2000.

Gamble, John F. $PM_{2.5}$ and Mortality in Long-term Prospective Cohort Studies: Cause-Effect or Statistical Associations? Environ Health Perspect 106:535–549 (1998).

- Kunzli, N. and Tager, I.B. Comments on "$PM_{2.5}$ and Mortality in Long-term Prospective Cohort Studies: Cause-Effect or Statistical Associations?" and Gamble, John. Reply to Kunzli and Tager Regarding Causality in $PM_{2.5}$ Cohort Studies. Environ Health Perspect 107–5, 1999; Correspondence.

People With Pre-Existing Cardiac or Respiratory Conditions Have Higher Than Average Risk of Death from Exposure to Particles

Canada's national health insurance system enables access to detailed health records of patients. This permitted Dr. Mark Goldberg and colleagues at McGill University to conduct a detailed analysis of particle pollution and mortality in Montreal. Investigators were able to link individual deaths in Montreal to medical information up to 5 years before death. These data were used in conjunction with clinical expertise to define susceptible subgroups at risk of premature death from several different measures of particulate pollution. Subjects with acute lower respiratory disease, congestive heart failure, and a combination of cardiovascular diseases died at higher rates for increases in each of the three particulate matter measures. Associations with coefficient of haze and predicted $PM_{2.5}$ were reported for subjects with cancer, chronic coronary artery disease, and coronary artery disease, while effects of sulfate were associated with acute and chronic upper respiratory disease.

- Goldberg, M.S., Bailar, J.C. III, Burnett, R.T., Brook, J.R., Tamblyn, R., Bonvalot, Y., Ernst, P., Flegel, K.M., Singh, R.K., and Valois, M-F. Identifying Subgroups of the General Population That May be Susceptible to Short-Term Increases in Particulate Air Pollution; A Time-Series Study in Montreal, Quebec. Health Effects Institute, Research Report Number 97, October 2000.

"Coarse" Particles are Also Linked with Disease and Death

This study by Dr. Morton Lippmann and colleagues from the New York University School of Medicine attempted to identify components of particulate matter and other air pollution mixtures that were associated with excess daily deaths and hospital admissions of the elderly in the Detroit metropolitan area. Investigators reported that deaths from repiratory diseases were associated with PM_{10} and total suspended particulates. Unexpectedly, they found that relative risks for PM_{10}–2.5, the coarse particle fraction, were similar to those for $PM_{2.5}$, and even higher in the case of ischemic heart disease and stroke. The authors conclude that "the finding of elevated and significant effects for PM_{10}–2.5 suggests that there may still be a rationale to consider the health effects of the coarse fraction as well as the fine fraction of PM."

- Lippmann, M., Ito, K., NAdas, A., and Burnett, R.T. Association of Particulate Matter Components with Daily Mortality and Morbidity in Urban Populations. Health Effects Institute Research Report Number 95, August 2000.

BIOLOGIC MECHANISMS AND CARDIAC EFFECTS

Air Pollution Tied to Low Heart Rate Variability, a Risk Factor for Heart Attacks

Particulate air pollution has been linked to cardiovascular mortality in a number of studies, but the mechanisms for this effect are not well understood. Recent research centers on the effect of pollution on heart rate and heart rate variability. Low heart rate variability is a marker of poor cardiac control by the autonomic nervous system, and is associated with a higher risk of heart attacks and sudden cardiac death. One hypothesis is that inhalation of particle air pollution may trigger an inflammatory response in the lung, followed by the release of chemical mediators that—affect autonomic nervous system control of the heart beat.

Pope, et al. measured oxygen saturation and pulse rate in a panel of 90 elderly residents of the Utah Valley, using a small medical device known as an oximeter. The experiment was conducted during the winter months, when PM concentrations are highest. Researchers found little evidence of pollution effects on the oxygen carrying capacity of the blood, but observed that a small elevation in pulse rate was associated with a rise in PM_{10} levels. The medical and biological relevance of this effect is unclear.

Dr. Duanping Liao, of the University of North Carolina, and cb-investigators, conducted daily electrocardiogram measurements on elderly nursing home residents outside Baltimore, Maryland. Harvard physician Dr. Diane Gold et al. studied 53- to 87-year old active residents of Boston. 25 minutes of electrocardiogram measurements during different exercise states were taken on a weekly basis. Both the Baltimore and Boston studies found that elevated concentrations of fine particulate matter were associated with lower heart rate variability, and that the association was stronger for people with pre-existing cardiovascular conditions.

- Pope, C.A., Dockery, D.W., Kanner, R.E., Villegas, G.M., and Schwartz, J. Oxygen Saturation, Pulse Rate, and Particulate Air Pollution: A Daily Tune-Series Panel Study. Am J Respir Crit Care Med 1999;159:363–372.
- Liao, D., Creason, J., Shy, C., Williams, R., Watts, R., and Zweidinger, R. Daily Variation of Particulate Air Pollution and Poor Cardiac Autonomic Control in the Elderly. Environ Health Perspect 107:521–525 (1999).
- Gold, D.R., Litonjua, A., Schwartz, J., Lovett, E., Larson, A. Nearing, B., Allen, G., Verrier, M., Cherry, R., and Verrier, R. Ambient Pollution and Heart Rate Variability. Circulation. 2000;101:1267.
- Stone, P.H. and Godleski J.J. First Steps Toward Understanding the Pathophysiologic Link Between Air Pollution and Cardiac Mortality. Am Heart J 1999;138:803–7.

Increased Heart Rate and Plasma Viscosity During an Air Pollution Episode Suggest Possible Mechanisms

The World Health Organization Monitoring Survey of Trends and Determinants in Cardiovascular Disease (the "MONICA" survey) took place in Augsburg, in Southern Germany during the winter of 1984–1985. Over 4,000 randomly selected adults participated, and received electrocardiograms to measure their resting heart rate, and donated blood samples to measure plasma viscosity. Electrocardiograms were administered again in 1987–1988.

In January 1985, an air pollution episode occurred throughout central Europe, with elevated concentrations of sulfur dioxide, total suspended particulates, and carbon monoxide. During the air pollution episode, higher heart rates were observed for men and women, after adjusting for cardiovascular risk factors and weather. An elevated resting heart rate is a risk factor for death and fatal heart disease, and may signal changes in the autonomic control of the heart, that might partially account for the adverse health effects observed in association with air pollution.

One hypothesis is that increased plasma viscosity might lead to constricted blood flow in the heart (ischemia), which can be fatal in people with severe coronary heart disease. During the air pollution episode, increases in plasma viscosity were observed, and persisted after adjusting for other cardiovascular risk factors and weather. German researcher Annette Peters, et al. conclude that "the increased plasma viscosity observed in these analyses of a cross-sectional survey might therefore represent a part of the pathophysiological chain linking high ambient air pollution to increased mortality and hospital admissions for cardiovascular diseases":

An alternate hypothesis is proposed by Professor Anthony Seaton of the University of Aberdeen Medical School. He collected blood samples from 112 elderly people in two cities in the U.K. over an 18-month period, and examined various blood values in comparison to PM_{10} concentrations. Based on the analysis, Seaton suggests—that inhalation of some component of PM_{10} may cause sequestration of red blood cells, which may explain the cardiovascular effects reported in other studies.

- Peters, A., Perz, S., Doring, A., Stieber, J., Koenig, W., and Wichmann, H.E. Increases in Heart Rate During an Air Pollution Episode. Am J Epidemiol 1999;150:1094–8.
- Peters A., Doring A., Wichmann H.E., and Koenig, W. Increased Plasma Viscosity During an Air Pollution Episode: A Link to Mortality? Lancet 1997 May 31;349(9065):1582–7.
- Seaton, A., Soutar A., Crawford, V., Elton, R., McNerlan, S., Cherrie, J., Watt, M., Agius, R., Stout, R. Particulate Air Pollution and the Blood. Thorax 1999 Nov;54(11):1027–32.

Heart Patients Vulnerability to Potentially Fatal Arrhythmias Increases After Exposure to Air Pollution

A pilot study was designed to test the hypothesis that heart patients with a history of serious arrhythmia requiring implanted cardiac defibrillators experience potentially life-threatening arrhythmias following short term increases in air pollution. Defibrillators monitor electrical activity of the heart and initiate interventions such as pacing or shock therapy to restore a normal heartbeat. The devices record information on arrhythmic, events.

One hundred heart patients in eastern Massachusetts were followed for a 3-year period. The study found that a subgroup of these patients—those with more than ten defibrillator events—were most susceptible to pollution, with effects occurring one to 2 days after exposure. Among these patients, the strongest associations were with nitrogen dioxide, but positive associations were reported for PM_{10} and $PM_{2.5}$ exposures as well.

- Peters, A., Liu, E., Verrier, R.L., Schwartz, J., Gold, DR., Mittleman, M., Baliff, J., Oh, J.A., Allen, G., Monahan, K., and Dockery, D.W. Air Pollution and Incidence of Cardiac Arrhythmia. Epidemiology 2000 Jan; 11(1):11–7.

Combustion Source Metals May Trigger Biologic Responses to Ambient Particulate Matter

Researchers have been trying to determine whether one component of particulate matter—such as metals—is responsible for the toxic effects. U.S. EPA investigators led by Dr. Daniel Costa obtained samples of particulate matter from oil and coal fly ash and ambient air from St. Louis, MO, Washington, DC, Dusseldorf, Germany, and Ottawa, Canada. The fly ash is rich in metal components such as iron, copper, nickel, vanadium, and zinc, as well as sulfate. Laboratory rats were instilled with PM samples from these sources, and lung cells were obtained via bronchoalevolar lavage and analyzed for signs of cell injury. Investigators found that the constituent metals and their bioavailability determine the acute inflammatory response of PM samples in lung tissue.

In a second experiment, rats were pretreated with a chemical intended to model certain disease conditions, namely inflammation of blood vessels and high blood pressure in the lungs. These animals were instilled with the fly ash samples, and lung cells were obtained for laboratory examination. After 96 hours of exposure, there was clear evidence of lung inflammation, however many of the test animals had died, apparently due to altered cardiac function. Survivors had increased electrocardiographic changes. Investigators hypothesize that soluble metals from PM mediate an array of injuries to the cardiopulmonary system of healthy and at-risk subjects.

- Costa, D. L., and Dreher, K.L. Bioavailable Transition Metals in Particulate Matter Mediate Cardiopulmonary Injury in Healthy and Compromised Animal Models. Environ Health Perspect 105 (Supp15): 1053–1060 (1997).

Laboratory Research on Dogs Suggests that PM May Harm People with Heart Disease

This toxicology study by Harvard pathologist Dr. John Godleski is one of the first to test whether exposure to particulate matter can change heart function in laboratory animals. Two groups of dogs were tested—healthy dogs, and dogs with an induced coronary occlusion intended to simulate human coronary artery disease. Researchers exposed dogs to concentrated particles from the ambient Boston air. Both the normal and the compromised animals showed effects, but the clearest sign of PM effects was found in the dogs with the induced heart condition. The occluded animals were more susceptible to serious arrhythmias when exposed to air pollution. The electrocardiogram signals for these dogs indicated more rapid development of ischerma, an inadequate flow of blood through the heart that can lead to a heart attack. Study reviewers concluded: "this is a plausible and important mechanism to explain the association of increased cardiopulmonary mortality and exposure to particle pollution."

• Godleski, J.J., Verrier, R.L., Koutrakis, P., and Catalano, P. Mechanisms of Morbidity and Mortality from Exposure to Ambient Air Particles. Health Effects Institute Research Report Number 91, February 2000.

Concentrated Air Particles Induce Pulmonary Inflammation and Blood Changes in Humans

Effects of particles are showing up not only in laboratory animals, but also in a chamber study with human subjects performed by EPA research physician Dr. Andrew Ghio and colleagues. This controlled exposure study of young, healthy volunteers examined the effect of exposure to concentrated ambient particles from Chapel Hill, North Carolina. Volunteers alternated between moderate exercise and rest over a 2-hour period in a chamber with high particle concentrations. No symptoms or decrements in pulmonary function were noted. However, 18 hours after exposure, lung tissue had a higher concentration of neutrophils, a marker of inflammation. Blood work indicated a higher concentration of fibrinogen, which is a risk factor for clotting and heart attacks.

• Ghio, A.J., Kim, C., and Devlin, R.B. Concentrated Ambient Air Particles Induce Mild Pulmonary Inflammation in Healthy Human Volunteers. In Press.

HOSPITAL AND EMERGENCY ROOM VISITS

Air Pollution May Account for Five Percent of Cardiac Hospital Admissions

Numerous studies have focused on mortality because it is an easy to measure effect for which data is readily available. It is important to note that early deaths represent just the tip of the iceberg of particulate related health effects. For each death, there are many more people admitted to the hospital, and for each hospital admission, many more visits to emergency departments and doctors offices. Similarly, for each patient who visits an emergency clinic, many more experience uncomfortable respiratory symptoms or days when they must restrict their activity, increase their use of medication, or remain indoors.

Increased hospital admission rates represent one of the most serious effects of air pollution. This study examined the association between PM_{10}, carbon monoxide, and hospital admissions of the elderly for heart disease across eight urban counties with different pollution and weather profiles. The eight locations are: Chicago; Colorado Springs; New Haven; Minneapolis; St. Paul; Seattle; Spokane; and Tacoma. The study design was intended to minimize confounding by weather or other pollutants. Associations of both PM_{10} and CO with cardiovascular hospital admissions were observed in areas with widely varying correlations between these pollutants and weather factors or other air pollutants. Overall, the results suggest that air pollution may be responsible for 5 percent of hospital admissions for heart disease, representing an enormous public health impact.

• Schwartz, Joel. Air Pollution and Hospital Admissions for Heart Disease in Eight U.S. Counties. Epidemiology 1999; 10:17–22).

Emergency Room Visits for the Respiratory Illness in the Elderly Linked to Air Pollution

Consistent with reports of aggravated symptoms in those; with chronic respiratory conditions, a study in Montreal, Canada found strong associations between air pollution and emergency room visits for patients over 64 years of age during 1993, when more data were available. Positive associations were reported for ozone, PM_{10}, $PM_{2.5}$, and sulfate, at air pollution levels well below the U.S. air quality standards. The elderly are especially susceptible to the effects of air pollution.

The NMMAPS study, discussed above, reported strong and consistent associations between particulate air pollution and hospital admissions among the elderly for cardiovascular disease, pneumonia, and chronic obstructive pulmonary disease.

• Delfino, R.J., Murphy-Moulton, A.M., Burnett, R.T., Brook, JR., and Becklake, M.R. Effects of Air Pollution on Emergency Room Visits for Respiratory Illnesses in Montreal, Quebec. Am J Respir Crit Care Med 1997;155:568–576.

Pre-Existing Cardiovascular Disease Increases the Risk of PM-Related Hospital Admissions for Respiratory Causes

This 10-year study of Medicare patients in Chicago was designed to identify subgroups that are especially susceptible to particulate pollutions. Researchers examined records of previous hospital admissions and secondary diagnoses to determine wither people with certain conditions were predisposed to having a greater risk from air pollution. Investigators found that people with asthma had double the risk of a PM_{10}-associated hospital admission, and that people with heart failure had double the risk a PM_{10}-induced COPD admission. The authors conclude, “the results suggest that patients with acute respiratory infections or defects in the electrical control of the heart are a risk group for particulate matter effects."

- Zanobetti, A., Schwartz, J., and Gold, D. Are There Sensitive Subgroups for the Effects of Airborne Particles? Environmental Health Perspectives Vol. 108, No. 9, pp. 841–845, September 2000.

INFANT MORTALITY AND EFFECTS ON CHILDREN

Growth in Children's Lung Function is Slowed by Air Pollution

Researchers with the Children's Health Study led by the University of Southern California have monitored levels of major air pollutants in a dozen southern California communities since 1993, while tracking the respiratory health of more than 3,000 school age children. The 12 communities, which fell along a gradient of air pollution levels, were all within a 200-mile radius of Los Angeles. The California towns studied were Alpine, Atascadero, Lake Arrowhead, Lake Elsinore, Lancaster, Lompoc, Long Beach, Mira Loma, Riverside, San Dimas, Santa Maria, and Upland.

In fourth-graders, significant deficits in growth of lung function were associated with various measures of fine particles (PM_{10}, $PM_{2.5}$, and PM_{10}–2.5), nitrogen dioxide, and inorganic acid vapor, but not with ozone. The deficits were larger for children that spent more time outdoors. "This is the best evidence yet of a chronic effect of air pollution in children," said Dr. John Peters, University of Southern California professor of preventative medicine and one of the study authors. The study concluded that "the results suggest that exposure to air pollution may lead to a reduction in maximal attained lung function, which occurs early in adult life, and ultimately to increased risk of chronic respiratory illness in adulthood."

- Gaudennan, J.W., McConnell, R., Gilliland, F., London, S., Thomas, D., Avol, E., Vora, H., Berhane, K., Rappaport, E.B., Lurmann, F., Margolis, H.G., and Peters, J. Association between Air Pollution and Lung Function Growth in Southern California Children. American Journal of Respiratory and Critical Care Medicine, Vol. 162. pp 1383–1390, 2000.

Doctor Visits Climb In Relation to Air Pollution

In Paris, France, doctors still make house calls, and public records on the reason for the visits are available through the French national health insurance program. This enabled investigators to examine a significant but understudied health endpoint; doctor visits, that affects a much larger number of patients than those admitted to hospitals or treated in emergency departments of hospitals. The statistical model of daily air pollution effects used in this study controlled for season, pollen counts, influenza epidemics and weather. Medina et al. report that house calls for asthma for children 0–14 years old showed the strongest association with air pollution.

- Medina, S., Le Tertre, A., Quenel, P., Le Moullec, Y., Lameloise, P., Guzzo, J.C., Festy, B., Ferry, R., and Dab, W. Air Pollution and Doctors' House Calls: Results from the ERPURS System for Monitoring the Effects of Air Pollution on Public Health in Greater Paris, France, 1991–1995. Environmental Research 75, 73–84, 1997.

Air Pollution May Contribute to Infant Mortality

A small but growing body of literature suggests that air pollution may contribute to infant mortality. British scientists Bobak and Leon analyzed infant mortality and several measures of long-term exposure to air pollutants in highly polluted regions of the Czech Republic. They found a consistent, positive association between PM_{10} levels and post neonatal infant mortality from respiratory causes, after controlling for socioeconomic factors and other pollutants.

Dr. Dana Loomis, of the University of North Carolina, and co-workers found that air pollution is associated with acute increases in infant mortality in Mexico City after controlling for temperature and other factors. Increases in fine particles, ozone and nitrogen dioxide resulted in an increased number of infant deaths 3 to 5 days later. The effect of particles was the most consistent and the least sensitive to the presence of other pollutants.

A study by EPA scientist Dr. Tracey Woodruff et al., of 86 cities in the United States reported an association between infant mortality and the level of inhalable particles in the first 2 months of life.

- Bobak, M. and Leon, D.A. The Effect of Air Pollution on Infant Mortality Appears Specific for Respiratory Causes in the Postneonatal Period. Epidemiology 1999;10:666–670.
- Loomis, D., Castillejos, M., Gold, D.R., McDonnell, W., and Borja-Aburto, V.H. Air Pollution and Infant Mortality in Mexico City. Epidemiology 1999;10:118–123.

• Woodruff, T.J., Grillo, J., and Schoendorf, K.C. The Relationship Between Selected Causes of Postneonatal Infant Mortality and Particulate Air Pollution in the United States. Environ Health Perspect 1997;105:607–612. ‘

Air Pollution In Highly Polluted Regions May Cause Low Birth Weight Infants

Low birth weight is the most important predictor for neonatal mortality in developed and developing countries, and is a significant determinant of infant health and survival. A large study in Beijing, China looked at maternal exposure to air pollution during pregnancy and subsequent birth weight of infants. Coal stoves used for heating and cooking are a major source of indoor and outdoor air pollution in the study region. Xiaobin Wang of the Boston University School of Medicine and colleagues found a significant exposure-response relationship between maternal exposure to sulfur dioxide and total suspended particles during the third trimester of pregnancy and low birth weight.

• Wang, X., Ding, H., Ryan, L., and Xu, X. Association Between Air Pollution and Low Birth Weight: A Community-Based Study. Environ Health Perspect (1997);105:514–520.

ASTHMA EXACERBATION

Children's Emergency Room Visits for Asthma Increase on High Air Pollution Days

"Asthma is the most common chronic illness in children and the cause of most school absences," state Norris et al., in their study of children's emergency department visits for asthma. University of Washington investigators found significant associations between pediatric hospital visits for asthma and increased daily concentrations of PM and carbon monoxide in Seattle. Significantly, exacerbation of asthma was evident even when daily $PM_{2.5}$ concentrations were substantially below the level of the newly adopted National Ambient Air Quality Standard of 15 μg/m3 annually.

In perhaps the largest study of pediatric asthma visits to date, Dr. Paige Tolbert, of the Rollins School of Public Health at Emory University, and co-investigators, obtained data on emergency department visits for three summers from seven large Atlanta area hospitals. The study included information on a variety of pollutants including spatial resolution of ozone data, a broad range of exposure levels, and a balanced distribution of socioeconomic status in the study population.

Increases in both ozone and particulate matter were found to heighten the risk of pediatric emergency room visits for acute asthma. According to the authors, "the study suggests continuing health risks at pollution levels that commonly occur in many U. S. cities," and "supports accumulating evidence regarding the relation of air pollution to childhood asthma exacerbation."

• Norris, G., YoungPong, S.N., Koenig, J.Q., Larson, T.V., Sheppard, L., and Stout, J.W. An Association Between Fine Particles and Asthma Emergency Department Visits for Children in Seattle. Environ Health Perspect 107:489–493 (1999).

• Tolbert, P.E., Mulholland, J.A., MacIntosh, D.D., Xu, F., Daniels, D., Devine, O.J., Carlin, B.P., Klein, M., Dorley, J., Butler, A.J., Nordenberg, D.F., Frumkin, H., Ryan, P.B., and White, M.C. Air Quality and Pediatric Emergency Room Visits for Asthma in Atlanta, Georgia. Am J Epidemiol 2000;151:798–810.

Children with Asthma are More Susceptible to Respiratory Effects

Increased particle concentrations have been associated with acute reductions in lung function and increased symptom reporting in children, including children with asthma. Dr. Sverre Vedal, Professor of Medicine at the University of British Columbia, and co-workers followed a group of 2,200 elementary school children in a pulp mill community on Vancouver Island, in Canada. Concentrations of potentially important copollutants such as sulfur dioxide, ozone, and acid aerosol were very low in the study community.

Vedal et al. found that children experience declines in peak expiratory flow, a measure of respiratory function, and increased symptoms such as cough, phlegm production, and sore throat, after increases in relatively low 24-hour PM_{10} concentrations. Children with asthma were found to be more susceptible to these effects than other children.

• Vedal, S., Petkau, J., White, R., and Blair, J. Acute Effects of Ambient Inhalable Particles in Asthmatic and Nonasthmatic Children. Am J Respir Crit Care Med 1998, Vol. 157, No. 4, 1034–1043.

Children's Asthma Symptoms Increase on High Pollution Days

This study followed a group of 133 children with mild to moderate asthma, ages 5–13, in the Seattle, Washington area. Daily reports of asthma symptoms were obtained from study diaries and compared with daily air pollution levels during 1994 and 1995. Researchers found that a 30 percent increase in symptoms for each 10 μg/m3 increase in PM_{10} and an 18 percent increase in symptoms for a 10 μg/m3 increase in PM_{10} Effects were also increased with carbon monoxide increases, which authors assume serves as a marker for vehicle exhaust. Study authors conclude: "These results for daily symptoms complement the other Seattle-area studies that found air pollution health effects for emergency department visits and hospital admissions. Taken together, these .studies suggest that the health effects among asthmatics from short-term changes in air pollution levels are an important public health problem."

• Yu, O., Sheppard, L., Lumley, T., Koenig, J.Q., and Shapiro, G.G. Effects of Ambient Air Pollution on Symptoms of Asthma in Seattle—Area Children Enrolled in the CAMP Study. Environmental Health Perspectives, Vol. 108, No. 12, pp. 1209–1214, Dec. 2000.

Particulate Pollution Worsens Bronchitis in Asthmatic Children

A University of Southern California School of Medicine study of more than 3,600 fourth, seventh and tenth grade children relied on parent questionnaires to identify children with pre-existing asthma or wheeze, and to assess their bronchitic symptoms. The students lived in 12 communities in Southern California with a broad range of air pollution levels: Alpine; Atascadero; Lake Elsnore; Lake Gregory; Lancaster; Lompoc; Long Beach; Mira Loma; Riverside; San Dimas; Santa Maria; and Upland, California. Children with asthma were much more likely than other children to experience bronchitis and phlegm in relation to PM_{10} exposures.

• McConnell, R., Berhane, K., Gilliland, F., London, S.J., Vora, H., Avol, E., Gaudernan, W.J., Margolis, H.G., Lurmann, F., Thomas, D.C., and Peters, J.M. Air Pollution and Bronchitic Symptoms in Southern California Children with Asthma. Environ Health Perspect 107:757–760 (1999).

• Peters, J.M., Evol, E., Navidi, W., London, S.J., Gauderman, W.J., Lurmann, F., Linn, W.S., Margolis, H., Rappaport, E., Hong, J. Jr., and Thomas, D.C. A Study of Twelve Southern California Communities with Differing Levels and Types of Air Pollution; l. Prevalence of Respiratory Morbidity. Am J Respir Crit Care Med 1999;159L760–767.

• Etzel, Ruth A. Research Highlights: Air Pollution and Bronchitic Symptoms in Southern California Children With Asthma. Environ Health Perspect Vol. 107, No. 9, September 1999.

Cleaning Up Air Pollution Improves the Respiratory Health of Children

A rather dramatic improvement in air quality in East Germany occurred following the German reunification in 1990. Researchers wanted to study if the declines in air pollution had produced a corresponding improvement in health, and they focused in on a cohort of first-, third-, and sixth-grade children in three East German communities. During the study period, bronchitis, ear infections, and frequent colds Were dramatically reduced. Authors found that "the prevalence of nonasthmatic respiratory symptoms and diseases was higher in children living in more polluted communities, especially with respect to TSP and .f02, suggesting that disease occurrence may be reduced within a short period by improvement in air quality."

• Heinrich, J., Hoelscher, B., and Wichmann, H.E. Decline of Ambient Air Pollution and Respiratory Symptoms. American Journal of Respiratory and Critical Care Medicine, Vol. 161, pp. 1930–1936, 2000.

RECENT RISK ASSESSMENTS

Air Pollution from Power Plants Responsible for 30,000 Premature Deaths Each Year in U.S.

This analysis by Abt Associates used EPA-approved emissions and air quality modeling techniques to forecast ambient air quality in 2007, assuming full implementation of the Clean Air Act's acid rain control program, and the EPA's 1999 "NOx State Implementation Plan (SIP) call." Analysts then applied risk functions derived from epidemiological studies to estimate health impacts of power plant emissions in the U.S. The focus of the study was on gaseous emissions of sulfur dioxide and nitrogen oxides that are converted in the atmosphere to fine particle sulfates and nitrates. The analysis estimated that 30,100 deaths maybe attributed to power plant emissions each year. In addition, power plant emissions causes 20,100 hospitalizations for respiratory and cardiovascular causes, more than 7,000 asthma-related emergency room visits, 18,600 cases of chronic bronchitis, 600,000 asthma attacks, over 5 million lost work days, and over 26 million minor restricted activity days. Reductions in emissions from uncontrolled power plants could substantially reduce the adverse health effects.

In addition, analysis used a simpler model to estimate the impacts of emissions from on-and off road diesel engines. The analysis reported that 15,400 premature deaths each year are attributable to the diesel contribution to fine particle concentrations. In addition, there are an estimated 11,100 cases of chronic bronchitis due to diesel emissions, thousands of hospitalizations due to chronic obstructive pulmonary disease, pneumonia, asthma, and cardiovascular causes, and over a million cases of minor illness such as acute bronchitis, upper and lower respiratory symptoms, and asthma attacks. Because of the use of different models, these results are not directly comparable to the power plant estimates.

Abt Associates, Inc. with ICF Consulting, and E.H. Pechan Associates, Inc. Prepared for Clean Air Task Force. The Particulate-Related Health Benefits of Reducing Power Plant Emissions. October 2000.

Air Pollution Causes 40,000 Premature Deaths Each Year in Alpine Countries

As part of an assessment prepared for the World Health Organization, Nino Kunzli and coauthors estimated health risk attributable to PM_{10} pollution in three European countries, Austria, France, and Switzerland. Using functions of health risk obtained from epidemiological studies, the authors estimate that air pollution caused 6 percent of total mortality, or more than 40,000 cases each year, with about half associated with motor vehicle pollution. In addition, the study estimated that 47,000 new cases of chronic bronchitis in adults, more than 500,000 episodes of bronchitis in children, and more than a million asthma attacks are attributable to air pollution each year. Despite uncertainties inherent in risk assessment, this analysis highlights the magnitude of the public health burden attributable to current levels of air pollution.

• Kunzli N., Kaiser, R., Medina, S., Studnicka, M., Chanel, O., Filliger, P., Herry, M., Horak, F. Jr., Puybonnieux-Texier, V., Quenel, P., Schneider, J., Seethader, J., Vergnaud, J-C., and Sommer, H. Public-Health Impact of Outdoor and Traffic-Related Air Pollution: A European Assessment. The Lancet, Vol. 356, pp. 795–801, September 2, 2000.

[From the American Lung Association, June 1, 2001]

ANNOTATED BIBLIOGRAPHY OF RECENT STUDIES OF THE HEALTH EFFECTS OF OZONE AIR POLLUTION 1997–2001

In 2001, the U.S. Environmental Protection Agency (EPA) will commence a periodic review of the National Ambient Air Quality Standards (NAAQS) for ozone, a common and pervasive air pollutant in the United States. The review will begin with a compilation of all the scientific and medical studies published on ozone air pollution since EPA's last review.

In 1997, EPA revised the standard for ozone from 0.12 ppm averaged over 1 hour, to a standard of 0.08 ppm averaged over 8 hours. The new standard was set to reflect the findings of chamber studies performed in the early 1990's, which found that ozone poses health problems when people are exposed to lower levels for longer periods of time.

Ozone is the principle component of ground-level smog. It is formed when hydrocarbon and nitrogen oxide pollution from vehicles, power plants, refineries . and other sources react in the atmosphere in the presence of sunlight. Ozone is a powerful oxidizing agent that damages lung tissue.

Recent research with laboratory animals, clinical subjects, and human populations has identified a cascade of adverse health effects from ozone at levels common in the United States. Effects include increased respiratory symptoms, damage to cells of the respiratory tract, pulmonary inflammation, declines in lung function, increased susceptibility to respiratory infections, and increased risk of hospitalization and early death.

Four groups of people are especially sensitive to ozone: children, people with chronic obstructive respiratory disease (chronic bronchitis and emphysema) and asthma, persons who exercise or work outdoors, and people who, for reasons that remain unknown, are more sensitive to the physiologic effects of ozone.

This bibliography represents a sampling of the peer-reviewed scientific literature on the health effects of ozone air pollution published since EPA's last revision of the standards in 1997.

Air pollution research may involve epidemiological studies of human populations, chamber studies . where human volunteers are exposed to air pollution under controlled conditions, and toxicological studies with laboratory animals. In recent years, air pollution research funds have been largely directed toward the study of particulate matter. Nevertheless, there were some important developments regarding the health effects of ozone. Important new findings include:

- Identification of the possible genetic basis for susceptibility to ozone;
- Increasing evidence of a mortality effect of ozone;
- Evidence of long-term impacts on lung function from chronic exposure; and
- Increased evidence of the effects of ozone on sensitive groups such as children and asthmatics.

This bibliography does not attempt to be comprehensive: exclusion does not imply that a study is unimportant; inclusion does not imply endorsement.

LONG-TERM STUDIES

Ozone Harms the Respiratory Health of U.S. Military Academy Cadets

Researchers from Columbia University and New York University sought to determine whether changes in lung function or respiratory symptoms would occur over the course of a summer among healthy young adults working outdoors in the presence of ozone. The study followed 72 sophomore cadets from the U.S. Military Academy at West Point, New York, during their summer training at Fort Benning, GA, Fort Leonard Wood, MO, Fort Sill, OK, and Fort Dix, NJ. All the subjects on average experienced a decline in lung function over the course of the summer. There were also significant increases in reports of cough, chest tightness, and sore throat. The decline in lung function was greatest in the group of military cadets who attended training in Fort Dix, New Jersey, where peak hourly ozone concentrations above 100 ppb occurred frequently. "These results suggest a possible adverse respiratory-health impact of exposures to particulate matter and ozone in healthy young adults engaged in intensive outdoor training," conclude the authors.

- Kinney, P.L. and Lippmann, M. Respiratory Effects of Seasonal Exposures to Ozone and Particles. Archives of Environmental Health, Vol. 55, No. 3, pp. 210–216, May/June 2000.

Lifetime Ozone Exposure Exerts Negative Effect on Small Airways of Lung

This pilot study is the first attempt to relate lifetime cumulative ozone exposure to small airway pulmonary function. 130 nonsmoking, non-asthmatic freshmen from the University of California at Berkeley who were lifelong residents of the Los Angeles Basin or the San Francisco Bay

Area volunteered to participate in lung function testing. Researchers observed declines in midand end-expiratory flow measures of the small airways that are considered early indicators for pathologic changes that might ultimately progress to chronic obstructive lung disease. These declines were associated with estimated long-term ozone exposures.

- Kunzli, N., Lurmann, F., Segal, M., Ngo, L., Balmes, J., and Tager, I.B. Association between Lifetime Ambient Ozone Exposure and Pulmonary Function in College Freshmen-Results of a Pilot Study. Environmental Research, Vol. 72, pp. 8–23, 1997.

Lung Function in Girls and Boys is Diminished by Ozone

The California Children's Health Study followed 3,300 school children that lived in 12 Southern California communities that fell along a gradient of air pollution levels for a period of 10 years. Four different measures of pulmonary, function were tested, with different pollutants most strongly associated with each measure. Girls with asthma, and boys who spent more time outdoors experienced diminished lung function in association with ozone.

- Peters, J.M., Avol, E., Gauderman, W.J., Linn, W.S., Navidi, W., London, S.J., Margolis, H., Rappaport, E., Vora, H., Gong, H., and Thomas, D.C. A Study of Twelve Southern California Communities with Differing Levels and Types of Air Pollution. II. Effects on Pulmonary Function. American Journal of Respiratory and Critical Care Medicine, Vol. 159, pp. 7680775, 1999.

Long-Term Ozone Exposure Diminishes Respiratory Health

Few studies have reported on the respiratory effects of prolonged, multi-year exposures to ozone. This study examined data from health status questionnaires and lung function measurements in relation to residence histories to examine the effect of long-term ozone exposures on over 500 non-smoking Yale college students. Investigators found that "living for four or more years in regions of the country with high levels of ozone and related copollutants is associated with diminished lung function and more frequent reports of respiratory symptoms."

• Galizia, A. and Kinney, P.L. Long-Term Residence in Areas of High Ozone: Associations with Respiratory Health in a nationwide Sample of Nonsmoking Young Adults. Environ Health Perspect, Vol. 107, No. 8, pp. 675–679, August 1999. .

Long-Term Ozone Exposure Might Inhibit Lung Function Growth in Children

Frischer et al. followed a group of 1,150 first and second grade children in two counties in Austria from 1994–1996, to investigate the long-term effects of ambient ozone. The highest and lowest exposure to ozone differed by a factor of two. Researchers found small but consistent decrements in lung function associated with ambient ozone. They conclude: "This is the first study that suggests chronic effects of ozone on lung function growth in children. Thus, ozone would constitute a risk factor for premature respiratory morbidity during later life."

A subsequent long-term study in Southern California by Gauderman et al. found an association between particulate matter and children's lung function growth, but not with ozone.

• Frischer, T., Studnicka, M., Gartner, C., Tauber, E., Horak, F, Veiter, A., Spengler, J., KUhr, J., and Urbanek, R. Lung Function Growth and Ambient Ozone: A Three-Year Population Study in School Children. Am J Respir Crit Care Med, Vol. 160, pp. 390–396, 1999.

• Gauderman, J.W., McDonnell, R., Gilliland, F., London, S., Thomas, D., Avol, E., Vora, H., Berhane, K., Rappaport, E.B., Lurmann, F., Margolis, H.G., and Peters, J. Association between Air Pollution and Lung Function Growth in Southern California Children. American Journal of Respiratory and Critical Care Medicine, Vol. 162. pp 1383–1390, 2000.

Long-Term Exposure to Ozone is Related to Asthma Development in Men

Asthma is a multi-factor disease with many contributing factors. Air pollution is generally considered to be an exacerbating, rather than a causal factor. This prospective cohort study of over 3,000 adults in the nonsmoking Seventh Day Adventist community sought to examine the whether long-term exposure to ozone air pollution can contribute to the prevalence of asthma. The study found that 8-hour average ambient ozone concentration averaged over a 20-year period was associated with doctor diagnoses of adult-onset asthma in nonsmoking males.

• McDonnell, W.F., Abbey, D.E., Nishino, N., and Lebowitz, M.D. Long-Term Ambient Ozone Concentration and the Incidence of Asthma in Nonsmoking Adults: The Ashmog Study. Environmental Research, Section A Vol. 80, pp. 110–121, 1999.

Nasal Biopsies from Children Reveal Ozone Damage

Children in Mexico City are routinely exposed to high levels of ozone, particulate, and aldehyde air pollution. Biopsies taken from these children exhibit a wide range of pathologic changes to the cells of the nasal passages. "The severe structural alteration of the nasal epithelium together with the prominent acquired ciliary defects are likely the result of chronic airway injury in which ozone, particulate matter, and aldehydes are thought to play a crucial role," conclude researchers. "The nasal epithelium in SWIIhIC [Southwest Metropolitan Mexico City] children is fundamentally disordered,' and their mucocilliary defense mechanisms are no longer intact. A compromised nasal epithelium has less ability to protect the lower respiratory tract and may potentially leave the distal acinar airways more vulnerable to reactive gases."

• Calderon-Garciduenas, L., Valencia-Salazar, G., Rogriguez-Alcaraz, A., Gambling, T.M., Garcia, R., Osnaya, N., Villarreal-Calderon, A., Devlin, R.B., and Carson, J.L. Ultrastructural Nasal Pathology in Children Chronically and Sequentially Exposed to Air Pollutants. American Journal of Respiratory Cell and Molecular Biology, Vol. 24, pp. 132–138, 2001.

SHORT-TERM STUDIES

Lung Function Diminishes Following Exposure to Air Pollution

Swiss researchers followed a group of 3,900 nonsmoking adults from eight areas of Switzerland that represent a range of urbanization, air pollution, altitude, and weather conditions. In this study, researchers obtained three different measures of lung function and compared the results with prior days measurements of ozone, total suspended particulates, and nitrogen dioxide. Daily average concentrations of ozone were significantly associated with mean respiratory function measures during the summer months. Associations remained stable after controlling for other pollutants and for pollen. Though the effects were small, researchers conclude that current levels of air pollution have public health significance.

• Schindler, C., Kunzli, N., Bongard, J.-P:, Leuenberger, P., Karrer, W., Rapp, R., Monn, C., Ackermann-Liebrich, U., and The Swiss Study on Air Pollution and

Lung Diseases in Adults Investigators. Short-Term Variation in Air Pollution and in Average Lung Function Among Never-Smokers: The Swiss Study on Air Pollution and Lung Diseases in Adults (SAPALDIA). American Journal or Respiratory and Critical Care Medicine, Vol. 163, pp. 356–361, 2001.

School Absences Rise With High Ozone Days

School absenteeism is used as an indicator of the overall health of school-aged children. A study by Chen et al. assessed the association between daily air pollution concentrations and absences among 28,000 elementary school children in Washoe County, Nevada, home of Reno between 1996 and 1998. Investigators found that ozone and carbon monoxide, but not PM_{10}, were statistically significant predictors of daily absenteeism in elementary schools.

The Children's Health Study is being carried out in 12 southern California communities that fall along a gradient of air pollution. This study explored the effect of ozone, PM_{10}, and nitrogen dioxide on school absenteeism due to upper-and lower-respiratory illness in a cohort of fourth graders. Researchers found that relatively small short-term changes in ozone, but not the other pollutants, were associated with increases in school absences due to respiratory illness in children 9–10 years of age. "Because exposures at the levels observed in this study are common, the increase in school absenteeism from respiratory illnesses associated with relatively modest day-to-day changes in ozone concentration documents an important adverse impact of ozone on children's health and well-being," state the authors.

- Chen, L., Jennison, B.L., Yang, W., and 0maye, S.T. Elementary School Absenteeism and Air Pollution. Inhalation Toxicology, Vol. 12, pp. 997–1016, 2000.
- Gilliland, F.D., Berhane, K., Rappaport, E.B., Thomas, D.C., Avol, E., Gauderman, W.J., London, S.J., Margolis, H.G., McConnell, R., Islam, K.T., and Peters, J.M. The Effects of Ambient Air Pollution on School Absenteeism Due to Respiratory Illness. Epidemiology, Vol. 12, No. 1, pp. 43–54, January 2001.

Summertime Haze Air Pollution Exacerbates Asthma in Children

This study focused on children ages 7–13 with moderate to severe asthma who attended a summer "asthma camp" in the early 1990's in the Connecticut River Valley. Daily records were kept of environmental conditions, as well as of subject medication use, lung function, and medical symptoms. Air pollution, especially ozone, was consistently correlated with acute asthma exacerbations, chest symptoms, and lung function decrements. ".:. the monotonic nature of the relationships of ozone with reduced lung function and increased numbers of asthma symptoms and exacerbations found in this work indicates that these effects extend will below the present 120 ppb concentration level, so that even meeting this standard will not be fully protective for these sensitive individuals. Past medical advice that children with asthma should take care to avoid exposure to air pollutants is further supported by the results of this research."

- Thurston, G.D., Lippman, M., Scott, M.B., and Fine, J.M. Summertime Haze Air Pollution and Children with Asthma. Am J Respir Crit Care Med, Vol. 155, pp. 654–660, 1997.

Ozone Plus Allergens Exacerbates Asthma

Asthma is an inflammatory disease of the airways. This is the first epidemiologic study to demonstrate a difference in the inflammatory reaction of the upper airways to ozone as compared to allergens in patients with intermittent to severe persistent asthma. The study of sixty asthmatic patients of the Leiden University Hospital in The Netherlands took samples of nasal lavage and analyzed it in the laboratory for signs of inflammation. Researchers found that "both ambient ozone and allergen exposure are associated with inflammatory responses in the upper airways of subjects with asthma, although the type of inflammation is qualitatively different." They speculate that "during episodes with both increased allergen levels and high ambient photochemical air pollution asthma exacerbations are more likely to develop than during periods with either increased allergens or ambient photochemical air pollution alone."

- Hiltermann, T.J.N., de Bruijne, C.R., Stolk, J., Zwinderman, A.H., Spiksma, F.T.M., Roemer, W., Steerenberg, P.A., Fischer, P.H., van Bree, L., and Hiemstra, P.S. Effects of Photochemical Air Pollution and Allergen Exposure on Upper Respiratory Tract Inflammation in Asthmatics. Am J Respir Crit Care Med, Vol. 156, pp. 1765–1772, 1997.

Children with Mild Asthma Suffer the Effects of Air Pollution

A number of important studies have been conduced in Mexico City where air pollution levels are high. This study involved a panel of Mexican children ages 5–13 with mild asthma. Researchers determined that a 50 ppb increase in the daily 1-

hour maximum ozone was related to an 8 percent increase in cough, a 24 percent increase in phlegm, and an 11 percent increase in other respiratory symptoms in the study population.

• Romieu, I., Meneses, F., Ruiz, S., Huerta, J., Sienra, JJ, White, M., Etzel, R., and Hernandez, M. Effects of Intermittent Ozone Exposure on Peak Expiratory Flow and Respiratory Symptoms among Asthmatic Children in Mexico City. Archives of Environmental Health, Vol. 52(5), pp. 368–376, Sep-Oct 1997.

Ozone is a Risk Factor for Respiratory Problems in Kids, Especially Babies, Toddlers, and Adolescents

Burnett et al. examined the association between air pollution and hospital admissions for acute respiratory problems in babies and toddlers during a 15-year period in Toronto, Canada. A 35 percent increase in the daily hospitalization rate for respiratory problem was associated average ozone concentrations in the summer, but not during other seasons. The ozone effect persisted after adjustment for other air pollutants and weather:

Braga and coworkers examined daily hospital admission records for children of different ages, compared to daily concentrations of ozone, particulate matter, sulfur dioxide, carbon monoxide, and nitrogen dioxide over a 5-year period in Sao Paulo, Brazil. The study showed that daily respiratory hospital admissions for children and adolescents increased with air pollution, with children less than 2 years old the most susceptible, and adolescents were the next most susceptible age group.

• Burnett, R.T., Smith-Doiron, M., Stieb, D., Raizenne, M.E., Brook, J.R., Dales, R.E., Leech, J.A., Cakmak, S., and Krewski, D. Association between Ozone and Hospitalization for Acute Respiratory Diseases in Children Less than 2 Years of Age. American Journal of Epidemiology, Vol. 153, No. 5, pp. 444–452, 2001.

• Braga, A.L., Saldiva, P.H., Pereira, L.A., Menezes, J.J., Conceicao, G.M., Lin, C.A., Zanobetti, A., Schwartz, J., and Dockery, D.W. Health Eflects of Air Pollution Exposure on Children and Adolescents in Sao Paulo, Brazil. Pediatric Pulmonology, Vol. 31 (2), pp. 106–113, Feb. 2001.

Low Levels of Ozone Contribute to Hospitalization for Respiratory Disease

A study by Health Canada researcher Richard Burnett et al. compared air pollution data to hospital admissions in 16 Canadian cities, over a 10-year period. The study controlled for many factors including day of week, season, other air pollutants, and climate. The prior day's peak hourly ozone concentration was positively associated with respiratory hospital admissions during the April-December period. The effects varied from city to city. Researchers conclude that "these results suggest that ambient air pollution at the relatively low concentrations observed in this study, including tropospheric ozone, is associated with excess admissions to hospital for respiratory diseases in populations experiencing diverse climates and air pollution profiles."

In Brisbane, Australia, ozone levels are reasonably constant year round. This large study of daily admissions to public hospitals during the period 1987–1994 found that ozone was consistently associated with admissions for asthma and respiratory disease-with little evidence of a threshold.

• Burnett, R.T., Brook, JR., Yung, W.T., Dales, R.El, and Krewski, D. Association between Ozone and, Hospitalization for Respiratory Diseases in 16 Canadian Cities. Environmental Research, Vol. 72, pp. 24–31, 1997.

• Petroeschevsky, A., Simpson, R.W., Thalib, L., and Rutherford, S. Associations between Outdoor Air Pollution and Hospital Admissions in Brisbane, Australia. Archives of Environmental Health, Vol. 56(1), pp. 37–52, Jan-Feb 2001.

Summertime Ozone Sends the Elderly to the Emergency Room

This study examined daily emergency room visits for respiratory illnesses in 25 hospitals in Montreal, Quebec in relation to summertime air pollution. Though the ozone levels never exceeded the 1-hour NAAQS of 120 ppb, statistically significant relationships were found between respiratory emergency room visits for patients over age 64, and both 1-hour and 8-hour maximum ozone levels measured the day before. "These findings confirm the impression that while air quality standards may protect the respiratory health of the general population, this is not the case for susceptible subgroups such as the elderly," conclude the researchers.

• Delfino, R.J., Murphy-Moulton, A.M., and Beeklake, M.R. Emergency Room Visits for Respiratory Illnesses among the Elderly in Montreal: Association with Low Level Ozone Exposure. Environmental Research, Section A, Vol. 76, pp. 67–77, 1998.

Ozone Exposure May Make the Heart Work Harder

This study is the first chamber study to directly measure the effect of ozone on the function of the human heart. Investigators studied a small group of healthy adult males and those with high blood pressure. Overall, researchers did not find evidence of major short-term cardiovascular effects from ozone exposure. However, they reported that their results "suggest that ozone exposure can increase myocardial work and impair pulmonary gas exchange to a degree that might be clinically important in persons with significant preexisting cardiovascular impairment, with or without concomitant lung disease."

- Gong, H. Jr., Wong, R., Sarma, R.J., Linn, W.S., Sullivan, E.D., Shamoo, D.A., Anderson, K.R., and Prasad, S.B. Cardiovascular Effects of Ozone Exposure in Human Volunteers. Am J Respir Crit Care Med, Vol. 158, pp. 538–546, 1998.

Ozone Damages the Lungs of Exercisers

The lungs work harder and take in more air when people are exercising. A study by Frampton et al. of healthy adult smokers and nonsmokers subjected volunteers to exercise while exposing them to ozone and filtered air in a laboratory chamber. The authors conclude that: "exposure to ozone with exercise, at concentrations relevant to urban outdoor air, results in ozonation of lipids in the airway epithelial lining fluid of humans."

A study of adult cyclists in Parma, Italy measured levels of lung-specific proteins in the blood following a 2-hour bicycle ride during the summer, under differing ozone smog conditions. Researchers Broeckaert et al. found increased airway permeability in moderately exercising participants exposed to an average of 0.07 ppm ozone over 2 hours.

- Frampton, M.W., Pryor, W.A., Cueto, R., Cox, C., Morrow, P.E., and Utell, M.J. Ozone Exposure Increases Aldehydes in Epithelial Lining Fluid in Human Lung. Am J Respir Crit Care Med, Vol., 159, pp. 11134–1137, 1999.
- Broeckaert, F., Arsalane, K., Hermans, C., Bergamaschi, Brustolin, A., Mufti, A., and Bernard, A. Lung Epithelial Damage at Low Concentrations of Ambient Ozone. The Lancet, Vol. 353, pp. 900–901, March 13, 1999.

Ozone Increasingly Implicated in Premature Mortality

Recent studies of air pollution and mortality have looked at the impacts of all the major pollutants, and have increasingly been reporting positive associations with ozone. Dr. Jonathan M. Samet and coauthors from the Johns Hopkins University School of Public Health examined five major air pollutants in 20 of the largest cities in the United States from 1987 to 1994, as part of NMMAPS—the National Morbidity, Mortality, and Air Pollution Study. Ozone levels were positively associated with mortality rates during the summer months when ozone levels were highest, though effects are not as strong as with particulate matter.

A similar study known as the APNEA project—Air Pollution and Health: a European Approach—of six cites in Central and Western Europe examined data on daily deaths and daily air pollution levels. Significant positive associations were found between daily deaths and ozone. Positive associations were also reported for nitrogen dioxide, but study authors believe this may be due to confounding by other vehicle-derived pollutants and needs further study.

Thurston and Ito poled data from 15 studies and estimated a small effect of ozone on total mortality. According to Samet et al.: "Taken together, the results of these three studies provide consistent evidence that exposure to ozone also increases the risk of death."

- Samet, J.M., Dominici, F., Curriero, F.C., Coursae, I., and Zeger, S.L. Fine Particulate Air Pollution and Mortality in 20 U.S. Cities, 1987–1994. New England Journal of Medicine, Vol. 343, No. 24, pp. 1742–1749, December 14, 2000
- Tuoloumi, G., Katsouyanni, K., Zmirou, D., Schwartz, J., Spix, C., de Leon, A.P., Tobias, A., Quennel, P., Rabezenko, D., Bacharova, L., Bisanti, L., Vonk, J.M., and Ponka, A. Short-Term Effects of Ambient Oxidant Exposure on Mortality: A Combined Analysis Within the APHEA Project. American Journal of Epidemiology, Vol. 146:14o. 2, pp. 177–185, 1997.
- Thurston, G.D., and Ito, K. Epidemiological Studies of Ozone Exposure Effects. In, Air Pollution and Health, Edited by S.T. Holgate, J.M. Samet, H.S. Koren, and R.L. Maynard, Academic Press, 1999.

OTHER STUDIES

Genetic Basis for Ozone Responsiveness Identified

It is well established that ozone induces lung hyperpermeability and inflammation in humans and in laboratory animals, and that some individuals are more susceptible than others to ozone damage. A number of factors may contribute to this differential responsiveness, including age, sex, nutrition, and pre-existing disease, such as asthma. This study by Dr. Steven Kleeberger of the Johns Hopkins School of Hygiene and Public Health explores the genetic basis for Susceptibility, after controlling for other known susceptibility factors. The study identifies a likely ozone "susceptibility gene" in mice.

• Kleeberger, S.R., Reddy, S., Zhang, L.-Y., and Jedlicka, A.E. Genetic Susceptibility to Ozone-Induced Lung Hyperpermeability. Am J. Respir. Cell Mol. Biol., Vol. 22, pp. 620–627, 2000.

Inner-City Asthmatic Children Born Prematurely or with Low Birth Weight Have Greatest Response to Ozone

This study sought to ascertain which subgroups in a cohort of 846 inner-city asthmatic children aged 4–9 years old were most susceptible to the effects of summertime ozone. The children were recruited from emergency departments and primary care clinics in the Bronx and East Harlem in New York City, Baltimore, Washington, DC, Detroit, Cleveland, Chicago, and St. Louis, MO. The study reported that "children of low birth weight or of premature birth are at greater risk for respiratory problems, and appear to be substantially more susceptible to the effects of summer air pollution than children of normal birthweight or full-term gestation."

• Mortimer, K.M., Tager, I.B., Dockery, D.W., Neas, L.M., and Redline, S. The Effect of Ozone on Inner-City Children with Asthma: Identification of Susceptible Subgroups. Am J Respir Crit Care Med, Vol. 162, pp. 1838–1845, 2000.

During Atlanta Summer Olympus, Decreased Traffic Reduced Asthma Incidents in Children

The 1996 Summer Olympics in Atlanta, a concerted effort was made to lower traffic congestion to enable spectators to get to the games. Public transit was enhanced, the downtown was closed to private cars, and businesses were encouraged to promote telecommuting and alternative work hours. As a result, there were large: and significant decreases in ozone concentrations, and somewhat lesser reductions in carbon monoxide and PM_{10} concentrations. During this period, researchers found significant reductions in the numbers of urgent care visits, emergency care visits, and hospitalizations for asthma among children ages 1—16 years. Dr, Michael S. Friedman of the Centers for Disease Control and Prevention and coauthors conclude: "Our finding suggest that efforts to decrease ozone and PM_{10} concentrations from moderate to low levels can decrease the burden of asthma."

• Friedman, M.S., Powell, K.E., Hutwagner, L., Graham, L.M., and Teague, W.G. Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma. Journal of the American Medical Association, Vol. 285, No. 7, pp. 897–905, 2001

RESPONSES OF JOHN KIRKWOOD TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. We've heard from EPA and industry that stringent enough caps could obviate the need for New Source Review and a host of other Clean Air Act requirements. What are your views on the position?

Response. We believe the number, diversity, and geographic distribution of emissions sources will make it impossible to monitor the local impact of cap-and-trade proposals. This program will be more challenging because the "easy" reductions have been obtained during implementation of the Title IV program. Existing Clean Air Act programs must be maintained as a safeguard to protect against adverse local air pollution impact.

Question 2. I share your concern about the speed with which the Administration is moving on implementing the new ozone and fine particulate standards. That seems to make the Clean Power Act all the more important. Do you have any further thoughts on how we might move the Administration along?

Response. We believe the Bush Administration has devoted far too few resources to implementation of the new ambient air quality standards for ozone and fine particles. We urge you to utilize all the oversight tools at your disposal to re-new a focus on implementing these critical standards. The Administration appears to be satisfied with blaming litigation for the delays. However, substantial evidence suggests it will not be ready to move forward with necessary implementation measures once the litigation is concluded.

Question 3. Some of your panel have expressed concern about the local impacts of trading. How do we run a national cap-and-trade program efficiently without jeopardizing local environmental quality and public health?

Response. The American Lung Association has grave concerns whether any national cap-and-trade program can operate in a way that assures local environmental quality and public health will not be jeopardized. Such a program must be a supplement to current Clean Air Act authorities. In this way, current law provides some protections. It is of paramount importance that State authority to protect its citizens not be preempted.

Question 4. During the hearing, Senators Lieberman and Voinovich requested information on the contribution that reduced power plant emissions would make to reducing premature mortality and providing other health benefits. Can you submit for the record any additional studies together with any additional observations you may have on this question?

Response. The American Lung Association is not aware of any study which has evaluated the health benefits that would be achieved from the specific power plant emissions reduction levels called for in the Clean Power Act, S. 556. However, we submit for the record a study entitled, "The Particulate-Related Health Benefits of Reducing Poser Plant Emissions" by Abt Associates. This study used the same peer-reviewed, state-of-the art research methodology used by EPA to estimate the health benefits of power plant control Exhibit 6–2 from that study (attached) shows that a "75 Percent Reduction" Scenario which, notwithstanding its name, represents a two-thirds reduction from expected power plants SO_2 emissions under existing law in 2007 would yield a mean reduction of 18,700 premature deaths per year and over 15,000 fewer hospitalizations per year plus many other health benefits. Since the Clean Power Act would require a true 75 percent reduction of SO_2 from power plants it is safe to say that health benefits would significantly exceed those described in the Abt Associates study. We caution that it is not appropriate to mathematically project the increase in benefits from the Clean Power Act based on the Abt study findings.

Senator Voinovich asked during the hearing what the health benefits would be from "turning off" all coal-fired power plants. Exhibit 6–3 of the Abt Associates study (attached) estimated that all power plant emissions cause a mean of 30,100 premature deaths annually, based on projected emissions levels in 2007 plus many other enumerated adverse health effects. Presumably if these power plants were "turned off" these adverse health outcomes would be avoided.

Question 5. Senator Voinovich inquired whether the National Governors Association policy on New Source Review was at odds with the support of this program expressed by the American Lung Association as well as State and local air regulators. Please elaborate your views on this matter.

Response. We do not interpret the NGA energy policy that addresses New Source Review to be inconsistent with our views.

The NGA policy advocates improvements to NSR that "enhance the environment and increase energy production capacity, while encouraging energy efficiency, fuel diversity, and the use of renewable resources." (Section NR–18.6) We take this statement to mean that the NGA supports changes to the NSR program that achieve greater environmental protection in ways that improve the efficiency and certainty of the review process. The ALA supports regulatory changes to the NSR program that would provide greater health and environmental benefits while achieving the other goals endorsed by the NGA. The Natural Resources Defense Council has provided proposed regulatory changes in the NSR program to the Environment and Public Works Committee that incorporate these concepts. The American Lung Association opposes the changes proposed by the utility industry that, in our view, would weaken the health protections provided by the NSR program.

STATEMENT OF CECIL E. ROBERTS, PRESIDENT, UNITED MINE WORKERS OF AMERICA

Mr. Chairman and members of the committee: As president of the nation's first and foremost energy union, I appreciate the opportunity to participate in the committee's consideration of legislation to reduce emissions from coal-fired powerplants. The United Mine Workers of America (UMWA) supports additional reductions in sulfur dioxide (SO_2), nitrogen oxides (NOx) and mercury from coal-fired power plants, provided that the reductions are designed in a way that preserves coal miners jobs. However, we do not support reduction schemes that force or encourage electric utilities to switch away from coal, thereby causing economic harm to coal miners and their communities.

UMWA members mine, process, transport and consume coal in their daily jobs. That's how most of them put food on the table, pay their bills and build a future for their families. Their economic interests are entwined with energy and environmental issues more than most other workers. The issues being discussed by the committee with regard to S. 556 not only raise the question for them of how much their utility bills may rise as we seek to reduce emissions, but whether they can remain gainfully employed and support their families.

The Role of Coal in America's Energy Supply

Coal is an indispensable part of America's energy supply, and the United States is blessed with an abundance of coal. The latest estimates indicate that the United States has a demonstrated coal reserve base of over 500 billion tons, with an estimated 275 billion tons of recoverable reserves. At current production rates, this represents about 275 years of recoverable coal reserves. Coal represents about 95 percent of all U.S. fossil fuel energy reserves. About one-quarter of all the world's known coal reserves are found in the United States. U.S. recoverable coal reserves have the energy equivalent of about one trillion barrels of oil. That is comparable to all of the world's known oil reserves.

Coal is used to generate some 56 percent of our nation's electricity. To back coal out of our nation's energy supply mix means that we would have to find some other fuel to replace it, most likely natural gas. Such a fundamental shift in U.S. energy policy brings into question not only the cost, but also the availability of natural gas supplies. We know that we have enough identified, economically recoverable coal reserves to last for hundreds of years. While sufficient domestic supplies of natural gas may be currently available, future availability—and cost—is much less certain than in the case of coal. We believe that substantial increases in demand for natural gas inevitably will lead to higher costs and greater dependence on foreign sources for supply. And we should all be mindful of the fivefold increase in natural gas prices that some of our citizens faced last winter. Environmental policies that drive electric utilities away from coal and toward more natural gas use may well be in conflict with our energy policy goals of maintaining a reliable, low-cost mix of generating sources that can temper the price increase of one particular fuel.

While we are blessed with an abundant supply of coal, we are challenged in its use because of the nation's concern about the environment. Americans demand a cleaner environment at the same time they demand low-cost, reliable and available energy. For coal to continue to play the vital role that it can—and should—play in our energy mix, we must ensure that coal is consumed with the minimum amount of emissions that technology will allow. This means that we must continue to develop highly advanced technologies to convert coal to a usable form of energy more efficiently and to capture any harmful emissions before they escape into the atmosphere.

How Coal Miners Fared Under the 1990 Clean Air Act Amendments

Before getting to specific comments on S. 556, let me say at the outset that coal miners did not fare well under the Clean Air Act Amendments of 1990. Electric utilities engaged in substantial fuel switching in response to Title IV acid rain controls and UMWA members in the high sulfur coal producing regions in northern Appalachia and the Midwest were displaced by the thousands. Nearly 60 percent of the SO_2 reductions achieved in Phase I were accomplished through fuel switching and only about 28 percent were accomplished through installation of scrubbers. This coal switching proved to be devastating to high sulfur coal mining communities. Let me cite just a few examples. In 1990, coal mines in northern West Virginia produced 56.6 million tons and employed 10,053 coal miners. In 2000, production had fallen to 37.6 million tons and employment had declined to 3,712 coal miners, a 33.6 percent drop in production and a 63.1 percent drop in employment. In Ohio, coal production was 35.3 million tons in 1990 and the state's coal mines employed 5,866 mine workers. By 2000, output had declined to 22.3 million tons and employment had dropped to 2,688 mine workers, a 36.8 percent drop in coal production and 54.2 percent decline in coal mining jobs. In Illinois, coal production was 60.4 million tons in 1990 and 10,018 coal miners were working. By 2000, production had fallen to 33.4 million tons (a 44.6 percent reduction) and only 3,454 coal miners were working (a decline of 65.5 percent). In western Kentucky, 5,586 coal miners produced 44.9 million tons in 1990; by 2000, only 2,510 coal miners were employed (a drop of 55.1 percent) and production had declined to 25.8 million tons (a drop of 42.6 percent). That's a 78 million ton loss of coal production and over 19,000 lost jobs in those four states alone. Overall, the major eastern coal producing states lost over 113 million tons of coal production from 1990 to 2000 and employment is down by over 30,000 jobs.

Although nationwide coal production was essentially unchanged over the decade, the high sulfur coal regions suffered serious economic harm as a result of the 1990 Amendments. And the sad fact is that the coal producing states that gained output from the utilities' fuel switching did not gain significant numbers of new jobs. Having gone through that experience with the 1990 Amendments, we view with a skeptical eye any legislative proposal that sets emission reduction targets and timetables that surpass our technological capabilities.

S. 556 Would Be Devastating to Coal Miners and Their Communities

We believe that S. 556 falls into that category. Indeed, it appears from government analyses that S. 556 may threaten to disrupt coal mining communities far more than Title IV. Emission reductions called for in the bill would be achieved in large part by utilities switching away from coal, not by installation of control technology. As we understand it, S. 556 would require electric utilities to meet the following emission reduction targets by 2007:

- Sulfur dioxide—75 percent reduction from Title IV Phase II levels, a cap of about 2.2 million tons nationwide;
- Nitrogen oxides—75 percent reduction from 1997 levels, a cap of about 1.5 million tons nationwide;
- Mercury—90 percent reduction from 1999 levels, a cap of about 5 tons nationwide; and,
- Carbon dioxide—reduction to 1990 levels, a cap of about 500 million tons nationwide.

We have reviewed economic analyses of S. 556 conducted by the U.S. Energy Information Administration (EIA) and the U.S. Environmental Protection Agency (EPA). These studies find that implementation of the targets and timetables in S. 556 would result in a one-third to one-half reduction of coal use in the electric utility sector. Much of the loss in coal production stems from the bill's requirement for a 90 percent reduction in mercury and the 1990 carbon dioxide cap. Technology to control mercury is in various stages of research and development, and is unlikely to be in widespread commercial application by 2007. As a result, utilities faced with a 90 percent reduction requirement are likely to switch from coal to natural gas. In the case of carbon, there is no current technology to capture and sequester carbon from electric utility emissions. Indeed, the Federal Government has only recently begun research and development of such technologies. Faced with a requirement to return to 1990 carbon emission levels, utilities are expected to engage in substantial fuel switching away from coal.

Because the mercury and carbon dioxide reductions called for in S. 556 cannot be met with technology, the end result of the bill is to require utilities to switch from coal to natural gas. The United States currently produces about 1.1 billion tons of coal annually. In its analysis of S. 556, EIA found that implementation of the reductions would cause the loss of 506 million tons of coal production nationwide from its reference case in 2010, rising to a loss of 657 million tons in 2020. Even if we assume that there would be no growth in coal production in the reference case, S. 556 would mean the loss of 319 million tons by 2010 and 423 million tons by 2020. Such coal market disruptions far exceed the coal switching that resulted from Title IV. In addition, these losses are likely to have a negative economic impact all coal producing states, not just the high sulfur states in the eastern coal fields. For example, EIA projects a loss of 190 million tons in 2010 from eastern coal producing states (from a base of 564 million tons) and a loss of 316 million tons from western states (from a base of 725 million tons). We have attached summary coal production impacts from two EIA studies at the end of this statement.

What would be the economic cost of this loss of coal production? Tens of thousands of coal miners would lose their jobs in areas of the country that have little or no comparable alternative employment. These are the jobs, in fact, that support other jobs in the region. Coal mining jobs, along with the railroad and electric utility jobs that depend on coal mining, tend to be the economic engines of their communities. As these jobs disappear, other jobs that directly or indirectly provide goods and services to the these industries and their workers are affected. Using conservative economic multipliers from the U.S. Commerce Department, we estimate that the loss of 190 million tons of coal in eastern coal producing states in 2010 would mean the loss of $4.7 billion annually in direct coal mining revenue, $9.1 billion per year in lost economic output in all industries, $2.5 billion per year in lost household earnings, and the loss of more than 85,000 jobs in all industries. In the western states, the loss of 316 million tons of coal by 2010 would mean the loss of $2.9 billion annually in direct coal mining revenue, $5.3 billion per year in lost economic output in all industries, $1.4 billion per year in lost household earnings, and the loss of nearly 50,000 jobs in all industries. In addition, over a hundred thousand retired coal miners look to the coal industry for lifetime retiree health benefits that were earned during their working lives. If we wipe out half the coal industry, where are the retirees going to get their health care? Who will finance those life-saving benefits when we have removed $7.6 billion of revenue from the coal industry?

The UMWA believes the burdens that would be placed on coal miners and their communities by S. 556 are unacceptable. They should not be asked to give up their jobs, their health care and their economic futures because of arbitrary deadlines and reduction targets that cannot be reasonably expected to be met with available technological controls. S. 556 would be punitive in the extreme for coal miners and their communities. It should be rejected for more cost-effective reductions that will allow coal to continue its vital role in our energy mix and coal miners to continue their employment.

The UMWA Supports A Three-Pollutant Approach That Preserves Coal Miners' Jobs

The UMWA supports appropriate additional reductions in sulfur dioxide, nitrogen oxides and mercury from coal-fired powerplants, provided that they are designed in a way that preserves coal miners' jobs. We do not support inclusion of carbon dioxide in the committee's emission reduction bill. By enacting a three-pollutant bill, we believe that the United States can make considerable strides in environmental control and public health while still pursuing a national energy strategy that includes coal. Inclusion of carbon dioxide in this bill, in our opinion, force utilities to switch away from coal and will unnecessarily delay, and possibly prevent, its enactment.

A clear plan for reducing emissions of sulfur and nitrogen oxides could provide the electric utility industry with greater certainty for planning and investments, lead to the simplification of regulatory programs, and create significant job opportunities for the construction and operation of pollution control devices. At the same time, such a strategy would allow coal miners and their communities to retain the high-paying jobs that they so desperately need.

In reviewing S. 556, we are concerned that the legislation has gone too far in specifying the magnitude of emission reductions to be accomplished over the next decade. We believe that a more realistic—and more cost-effective—set of reductions can be enacted that would not conflict with the nation's need to continue using coal, while improving air quality and enhancing the use of available air pollution control technologies. For example, EIA's analyses suggests that a 50 percent–65 percent reduction in SO_2 and NOx could be achieved in the electric utility sector without severe loss of coal markets and coal mining jobs. We believe that these reductions should occur in one phase, with appropriate deadlines to ensure that utilities will have enough lead time for the orderly installation of technology without potential disruptions of the nation's power supply. In addition, the committee should consider the compliance deadlines with an eye toward the financial condition of the nation's electric utilities, particularly the medium-sized utilities.

In terms of mercury, we are concerned that technological controls for reducing mercury emissions from coal-fired powerplants are in a very early stage of commercial development. Setting an overly ambitious target for controlling mercury—where there is simply no evidence of an imminent threat to public health—could be harmful to coal mining communities and be at odds with the larger national energy policy debate. Therefore, we recommend that mercury controls occur in two or more phases.

The UMWA participates in an EPA workgroup on mercury control. We are not confident that technologies will be available by 2007 to ensure S. 556's reductions are achieved. It is likely that a more modest reduction could be achieved at substantially lower costs through available technologies, without imposing any risk to public health. In all events, it would be desirable to postpone setting a final mercury target until the "co-benefits" of mercury reductions through NOx and SO_2 controls are demonstrated through a first phase control program focused on reducing these emissions.

A target for annual NOx emissions of about 2 million tons should be feasible with the use of selective catalytic reduction (SCR) and other NOx control equipment. However, some utilities are encountering difficulties with SCR equipment in boilers designed to burn high-sulfur coals. Again, these difficulties highlight the need to set reasonable deadlines to ensure that the technologies used to meet the reductions work well in tandem.

Based on our experience with the Ozone Transport Assessment Group process, and EPA's subsequent NOx SIP Call, we would recommend a NOx emission rate of 0.20 lb. NOx/MMBTU as the planning basis for new NOx control requirements outside of the eastern 18-State SIP Call region, and for non-ozone season emission controls within the SIP Call region itself. We recognize that the 0.15 lb. ozone season limit on plants in the SIP Call region would be difficult to change given recent court decisions.

In general, a NOx emission limit of 0.20 can be achieved more readily than a limit of 0.15 because it provides greater opportunities for the use of low-NOx burners, overfire air, and other less capital-intensive equipment. Unlike the densely populated East, there are no ozone problems in western states other than California justifying an extremely low NOx limit below the levels otherwise required by the Clean Air Act.

S. 556's proposed 2.2 million ton cap on annual SO_2 emissions, compared to the 8.9 million ton cap that will result once the 1990 acid rain program is fully implemented, would represent a very significant further reduction of sulfur emissions that contribute to acid deposition and to other environmental problems. The 8.9 million ton SO_2 cap in the 1990 Clean Air Act Amendments itself represents a 50 percent reduction of SO_2 emissions from 1980 levels.

Based on a variety of studies that have been done in the private sector and by government agencies, we see a somewhat more modest SO_2 reduction target—roughly in the range of 3.0 to 4.0 million tons—as representing both a technically achievable and cost-effective control level that would not conflict with our goal of ensuring that coal miners can continue to provide for their families.

An SO_2 and NOx control plan along these lines could be implemented as a first step in a longer-range plan to reduce mercury emissions. The experience in mercury "co-benefits" achieved by the first phase controls for SO_2 and NOx emissions would be vital in assessing the feasibility of ultimate mercury reduction targets. In light of this, the committee may want to consider early reduction allowances for SO_2 controls that also reduce mercury emissions on the theory that such reductions are more valuable than those strategies that only reduce SO_2 alone. There is precedent for such extra credit in Title IV of the 1990 Amendments, which allocated 2:1 bonus allowances to utilities that chose to install control technology.

In summary, Mr. Chairman, the UMWA is prepared to work with the proponents of additional reductions in SO_2, NOx and mercury emissions in coal-fired power plants, provided that the reduction provisions are designed in a way that preserves coal miners' jobs. We look forward to working with you to achieve these goals.

Table C16. Coal Supply, Disposition, and Prices
(Million Short Tons per Year, Unless Otherwise Noted)

Supply, Disposition, and Prices	1999	Projections 2005 Reference	2005 Reference with Emissions Limits	2005 Advanced Technology	2005 Advanced Technology with Emissions Limits	2010 Reference	2010 Reference with Emissions Limits	2010 Advanced Technology	2010 Advanced Technology with Emissions Limits
Production[1]									
Appalachia	434	432	356	421	354	425	267	406	270
Interior	182	185	140	184	142	183	113	187	118
West	486	612	534	616	539	681	403	677	412
East of the Mississippi	558	569	466	557	468	564	374	547	382
West of the Mississippi	544	659	564	664	567	725	409	724	417
Total	**1102**	**1228**	**1030**	**1222**	**1035**	**1289**	**783**	**1271**	**800**
Net Imports									
Imports	9	16	12	16	12	17	9	17	9
Exports	58	60	60	60	60	58	59	58	60
Total	**-49**	**-44**	**-48**	**-44**	**-48**	**-40**	**-50**	**-41**	**-51**
Total Supply[2]	**1053**	**1184**	**982**	**1177**	**987**	**1249**	**733**	**1231**	**749**
Consumption by Sector									
Residential and Commercial	5	5	5	5	5	5	5	5	5
Industrial[3]	79	82	83	82	82	83	82	82	80
Coke Plants	28	25	25	25	25	23	23	22	22
Electric Generators[4]	920	1073	870	1067	875	1139	623	1125	644
Total	**1031**	**1185**	**983**	**1179**	**987**	**1250**	**733**	**1233**	**751**
Discrepancy and Stock Change[5]	**21**	**-1**	**-1**	**-1**	**-0**	**-1**	**-0**	**-2**	**-2**
Average Minemouth Price									
(1999 dollars per short ton)	17.13	15.22	14.47	14.30	13.77	14.19	14.63	12.73	13.40
(1999 dollars per million Btu)	0.82	0.74	0.69	0.69	0.66	0.69	0.68	0.62	0.62
Delivered Prices[6] (1999 dollars per short ton)									
Industrial	31.37	29.65	28.57	28.64	27.71	28.56	26.05	26.79	24.68
Coke Plants	44.38	42.40	42.56	40.95	41.27	41.25	41.59	38.97	39.25
Electric Generators									
(1999 dollars per short ton)	24.69	22.92	21.25	22.09	20.66	21.26	20.40	19.73	19.50
(1999 dollars per million Btu)	1.21	1.13	1.05	1.10	1.01	1.06	0.98	0.98	0.93
Average	**25.74**	**23.80**	**22.42**	**22.94**	**21.77**	**22.11**	**21.69**	**20.54**	**20.63**
Exports[7]	37.50	36.41	35.96	35.06	34.73	35.57	34.32	33.40	32.43

[1]Includes anthracite, bituminous coal, lignite, and waste coal delivered to independent power producers. Waste coal deliveries totaled 8.5 million tons in 1995, 8.8 million tons in 1996, 8.1 million tons in 1997, 8.6 million tons in 1998, and are projected to reach 9.6 million tons in 1999, and 12.2 million tons in 2000.
[2]Production plus net imports and net storage withdrawals.
[3]Includes consumption by cogenerators.
[4]Includes all electric power generators except cogenerators, which produce electricity and other useful thermal energy. Includes small power producers and exempt wholesale generators.
[5]Balancing item: the sum of production, net imports, and net storage minus total consumption.
[6]Sectoral prices weighted by consumption tonnage; weighted average excludes residential/ commercial prices and export free-alongside-ship (f.a.s.) prices.
[7]F.a.s. price at U.S. port of exit.
Btu = British thermal unit.
Note: Totals may not equal sum of components due to independent rounding. Data for 1999 are model results and may differ slightly from official EIA data reports.
Sources: 1999 data based on Energy Information Administration (EIA), *Quarterly Coal Report*, DOE/EIA-0121(2000/1Q) (Washington, DC, August 2000) and EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, SCENAEM.D081601A, SCENBBS.D080301A, SCENBEM.D081701A. **Projections:** EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, SCENAEM.D081601A, SCENBBS.D080301A, SCENBEM.D081701A.

Projections							
2015				2020			
Reference	Reference with Emissions Limits	Advanced Technology	Advanced Technology with Emissions Limits	Reference	Reference with Emissions Limits	Advanced Technology	Advanced Technology with Emissions Limits
404	246	392	247	396	227	375	228
171	105	175	115	164	92	177	113
742	372	715	395	775	360	719	375
536	345	526	357	526	313	513	336
782	378	755	401	810	366	758	380
1317	**723**	**1282**	**758**	**1336**	**679**	**1271**	**716**
18	9	18	9	20	9	20	9
56	60	57	60	56	64	56	61
-37	**-51**	**-39**	**-51**	**-36**	**-55**	**-36**	**-52**
1280	**671**	**1243**	**706**	**1300**	**624**	**1234**	**664**
5	5	5	5	5	5	5	5
84	83	82	81	85	86	81	81
21	21	19	19	19	19	17	17
1172	562	1138	602	1190	515	1133	563
1282	**671**	**1245**	**707**	**1299**	**625**	**1236**	**666**
-2	**0**	**-2**	**-1**	**1**	**-1**	**-2**	**-2**
13.40	13.58	11.63	12.01	12.93	12.61	10.76	10.97
0.66	0.63	0.57	0.56	0.64	0.59	0.53	0.51
27.43	24.63	25.13	23.00	26.49	23.32	23.41	21.34
39.93	39.90	36.61	36.74	38.50	38.68	34.36	34.47
20.24	18.77	18.42	17.53	19.34	17.28	16.94	16.10
1.02	0.91	0.92	0.84	0.98	0.84	0.85	0.78
21.03	**20.16**	**19.14**	**18.69**	**20.09**	**18.76**	**17.61**	**17.22**
34.66	32.44	31.36	29.96	33.07	31.01	29.32	28.32

Table D16. Coal Supply, Disposition, and Prices
(Million Short Tons per Year, Unless Otherwise Noted)

Supply, Disposition, and Prices	1999	Projections									
		2005					2010				
		Reference	CEF-JL Moderate	CEF-JL Moderate with Emissions Limits	CEF-JL Advanced	CEF-JL Advanced with Emissions Limits	Reference	CEF-JL Moderate	CEF-JL Moderate with Emissions Limits	CEF-JL Advanced	CEF-JL Advanced with Emissions Limits
Production[1]											
Appalachia	434	432	417	364	402	352	425	410	283	358	279
Interior	182	185	179	144	167	143	183	183	123	157	120
West	486	612	623	538	552	525	681	676	410	509	437
East of the Mississippi	558	569	548	482	521	465	564	548	400	474	393
West of the Mississippi	544	659	671	564	600	556	725	721	416	551	442
Total	**1102**	**1228**	**1219**	**1046**	**1121**	**1020**	**1289**	**1270**	**817**	**1025**	**836**
Net Imports											
Imports	9	16	16	12	12	12	17	17	9	9	9
Exports	58	60	60	60	60	60	58	58	60	57	60
Total	**-49**	**-44**	**-44**	**-48**	**-48**	**-48**	**-40**	**-40**	**-51**	**-49**	**-51**
Total Supply[2]	**1053**	**1184**	**1175**	**997**	**1073**	**972**	**1249**	**1229**	**766**	**976**	**785**
Consumption by Sector											
Residential and Commercial	5	5	5	5	5	5	5	5	5	5	5
Industrial[3]	79	82	82	82	78	78	83	81	80	75	73
Coke Plants	28	25	25	25	24	24	23	23	23	19	19
Electric Generators[4]	920	1073	1064	886	968	867	1139	1121	658	876	687
Total	**1031**	**1185**	**1176**	**998**	**1074**	**973**	**1250**	**1231**	**766**	**976**	**785**
Discrepancy and Stock Change[5]	**21**	**-1**	**-1**	**-1**	**-1**	**-1**	**-1**	**-2**	**-0**	**0**	**-0**
Average Minemouth Price											
(1999 dollars per short ton)	17.13	15.22	14.79	14.66	14.94	14.46	14.19	13.93	15.08	13.88	14.27
(1999 dollars per million Btu)	0.82	0.74	0.72	0.70	0.72	0.69	0.69	0.68	0.70	0.67	0.67
Delivered Prices[6] **(1999 dollars per short ton)**											
Industrial	31.37	29.65	29.38	28.66	29.34	28.57	28.56	28.26	26.35	27.77	26.16
Coke Plants	44.38	42.40	42.43	42.52	42.58	42.46	41.25	41.15	41.62	41.10	40.92
Electric Generators											
(1999 dollars per short ton)	24.69	22.92	22.59	21.42	22.37	21.26	21.26	20.92	21.16	20.51	20.77
(1999 dollars per million Btu)	1.21	1.13	1.13	1.05	1.11	1.04	1.06	1.05	1.00	1.02	1.00
Average	**25.74**	**23.80**	**23.49**	**22.55**	**23.32**	**22.37**	**22.11**	**21.79**	**22.32**	**21.48**	**21.77**
Exports[7]	37.50	36.41	36.29	35.91	36.32	35.86	35.57	35.37	34.64	35.06	33.96

[1]Includes anthracite, bituminous coal, lignite, and waste coal delivered to independent power producers. Waste coal deliveries totaled 8.5 million tons in 1995, 8.8 million tons in 1996, 8.1 million tons in 1997, 8.6 million tons in 1998, and are projected to reach 9.6 million tons in 1999, and 12.2 million tons in 2000.
[2]Production plus net imports and net storage withdrawals.
[3]Includes consumption by cogenerators.
[4]Includes all electric power generators except cogenerators, which produce electricity and other useful thermal energy. Includes small power producers and exempt wholesale generators.
[5]Balancing item: the sum of production, net imports, and net storage minus total consumption.
[6]Sectoral prices weighted by consumption tonnage; weighted average excludes residential/ commercial prices and export free-alongside-ship (f.a.s.) prices.
[7]F.a.s. price at U.S. port of exit.
Btu = British thermal unit.
CEF = Clean Energy Future.
Note: Totals may not equal sum of components due to independent rounding. Data for 1999 are model results and may differ slightly from official EIA data reports.
Sources: 1999 data based on Energy Information Administration (EIA), *Quarterly Coal Report*, DOE/EIA-0121(2000/1Q) (Washington, DC, August 2000) and EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, SCENCBS.D080301A, SCENCEM.D081601A, SCENDBS.D092601B, SCENDEMR.D092701A. **Projections:** EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, SCENCBS.D080301A, SCENCEM.D081601A, SCENDBS.D092601B, SCENDEMR.D092701A.

Projections									
2015					2020				
Reference	CEF-JL Moderate	CEF-JL Moderate with Emissions Limits	CEF-JL Advanced	CEF-JL Advanced with Emissions Limits	Reference	CEF-JL Moderate	CEF-JL Moderate with Emissions Limits	CEF-JL Advanced	CEF-JL Advanced with Emissions Limits
404	391	274	321	272	396	384	258	275	254
171	171	126	126	119	164	166	117	99	117
742	727	395	551	411	775	757	412	580	395
536	523	394	411	385	526	515	370	348	365
782	766	401	587	417	810	794	418	606	400
1317	**1289**	**794**	**998**	**802**	**1336**	**1308**	**788**	**954**	**766**
18	18	9	9	9	20	20	9	9	9
56	54	60	55	60	56	56	60	58	59
-37	**-35**	**-51**	**-46**	**-51**	**-36**	**-36**	**-51**	**-49**	**-50**
1280	**1254**	**743**	**952**	**751**	**1300**	**1272**	**737**	**905**	**716**
5	5	5	5	5	5	5	5	5	5
84	82	81	74	72	85	83	82	73	72
21	21	21	16	16	19	19	19	13	13
1172	1149	636	858	658	1190	1167	633	814	625
1282	**1257**	**744**	**953**	**751**	**1299**	**1274**	**739**	**906**	**715**
-2	**-3**	**-1**	**-1**	**-0**	**1**	**-2**	**-2**	**-1**	**1**
13.40	13.24	14.44	12.71	13.79	12.93	12.78	13.47	11.51	13.45
0.66	0.65	0.67	0.62	0.64	0.64	0.63	0.63	0.57	0.63
27.43	27.22	25.28	26.43	25.26	26.49	26.19	24.08	24.22	24.11
39.93	39.63	40.18	39.50	39.44	38.50	38.56	38.83	38.02	38.17
20.24	19.96	19.76	19.39	19.34	19.34	19.05	19.07	18.21	18.60
1.02	1.00	0.94	0.98	0.93	0.98	0.96	0.92	0.93	0.89
21.03	**20.77**	**20.94**	**20.28**	**20.34**	**20.09**	**19.81**	**20.14**	**18.99**	**19.53**
34.66	34.18	32.87	33.48	32.43	33.07	33.01	31.82	31.56	31.70

Table B10. Coal Supply, Disposition, and Prices
(Million Short Tons per Year, Unless Otherwise Noted)

Supply, Disposition, and Prices	1999	Projections								
		2005			2010			2020		
		Reference	50 Percent	50 Percent with CO_2 Cap	Reference	50 Percent	50 Percent with CO_2 Cap	Reference	50 Percent	50 Percent with CO_2 Cap
Production[1]										
Appalachia	434	432	425	435	425	427	415	396	398	358
Interior	182	185	178	182	183	186	169	164	160	132
West	486	612	610	589	681	625	613	775	726	625
East of the Mississippi	558	569	560	574	564	574	548	526	534	464
West of the Mississippi	544	659	653	632	725	664	649	810	749	650
Total	**1102**	**1228**	**1213**	**1206**	**1289**	**1238**	**1197**	**1336**	**1284**	**1115**
Net Imports										
Imports	9	16	16	16	17	17	17	20	20	20
Exports	58	60	60	60	58	58	58	56	56	58
Total	**-49**	**-44**	**-45**	**-45**	**-40**	**-40**	**-40**	**-36**	**-36**	**-38**
Total Supply[2]	**1053**	**1184**	**1168**	**1162**	**1249**	**1197**	**1157**	**1300**	**1247**	**1077**
Consumption by Sector										
Residential and Commercial	5	5	5	5	5	5	5	5	5	5
Industrial[3]	79	82	82	82	83	82	82	85	83	83
Coke Plants	28	25	25	25	23	23	23	19	19	19
Electric Generators[4]	920	1073	1057	1050	1139	1088	1046	1190	1142	972
Total	**1031**	**1185**	**1169**	**1162**	**1250**	**1198**	**1156**	**1299**	**1249**	**1079**
Discrepancy and Stock Change[5]	**21**	**-1**	**-1**	**-0**	**-1**	**-1**	**1**	**1**	**-2**	**-3**
Average Minemouth Price										
(1999 dollars per short ton)	17.13	15.22	15.27	15.61	14.19	14.97	14.76	12.93	13.41	13.17
(1999 dollars per million Btu)	0.82	0.74	0.74	0.75	0.69	0.72	0.71	0.64	0.65	0.64
Delivered Prices (1999 dollars per short ton)[6]										
Industrial	31.37	29.65	29.58	29.67	28.56	28.79	28.51	26.49	26.35	25.63
Coke Plants	44.38	42.40	42.41	42.42	41.25	41.45	41.36	38.50	38.64	38.55
Electric Generators										
(1999 dollars per short ton)	24.69	22.92	22.98	23.10	21.26	21.53	21.72	19.34	19.69	19.33
(1999 dollars per million Btu)	1.21	1.13	1.13	1.13	1.06	1.05	1.06	0.98	0.98	0.96
Average	**25.74**	**23.80**	**23.87**	**23.98**	**22.11**	**22.41**	**22.59**	**20.09**	**20.42**	**20.15**
Exports[7]	37.50	36.41	36.31	36.26	35.57	35.81	35.67	33.07	33.07	32.63

[1]Includes anthracite, bituminous coal, lignite, and waste coal delivered to independent power producers. Waste coal deliveries totaled 8.5 million tons in 1995, 8.8 million tons in 1996, 8.1 million tons in 1997, 8.6 million tons in 1998, and are projected to reach 9.6 million tons in 1999, and 12.2 million tons in 2000.
[2]Production plus net imports and net storage withdrawals.
[3]Includes consumption by cogenerators.
[4]Includes all electric power generators except cogenerators, which produce electricity and other useful thermal energy. Includes small power producers and exempt wholesale generators.
[5]Balancing item: the sum of production, net imports, and net storage minus total consumption.
[6]Sectoral prices weighted by consumption tonnage; weighted average excludes residential/ commercial prices and export free-alongside-ship (f.a.s.) prices.
[7]F.a.s. price at U.S. port of exit.
Btu = British thermal unit.
CO_2 = Carbon dioxide.
Note: Totals may not equal sum of components due to independent rounding. Data for 1999 are model results and may differ slightly from official EIA data reports.
Sources: 1999 data based on Energy Information Administration (EIA), *Quarterly Coal Report* , DOE/EIA-0121(2000/1Q) (Washington, DC, August 2000), and EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, RENC5012.D081701B, REWC5012.D081701A. **Projections:** EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, RENC5012.D081701B, REWC5012.D081701A.

Table C10. Coal Supply, Disposition, and Prices
(Million Short Tons per Year, Unless Otherwise Noted)

Supply, Disposition, and Prices	1999	Projections								
		2005			2010			2020		
		Reference	65 Percent	65 Percent with CO_2 Cap	Reference	65 Percent	65 Percent with CO_2 Cap	Reference	65 Percent	65 Percent with CO_2 Cap
Production[1]										
Appalachia	434	432	438	421	425	408	406	396	367	330
Interior	182	185	188	175	183	167	161	164	157	117
West	486	612	570	600	681	617	600	775	725	644
East of the Mississippi	558	569	583	554	564	539	533	526	505	435
West of the Mississippi	544	659	613	642	725	652	634	810	744	656
Total	**1102**	**1228**	**1196**	**1196**	**1289**	**1191**	**1167**	**1336**	**1249**	**1091**
Net Imports										
Imports	9	16	16	16	17	17	17	20	20	20
Exports	58	60	60	60	58	61	61	56	55	56
Total	**-49**	**-44**	**-44**	**-45**	**-40**	**-43**	**-43**	**-36**	**-36**	**-36**
Total Supply[2]	**1053**	**1184**	**1152**	**1151**	**1249**	**1148**	**1123**	**1300**	**1213**	**1054**
Consumption by Sector										
Residential and Commercial	5	5	5	5	5	5	5	5	5	5
Industrial[3]	79	82	82	82	83	82	81	85	82	81
Coke Plants	28	25	25	25	23	23	23	19	19	19
Electric Generators[4]	920	1073	1040	1040	1139	1042	1019	1190	1109	954
Total	**1031**	**1185**	**1153**	**1152**	**1250**	**1151**	**1128**	**1299**	**1215**	**1058**
Discrepancy and Stock Change[5]	**21**	**-1**	**-1**	**-1**	**-1**	**-3**	**-4**	**1**	**-2**	**-4**
Average Minemouth Price										
(1999 dollars per short ton)	17.13	15.22	15.78	15.21	14.19	14.69	14.62	12.93	12.87	12.35
(1999 dollars per million Btu)	0.82	0.74	0.75	0.73	0.69	0.70	0.70	0.64	0.63	0.60
Delivered Prices (1999 dollars per short ton)[6]										
Industrial	31.37	29.65	29.75	29.38	28.56	28.42	28.18	26.49	25.86	25.12
Coke Plants	44.38	42.40	42.49	42.34	41.25	41.55	41.23	38.50	38.42	38.62
Electric Generators										
(1999 dollars per short ton)	24.69	22.92	23.11	22.91	21.26	21.49	21.50	19.34	19.21	18.99
(1999 dollars per million Btu)	1.21	1.13	1.13	1.13	1.06	1.05	1.05	0.98	0.96	0.95
Average	**25.74**	**23.80**	**24.01**	**23.80**	**22.11**	**22.38**	**22.38**	**20.09**	**19.96**	**19.81**
Exports[7]	37.50	36.41	36.35	36.12	35.57	35.41	35.12	33.07	32.50	32.53

[1]Includes anthracite, bituminous coal, lignite, and waste coal delivered to independent power producers. Waste coal deliveries totaled 8.5 million tons in 1995, 8.8 million tons in 1996, 8.1 million tons in 1997, 8.6 million tons in 1998, and are projected to reach 9.6 million tons in 1999, and 12.2 million tons in 2000..

[2]Production plus net imports and net storage withdrawals.

[3]Includes consumption by cogenerators.

[4]Includes all electric power generators except cogenerators, which produce electricity and other useful thermal energy. Includes small power producers and exempt wholesale generators.

[5]Balancing item: the sum of production, net imports, and net storage minus total consumption.

[6]Sectoral prices weighted by consumption tonnage; weighted average excludes residential/ commercial prices and export free-alongside-ship (f.a.s.) prices.

[7]F.a.s. price at U.S. port of exit.

Btu = British thermal unit.

CO_2 = Carbon dioxide.

Note: Totals may not equal sum of components due to independent rounding. Data for 1999 are model results and may differ slightly from official EIA data reports.

Sources: 1999 data based on Energy Information Administration (EIA), *Quarterly Coal Report* , DOE/EIA-0121(2000/1Q) (Washington, DC, August 2000), and EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, RENC6512.D081701B, REWC6512.D082001A. **Projections:** EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, RENC6512.D081701B, REWC6512.D082001A.

Table D10. Coal Supply, Disposition, and Prices
(Million Short Tons per Year, Unless Otherwise Noted)

Supply, Disposition, and Prices	1999	Projections								
		2005			2010			2020		
		Reference	75 Percent	75 Percent with CO_2 Cap	Reference	75 Percent	75 Percent with CO_2 Cap	Reference	75 Percent	75 Percent with CO_2 Cap
Production[1]										
Appalachia	434	432	411	417	425	422	422	396	371	329
Interior	182	185	162	168	183	169	173	164	152	133
West	486	612	615	600	681	597	568	775	686	596
East of the Mississippi	558	569	533	544	564	558	563	526	513	444
West of the Mississippi	544	659	656	641	725	630	600	810	696	615
Total	**1102**	**1228**	**1188**	**1185**	**1289**	**1188**	**1163**	**1336**	**1209**	**1059**
Net Imports										
Imports	9	16	16	16	17	17	17	20	20	20
Exports	58	60	60	60	58	58	58	56	55	56
Total	**-49**	**-44**	**-45**	**-45**	**-40**	**-40**	**-41**	**-36**	**-36**	**-37**
Total Supply[2]	**1053**	**1184**	**1144**	**1140**	**1249**	**1148**	**1122**	**1300**	**1173**	**1022**
Consumption by Sector										
Residential and Commercial	5	5	5	5	5	5	5	5	5	5
Industrial[3]	79	82	82	82	83	80	81	85	78	77
Coke Plants	28	25	25	25	23	23	23	19	19	19
Electric Generators[4]	920	1073	1033	1029	1139	1038	1014	1190	1070	930
Total	**1031**	**1185**	**1146**	**1141**	**1250**	**1146**	**1123**	**1299**	**1173**	**1031**
Discrepancy and Stock Change[5]	**21**	**-1**	**-2**	**-1**	**-1**	**2**	**-1**	**1**	**1**	**-9**
Average Minemouth Price										
(1999 dollars per short ton)	17.13	15.22	15.00	15.21	14.19	15.03	15.25	12.93	13.38	12.75
(1999 dollars per million Btu)	0.82	0.74	0.72	0.73	0.69	0.72	0.72	0.64	0.64	0.62
Delivered Prices (1999 dollars per short ton)[6]										
Industrial	31.37	29.65	29.29	29.32	28.56	28.54	28.47	26.49	25.95	27.47
Coke Plants	44.38	42.40	42.39	42.32	41.25	41.32	41.25	38.50	38.60	38.50
Electric Generators										
(1999 dollars per short ton)	24.69	22.92	22.88	22.90	21.26	21.45	21.62	19.34	19.53	19.90
(1999 dollars per million Btu)	1.21	1.13	1.13	1.13	1.06	1.04	1.05	0.98	0.96	0.99
Average	**25.74**	**23.80**	**23.77**	**23.79**	**22.11**	**22.34**	**22.51**	**20.09**	**20.27**	**20.81**
Exports[7]	37.50	36.41	36.12	36.08	35.57	35.50	35.42	33.07	32.75	32.28

[1]Includes anthracite, bituminous coal, lignite, and waste coal delivered to independent power producers. Waste coal deliveries totaled 8.5 million tons in 1995, 8.8 million tons in 1996, 8.1 million tons in 1997, 8.6 million tons in 1998, and are projected to reach 9.6 million tons in 1999, and 12.2 million tons in 2000.
[2]Production plus net imports and net storage withdrawals.
[3]Includes consumption by cogenerators.
[4]Includes all electric power generators except cogenerators, which produce electricity and other useful thermal energy. Includes small power producers and exempt wholesale generators.
[5]Balancing item: the sum of production, net imports, and net storage minus total consumption.
[6]Sectoral prices weighted by consumption tonnage; weighted average excludes residential/ commercial prices and export free-alongside-ship (f.a.s.) prices.
[7]F.a.s. price at U.S. port of exit.
Btu = British thermal unit.
CO_2 = Carbon dioxide.
Note: Totals may not equal sum of components due to independent rounding. Data for 1999 are model results and may differ slightly from official EIA data reports.
Sources: 1999 data based on Energy Information Administration (EIA), *Quarterly Coal Report* , DOE/EIA-0121(2000/1Q) (Washington, DC, August 2000), and EIA, AEO2001 National Energy Modeling System runs SCENABS.D080301A, RENC7512.D081701B, REWC7512.D081701B. **Projections:** EIA, AEO2001 National Energy Modeling System runsSCENABS.D080301A, RENC7512.D081701B, REWC7512.D081701B.

RESPONSES OF BILL BANIG, UNITED MINE WORKERS OF AMERICA, TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. You mentioned that the nation has 275 years worth of recoverable coal reserves at today's production rates. If we use today's fleet that would certainly add a lot of carbon to the atmosphere. Carbon concentrations would go higher than the planet has had for hundreds of millions of years. What kind of cap on greenhouse emissions can the UMW live with? And, maybe more important, when would the UMW support setting that cap?

Response. I agree that use of coal will add carbon to the atmosphere if we do not develop technology to capture and sequester carbon emissions. That is why we have advocated the development of such technologies since the late–1980's. Unfortunately, while the United States and other nations have spent billions of dollars over the last 20 years studying the phenomenon of climate change, expenditures for research into technology to capture and sequester carbon have only recently begun and amount to only a few tens of millions of dollars. We need to accelerate that research and development.

The UMWA does not currently support a cap on carbon because no technology currently exists to remove carbon from coal. The obvious result from a cap without a means to achieve reductions was shown clearly in the EIA studies that were attached to my testimony coal use would plummet and coal miners would be unemployed by the thousands. Most disturbingly, their economic devastation would not result in a "cure" for climate change. Dr. Bert Bolin, former head of the U.N. Intergovernmental Panel on Climate Change (IPCC), wrote in Science magazine shortly after the 1997 Kyoto conference that if the world does nothing to reduce carbon emissions, global concentrations of carbon dioxide will be 383 parts per million (ppm) in 2010. With full implementation of the Kyoto Protocol, carbon dioxide concentrations will be 382 ppm. In other words, full compliance with Kyoto at the expense of coal miners and other energy-related workers will only reduce carbon concentrations by one part per million. The change in projected temperature 50 years from now will be measured in tenths of a degree.

We believe that it is wrong to ask one group of workers to sacrifice their jobs for a treaty (or Federal legislation) that does nothing to resolve the problem. We would support carbon caps that can be met by technology that will allow coal miners to continue to support their families. We will vigorously oppose treaties or legislation that result in the destruction of our members' jobs.

Question 2. Would it be easier for the United Mine Workers to support a carbon cap, if they received allocations or received funds for covering costs like retraining for dislocated workers?

Response. Your question is premised on the assumption that coal miners must lose their jobs in order for the nation to address climate change. We reject the notion that coal miners' jobs should be sacrificed. As noted above, we believe that the United States should be aggressively developing technology to capture and sequester carbon, not looking for ways to reduce the use of our most abundant domestic fuel. The fact is that coal will be burned in substantial quantities in the coming decades, regardless of what the United States chooses to do with its domestic energy policy. India, China and other nations with vast coal resources will use their domestic energy supplies to grow their economies. The United States should lead in the development of technology to ensure that coal will be consumed in ways that are compatible with a cleaner environment. The best way to do that is to develop technology to reduce or eliminate carbon emissions from coal combustion domestically and then lead the technology transfer to developing nations as they use their indigenous resources.

With regard to retraining or transition funds for dislocated workers, we believe that all workers who are dislocated by government policy or economic circumstances should receive transition assistance. Particularly in the case of government policies to achieve a public good, the workers and the communities affected should be made whole economically, not just offered some temporary retraining assistance. Having said that, however, we do not believe that such transition programs should be linked to support for carbon caps. Offering a first class funeral provides little comfort to workers and communities that have been executed economically.

CLEAN POWER ACT

TUESDAY, JANUARY 29, 2002

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
SUBCOMMITTEE ON CLEAN AIR, WETLANDS, AND CLIMATE CHANGE,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:40 a.m. in room 406, Senate Dirksen Building, Hon. Joseph Lieberman [chairman of the subcommittee] presiding.

TECHNOLOGIES FOR REDUCING AIR POLLUTION FROM STATIONARY SOURCES

Present: Senators Lieberman, Voinovich, Smith, Corzine, Clinton, and Carper.

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH [assuming the chair]. I've been asked by the majority if I would begin the hearing this morning. Senator Lieberman is on his way. We have some important witnesses here, and I'd just like to thank the chairman of the subcommittee for holding this hearing today on the available technologies for controlling CO_2 and mercury.

I requested this hearing last year when the committee first began hearings on S. 556, the Jeffords-Lieberman 4-Pollutant Bill. I'm pleased that the chairman has chosen this topic for the first hearing as his chairmanship of the subcommittee.

It's my understanding that the chairman of the full committee, Senator Jeffords, has announced that he intends to mark up his bill on February 14. While I believe it is important to move forward if we hope to get a bill this year, and I think it is important that we spend a lot of time, that we do really work conscientiously to get a bill out this year, I think it's important that we cover the necessary issues and understand what the impact of the bill will be on the environment, our energy supply, on our Nation's economy. And so far as a committee and a subcommittee, we have not begun to answer any of these very important questions.

We are told that the chairman's bill, as drafted, is not supported by a single utility in this country. We know that the National Governor's Association has endorsed a three-pollutant strategy, not the four-pollutant strategy found in the chairman's bill. We also know that the chairman's bill will mean the end of coal as a viable source of energy in this country. In my particular State, that's pretty significant, because it's about 85 percent in Ohio and across the country it's about 50 percent.

What we don't know is what the impact of this bill will have on our energy supply or what the impact will be for our Nation's manufacturing base. And again, my State and others in my region of the country are the manufacturing backbone of America. The chairman's bill will cause massive fuel switching to natural gas, which is an important raw material for our Nation's chemical and plastic industry, for the fertilizer for our farmers and for food preparation and the service industry. In other words, if we eliminate coal, and we go to gas, we're going to drive up the demand for natural gas. I think we saw early last year what can happen to this country when natural gas prices skyrocket.

We also don't know what the impact will be on the Nation's public power sector or our co-ops. All of these issues need to be addressed by the subcommittee or the full committee before we move forward with this legislation. The fact of the matter is, if we want a bill with a chance of passing, then we need to sit down together on both sides of the aisle and work through these issues. That's really something that I've been trying to underscore constantly over all these hearings.

I want to work together with the chairman of the committee and the chairman of this subcommittee to pass meaningful legislation, which will make significant emission reductions. We need to get emission reductions. And also, will secure safe, efficient, reliable and cost effective energy for the American consumer.

Today's hearing is an important first step. As a committee and as a country, we are all familiar with the available control technologies for reducing NOx and SOx. Although it is important to note that some of these technologies are still in their infancy and we'll be hearing about some of those today, such as SCR units. And we need to monitor closely the problems some utilities are having as they install these devices. We're getting mixed reaction from some of this technology around the country.

What is less well known are the available technologies for reducing mercury and CO_2. According to the EPA, current technologies can reduce mercury anywhere from 40 to 90 percent, depending upon the type of coal burned. In addition, some of the test cases seem to show that it's easier to reduce mercury levels when the concentration of mercury in the coal is very high. It is much harder to obtain the same mercury reduction percentage from coal containing lower amounts of mercury. Therefore, it would be difficult to reduce mercury to the levels required under the Jeffords bill if you start with relatively clean coal.

It's also my understanding that some of the state-of-the-art facilities around the country have had a difficult time reducing mercury. For example, I have a letter from Kansas City Power and Light which I'd like to introduce into the record and would like to read a brief passage from. "Kansas City Power and Light just rebuilt a 550 megawatt unit at our Hawthorne five facility, using a state-of-the-art combination of SCR, dry scrubber and fabric filter and burning low sulfur sub-bituminous coal. This combination of equipment and fuel, making Hawthorne Five the cleanest coal-fired plant in the country, maybe able to achieve a 45 percent level of mercury reduction, based on currently available information."

[The information referred to follows:]

KANSAS CITY POWER AND LIGHT,
Kansas City, MO 64141, January 28, 2002.

The HONORABLE GEORGE VOINOVICH
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

DEAR SENATOR VOINOVICH: Thank you for inviting Kansas City Power & Light to comment on provisions in S. 556, the Clean Power Act of 2001, to address mercury emissions from coal-fired electric generating units and the technology currently available to address such emissions.

Kansas City Power & Light is the second largest investor owned electric utility in Missouri, with 70 percent of its more than 3,733 megawatt generation capacity being coal-fired. The remainder of Kansas City Power & Light's generation is made up of nuclear, natural gas and oil.

At the outset, let me say that Kansas City Power & Light supports a multi-emissions strategy that imposes reasonable emissions reductions of sulfur dioxide, nitrogen oxides, and mercury under timeframes that allow us to achieve such reductions in a cost-effective manner. In our view, this approach should allow "co-benefits" for mercury control through installation of currently available technology to remove emissions of sulfur dioxide, nitrogen oxides and particulate matter rather than impose a rigid 90 percent source specific reduction mandate. We firmly believe a co-benefits approach can achieve real environmental benefits while providing our company and other companies a degree of business certainty in the foreseeable future.

The treatment of mercury emissions under S. 556 and a recent proposal by the Environmental Protection Agency (EPA) is a significant concern to Kansas City Power & Light because we use western low sulfur subbituminous coal. Mercury emissions from low sulfur subbituminous coal are lower and in a form, known as "elemental" mercury, which is extremely difficult to remove, a fact with which virtually everyone, including EPA, agrees.

The amount of mercury emitted from a coal-fired power plant is impacted by a number of factors, including the type of coal being fired, boiler design and operation, fly ash characteristics, and associated environmental controls. Estimates of mercury removal are made even more difficult due to the large volumes of gas to be treated, low concentrations of mercury, and the presence of difficult to capture species such as elemental mercury.

The capture of mercury by flue gas cleaning devices is dependent on the chemical and physical forms of mercury. Factors that affect the speciation and capture of mercury in coal-fired combustion systems include the type and properties of the coal, the combustion conditions, the type of flue gas cleaning technologies employed, and the temperatures at which the flue gas cleaning systems operate. There are three basic forms of mercury in the flue gas from coal combustion: elemental mercury (Hg_0, ionic mercury [Hg(II)], and particulate-bound mercury [Hg(p)].

Both Hg_0 and Hg(II) are in the vapor phase at flue gas cleaning temperatures. Hg_0 is insoluble in water and cannot be captured in wet scrubbers.

To comply with the provisions of S. 556, taking into account proven commercially available control equipment currently available, each coal-fired unit in the United States would be required to install a scrubber system for sulfur dioxide. Selective catalytic reduction for nitrogen oxides, and a fabric filter for particulate control.

Currently there is no proven or demonstrated technology to control mercury emissions. There is evidence, however, based on experience in Europe and the Electric Power Research Institute's (EPRI) bench scale studies, that mercury can be co-beneficially removed by air pollution control equipment required to comply with other Clean Air Act requirements, i.e., wet (flue gas desulfurization, also known as FGD) or dry scrubber systems (SDA) for sulfur dioxide (SO_2) control, selective catalytic reduction (SCR or SNCR) for nitrogen oxides (NOx), and fabric filters or baghouses for capture of particulate matter (PM).

After a thorough study of the research information presently available, KCPL is confident that any coal- fired unit equipped with SCR, SDA, and fabric filters, as would be required by S. 556, will achieve the maximum degree of reduction in emissions of mercury through co-benefits, taking into consideration the costs of achieving such emission reduction, any non-air quality health and environmental impacts, and energy requirements associated with the emission reduction.

The level of control of mercury through co-benefits is based on several assumptions:

- All of the mercury produced in the combustion process from low sulfur subbituminous coal is in the elemental form;
- An SCR catalyst converts 60 percent of this elemental mercury to ionic mercury;
- 25 percent of the ionic mercury material is removed in the dry scrubber; and
- 70 percent of the remaining ionic mercury material is removed in the fabric filter.

These assumptions are based on the limited amount of research data available, and resume that the EPRI research studies and analyses from Phase ill of EPA's Information Collection Request (ICR) are correct and applicable.

At an August 2001 meeting, an EPA official observed that SCR and SNCR might improve mercury removal. This confirmed the utility industry's position that the use of post-combustion NOx controls such as SCR and SNCR may enhance oxidation of Hg_0 to Hg(II) and thus result in the co-benefit of increased mercury removal in FGD systems.

EPA's analyses from Phase III of its ICR provide mercury removal efficiencies of existing air pollution control equipment as shown in the attached chart.

EPA and industry appear to agree that there are presently two primary technologies that could be considered in establishing a regulatory standard for mercury. They are co-control with FGD and powdered activated carbon injection.

The injection of powdered activated carbon or other absorbents upstream of a particulate control device is one of the most promising methods for controlling mercury emissions from existing utility boilers equipped only with electrostatic precipitators (ESPs) or fabric filters. The key statement is controlling mercury emissions from existing utility boilers equipped only with electrostatic precipitators or fabric filters. Should S. 556 be enacted in its present form, each coal-fired unit in the United States will be required to install a scrubber system for sulfur dioxide control, selective catalytic reduction for nitrogen oxides, and a fabric filter for particulate control. This therefore would negate any benefit to be achieved because utility boilers would not be equipped only with electrostatic precipitators or fabric filters.

A number of studies carried out at bench, pilot, and full-scale levels have examined the influence of carbon type, carbon structure, carbon surface chemistry, injection method (dry or wet), amount of carbon injected, and flue gas temperature on mercury removal. Results indicate that a wide variety of factors influence the mercury removal obtained with sorbent injection upstream of an ESP or fabric filter baghouse. These factors include the mercury species being removed (oxidized vs. elemental), the flue gas composition, process conditions (e.g., temperature), sorbent characteristics (e.g., size), and the presence of other active surfaces (e.g., fly ash). Results also show that although general trends between different sorbents and test conditions exist, sorbent performance tends to be site-specific and depends on the exact nature of the flue gas at a particular site.

Based on review of the available information, a new unit firing subbituminous coal, which produces primarily elemental mercury (the hardest form to remove), equipped with SCR, SDA, and a fabric filter, may not realize any additional mercury removal due to the addition of powdered activated carbon or other dry sorbent injection. This is of great concern to Kansas City Power & Light because we just rebuilt a 550 megawatt unit, our Hawthorn 5 facility, using a state-of-the-art combination of SCR, dry scrubber and fabric filter and burning low sulfur subbituminous coal. This combination of equipment and fuel, making Hawthorn 5 the cleanest coal-fired power plant in the country, may be able to achieve a 45 percent level of mercury reduction based on currently available information.

We therefore urge the committee to develop a more flexible legislative approach to mercury that recognizes the limited effectiveness of state-of-the-art technology in removing elemental mercury from flue gas emissions. Until there are better technological advances, we believe the committee should allow a co-benefits approach to mercury.

We appreciate your good work on this important issue. We encourage you to continue your efforts to balance an outcome that will protect the environment and a reliable and affordable supply of electricity throughout the country.

Sincerely,

BERNARD J. BEAUDOIN,
Chairman of the Board President and Chief Executive Officer.

ATTACHMENT: MEAN MERCURY EMISSION REDUCTIONS FOR PC-FIRED BOILERS

MEAN MERCURY EMISSION REDUCTIONS FOR PC FIRED BOILERS

Add-on Controls	Type of Coal		
	Bituminous	Subbituminous	Lignite
PM Only			
CS-ESP	46	16	0
HS-ESP	12	13	NT
CS-FF	83	72	NT
PM Scrubber	14	0	33
Dry FGD Scrubbers			
SDA + ESP	NT	38	NT
SDA + FF	98	25	17
SCR + SDA + FF	98	NT	NT
Wet FGD Scrubbers			
CS-ESP + Wet FGD	81	35	44
HS-ESP + Wet FGD	55	33	NT
CS-FF + Wet FGD	96	NT	NT

Senator VOINOVICH. We clearly need to be careful about requiring more than co-benefits for mercury reductions. As far as CO_2 is concerned, there are some controlled technologies for coal that allow for the capture or sequestration of CO_2 such as the integrated gasification combined cycle, or IGCC, and some other technologies. I'm glad that both GE, one of the producers of that technology, and Global Energy, a Cincinnati based company, are here today to testify.

However, we must not lose sight of the fact that while the technology is old, its application to the energy industry and its ability to capture carbon are relatively new. In addition, it's my understanding that this technology can be expensive. It is not simply adding a new component to an existing unit, such as a scrubber, but basically building a new plant from the ground up. I'd like to hear specifically from the witnesses on this point.

Unfortunately, we are not the only ones new to this technology. I understand the State of Florida is considering requiring the DOE IGCC pilot facility in Tampa to either add a scrubber to the facility, which creates significant technical problems, or burn a combination of coal and biomass which defeats the purpose of clean coal technology. It's kind of an interesting situation. If this committee is going to encourage this technology, we must first understand how the States will regulate them.

In addition, according to Tampa Electric, “Although theories exist on methods to control mercury and carbon dioxide from IGCC facilities, no technology exists that could be implemented today. The projects remain in the development phase and have not yet been demonstrated as commercially viable.”

I look forward to the testimony of all the witnesses, and I look forward to working with all of my colleagues on a bipartisan and multi-regional approach to this issue. I really genuinely want the witnesses to know and the people that are in this room that I really believe that all of us, if we can sit down and work on this, that we can dramatically reduce emissions from power plants in this country and also provide a situation where we can have, we can continue to burn coal and the other sources that we have to keep energy costs competitive so that we can maintain the economy of our great Nation.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Mr. Chairman, thank you for holding this hearing today on the available technologies for controlling CO_2 and mercury. I requested this hearing last year when the committee first began holding hearings on S. 556, the Jeffords/Lieberman 4-pollutant bill, and I am pleased that you have chosen this topic for your first Hearing as chairman of this subcommittee.

It is my understanding that the chairman of the full committee, Senator Jeffords, has announced that he intends to markup his legislation on February 12. While I believe it is important to move forward if we hope to get a bill this year, I also believe it is important that we cover the necessary issues and understand what the impact of the bill will be on the environment, our energy supply, and our nation's economy. So far, as a committee and as a Subcommittee, we have not begun to answer any of these questions.

We are told that the chairman's bill, as drafted, is not supported by a single utility in this country. We know that the National Governor's Association has endorsed a 3-pollutant strategy, not the 4-pollutant strategy found in the chairman's bill. And, we also know that the chairman's bill will mean the end of coal as a viable fuel source.

What we don't know, is what the impact of this bill will have on our energy supply or what the impact will be for our nation's manufacturing base. The chairman's bill will cause massive fuel switching to natural gas, which is an important raw material for our nation's chemical and plastic industry, for the fertilizer for our farmers, and for the food preparation and service industry. We also don't know what the impact will be on our nation's public power sector or the Coops. All of these issues need to be addressed by this Subcommittee or the Full committee before we move forward with the legislation.

The fact of the matter is, if we want a bill with a chance of passing then we need to sit down together, on both sides of the aisle, and work through these issues. Mr. Chairman, I want to work together to pass meaningful legislation which will make significant emission reductions and which will secure our safe, efficient, reliable and cost-effective energy supply for the American consumer.

Today's hearing is an important first step. As a committee and as a country, we are all familiar with the available control technologies for reducing NOx and SO_2. Although it is important to note that some of these technologies are still in their infancy, such as SCR units, and we need to monitor closely the problems some utilities are having as they install the devices.

What is less well known, are the available technologies for reducing mercury and CO_2. According to the EPA, current technologies can reduce mercury anywhere from 40 percent to 90 percent, depending upon the type of coal burned. In addition, some of the test cases seem to show that it is easier to reduce mercury levels when the concentration of mercury in the coal is very high.

It is much harder to obtain the same mercury reduction percentage from coal containing lower amounts of mercury. Therefore, it could be difficult to reduce mercury to the levels required under the Jeffords' bill if you start with relatively clean coal. It is also my understanding that some of the state-of-the-art facilities around the country have had a difficult time reducing the mercury. For example, I have a letter from Kansas City Power and Light, which I would like to introduce into the record, and I would like to read a brief passage, "Kansas City Power and Light just rebuilt a 550 megawatt unit, our Hawthorn 5 facility, using a state-of-the-art combination of SCR, dry scrubber and fabric filter and burning low sulfur subbituminous coal. This combination of equipment and fuel, making Hawthorn 5 the cleanest coal-fired power plant in the country, may be able to achieve a 45 percent level of mercury reduction, based on currently available information."

We clearly need to be careful about requiring more than co-benefits for mercury reductions. As far as CO_2 is concerned, there are some control technologies for coal that allow for the capture or sequestration of CO_2, such as the Integrated Gasification Combined Cycle or IGCC and some other technologies. I am glad that both GE, one of the producers of the technology and Global Energy, a Cincinnati based company are here today to testify.

However, we must not lose sight of the fact that while the technology is old, its application to the energy industry and its ability to capture carbon are relatively new. In addition, it's my understanding that this technology can be expensive. It is not simply adding a new component to an existing unit, such as a scrubber, but basically building a new plant from the ground up. I would like to hear specifically from the witnesses on this point.

Unfortunately we are not the only ones new to this technology. I understand that the State of Florida is considering requiring the DOE IGCC pilot facility in Tampa to either add a scrubber to the facility, which creates significant technical problems, or burn a combination of coal and biomass, which defeats the purpose of clean coal technology. If this committee is going to encourage this technology then we must first understand how the States will regulate them.

In addition, according to Tampa Electric, "Although theories exist on methods to control mercury and carbon dioxide from IGCC facilities, no technology exists that could be implemented today. The projects remain in the development phase and have not yet been demonstrated as commercially viable."

And I would like to introduce a letter into the record from Tampa Electric which goes into more detail. I look forward to the testimony of all of the witnesses and I look forward to working with all of my colleagues on a bipartisan and multi-regional approach to this issue. Thank you.

Senator VOINOVICH. I would now like to call on, I think, Senator—I'm trying to think, who is the next seniority on the Democrat side? This is the first hearing, by the way, we've had of this subcommittee this year.

Senator CLINTON. Well, I have a little tiny bit of seniority. But Senator Corzine was here first. So I think he should go first.

Senator CORZINE. Ladies first.

OPENING STATEMENT OF HON. HILLARY RODHAM CLINTON, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator CLINTON. Now he's being very chivalrous. All right, well, then, I will go ahead.

Thank you so much, Senator Voinovich. You know, yesterday, January 28, it was 67 degrees in the Washington area. And the 67 degree temperature at Dulles Airport tied the record high for that location, which was set way back in 1999. In New York City, where I was yesterday, temperatures were also very high, and today they're expected to rise in the low to mid 60's, breaking the 55 degree record for the day which was set in 1975. Temperatures in the city over the last couple of days have far surpassed the 38 degree norm for this time of year.

Now, as enjoyable as this winter respite may be, it definitely, I think, makes us stop and wonder if this is simply an anomaly or part of a more disturbing trend that is of concern to us. The Administration in its testimony today before the committee "recognizes the seriousness of the buildup of greenhouse gases in the atmosphere," and acknowledges that "reducing greenhouse gas emissions will be a necessary part of a long term solution to climate change."

I agree that we need a solution to climate change, and that's why I'm pleased that we're here today to learn about available and emerging technologies and market-driven mechanisms we can use to reduce harmful emissions of sulfur dioxide and, nitrogen oxide, mercury and yes, CO_2. It would be difficult to overstate the importance of these technologies. I believe they are our road map to a balanced national energy policy that embraces energy efficiency measures and new, cleaner sources of power, including renewable energy sources alongside traditional energy sources. I'm very proud that companies in New York are helping to pave the way by creating new technologies that we can take advantage of.

I thank Chairman Lieberman for holding today's hearing, and I applaud our ranking member, Senator Voinovich, for continually pushing us to hold this important hearing. According to the written testimony we've received for today's hearing, the Administration will testify that "addressing CO_2 is a question of climate change policy and separate from clean air policy."

I think we will hear from today's witnesses that policy perspectives aside, from a technical standpoint, this is not the case. Through existing and emerging technologies, we can achieve significant reductions in all four emissions and oftentimes simultaneously. We can do so while continuing to maintain a robust and diverse energy supply that includes power generation from coal, natural gas, renewables and other forms of energy.

Now, in New York, we are already playing an important role in helping to achieve a balanced national energy policy as well as a sound environmental policy. In fact, New York is the birthplace of an exciting cutting edge technology, integrated gasification combined cycle, known as IGCC, which we will hear about today. This is a technology that delivers environmentally superior power generation from coal.

Now, while coal gasification has a long history going back at least to the 1930's, IGCC's roots trace back to GE's Global Research Center in Schenectady, to the early 1970's. And it was at GE's Schenectady facility that pilot testing of this IGCC technology demonstrated the ability to convert dirtier, solid fuels into clean gas fuel, and it was possible to integrate this gasification technology into a gas turbine.

Further work at GE's Global Research Center led to the first full scale clean coal demonstration of IGCC in the 1980's. And New York continues to serve as the central hub of GE's efforts to move this technology into global commercial projects. The Schenectady main plant, which is home to 4,800 GE employees, is now in the process of expanding rather significantly. And the GE Global Research Center will be, I predict, a global leader in this technology and its commercial application.

I'm delighted that Ed Lowe, GE manager for the gas turbine and combined cycle product lines, is here with us today. I thank Mr. Lowe and I thank GE, and welcome all the other witnesses.

Mr. Chairman, unfortunately, as we know in the Senate, I will have to leave probably earlier than I would like because of a hearing in the Budget Committee. But I would be remiss in not applauding this committee and its hard work on the Brownfields Bill, which was finally signed into law, which I think will make such a significant difference in our reclamation and redevelopment efforts, and the kind of environmental stewardship, as well as meeting our energy needs, that this committee is working very hard to achieve. I applaud your leadership, and I very much appreciate Senator Voinovich's strong call to working together to try to see what we can achieve. I think technology will play a major role in the achievements that we can put forward in the year to come.

Thank you very much.

Senator LIEBERMAN [assuming the chair]. Thanks so much, Senator Clinton. I thank Senator Voinovich and apologize to all my colleagues on the committee and the witnesses. It was one of those mornings where I got held up at a breakfast meeting. But I'm very glad you went forward, and I'm going to hold my statement until the end.

Senator Smith, why don't you go forward.

Senator SMITH. Thank you very much, Mr. Chairman, and thank you and Senator Voinovich for your leadership in having this hearing and working so hard on the issue of clean air.

I would ask unanimous consent to put a statement into the record for Senator Inhofe.

Senator LIEBERMAN. Without objection, so ordered.

[The prepared statement of Senator Inhofe follows:]

PREPARED STATEMENT OF HON. JAMES M. INHOFE, U.S. SENATOR FROM THE STATE OF OKLAHOMA

I commend the chairman on holding this hearing to hear testimony on compliance options for electric power generators to meet new limits on carbon and mercury emissions contained in S. 556. When drafting S. 556, I am afraid that the full committee chairman has not come close to fully considering all the issues associated with his proposal. If such legislation is to ever be enacted into law, the compromise, unlike S. 556, must contemplate and balance our nation's existing environmental achievements and energy supply and security.

I have four concerns with this legislation:

S. 556 ignores regional differences

I believe S. 556 to be inequitable to require an across the board reduction in pollutants when States, such as Oklahoma, currently emit well below the national averages. Oklahoma's environmental profile mirrors that of many western States. Oklahoma does not have mercury problems. In fact, according to EPA, Oklahoma mercury emissions from coal fired utility boilers are 1.8 percent of the nationwide total. Therefore, before we are asked to reduce our emissions even further, other States in the Midwest and North East should be expected to get their emission levels down to the levels cleaner States—like Oklahoma—are today. It is ridiculous to impose percentage reductions on us—at enormous marginal expense to Oklahomans—before those regions who have significant air problems do their part.

S. 556 is horrible energy policy

By limiting fuel options for power generation, increasing the cost of electricity to Americans, and stopping the construction of new generating facilities, S. 556 is the very antithesis of sound national energy policy. This bill would undo everything that proponents of a national energy policy have been fighting for.

S. 556 is also the antithesis of economic stimulus

S. 556 would make the price and availability of energy an economic national crisis. In Oklahoma, S. 556 would significantly change the source of energy away from affordable coal to more expensive options—in addition to causing power plant closures. Oklahoma depends upon coal for 61.2 percent of our power. This is because of coal's much lower fuel cost versus natural gas, and coal is a clean source of energy.

The result is Oklahoma utility rates are 19 percent less that the national average power rate. Our utility rates are much lower than States that depend heavily upon more expensive natural gas (e.g., New York, New Jersey, California) and oil/renewables for generation. S. 556 would ensure that our rates would go through the roof. Higher energy prices affect everyone. However, when the price of energy rises that means the less fortunate in our society must make a decision between keeping the heat and lights on or paying for other essential needs.

Where is the New Source Review Reform?

Additionally, S. 556 adds even more regulations to an already over-complex regulatory scheme, which includes things such as New Source Review. As many of you know, I have been saying for quite a while now that, unless reformed, EPA's NSR policies will continue to interfere with our nation's ability to meet our energy and fuel supply needs. S. 556 will just magnify this problem.

Conclusion

As a Senator and grandfather, I want to ensure the cleanest environment for our nation. The real challenge with dealing with this issue isn't getting just environmental protection or just affordable energy. The real challenge is getting both. S. 556 does not even come close to getting us both. With that being said, I reiterate my pledge to work with this committee to develop legislation on this matter of enormous importance.

OPENING STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator SMITH. Mr. Chairman, I'll be very brief. I want to also, as Senator Clinton has said, apologize to the witnesses. There are so many things going on today we're probably not going to be able to stay very long. But I certainly want to extend a special welcome to Mr. Frank Alix, the chairman and CEO of Powerspan, a company in New Durham, New Hampshire, who will be testifying a little later on. He's no stranger to the committee, he's testified before actually. I've read that testimony and I'm very familiar with your technology.

You know, Senator Voinovich, a few years ago, when I was a relatively junior member of the committee and you were Governor of Ohio, there was a lot of talk about the friction and confrontation between your region of the country and New England. There was a lot of anger and frustration expressed, and now we're seeing cooperation.

There's some irony perhaps in the fact that Frank Alix's company is working on a pilot project in Ohio to bring reductions in NOx, SOx and mercury at dramatic levels with technology. We have to see how this works when it gets out to the commercial level. I know Mr. Alix will be talking about it. I don't want to put him on the spot, but at least in the pilot, we're seeing well over 80 percent reduction in mercury, perhaps as 99 percent in SOx and 75 to 80 percent in NOx, in the pilot projects working with Ohio and the company in Ohio.

So this is tremendous and very exciting. I'm proud to say that we have a company in New Hampshire that's doing that. But certainly, if we allow the entrepreneurship and innovation to lead the way, regulation may not be necessary to the extent that it is now.

I know that we're going to be voting on a bill soon, and I want to identify myself with the remarks of Senator Voinovich in saying, I hope that we can work together to get a bill that is not going to shut down the utilities, and it can be a bipartisan bill, so that we can get help in this area to clean up the air and still produce the energy we need, and not demand the impossible of the utility sector. I think these kinds of results that we're seeing show that we can get the results and still keep the utilities working.

The last thing we need to do is create more uncertainty in our energy markets. We need to ask, are the demands that we're contemplating technologically feasible. That's really the issue. Certainly that's a question worth answering before we proceed.

I believe we need to look beyond the capabilities of the technology of today and look at the technology of tomorrow, which I think people like Frank Alix are doing. We need to create a regulatory structure that allows flexibility to implement newer and more effective technologies, not shut those technologies down. We need to get out of this regulatory box, relying on technology that is in many ways already obsolete, and we can't get out of the box.

That's why I'm a very strong advocate of the cap-and-trade system. I know there are some critics, the left and the right, about it, saying it's still Government involvement. But we have a system, we have a Clean Air Act. I don't think anybody's going to repeal it any time soon, so we need to be working within that Act and we can do that with cap-and-trade, as we did, Senator Voinovich, with acid rain a few years ago and it worked. People said it was going to cost $5 billion or $6 billion. It cost less than a billion, and we made dramatic reductions in the acid rain that affects New York and New Hampshire and Connecticut and so many other States. We're not there yet. But we have made dramatic reductions.

So I think a system based on performance that encourages technological advances is the right way to go. Environmental benefits are going to come sooner rather than later under the old command and control approach. Allowing flexibility for new technologies and incentives is a win for the environment, it's a win for energy and it's a win for the consumer and the economy. And that's the right approach to both energy security and environmental problems.

I firmly believe that new technologies can compete in an open market where the most important test is cost effectiveness. We can make money, if companies can make money cleaning up the environment and producing energy, that's got to be a win-win. We get a faster, higher reduction in air pollution. The utility sector will get more security through performance based, predictable system of targets. And we eliminate what I think is a bewildering, certainly confusing network of regulations.

The American consumer is going to win because secure and predictable energy markets reduce the cost of goods and services. The economy is going to benefit because the inventors of new emissions control technologies create dynamic new companies. And we're seeing now that in the old scrubbers that was the technology of the 1980's, we're now seeing this new technology may in fact bring costs down as much as 50 or 60 percent less than the cost to the companies and utilities of the scrubbers.

So that's why it's exciting. I think that companies who are producing this kind of technology are setting a national standard which of course is going to have huge export potential in the international arena. So all of these countries that are now developing that haven't yet come to the level that we've come to in producing some of the problems that we've had with coal and other technology, we'll now export that technology to them, and they'll be building plants that will be state-of-the-art rather than 20 years or 30 years behind where we are now.

That's the American way, innovation, flexibility, ingenuity, and export these technologies to the developing countries of the world who are going to need the energy of the future. So Mr. Chairman, I look forward to hearing the discussion from the witnesses and again, thank you and Senator Voinovich for having the hearing today.

Senator LIEBERMAN. Thank you, Senator Smith, for a very excellent statement.

Senator Corzine.

OPENING STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW YORK

Senator CORZINE. Thank you, Mr. Chairman. I appreciate your holding this hearing. It is truly one that is important to all of us. I concur that we have an issue of both clean air but also climate change. I look at that thermometer that Senator Clinton talked about and then some of the academic studies that would reinforce the thoughts that may be reflected there, and think there is much for us to do.

I welcome the witnesses. I will study your comments, because I have two other hearings at this time. So I apologize, I will be leaving. I want to welcome particularly Dr. Sandor. At another time in our lives, he and I worked on developing financial instruments that created the futures markets for government securities. I think that some of those same concepts apply potentially very well in this cap-and-trade concept that offers some opportunity to bring the benefits of technology to the economics of power production. So I look forward to working very closely with him.

Before I start, turn it back over, I want to take note of an announcement that was made in New Jersey this week, the end of last week, by one of our great companies, PSE&G Power, which has been dealing with the four-pollutant issue. They just agreed to a settlement, both with EPA and the New Jersey Department of Environmental Protection, with regard to a comprehensive plan on all four pollutants, agreed to a $300 million investment dealing with NOx, SOx, mercury and carbon dioxide in a very proactive and comprehensive agreement.

I have a statement from the company that I think I would like to put in the record which is very detailed with regard to all the activities. But they have a strong statement, we are backing up our advocacy for four-pollutant power plant legislation at the Federal level with real local action. And we're leading where industries should follow if we are to help this nation meet the unrealized goals of the Clean Air Act.

They go on to say that they continue to believe that coal has been and will continue to be the backbone of affordable energy in this country, but technologies exist to burn coal cleanly. Our investment in these technologies is an investment in the future of coal.

So I think that the do-able is a reality, if a good company that's interested in rates of return like all other companies across this country, if there is a commitment to making sure that we incorporate all of the issues of cleaning up our air and protecting our climate are at hand. By the way, they had agreed to a voluntary 15 percent reduction in carbon dioxide emissions, they may be looking for more. So there are ways to move in this area and I congratulate them and I also think it can be used as an example that we can take more broadly across the Nation.

This really is an important issue for us all to agree to debate and to get conclusion on. I agree with the bipartisanship, the partnership that's necessary regionally, public and private sector. But it's also something we need to work on, and I congratulate you, Mr. Chairman, for your efforts in ventilating this issue as well as possible. Thank you.

STATEMENT OF HON. JON S. CORZINE, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Thank you, Mr. Chairman. I want to thank you for holding this hearing on S. 556, the Clean Power Act. Today's focus on the potential impacts of this legislation on the environment, the economy, energy supply, and existing mandates is a critical part of the discussion. Mr. Chairman, air pollution is one of the most serious environmental health issues that we face. As we all know, power plants are significant emitters of SOx, NOx and mercury. While great strides have been made in the control of SOx and NOx, we need to do more and do so in a cost-effective, energy efficient manner. Including mercury in the package will allow us to address a serious public health issue and provide a stable regulatory regime for the power industry.

Finally, global warming is a pressing issue that we need to address seriously and soon. Just this week it was reported that the nine-island nation of Tuvalu has conceded defeat to rising seas and is seeking refuge for its 11,000 citizens. My state of New Jersey has been a leader in facing up to the issue of global climate change, committing to reducing statewide greenhouse gas emissions 3.5 percent below 1990 levels by 2005. While New Jersey is making impressive strides with this voluntary initiative, they are looking for the Federal Government to take the lead in setting mandatory caps on carbon dioxide. Power plants are a good place to start. Power plants represent ⅓ of New Jersey's—and the Nation's—carbon dioxide emissions. Limiting their CO_2 emissions would be an important step in combating climate change.

Mr. Chairman, power plants are certainly not the only sources of these 4 pollutants. But they are major sources, and there is great opportunity for cost-effective reductions to be made, particularly through a comprehensive approach, as the Clean Power Act provides. I look forward to hearing the testimony of the witnesses and thank you again for holding this hearing.

OPENING STATEMENT OF HON. JOSEPH I. LIEBERMAN, U.S. SENATOR FROM THE STATE OF CONNECTICUT

Senator LIEBERMAN. Thanks very much, Senator Corzine.

Let me just say a few words, asking the indulgence of the witnesses before we go to you. I believe that one of this committee's, and indeed the Congress's, highest priorities in this session, should be the passage of multi-pollutant legislation. Today's hearing is on compliance options for electric power generators to meet the limits on carbon and mercury emissions that are contained in S. 556, which is the Clean Power Act that Senator Jeffords and Senator Collins and I and several other sponsors, including members of this committee, I believe that Senator Clinton and Senator Corzine are both co-sponsors, we're up to 19 at this point.

Clearly, there's a disagreement here on one of the four pollutants, which is carbon. The Administration is for a three-pollutant approach. We feel very strongly that it's critical to our future well-being and indeed, economic well-being, that we go after all four and that we can do it. This hearing is very much done at the encouragement of Senator Voinovich, who I'm so pleased to have as my ranking member on this subcommittee. I thank him for his not only encouraging this hearing, but for the statement and the spirit of the statement that he made earlier, because I do think while we have some disagreements here, in that spirit we can build toward some kind of accomplishment.

It is one measure of America's economic strength than even in less than stellar economic times we as a nation still consume a great deal of electricity. We need it. It takes electricity, obviously, not only to heat our homes and cool our refrigerators, but to run the technological tools that power the innovation economy. And all that electricity isn't just conjured up magically out of the ether. It comes from a variety of sources, and those sources produce emissions in the process.

So I think all of us here understand that it is essential that we tackle the environmental effects resulting from electricity generation. First, that means achieving steep reductions in two pollutants we're not going to talk about specifically today, nitrogen oxides and sulfur dioxide. Reductions in the emissions of NOx will reduce smog that too often makes it difficult for asthmatics, children, the elderly and others to breathe. As Senator Smith has referred to, reductions in sulfur dioxide will help stem the systemic problem of acid rain by further controlling the harmful compound that creates it and that too many of our smokestacks pump into the air.

These chemicals are only half the problem. If we want a future with cleaner air and water for our kids and their kids, we've got to also address, I believe strongly, emissions of the other two substances covered by the Clean Power Act that I've referred to, and that's mercury and carbon dioxide. Today, coal burning electric utilities emit more mercury into the environment than any manmade source, largely through atmospheric deposition, but also through non-point runoff. That mercury can accumulate in fish and animal tissue in a toxic form, which is not only a danger to the fish but also to those of us humans who consume a fair amount of fish.

Methyl mercury exposure, especially when it occurs to a developing fetus or a younger child, can cause serious neurological impairments. This is a serious problem that's been worsening over the course of many years to the point that nationwide, 41 States now have fish advisories that warn people against eating fish, and that cumulatively covers 60 percent of all the water bodies in the United States. In my own home State of Connecticut, there are fish advisories for all lakes based on mercury accumulation in fish. So this is a real problem, not an imagined one.

The problems associated with uncontrolled emission of carbon dioxide are probably better known. Global warming is one of the most serious and pressing environmental challenges that we face here in the United States and the world. We can't address global warming without focusing directly on America's utility companies, because they account for about 40 percent of the Nation's greenhouse gas emissions, 40 percent from our utilities, and 10 percent of the world's greenhouse gas emissions come from right here, from our utility plants.

Global warming is a serious problem. But there is some good news here, and some hope if we act wisely. Because as has been said by my colleagues, and is the reason for this hearing, there are remarkable technological answers to this problem that are within our reach. And that's what we're going to hear about today.

I do want to stress that I feel strongly that technology will allow us to answer the challenges that we face without, as some have suggested, "moving beyond coal." Coal can be a part of the solution, that's a fact. From the American point of view, we ought to do everything we can technologically to try to make coal continue to be part of the solution, because it is such an enormous American natural resource. And of course, the challenge is to have technology that will enable us to continue to use coal without polluting our environment.

All the technologies that will be discussed here today I think present not only real opportunities for environmental protection, but for economic growth. I look forward to hearing about them right now.

I thank the witnesses for being here. Senator Carper, your timing is beautiful and incredible. Would you like to make an opening statement?

OPENING STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. I'll be really brief, thank you very much. I look forward to hearing from our witnesses, and thank you very much for scheduling this hearing today.

In the State of Delaware, we have, like most places, a lot of rivers, streams and ponds, that kind of thing. We cannot eat the fish in more than 60 percent of those streams. And as it turns out, neither can people in about 40 other States. The reason why is, part of it, contamination from mercury, not so much put into the air from sources in our State, but from other places out to the west of us. They simply come in, it rains not just on our parade, it rains on our bodies of water and we can't eat our fish.

We have problems with ozone, ozone alerts. Part of that is from our own doing, but a lot of it is not. And we face the nitrogen oxide, again, that comes from places outside of Delaware and simply ends up deposited in our air and makes our breathing more difficult. And it causes us to make adjustments, economic adjustments and just adjustments with our daily lives that grow out of that ozone that's traced back to the nitrogen oxide.

We have some large bodies of water that we're very proud of: Delaware Bay to the east, the Chesapeake Bay to the west, and a whole lot of inland bays in the southern part of our State. They face problems with nutrient loading. Again, part of that nutrient loading comes from air pollution, washes down out of the sky when it rains. And we have to figure out what other ways to reduce point and non-point sources of pollution that lead into the inland bays in an effort to try and clean them up. We have to do more than rightfully we ought to, simply because of the sources that come to us from other places.

So for us, these issues in Delaware are more personal in nature. We have a real stake in this, this is not just some philosophical argument. We want to see these emissions of nitrogen, sulfur dioxide, we want to see the emissions of mercury and we want to see CO_2 reduced as well. With respect to CO_2, we've got a bunch of beaches, some of the people here in this hearing and on this committee come to our beaches throughout the year, especially during the summer months, to enjoy them.

As we look at the rise in the temperature on our planet, and we see over the next 100 years we're hearing anywhere from 2 to 10 degrees an increase in temperature, what that means for a little State like Delaware, which is flat and not very big in the first place, is that we're going to lose some maybe significant part of our land, our beach front, to the ocean. The sea level rise will be absorbed, washed over. And that is a matter of concern for us economically but it's also a matter of survival. We don't have much State to lose. The idea of us seeing an incursion of the ocean by a couple of miles, it's more than we want to contemplate.

So from all those perspectives, these issues are important to us. Having said that, there are right ways to address these issues and wrong ways. I'm grateful for the approach that our colleagues Senator Jeffords and Senator Lieberman have taken, the leadership that they've shown. Obviously there are concerns with the legislation, we've all heard those, we want to address those and hopefully today we'll move toward a markup, to get to where we all want to be, and that's reductions in NOx and SOx and carbon dioxide and mercury. But at the same time, to do so in a way that uses market systems, that doesn't put our utilities in sort of the difficult position that for some of them it's a matter of not being able to survive.

I'm the guy that always sees the glass as half full, even when it's empty. I think this stuff is not an empty glass, this is one that's at least half full. I look forward to working with especially the people sitting around this table, see if we can't tackle this one and do something good, not just for Delaware, but for all of us and for our country, maybe even for the rest of the world later this year. Thanks.

Senator LIEBERMAN. Thanks, Senator Carper. I like your optimism and your vision.

Senator VOINOVICH. Mr. Chairman, Senator Campbell apologizes for not being here today. He has a statement he would like inserted into the record.

Senator LIEBERMAN. Without objection, so ordered.

[The prepared statement of Senator Campbell follows:]

STATEMENT OF HON. BEN NIGHTHORSE CAMPBELL, U.S. SENATOR FROM THE STATE OF COLORADO

Mr. Chairman, first off, I would like to recognize and welcome a fellow Coloradan, Dr. Michael Durham of ADA Environmental Solutions of Littleton.

Mr. Chairman, Senator Voinovich, this is the third hearing relating to S. 556, and this time we focus on perhaps the most controversial aspects of the bill—whether technology even exists that would allow power producers to meet the aggressive carbon dioxide and mercury emissions reduction schedule in S. 556.

I am deeply concerned over the process in formulating this dramatic and sweeping legislation. This is a major change in policy that should be carefully reviewed. We have had two hearings at the full committee level. However, today, we hold a hearing on the most contentious issues only at the Subcommittee level. Second, we are going to hold one member's meeting next week, and then the majority intends to mark-up this bill. I am an optimist, but I am also a realist. Do we seriously think that given our members' strong disagreement on S. 556, that we can reach consensus in just one meeting? I hope that my friends supporting S. 556 come around, but I imagine that we will need to work together a bit more.

Again, this is the third hearing on S. 556, and this is the third hearing where I state, in no uncertain terms, my strong opposition. This bill is a one-size fits all approach that detrimentally affects the Western United States.

Fundamentally, the West differs from the East in several ways, and any legislation should reflect those differences. Yet, this bill ignores them completely. Again, it is important to note that this bill would require significant reductions in NOx where no problem exists, and similar command and control SOx reductions on a very minor Western problem.

Mercury is recognized as a harmful pollutant. However, we aren't sure how much is harmful and whether adequate technology exists to deal with it.

In December 2000, the EPA found cause for mercury reductions, but lacked sufficient information as to the degree of reductions. Today, the Agency is in the process of gathering scientific data in order to develop the proposed rule, set to be published by December 2003. The Agency charged with Enforcing the Environment needed additional time and study to make an educated decision based on clear science.

However, the distinguished sponsors of S. 556 somehow know the proper reduction levels with such certainty that they make it a part of their bill.

This bill's approach to mercury reductions mirror those taken for NOx and SOx, by completely ignoring Western differences. Mercury emissions from Western coal-fired plants is about 40 percent lower than the national average. Yet, S. 556 would require the same level of reduction as if the West's mercury emissions were much higher. Such an effect can only be a result of two things: (1) S. 556 completely ignored Western differences, or (2) S. 556 penalizes good actors in the West.

I am sure that proponents of S. 556 did not intend to penalize the West. Therefore, we can only assume that they ignored the critical differences of the West.

Well, I am here to tell you that the West isn't ignoring this bill. The State of Colorado opposes this bill, Xcel Energy opposes this bill, Colorado's municipal and cooperatively owned utilities oppose this bill, the Western Governor's Association oppose this bill, and I oppose this bill.

S. 556 also includes significant reductions in carbon dioxide in order to curb global climate change. First, carbon dioxide is not a pollutant and should not be treated as one. NOx, SOx, and mercury can affect people's health within their lifetime. Global warming cannot. Carbon dioxide's inclusion in a "multi-pollutant bill" amounts to an obstacle to doing what we all want to do, and that is to make sure that we have clean, safe air.

Second, the Constitution's Foreign Affairs Clause ensures that the nation speaks with one voice in international affairs. Our Commander-in-Chief has taken a position on the Kyoto Protocol, and is developing a strategy to deal with global warming. I look forward to the Administration's position on the issue.

Last, the carbon dioxide reductions called for in this bill would disproportionately impact the West and my State of Colorado in particular. Eighty-two percent of Colorado's electricity comes from coal-fired plants. The incredible costs associated with S. 556's carbon dioxide reductions is tantamount to a fuel switching mandate, placing everyone at the mercy of natural gas price swings. Whether or not fuel switching is the intent this de facto result would hurt my State and ratepayers across the Nation.

Both parties agree that energy security is a top priority. We should not implement uncertain policies that would effectively decrease our energy supply unless the gains are sure.

In sum, S. 556 is a short-sighted approach based on incomplete information that completely ignores Western differences and even penalizes good actors.

I hope that the majority reschedules the mark-up of this bill, and takes some of the West's concerns to heart. Thank you.

Senator LIEBERMAN. Let's go now and we'll go right across the table, beginning with Mr. Edward Lowe, Manager of Gas Turbine Combined-Cycle Product Lines, General Electric Power Systems, Schenectady, New York, international headquarters, Fairfield, Connecticut.

STATEMENT OF EDWARD C. LOWE, MANAGER, GAS TURBINE COMBINED-CYCLE PRODUCT LINES, GENERAL ELECTRIC POWER SYSTEMS, SCHENECTADY, NEW YORK

Mr. LOWE. Good morning, Mr. Chairman and members of the subcommittee. I appreciate the opportunity to testify this morning and to share our views about the benefits that integrated gasification combined cycle technology can deliver.

IGCC can cost effectively produce power from solid fuels such as coal with substantial environmental benefits over other coal power generation technologies. IGCC can help the country and our customers meet the environmental goals of reducing NOx, mercury, CO_2 and other pollutants, while also advancing sound energy policy goals of retaining a secure and diverse mix of fuels for electric power generation in improving the efficiency of the coal power generation base.

IGCC is a process that converts fuel such as coal, petroleum, coke, biomass and municipal waste into a low BTU, environmentally friendly natural gas type fuel called synthesis gas or syngas. Though coal gasification in the United States dates back to 1842, it was, as Senator Clinton mentioned, the 1970's before GE's Global Research Center in Schenectady, New York, demonstrated that poor fuels could be converted into low BTU syngas and integrated with a gas turbine cycle.

This work directly led to the first large commercial IGCC plant, the 120 megawatt cool water plant in California that was commissioned in 1984. Cool water was followed by two commercial 250 megawatt coal IGCC plants in the 1990's: Public Service of Indiana's Wabash River plant, commissioned in 1995, and Tampa Electric's Polk plant commissioned in 1996. These two plants utilize GE gas turbines and have successfully logged over 50,000 operating hours on coal syngas.

In IGCC, powerful pollutants are removed from the syngas before they reach the gas turbine. Therefore, end of pipe/stack cleanup is not necessary. Emissions of SOx, NOx, mercury, heavy metals and particulate from an IGCC plant are fractions of the emissions from other coal plants. Over 90 percent work removal is being achieved by a chemical process gasification plan in Kingsport, Tennessee.

High IGCC efficiencies yield CO_2 emissions that are 12 percent lower than those of modern coal steam boiler plants and about 30 percent lower than the average operating coal plant. Additionally, in the gasification process, carbon may be removed from the syngas to create a hydrogen rich fuel that can further reduce CO_2 gas emissions.

GE's commitment to advancing IGCC design is continuing at our Global Research Center in Schenectady, New York, and our recently commissioned combustion development facility in Greenville, South Carolina. In spite of these significant environmental benefits, we are concerned that permitting bodies may burden IGCC with duplicative and reliability reducing end of pipe controls for NOx emissions, such as selective catalytic reduction. These systems cannot work as reliably on IGCC as they do on natural gas fired units. The pollution prevention combustion technology on GE's IGCC gas turbines delivers NOx emissions below that of existing coal technologies. We strongly believe that IGCC must be evaluated as a coal technology with consideration given for the total environmental benefits when setting emission targets.

The cost to build a large IGCC plant has steadily decreased over the last 20 years, with installed prices now projected to be $1,200 a kilowatt, making IGCC cost competitive with modern coal plant options that utilize state-of-the-art emission controls. Coal IGCC offers superior environmental performance while projected to produce electricity prices that are competitive with modern directed fired coal plants.

Thank you for giving me the opportunity.

Senator LIEBERMAN. Thanks, Mr. Lowe. Very exciting testimony. I look forward to the questioning period.

Next we'll hear from Robert Kripowicz, Acting Assistant Secretary for Fossil Energy, U.S. Department of Energy. Good morning.

STATEMENT OF ROBERT S. KRIPOWICZ, ACTING ASSISTANT SECRETARY FOR FOSSIL ENERGY, DEPARTMENT OF ENERGY

Mr. KRIPOWICZ. Good morning, Mr. Chairman and members of the subcommittee.

In my testimony, I've attempted to describe a wide range of activities associated with managing emissions of carbon from the Nation's power industry. But let me say at the outset, I am best able to discuss those options that deal with power plant efficiency improvements and carbon sequestration. As the opening of my formal statement stresses, the Administration does not support the reductions in carbon dioxide called for in S. 556. Imposing such sharp reductions on the power generating industry alone would cause a dramatic shift from coal to natural gas, at exactly a time when, for the energy security and economic reasons, we need to be looking for ways to continue using all of our domestic energy resources.

In my formal statement, I provided a brief overview of the current U.S. power industry. This section makes two key points. First, that fossil fuels, and especially coal, are the dominant suppliers of electric power in this country, and one of the reasons why the United States benefits from some of the lowest cost electric power of any free market economy. The Administration has placed a major emphasis on efforts to enhance the environmental acceptability of coal-fired power generation and to provide a future for clean coal technology. We cannot support legislation that would cause a significant decline in our Nation's ability to use coal as a major source of current and future electricity.

The second point is that advanced technology works. Given time to mature and be deployed, improvements in pollution control technology have helped clean our air. Emissions levels of criteria air pollutants, such as particulates and sulfur dioxide, have declined significantly in the last three decades, even as the Nation's use of coal has tripled. Importantly, with advanced technology, we have achieved significant air quality improvements without imposing harsh economic penalties on our consumers. We need to allow the same cost effective progress to be made in technology that can reduce carbon emissions without acting prematurely and causing harmful disruptions in the economy.

There are three basic options for decoupling greenhouse gas emissions from the use of our low cost, abundant domestic energy resources. One is to improve efficiency. Most people associate this with enhancing the performance of automobiles or appliances or other end use systems, but efficiency improvements can also be applied at the power plant. Today's typical coal-fired power plants convert only a third of the energy value of coal into electricity. The rest is released as waste heat. Even the best natural gas combined-cycle turbines discard up to half of the fuel's energy.

If we could increase today's coal-fired power plant efficiencies just from 33 to 35 percent, we could reduce carbon emissions by nearly 26 million tons per year. But our technology program envisions much greater efficiency gains than just 2 percentage points. We see the potential for boosting power plant efficiencies into the 40 to 50 percent range during this decade and ultimately, to as high as 60 percent by the middle of the next decade.

Already operating in this country are the first two power plants that show how this can be done. In Tampa, Florida and West Terra Haute, Indiana, the Nation's first two commercial scale gasification combined-cycle plants are operating. Both are the result of DOE's clean coal technology program with industry. Both are demonstrating first of a kind efficiencies in the 40 to 45 percent range. So we believe we are well on our way to significant carbon emission reductions, simply as a function of the market adopting improved economically viable technology.

The second approach is to rely more on low or no carbon fuels. Natural gas is one of those fuels, emitting about half the carbon dioxide of coal. Most new power capacity additions in the foreseeable future, in fact, about 90 percent of them, are expected to use natural gas. So we must recognize the dangers of an over-reliance on any one energy resource. Such a heavy reliance on natural gas for future power needs may not necessarily be desirable from an economic or energy security standpoint.

The greater use of nuclear power, which emits no carbon along with renewable energy resources, can also play a long term role in reducing greenhouse gas emissions and the President's national energy plan supports both. Considerable progress has been made in bringing down the cost of renewable technologies, especially wind. But even if the contribution of these technologies expanded 90-fold, they would still represent a small fraction of the power needs of the country. Nonetheless, over the long run, they will inevitably play an increasingly important role in reducing greenhouse gases.

This leads to the third option, carbon sequestration. In terms of the others, this option is relatively new. Five years ago, few people would have mentioned carbon sequestration as a viable climate change mitigation approach. But that thinking has changed dramatically in the last few years. Carbon sequestration involves the capture and storage of carbon dioxide and other gases from fossil fuel combustion or perhaps from the atmosphere itself.

Research we've sponsored over the last four to 5 years now shows that it may be possible to develop ways to carry out carbon sequestration that are both effective and affordable. For example, in recent experiments, we've seen dramatic reductions in the cost to capture CO_2 from the flue gas at power plants. Technologies like coal gasification lend themselves to even more affordable sequestration, because they produce concentrated streams of CO_2 that are easy to capture and dispose of.

We're investigating approaches in which carbon sequestration might be geologically practical. Many of the Nation's coal-fired power plants overlie deep, unusable, saline aquifers which could hold huge quantities of CO_2, perhaps permanently. We're studying ways in which carbon sequestration might actually produce a supplemental source of revenue. For example, injecting CO_2 into oil fields or into coal seams can lead to enhanced production of marketable quantities of oil or natural gas.

Five years ago, we asked the technical community whether there were any good ideas in this area. We really didn't know. Today we're supporting more than 50 technically solid carbon sequestration projects in our research program, and we're investing more than $30 million a year to develop the testing. I might also mention the industry is contributing a like amount, another indication that these technologies hold promise. Carbon sequestration has become one of the highest priorities in our program.

In short, Mr. Chairman, although we cannot agree to mandated CO_2 reductions from the power industry, we can agree that research into new carbon management technologies and strategies is warranted, and in the long run, we believe the use of these technologies will be the most cost effective way to make significant reductions in greenhouse gases.

That completes my statement. Thank you.

Senator LIEBERMAN. Thanks very much, Mr. Kripowicz.

Now we'll go to Mr. Phil Amick, Vice President of Commercial Development, Global Energy, Inc., of Houston. Thanks for being here.

STATEMENT OF PHIL AMICK, VICE PRESIDENT, COMMERCIAL DEVELOPMENT, GLOBAL ENERGY, INC., HOUSTON, TEXAS

Mr. AMICK. Good morning. My name is Phil Amick and I'm Vice President of Global Energy. Global Energy is headquartered in Cincinnati. I'd like to thank the chairman and the other members of the subcommittee for allowing me to appear at this hearing.

Global Energy owns and operates the Wabash River Energy Limited Gasification Facility in Terra Haute, Indiana. We run this with synergy, with the Public Service of Indiana operating the power plant side of the plant. It's a 262 megawatt facility, powering about 250,000 homes while utilizing high sulfur local coals and even petroleum coke feed stocks with sulfur contents up to 5 and a half percent. More to the point of this hearing, it's the cleanest coal-fired power plant in the world of any technology. That may be disputed by others, but we really believe it.

The Wabash River plant is a repowering of a 1953 vintage pulverized coal plant, one that was operating on compliance call and had precipitators but was on scrub. Compared to the performance prior to repowering to the 1990 data for the older plant, the new facility makes six times as many megawatt hours of electric power, but has reduced emissions of SOx by over 5,500 tons a year, NOx by 1,180 tons per year and PM_{10} particulates by 100 tons per year.

The Wabash facility and the Tampa Electric Polk Power Station in Florida were the first of a new class of coal-based electric generation facilities with superior environmental performance. The Wabash plant has been operating since 1995 with emission rates lower than coal plants that are now being permitted for operation in 2005. The Wabash is a power plant that uses high sulfur coal feed stocks, but has SO_2 emissions that have run as low as one fortieth of the Clean Air Act year 2000 standards.

Sulfur is chemically extracted from the syngas and sold for use in the fertilizer industry. We make about a tank car per day of pure sulfur, sulfur that used to go up into the stack.

It's a coal power plant where all the ash products emerge as a vitrified black sand by-product which we market as construction material for asphalt applications. There are no solid wastes in the coal gasification process, there's no scrubber sludge, no fly ash or bottom ash. In our plant, the wastewater from the chemical process itself meets the national drinking water quality standards. Our carbon dioxide emissions are 20 percent lower than conventional unscrubbed coal-fired power plants because of the inherent efficiency of the gasification process. Our plant as well with no additional special equipment has a mercury removal rate of about 50 percent.

The key to this superior environmental performance is the fact that the gasification process takes place at high pressure. This facilitates the chemical processes that remove the pollutants. The high pressure operation also will facilitate additional carbon dioxide reduction and mercury removal on future plants that incorporate gasification. DOE and industry studies have indicated that significant reductions can be achieved with much less cost and performance impact than possible with the coal combustion technologies that operate near atmospheric pressure.

While the Wabash carbon dioxide emissions are already 20 percent less than conventional units, this emission could be reduced more than 75 percent by shifting the syngas to hydrogen by additional processes. This technology, already in use at some hydrogen production facilities, and I think Tampa, the TECO letter is right, it isn't in use at any utility plants yet, it could be retrofit to a gasification facility for as little as 2 percent of the original capital cost. The plant output reduction for this additional process step is a fraction of what would be seen in a conventional technology plant, and in a gasification facility, where it's just another process unit on the end of the pipeline, it can be retrofitted any time in the future.

Mercury removal is also much simpler in the gasification process. A plant like the Wabash River facility could be upgraded to 80 percent or better mercury removal by the addition of a single carbon bed vessel at a cost of less than $1 million. A facility such as the Tennessee Eastman gasification plant for chemical feedstock production in Kingsport, Tennessee, has achieved better than 90 percent mercury removal to meet their process constraints. They've been doing it for nearly two decades.

Gasification technology for coal based power generation is being commercially marketed by ourselves and others. We feel it is the most environmentally friendly solution for diversifying the fuel mix of new electrical power plant capacity. Through repowering much of the existing aging coal generation base can be upgraded as well, as was done at Wabash River.

Thank you, Mr. Chairman. That concludes my oral statement. With your permission, I have additional materials that could be put in the record.

Senator LIEBERMAN. Thanks, Mr. Amick. We'll include those all in the record. Thanks for your very helpful testimony.

Dr. Richard Sandor is the Chairman and CEO of Environmental Financial Products LLC of Chicago, Illinois and benefits before this committee from having once worked with Senator Corzine.

STATEMENT OF RICHARD L. SANDOR, CHAIRMAN AND CEO, ENVIRONMENTAL FINANCIAL PRODUCTS LLC

Dr. SANDOR. Thank you very much, Mr. Chairman. It's a great pleasure to be here with you today to talk about a subject which is very, very dear to my heart, and that is market based solutions to environmental and social problems.

I would like to describe a current effort which is going on in the private sector and share some of the activities and ideas that we're generating in that. I have the privilege of serving as the chairman of the Chicago Climate Exchange, which is an 18 month old project with the goal of establishing a voluntary cap-and-trade system for the trading of carbon. While this is only 15 or 18 months, the initial market architecture was proposed in 1992 at the Earth Summit in Rio in which we discussed the difficulties and technicalities with establishing a market for carbon.

The project that we have right now was funded by the Chicago based Joyce Foundation through a special Millennium grant to Northwestern University's Kellogg Graduate School of Management. The thought process was to take the upper midwest, essentially Minnesota, Wisconsin, Iowa, Illinois, Indiana, Michigan and Ohio, and use this as a pilot to learn more about implementing a private sector market based solution.

The upper midwest, while we think of it as a tiny geography, it's important to recognize it as a GDP of about $2 trillion, has a wide variety, which would rank it the fourth largest economy in the world, if it was taken on its own, its sectors include agriculture, forestry, manufacturing, automobiles, chemicals, pharmaceuticals, etc. So it has a broad base.

The feasibility study would determine one, proof of concept, two, provide some price discovery and inform the debate so that we could learn more about what the marginal costs of mitigation of greenhouse gases are. We went through the study, we talked about monitoring, verification, and 6 months ago we got a renewal to actually commit to the design. We'd hoped to get four entities, a couple of utilities and a couple of farmer cooperatives. The utilities providing credits generated for emissions reductions and the farmers providing sequestration and thereby pairing and trading with each other.

Well, we didn't get four entities, we ended up getting 46 entities. And they are now in the design process and have signed a nonbinding letter of intent to take on a cap-and-trade system on a voluntary basis and to develop a consensus. The members include Ford, Dupont, American Electric Power, Cinergy, Growmark, Agriliance, International Paper, Stora Enso, etc. The power sector in this voluntary pilot program that we're having basically includes three of the top ten utilities and constitutes 180,000 megawatts of capacity, representing 20 percent of the entire U.S. electricity sector.

By the way, a pilot that in and of itself in this sector is bigger than the emissions of the country of France. So we think we have scalability here and the ability to implement.

We've got Brazilian members as well, Cataguazes. We've expanded into Canada with OPG and Manitoba Hydro. We've added CEMEX and IMSA, two major Mexican companies, and a month ago we thought we had a new sector, which is very challenging and exciting, and that is municipalities. The city of Chicago has joined, it gives us transportation, and about 3 weeks ago, Mexico City.

We've done this with a blue ribbon advisory committee. The blue ribbon advisory committee does include former members of this august group, David Boren, who is President of the University of Oklahoma, Joe Kennedy, Jr., a former member of the House, Jim Thompson, a former Governor of the State of Illinois, Jeff Garten, Senator, the head of Yale School of Management, Don Jacobs, Maurice Strong, who was Under Secretary General of the United Nations and organized the Rio summit. So we've benefited from enormous input.

Where does that take us? It takes us to the point now that we are thoroughly into the design process. We think a sector approach, which allows power companies to trade with manufacturing companies to trade with forest product companies will in fact give us some insight into how we can design a system like this in the most effective manner, serving both cheap electricity and mitigating greenhouse gas emissions.

Thank you.

Senator LIEBERMAN. Thank you, Dr. Sandor.

We'll begin, why don't we do 7 minute rounds, then we'll go as long as we need to. I'll pick up right at the end.

As you know, I believe my office has been in touch with you, Senator McCain and I are working together to see if we can develop a cap-and-trade system for carbon emissions as a way to reduce the threat from global warming. And we've had a series of interesting discussions with representatives of different sectors of the economy and we hope to get to a point before long where we can introduce legislation on this. But we're trying to do it in a way that's cooperative.

So your initiative is very interesting to us. I notice that you have several electric power companies that are heavy users of coal that are active participants in the Chicago climate exchange process. I wonder if you could talk just a little bit about their participation and whether by participating they have agreed to reduce their CO_2 emissions.

Dr. SANDOR. The participation in the process today, Senator Lieberman, is a commitment to work in the design, develop a consensus cut level and then to participate if the consensus is reached. So it is a conditional commitment. But I honestly believe that almost all of the companies, if we can reach the consensus and design the market architecture, will indeed go forward on a voluntary basis and accept caps and trade within the system. Part of it to learn, part of it to mitigate, and part of it to have it start in a way in which they can influence the design and objectives of the program.

Senator LIEBERMAN. We'll be watching it real closely. I appreciate very much what you're doing and I hope you look back at it and say it was a pioneering effort that led to a consensus response to climate change.

Mr. Lowe, I think I said your report was very exciting, which I find it to be. Clarify for me how many plants now are using the IGCC technology.

Mr. LOWE. We right now have about 23 units in operation using IGCC. A number of these utilize petroleum coke as a feedstock, not coal. The reason being that petroleum coke is essentially a waste fuel with very little value. IGCC can end up burning that in an environmentally beneficial manner and generating electricity on a cost competitive basis.

I think you all know that the primary power generation technology of the past decade has been natural gas fired gas turbine based technology. And in that situation with gas prices as low as they are, that has been the selection for power generation for the past decade.

Senator LIEBERMAN. And help me understand just a little bit more about what the potential of the IGCC technology is in reducing carbon, specifically, as a pollutant.

Mr. LOWE. I think the key to this, as was mentioned by Mr. Kripowicz, is the efficiency benefit that IGCC can end up delivering. As I've indicated, this is probably about five points more efficient or about 13 percent more efficient than comparable coal technologies right now. Now, I think both technologies are going to advance over the decade and there are going to be increases. But inherently, by using the combined cycle technology, there should be an advantage there. So just from the efficiency benefit, you will end up getting a comparable reduction in CO_2 emissions.

Senator LIEBERMAN. Efficiency in this case means what?

Mr. LOWE. It means when you figure the amount of coal that you have going into the unit and you consider the amount of electricity you have going out of the unit, you consider the total energy content going in with the total energy content going out. It was mentioned that the average unit today is about 33 percent efficient, the average coal unit. I think if you take a look at current modern coal units, they're probably approaching 39 or 40 percent efficiency. Mr. Amick mentioned that for something like the unit that he has referenced we're up at 44 percent efficiency.

So 39 to 44 percent efficiency is the five point difference I'm talking about. If you take that five points and divide it by the base of 39, you come up with a 13 percent difference in efficiency which ends up translating to 13 percent less carbon dioxide going out for a comparable amount of energy going in. That's what it has, and also we talked about carbon stripping or sequestration. Those are others that I think are longer range technologies.

Senator LIEBERMAN. But the most significant advantage will be because of the efficiency in regard to carbon?

Mr. LOWE. I think that's the inherent benefit that IGCC has, yes.

Senator LIEBERMAN. Let me ask what value or commitment GE has to the continued development of this technology. I guess I'm asking for the obvious reason, I'm trying to measure what this company, which is an extraordinarily well respected company, has judged to be the market appeal and viability of this technology.

Mr. LOWE. Well, certainly we believe that our customers ought to have a variety of different alternatives available to them in meeting whatever the emissions and energy benefits are. They should be using, as an example, pulverized coal for the burning of coal. We also believe that IGCC has a benefit in this area, too. And we have invested in this technology, between our corporate research and development center and our actual power systems business over the past 25 years and the tens of millions of dollars on this.

Senator LIEBERMAN. OK, keep it up.

Mr. LOWE. Thank you.

Senator LIEBERMAN. Mr. Kripowicz, your testimony suggests that a four-pollutant bill would result in a move away from coal. But at the same time, in your testimony you've told us, and I think there's general agreement on this, building off of what Mr. Lowe has just said, that there is tremendous potential for efficiency gains for coal plants in the next decade. So I want to ask you to try to bring those together. In other words, how can you then assert that compliance with a four-pollutant bill is not possible for coal plants?

Mr. KRIPOWICZ. The basic reason, Mr. Chairman, is that the options for greatly increasing the efficiency of coal are not in the market at this particular point. So if you have a control, a mandated control strategy right now about the only technology that is viable is natural gas, and you will have a tremendous effect on the amount of coal capacity used, until there is an economic benefit to going to coal gasification.

On the margin right now, for the next several years, we don't see with current gas prices a large market for integrated combined cycle coal gasification.

Senator LIEBERMAN. My time is up, I just want to ask you if you'd response to that, Mr. Lowe. Do you think that a four-pollutant bill would lead inevitably to a shift from coal to natural gas, allowing for what you see as the increasing efficiency that will come, for instance, with IGCC technology?

Mr. LOWE. I think if you take a look at the overall emissions that you're going to be having that certainly, if future plants going forward have a very low CO_2 emissions reduction requirement on them that yes, you'll look for the most efficient way to do that, and natural gas would be certainly an economically viable alternative for utilities to look at.

Senator LIEBERMAN. So how to avoid that?

Mr. LOWE. The way that I think you have to look at this, and I am certainly not a policymaker or policy judge, I am a technologist, and the issues are extremely complicated, as all of you are aware. But from a technology standpoint, I think we need to develop all of the possible technology alternatives that there are for increasing efficiency and decreasing CO_2 emissions and then let the market decide what is the economic way to comply with this.

Senator LIEBERMAN. Yes. Obviously the key is, if we want to deal with global warming, carbon reduction, and we want to continue to use coal to drive the technology as forcefully as we can, last year in May, the National Coal Council, if I'm correct, said that IGCC could get 20 percent increases in efficiency over the next 5 years. I think if that begins to happen, we'll move in exactly the direction we want to go.

Senator Voinovich.

Senator VOINOVICH. Yes, I think I'd like to get to the bill, and to the difficulty that we have. Senator Carper and I have talked, he's for the four Ps, I'm for the three Ps. The issue is, what does the fourth P mean. I'd like your—are you familiar with the Jeffords bill, all of you?

Mr. LOWE. No, I am sorry, I have not gone into the details of these bills and I really don't feel comfortable being able to give you an intelligent position on that.

Senator VOINOVICH. I'd like you to look at it and get back, because the concern is, the same question that Senator Lieberman asked, if you put the cap on carbon, is that going to result in people's fuel switching to some other fuel and see the demise of coal. That's one issue. The other issue is the mercury issue, which is something that all of us want to do something about.

The question is, are the numbers in the legislation for mercury realistic in terms of timing to achieve them. For example, many of us believe that if we would reach the higher standards for sulfur and for nitrogen that we would get a lot more co-benefit in terms of the mercury. If we come in and say, this is what you've got to do on the mercury, set it high and everybody puts their money into that, we're not going to have this efficient—again, it's going to cause some tremendous problems in the marketplace.

So I'm really interested in your comments about the CO_2 and the mercury. And then if we're looking at some other way of dealing with the carbon problem, Mr. Sandor, I'm really excited about what you're talking about, the private sector getting together and looking at it, but I think that in the work that you're doing, in S. 556, you're not going to be able to take credit for carbon sequestration from forests or agriculture, methane captured from landfills, and so forth. You're looking at the whole big picture, aren't you, in terms of your cap-and-trade?

Dr. SANDOR. Yes, because we think it's very important to have both an allowance based system, which is the Clean Air Act's approach with sulfur dioxide, and to have an offset system. Because it may be possible, and the market will tell us, that coal can be used extensively if we offset through renewables like methane destruction and landfills, reforests, we've got hundreds of millions of acres that are out there which we could potentially do that, reductions by chemical companies of N_2O, which is very, very potent relative to carbon, could be used by utilities.

This is what we're hoping to learn, how much interaction there will be and therefore, how cheap can we get mitigation down. And it is a multi-sector approach.

Senator VOINOVICH. But the bill, the Jeffords bill, would not allow that to take place, it doesn't include other beyond the utilities. The real issue is, if you don't cap the carbon, but you want to do something about carbon, what would be the vehicle that you could put in place that would give us reason to believe that you would start to reduce the carbon. I think that's really what I'm really interested in anybody's thoughts on, on how you achieve that.

Could you comment, any of you that are familiar with the numbers, in terms of the mercury requirements that are in the Jeffords bill and the timing and whether that's realistic or not?

Mr. KRIPOWICZ. Senator, as you know, the Administration agrees with the three-pollutant strategy approach, because we think we can get significant pollution reductions at a reduced cost. The Administration is now in the process of analyzing on an interagency basis the proper set of numbers for the Administration to come forward with, and we expect that we will do that in the near future. The numbers will probably be different than those that are in the bill, but they will definitively state what the Administration's position is.

Senator VOINOVICH. I would say, Mr. Chairman, that the Administration ought to get moving.

Mr. KRIPOWICZ. It's not an easy problem, Senator.

Senator VOINOVICH. We've been waiting and waiting and waiting. I think it's time for somebody to sit down at a table and work the numbers out and come back, because we are anxious to hear from the Administration about where you stand on some of these numbers. Because I think it's important to our maybe coming to some kind of a consensus or compromise or something like that. But as long as you're sitting out there and we don't know where you are, it's not helping the situation.

Mr. KRIPOWICZ. I understand.

Senator VOINOVICH. The other thing I'm interested in, and maybe this is not relevant, but we have new source review, which is an issue that's now before the Administration, a lot of controversy about whether or not they should change it or not, and so forth, and when it came in. But one of the things that I have heard in terms of the limbo, is that nobody is doing anything in terms of efficiency, because they're concerned that if they do, they may be violating the new requirements for new source review. Does that have anything to do with the issue of energy efficiency that you're talking about, Mr. Kripowicz?

Mr. KRIPOWICZ. It has some effect. I think the report that Senator Lieberman referred to from the National Coal Council said that if they made changes to existing capacity they could get as much as a 20 percent increase in generating capacity out of the existing plants. I think that is what is not moving forward because of the uncertainty over the new source review.

Senator VOINOVICH. That's the first time I became familiar—you're basically saying if you can make these facilities much more efficient that it will genuinely, from a technological point of view, definitely it will reduce carbon?

Mr. KRIPOWICZ. Yes, sir, that's correct. We can provide the National Coal Council report to the committee if you'd like to see it.

Senator VOINOVICH. Mr. Lowe, would you want to talk about your IGCC and your Tampa Electric facility? In my opening statement, I referenced it and it appears that the State of Florida now is superimposing some new things. This is supposed to be a coal-fired facility with your technology, now they're saying it's not enough and they want you to put a scrubber on.

Mr. LOWE. Yes, that's absolutely right. At that facility, we originally started that facility up, Tampa did, it was operating. That along with another recent permit that has come out have had either five or 3 year, what we call back tree openers in it, whereby after three or 5 years of operation, the operator is now faced with potentially additional controls to put on it.

What's being thought of at Tampa is to put a selective catalytic reduction device on it to further lower NOx emissions and selective catalytic devices work well on natural gas-fired units. We have them on a number of our gas turbines that are out and operating.

However, there are some significant reliability concerns associated with trying to put these on an integrated gasification combined-cycle unit because of chemical interactions that can occur, and can significantly decrease the reliability of this unit, which would be a significant disincentive to trying to go to a coal-burning technology like this.

So we strongly believe that the emission requirements that should be developed for IGCC should be coal-based emission requirements and that if either policy or regulatory decisions drive this to try and achieve equivalent natural gas type emissions, it will dissuade the implementation of what we believe to be a very positive coal-burning technology.

Senator LIEBERMAN. Thanks, Senator Voinovich. Senator Carper.

Senator CARPER. Robert Byrd has been a Senator here almost forever. Among the things he does is look out for West Virginia. As we all know, West Virginia sits on an abundance of coal. He's used his good offices to try to ensure that we infuse a lot of Federal research dollars into taking that abundance of coal and finding ways to extract energy from it in ways that are cleaner and less harmful to our environment.

A couple of you talked about clean coal technology. I want those of you who are familiar with that, just step back and give us a bit of an update on where we are. We've put a lot of money into it. There are, I think, a lot of reasons why I want it to work, and how are we doing?

Mr. KRIPOWICZ. Actually, through the Department's clean coal program, what I want to say at the outset, it was a program in cooperation with the industry. We put a third of the money in and the industry actually put two-thirds of the money in. We've demonstrated technology that increases the efficiency and reduces the cost of SO_2 scrubbers by 50 percent.

We demonstrated the technology for low NOx burners, which now will be on about 85 percent of the existing coal plants, resulting in billions of dollars of sales. We demonstrated improvements in the selective catalytic reduction technology for nitrogen oxide, reductions that have decreased the cost of that technology by about 50 percent. And now those systems are also being applied to coal plants.

The two demonstration plants that have been mentioned here, Wabash and TECO, were part of the clean coal demonstration program, and they provide the basis for going forward with gasification technology and atmospheric fluidized beds which is a very clean way of burning coal, similar to a normal pulverized coal plant. There's now commercial technology, both in the United

States and in the rest of the world, and there have been, I believe, over $10 billion worth of sales of that technology, all based on the demonstrations that were performed in this program and the follow-up by the industry in commercializing the technology.

Senator CARPER. Any other comments from those of you that are familiar with the work, the progress?

Mr. LOWE. Just addressing IGCC in particular, I think when you take a look at the potential risk from going from a cool water design at 120 megawatts up to 250 megawatts for the Wabash and the Polk unit, I'll tell you, technology challenges are not linear. So although you're doubling the size, it's more like the square of that for the technology challenges.

Those would not be commercial today if it weren't for the incentives in the clean coal technology programs.

Senator CARPER. I think, Mr. Lowe, you're the one who mentioned the petroleum coke and the use of petroleum coke. Do you see it in lieu of coal?

Mr. LOWE. At different refineries around the country, you see a situation where are burning petroleum coke in gasification processes that are burning this waste fuel and also generating power generation, yes.

Senator CARPER. When you burn it, what do you harvest in terms of emissions or waste from the burning of the petroleum coke and what do you do with it?

Mr. LOWE. It's the same kind of vitrified slag that you get out, which means that it's a non-leaching silicone gaseous kind of slag that you end up getting out. In fact, I believe that Mr. Amick can probably comment, at the Wabash unit I believe you are using some mixtures and sometimes totally petroleum.

Mr. AMICK. We have run Wabash on 100 percent petroleum coke many times in the last year. We've found that even when we're running petroleum coke, which is 5 and a half and 6 percent sulfur, that we make virtually the same environmental standards as we do with coal in our plant, which was designed for high sulfur coal in the first place.

The main difference is——

Senator CARPER. You say high sulfur coal, you mentioned 5, 5 and a half percent sulfur content in the petroleum coke. How does that compare with the high sulfur coal?

Mr. AMICK. While Wabash was originally designed for some 5 percent sulfur coals, by the time we built it, the high sulfur coal mines had mostly closed down. So we have run 3 and a half percent sulfur coal, which is seven times more sulfur than the sub-bituminous powder river basin type coals.

On petroleum coke, we have found the primary difference is in the ash by-product, the slag by-product. It's a reduced volume, but we've found that all of the trace metals that are in the pet coke get captured in the slag and passes not only the T clip, the first level of leachate testing, but the RCRA and the universal standard testing, too, all the higher limits that the EPA has not enforced on the coal-fired power plants yet. So we're putting these into asphalt and even some landfill cover applications.

Senator CARPER. I just want to fully understand the potential, just sitting here and listening for the first time to what you're trying to do, the potential sounds rather dramatic. Am I over-reacting?

Dr. SANDOR. I personally don't think so. I think that establishing markets look formidable. It appeared to be incomprehensive 30 years ago that you could transfer interest rate risk and develop a futures market for Government securities. Yet it made living with the vicissitudes of markets easy. We have worked on things like catastrophe index bonds, hurricane index bonds, earthquake index bonds, which transfer major risks. And in the SO_2 program, everybody thought that that would be very difficult and it was indicated that the costs would be ridiculous, $1,800, and they averaged $138 for the decade in the 1990's at the Chicago Board of Trade auctions.

I think this is, and the Joyce Foundation believes this is potentially a transformational project that we have the ability to draw lots of sectors and the debate now, and I heard one last week at the UNDP, some forecasts are for $7 a barrel oil equivalent in the costs. I happen to think it's going to be two cents. So I think we're at dramatically different scales here. Hopefully, the price discovery, the entities we have, cities like Mexico City, companies like Ford and AEP and Dupont working together, building this consensus, we hope in our own small way can turn this into a demonstration project that has real meaning.

Senator CARPER. The legislation that several folks have alluded to today is called the four-pollutant bill. I'll try to cap its slant on four areas. One is CO_2, my recollection is the legislation would require us by 2007 to have returned to 1990 levels of CO_2 emissions. My recollection is that the legislation also says that with respect to mercury, we have to peel back mercury emissions by about 90 percent by 2007. With respect to SOx and NOx, I think the legislation calls for a 75 percent reduction by 2007.

I don't know that the legislation provides for a trading, market mechanisms to facilitate our getting to those points. I'm not so much interested in asking our witnesses to tell us whether those goals or guidelines are doable. I would say to Mr. Kripowicz, just to sort of follow up on what Senator Voinovich said, we're all looking forward to your input and are anxious to have your input. We can go forward and mark up a bill and all, but it would be terrific if we had the Administration's input to work with as we go forward.

Given the objectives for by 2007 in those four areas, I'd welcome any thoughts that you have, not so much with respect to, is it doable, but with respect to costs, the cost implications to us as consumers, to those who are running businesses to provide electricity, the costs for buying the electricity that is generated, and maybe even the cost that's harder to measure, and that's the cost to our health and to our environment. Would you all want to take a shot at that?

Mr. KRIPOWICZ. There's no question that if you control versus not controlling, you're going to have a higher cost than you do now. But we believe that the costs for a three P approach, not necessarily as I said, the Administration will come up with alternatives to what the bill itself has, but it will address and assess the manageability of the cost for three P. But we think a three P strategy can be done with minimal cost to the consumer for the environmental benefit that you get.

One of the biggest problems with the carbon emission cap is that we think it will be extremely costly. And there are varied, I know EPA has done a study, but our Energy Information Administration has also done a study which I believe the committee has, that an emission cap would increase electricity prices by 43 percent between now and 2010 and by 38 percent by 2020 over the reference case that they normally run. So it would be a tremendous increase in cost, which is one of the reasons why the Administration opposes that approach.

Senator CARPER. Does anybody else want to jump in on that point, the costs that might be associated with CO_2 reductions? Mr. Sandor?

Dr. SANDOR. Yes, I think that one of the reasons that we're working on this demonstration project is because there is not significant empirical data to really forecast the price. That's why the private sector is saying, let's get a handle on price. If we make the mitigation efforts as broad as possible, perhaps we're going to discover, as we did with sulfur, that forecasts of $1,800 or $1,500 a ton turn into reality to 130, to 10 percent or 20 percent. But we think you need to learn from this sort of real empirical data that economists, while providing the construct for intelligent insight into matters like this from a forecasting point of view really need empirical data.

Senator CARPER. Mr. Kripowicz.

Mr. KRIPOWICZ. Senator, I would just add that we agree definitely with the concept of trading. It's a market based mechanism, it's worked very well in the Clean Air Act to reduce the costs. They are actually much lower than they were projected originally. So in any control scheme, a trading system helps a great deal, because you end up doing the cheapest thing in order to encourage trades. So then the market plays a role. So that's very important.

Senator CARPER. And you expect that will be part of the Administration's proposal?

Mr. KRIPOWICZ. I don't know that for a fact. We'll see soon.

Senator CARPER. Well, I'll be disappointed if it isn't.

Mr. Chairman, you've been generous with our time. Thanks very much. And to all the witnesses, thank you.

Senator LIEBERMAN. Thank you, Senator Carper.

Just a final word, and I think Senator Voinovich would like to say a word, too. I thank the panel.

I do want to indicate that Senator Jeffords and I are very serious about moving forward as far and as fast as we can with the Clean Power Act. I know that Senator Jeffords wants to sit down with at least the two of us and Senator Voinovich, Senator Smith as well as the ranking member on both the full committee and this subcommittee. Because we think this problem is so important.

We also just, drawing from what I've heard from this excellent panel, our feeling is that if we set a cap on not just the three pollutants, but carbon also, we will drive the technologies that will in turn not only make the production of electricity more efficient, including with the use of coal, but will have a whole host of other positive effects, one of which will be that the projected cost increases in electricity that Mr. Kripowicz has said will be far below anything that would be experienced.

We've just seen so much unbelievable beyond our imagination happen through technology and markets, and in an unusual way, I think we can say that in this war we've been waging in Afghanistan, we've seen the capacity to do things that, you know, not just Eisenhower wouldn't have dreamed of, Schwarzkopf wouldn't have dreamed of. We've got unmanned aerial vehicles flying 20,000 feet overhead at night that are able to see people and animals moving on the ground and track enemy and then hit them with laser precision guided weapons.

I use that because it's on my mind, and it's on all of our minds. If we can do that, we can figure out a way to drive technology to produce energy efficiently and without inflating the price through the use of technology. The experience here is exactly the one that Dr. Sandor and others have talked about, which is that we've had such a great experience with the market based caps on acid rain causing pollutants that were part of the 1990 Clean Air Act amendments, that have not only achieved enormous reductions in acid rain, but at a fraction of the cost projected.

So just to answer or pick up on something that Senator Carper said, the four-pollutant bill doesn't specifically set up a trading system after the cap, but it is certainly contemplated as one of the responses that the Administrator under the bill could adopt. The project that Senator McCain and I are involved in with folks at the Pugh Trust particularly would specifically, if enacted, establish a cap-and-trade system, pattern on acid rain.

So I think we've got a serious problem here in all the effects that global warming will have on the geography of the State of Delaware, which though a small State, is beloved by many.

[Laughter.]

Senator LIEBERMAN. But on our health, and on our economy. So I think it's worth trying to do. I just wanted to state that for the record, as we conclude.

Senator Voinovich.

Senator VOINOVICH. It's interesting that Senator Carper is worried about his State being inundated with water, and our major concern in Ohio is Lake Erie's low levels. So it's interesting.

My comment would be that this technology is expensive to be installed. Wouldn't you agree that if we're going to come up with some new legislation in this area in terms of setting some new caps on the emissions that we will need to continue to provide money for continuing clean coal technology and also some incentive to the utilities to utilize the technology that's available rather than fuel switch?

Mr. Lowe, you've been using your technology, but the word I get back from a lot of utilities is that yes, you've got some new technology out there, Senator, but a lot of it's very, very expensive and we're going to weigh the cost of that versus fuel switching and we'll put it on the balance sheet and if it looks like it's better to go with it, we'll do it, if not, we'll fuel switch to gas. And frankly, when you really think about this, they can do that and just pass it on to the customers. They are utilities. They just pass it on.

So I think that I'd like your comment on having this legislation and the importance of continuing the money for clean coal technology and also some vehicle that's available that would help encourage these people to make it worth their while to install the technology. Whoever wants to answer.

Mr. KRIPOWICZ. Senator, the Administration's budget has an emphasis on clean coal technology, as you know. President Bush has championed clean coal technology and has provided significant funding for it, which includes improvements in the kind of technology that we've talked about this morning, but also in the area of mercury control. We also had large increases last year in our carbon sequestration budget, because in the long term, we believe we'll have to sequester carbon too, and those technologies are now in the process of being developed.

So we very strongly support the development of the technology in the President's budget.

Senator VOINOVICH. Mr. Amick.

Mr. AMICK. I can say unequivocally, our technology, which is one of the top three coal gasification technologies in the world today, wouldn't be where it is today without the DOE support we've had at Wabash and at other research projects we've done. The technology today, I mean, it's not only technically ready, but it's commercially ready, because we've had plants like Wabash and like Tampa that have been demonstrations where not only the utilities but the bankers can go out and kick the tires and take a look at it.

You talk about things, mechanisms to motivate people to use the new technologies, what we saw in H.R. 4, which was production credits for clean coal technology, tied to very much improved efficiencies. From our standpoint, that was a great thing.

Senator VOINOVICH. Any comments, Mr. Lowe?

Mr. LOWE. I think I clearly stated that IGCC technology would not be where it is today without clean coal technologies. I think that needs to be continued to be funded over the coming years.

Senator VOINOVICH. Well, we're hoping to have an energy bill debated in the Senate. And one of the parts of it that's going to be very important is that the Finance Committee is going to be considering the tax portions of H.R. 4. I think it's incumbent upon those of us that are interested in this area to make sure that that part of H.R. 4 that deals with technology incentives to move forward are maintained, so that if we do come up with a compromise, that it will be melded into that compromise and we can move forward and people will feel a lot more comfortable about what we're asking them to do.

Thank you.

Senator LIEBERMAN. Thanks, Senator Voinovich. Incidentally, one of the other committees I'm on, the Governmental Affairs Committee, reported out last fall or early winter an excellent proposal introduced by two of the titans of the Senate, Senators Byrd and Stevens, on climate change, which requires the establishment of an office in the White House to develop a national strategy to deal with climate change. But I mention this because significantly, and perhaps not surprisingly, but appropriately, it focuses and increases support for clean coal technologies through the Energy Department.

The other thing I meant to say at the end of my previous remarks, in terms of the discussion about new source review, just to put an optimistic ribbon on it, which is that if caps or other methods, but I believe caps, drive technology to make the production of electricity more efficient, then the plants will be more efficient and they won't trigger the new source reviews. So that's another way to avoid the kind of conflict that we're talking about.

I think we'd better go on to the second panel. So I thank the first panel, you've been very, very helpful and very encouraging. Have a good day.

Our first witness on the second panel is Mr. Michael Durham, President, ADA Environmental Solutions of Littleton, Colorado. The second witness will be Mr. Richard Miller of the Fabric Filter and FGD Sales Manager, Hamon Research-Cottrell, Inc., Walnutport, Pennsylvania. Then to Mr. Frank Alix, CEO of the Powerspan Corporation, of New Durham, New Hampshire. And finally, George Offen, Area Manager for Air Emissions and By-products of Electric Power Research Institute of Palo Alto, California.

This is a remarkably geographically diverse panel. We thank you for coming from as far and wide as you have come and Dr. Durham, we'll begin now with your testimony.

STATEMENT OF MICHAEL D. DURHAM, PRESIDENT, ADA ENVIRONMENTAL SOLUTIONS, LITTLETON, COLORADO

Mr. DURHAM. Good morning, Mr. Chairman. I'm Dr. Michael Durham, President of ADA Environmental Solutions. We are a company that develops and commercializes new air pollution control technology for the power industry.

We are currently managing a $7 million program involving a team of the Nation's leading engineers and scientists to scale up and demonstrate sorbent-based mercury control technology. The Department of Energy is providing two-thirds of the funding for the program. The remaining funds are provided by team members, including PG&E, Southern Company, Wisconsin Electric, EPRI, Ontario Power, FirstEnergy and TVA.

During 2001, we successfully completed two short term programs that represent the first full scale demonstrations of sorbent-based mercury control technology in the U.S. power industry. Tests were conducted on both bituminous and sub-bituminous coals. I have submitted detailed documents presenting results from these two successful programs. These results provide us with an early indication both of the high potential and the current limitations of this technology. This morning I will briefly summarize results and discuss plans for continued development.

Sorbent injection technology represents the simples and most mature approaches to controlling mercury emissions from coal-fired boilers. It involves injecting a solid material, such as powdered activated carbon, into the flue gas. The gas phase mercury contacts the sorbent and attaches to its surface. The sorbent with the mercury attached is then collected by the existing particle control device along with the fly ash.

Two 150 megawatt demonstrations were conducted during 2001. The first program was completed in the spring at the Alabama Power Gaston Station, which burns a low sulfur bituminous coal and uses a fabric filter to collect the carbon and fly ash. The second program was conducted during the fall at the Wisconsin Electric Pleasant Prairie Power Plant, which burns a sub-bituminous PRB coal and uses an electrostatic reciprocator to collect the carbon and fly ash.

These programs demonstrated that it is possible to design, build and operate equipment at a scale capable of treating power plant flue gas. We are encouraged by the potential shown for this technology in that short term removal levels in excess of 90 percent were achieved. These tests also prove that activated carbon was effective on both forms of mercury, including elemental mercury, which has been proven to be the most difficult form of mercury to collect. Elemental mercury is a dominant species produced by PRB coal and it is also produced by many bituminous coals.

However, these results also documented limitations of the technologies. Please refer to figure one in my submitted testimony, which is a comparison of the results from these two sites. You will see that the downstream particle device is the dominating factor in determining removal efficiency. While removal levels of 90 percent were obtained with a fabric filter, even with spray cooling ESP was limited to removal levels of 50 to 70 percent.

Since only 10 percent of plants currently have fabric filters, additional capital expenditures were required to achieve the higher levels at the majority of the power plants. It was also discovered that the presence of activated carbon in the ash prevented its use in concrete. This represents a significant expense that must be incorporated into the cost of technology.

Also it should be noted that these tests ran only for short periods of time with the longest continuous run being 2 weeks. Even with constant load conditions, with variations in the coal, it was not possible to maintain the 90 percent removal levels over a 5-day continuous run.

In conclusion, powdered activated carbon injection offers a promising approach for mercury control for coal-fired boilers. The injection equipment is relatively inexpensive and can be installed with minimal down time to the plant. It is effective for both bituminous and sub-bituminous coals, and when interfaced with a fabric filter, is capable of high levels of mercury removal.

However, additional testing is required to further characterize the capability and overcome the limitations of this technology. It is important to determine performance on a wider variety of coals and different plant operating conditions. Long term testing will be necessary to document impacts on downstream equipment.

As with other air pollution control technologies, sorbent-based mercury control needs to go through a phased approach as it matures to become accepted as commercially viable. We plan to participate in partnerships with DOE and power companies in risk shared programs, such as the clean coal power initiative, to continue to advance this promising technology.

Thank you for this opportunity to testify.

Senator LIEBERMAN. Thanks, Dr. Durham. I look forward to questions and answers.

Next is Richard Miller of Hamon Research-Cottrell, Somerville, New Jersey.

STATEMENT OF RICHARD L. MILLER, SALES MANAGER, FABRIC FILTERS AND FGD SYSTEMS, HAMON RESEARCH-COTTRELL, SOMERVILLE, NEW JERSEY

Mr. MILLER. Thank you, Mr. Chairman.

As was said, my name is Richard Miller. I'm Sales Manager for Fabric Filter and FGD Systems at Hamon Research-Cottrell. We've been in the business since 1907, when Dr. Frederick Cottrell first invented the first industrial electrostatic reciprocator. So our company has a long history of solving environmental air pollution control problems. This is just one of them.

In part of my testimony I wish to offer the following information, just as some highlights of it. Effective mercury reduction levels have been shown to occur naturally to various degrees across existing power stations. This is from the coal pile to the stack, so it depends on what type of environmental devices are in between.

Removal rates in excess of 90 percent have been achieved at some of these plants. Data suggests that it is easier to remove the mercury from eastern coals than it is from western or even some low grade coals such as lignite. Most existing power stations have electrostatic precipitators installed for particulate removal. A smaller number, but growing number, have fabric filter stations or installations, which generally remove a greater amount of particulates than other flues.

One commercially available removal technology which we want to talk about is called COHPAC, which stands for compact hybrid particulate collector. This was originally developed by the Electric Power Research Institute, or EPRI, as a multi-pollutant control device. It combines the existing precipitator with a hybrid pulse jet fabric filter that's added in series with it. It acts as a final polishing device.

With the use of COHPAC under recent short term test program conducted by DOE and operated by ADA-ES, an aging Hot-Side electrostatic precipitator which originally had shown levels as low as zero percent mercury capture was able to effectively achieve mercury reduction levels of 80 to 90 percent, using an activated carbon injection system. Additional testing is encouraged to confirm long term removal rates and any potential impacts on the existing system.

Mercury removal rates of 50 to 70 percent can be reasonably be expected to be achievable across precipitators alone, but it is expected to require greater amounts of sorbent, such as powderized activated carbon, which could result in higher O&M costs than fabric filter systems alone. Today, commercially available cost effective air pollution control technology have already achieved 90 percent mercury reduction levels on certain coals and operating conditions, again depending on the type of air pollution equipment present.

We in our industry recognize there's a cost to achieve the improved air quality. But you must also recognize that this investment has a high rate of return, not only in improved air quality but also in a highly efficient economic stimulus to a sluggish economy, which results in the creation of many jobs. Some utilities are even now ready to meet these challenges and await the implementations of these new regulations and time schedules.

As we heard earlier, Mr. Chairman, by Senator Corzine, Mr. Frank Cassidy of PSE&G Power back in July 12 last year, in a testimony before the Senate Committee on Commerce, Science and Technology, gave his support for the four-pollutant emission reduction program for the electric power industry. This past Thursday, on January 24, they announced an agreement with EPA and New Jersey Department of Environmental Protection for a 10 year comprehensive program to reduce emissions at their New Jersey coal-fired power plants, which currently burn low sulfur eastern bituminous coals.

PSE&G agreed to install state-of-the-art SCR and dry FGD technologies at both their Hudson and Mercer facilities, as well as a fabric filter system to be added to their Hudson facility. Guaranteed reductions included the 90 percent NOx, 90 percent SO_2 reduction, plus a 90 percent reduction in mercury levels across their systems, not to mention an additional 90 percent reduction at Hudson Station by adding in the fabric filter collector to the system. This is in addition to a 15 percent voluntary CO_2 reduction level.

So you can see the utilities are ready, they just need a little bit of a push sometimes to get started. And we ourselves are ready to deliver the equipment to meet the requirements.

So again, thank you, Mr. Chairman, for the opportunity to present my case to you.

Senator LIEBERMAN. Thank you, Mr. Miller.

Mr. Alix, of Powerspan Corporation.

STATEMENT OF FRANK ALIX, CHAIRMAN AND CEO, POWERSPAN CORPORATION, NEW DURHAM, NEW HAMPSHIRE

Mr. ALIX. Thank you, Mr. Chairman, for the opportunity to present Powerspan's perspective on the Clean Power Act.

Powerspan is a company formed in 1994, we're located in New Hampshire. We have about 50 scientists and engineers and we've had about $30 million of outside capital from venture capitalists and utilities invested to develop this technology. Our technology is called electrocatalytic oxidation, or ECO. It's distinguished by the ability to remove high levels of SO_2, NOx, mercury and fine particles in one compact installation.

We've got funding from FirstEnergy, American Electric Power, Cinergy, Ameren and Allegheny Energy. In a two megawatt slipstream test conducted for FirstEnergy in Ohio, we reduced emissions of mercury below minimum detectable limits, which is greater than 81 percent in that installation. We also believe, based on recent tests, our technology will be commercially able to remove 99 percent of the SO_2, 90 percent of the NOx or better, and we believe 80 to 90 percent of the mercury.

We produce a commercially valuable by-product, avoiding the need for new landfill disposal sites. We also estimate that our capital and operating costs will be about one half that of FGD and SCR systems when commercial.

Our first commercial unit, we've done the engineering and expect the installation to commence in the spring, also in Ohio, at FirstEnergy's Burger Plant. It's a 50 megawatt slipstream unit. It will be scaled commercially in all component and major designs. Based on that, we expect to have the commercial units available for larger installations beginning in 2003 and on out into 2005.

In considering the legislation, the Clean Power Act, we think there are some things that can play a real vital role in bringing new technology to the forefront that we'd like the committee to consider. First off, as you've mentioned, environmental technology is driven completely by environmental regulations. But we need certainty and time, as well as the utilities, to deploy our technology.

It takes a great deal of capital and about 5 years to get a technology like ours to market. So a legislation where you can telegraph the requirements 5, 10, 15 years in advance are a great aid to developing the most cost effective technology.

Second, the cost of environmental compliance is usually quite a bit less than predicted. The panel before made that quite clear on SO_2. We expect the cost of compliance with the provisions in the Clean Power Act will be quite a bit less, including mercury. I think there is some fine technology being demonstrated for activated carbon and fabric filters that we've heard discussed already. Our technology being retrofit to a coal-fired plant without any controls could get that done for an incremental cost that is quite small compared to current estimates.

I think the type of legislation, in terms of how individual pollutants are regulated, is also important. Traditionally, one pollutant is regulated at a time. So a plant owner might have to install mercury controls today, NOx controls in 5 years, SO_2 controls in 10 years. For a technology like ours that removes all three, that makes it very difficult to sell a multi-pollutant approach. We'd like to see limits that have a transition period that's very similar and overlap, so that we have some incentive to install the most cost effective solution.

Another potential problem is that reductions can be made early when compliance benefits are given for early compliance, then other reductions are made at the last possible minute. I think this makes good business sense for a utility, but for the air pollution control industry, it puts them in a feast or famine mode. I think that whatever reductions are called out in the Clean Power Act, it would be helpful for the industry to make those staged over time, so that we didn't reach a limit in 10 years that dropped off a cliff, and it wasn't until 8 years from now when people got serious about putting in controls. It makes a big difference for us.

Last, I think there is a lot of uncertainty about mercury and carbon control technologies. One thing I will say for certain, though, is that if you don't have a regulation for either, you'll never have the technology. So we're quite clear about that. I think one way of limiting risk and potentially coming out with a good outcome is things that we use in the financial community. Certainly my investors are quick to use them with me, and that's something called a ratchet or circuit breaker. In the case of a circuit breaker, of course, you set a fairly strict limit. But if the costs become prohibitive, you give the administrator some type of relief that they could either impose on a State basis or an industry basis or a plant basis.

In the case of a ratchet, if the costs are much lower than predicted, you could continue to drive down the cap. That would be a great incentive for a company like us, that we believe we have a very low cost combined technology available to continue developing our technology and to get even greater benefits than might be conceived today five to 10 years from now.

So I just suggest that as a potential opportunity to bridge this gap between the uncertainty of wanting fairly significant emission reductions but not knowing if the technology will be there. I'd like to propose that they be done in combination, so that if the technology in fact surpasses our expectations, then perhaps there's a way to ratchet these limits even tighter.

In summary, I believe, like you do, that we need to have a cleaner environment and power and security. I think that we do have an innovative entrepreneurial spirit in our country. There are a lot of people like this at Powerspan out there trying to make this happen. I think if you take a leap of faith and deliver the legislation, we'll show you, like companies have in the past, that we'll deliver the technology to do it. Thank you very much.

Senator LIEBERMAN. Thank you, Mr. Alix. We appreciate your testimony very much. I like the vision of this as a faith based initiative.

[Laughter.]

Senator LIEBERMAN. Mr. Offen.

STATEMENT OF GEORGE R. OFFEN, MANAGER, AIR EMISSIONS AND COMBUSTION BY-PRODUCT MANAGEMENT, ELECTRIC POWER RESEARCH INSTITUTE

Mr. OFFEN. Thank you, Senator Lieberman, and thank you for inviting EPRI to address your subcommittee on this important subject of mercury control.

As you mentioned, I manage EPRI's programs in air emission reduction and beneficial use of combustion by-products, which we've put together because of their relationship. EPRI was established nearly 30 years ago as a non-profit, collaborative R&D organization to carry out electricity related supplies, delivery, end-use and environmental R&D in the public interest.

We've been supported voluntarily since our founding in 1973 and our funders include electric power companies that are responsible for over 90 percent of the electricity sold in the United States, as well as 60 companies overseas. We also cooperate very closely with Government agencies in our research programs, including EPA and DOE. I would point out this is especially true in the case of mercury, the demonstrations that Dr. Durham and Mr. Miller talked about earlier were ones in which we collaborated.

For well over a decade, EPRI has been conducting research on all aspects of mercury, on the sources of it, the way it moves in the atmosphere and how it gets changed in the atmosphere, the potential health effects and control technology. In my remarks today, we'll focus just on the latter topic. We'll provide you with EPRI's conclusions on today's state of the technology in mercury control. We provide supporting facts in the submittals.

I just emphasize the word today, because our understanding of the technology is changing, and often dramatically, on a daily basis. We know quite a bit about the current emissions of mercury, we have quantitative data on mercury emission rates and reductions obtained by controls that are currently in place to reduce particulate and SO_2 emissions. These data have shown us that the emissions vary significantly from power plant to power plant depending on the fuels they fire and the air pollutant controls they have for other pollutants.

However, because these data are all based on measurements that are snapshots in time, and unfortunately, several years ago, when these measurements were made, we did not know all the properties of the gases that we now know are important to have measured, they weren't all collected. So we do have a substantial uncertainty about how to relate those measurements to averages that could be used to set realistically achievable emission limits for all plants.

Similarly, we've seen cases where the combination of SCR for NOx controls and SO_2 scrubbers do capture a significant amount of mercury. But it seems to be only with certain designs, and there's a question that has arisen as of some data we obtained earlier this year about the durability of the catalyst to do that, does that only happen when catalysts are fresh.

We go beyond the capture available from controls and other air pollutants, and we're rapidly gaining experience, as you heard earlier, with activated carbon injection, which we think is the technology most likely to be available first. At this point, we can estimate emission reductions within a range of 10 to 20 percent, but our experience is limited to a few combinations of fuel and air pollution controls. All of it is short term. I apologize for repeating comments you've heard already.

We therefore think that additional long term full scale tests are needed to obtain data on what we would call sustainable emission levels and on the impacts of the added carbon on both other air pollution controls and the usability of fly ash. These all affect the real costs of this technology and can dramatically.

Looking to the future, EPRI, DOE and others such as Powerspan are actively developing new technologies aimed at providing lower cost options than carbon injection or providing methods for taking advantage of an existing plant SO_2 scrubber, and methods that don't produce the waste. While some of these processes are quite innovative and look very promising, most are still in the early stages of development.

EPRI believes that some 20 full scale long term demonstrations of carbon injection and promising emerging technologies are needed to provide industry and the regulatory community with the information required to establish realistic emission limits for mercury. To conduct a program of this magnitude on an expedited schedule requires a public/private partnership. We're discussing such a collaborative program with both our funders and with DOE.

To conclude, I offer you EPRI's assessment of mercury control capabilities as we know them today. About 40 percent of the potential mercury emissions are already being removed by air pollution controls that are in place today across the electric power industry. And actually, more is being removed if you consider the amount that's removed by coal washing, and that doesn't seem to be discussed or measured too much, mainly on eastern coals.

Further reductions are definitely expected as additional NOx and SO_2 controls are added to meet current regulatory programs for acid rain, attainment of ozone and fine particulate standards. But exactly how much mercury will be removed as a result of these programs and at which sites remains a question, again, largely due to the question on SCRs role that I mentioned earlier. Depending on the particular controls in place, or added for the purposes of mercury controls, activated carbon injection could be expected to capture between 50 and 90 percent of the potential mercury emissions. Again, we need to answer questions on sustainable operation, impacts and costs using long term tests on full scale.

Emerging technologies do offer the promise of similar reductions at lower costs as well as solutions for difficult plant configurations. However, we will require a substantial research investment and therefore, we cannot really predict the availability dates, performance and final cost until the research is further along. EPRI has been in the business of evaluating technologies for many years. We have seen many successes and we've also seen many changes in direction. Unfortunately, one of these experiences was last spring when an ADP demonstration was stopped prematurely, as an example.

So that's our summary, and I thank you again for giving EPRI the opportunity to provide these comments.

Senator LIEBERMAN. Thanks very much, Mr. Offen, and thanks to the entire panel very interesting and encouraging reports.

I'm just going to ask one brief question. Unfortunately, the bells you heard behind you and the lights I see on the clock are telling me I've got about 3 minutes to get over to the floor and cast a vote. I think I made my inclinations pretty clear in the last panel, which is, I do feel strongly that the kinds of encouraging technological developments that you've spoken to here really would benefit from caps. Those caps would both give the consumer, in this case utilities, certainty of what the field was going to be, and then would in turn drive and assist the technologies you're developing.

My short question, asking a short answer, is, do you agree with me? Do you favor the caps that we've talked about?

Mr. ALIX. I favor caps.

Mr. MILLER. We need some kind of cap where you have nothing to target toward. We have to have that as a target.

Mr. DURHAM. And also, anything that provides flexibility to the utilities in achieving the caps will help the cost benefit of the process.

Senator LIEBERMAN. Well said.

Mr. OFFEN. I'm not going to comment on caps, because everyone takes a position on this legislation. I will say some of the comments that Mr. Alix made, though, I think, could be tied into that. He's absolutely right on the ball, on the button, when he said that what you need is a phased in program so that you learn, the reason some of the technologies have been reduced in cost, like scrubbers, is the initial installation, they were all high cost. But the fact that later installations learned from earlier installations, a phased-in approach is essential to achieving whatever goals you want to achieve at the best, most economical way and least destructive way.

Senator LIEBERMAN. Thank you all very much. I'm going to leave the record of the hearing open for 2 weeks. We'll probably want to direct some questions to you in writing. Your testimony today has been very helpful, we look forward to continuing to work with you on this problem. I thank everyone who's put the hearing together, and the hearing is now adjourned.

[Whereupon, at 11:30 a.m., the subcommittee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF ROBERT S. KRIPOWICZ, ACTING ASSISTANT SECRETARY FOR FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. Chairman and members of the subcommittee: I am pleased to have the opportunity to participate in the discussion today. As Acting Assistant Secretary for Fossil Energy, my remarks will concentrate primarily on the programs in my area.

The Administration will have activities that are carried out by many agencies throughout the government. While I will touch on issues and activities in other areas, I would defer to experts in other programs to discuss their efforts with you in more detail. The Administration strongly opposes including reductions for carbon dioxide in S. 556 or any multi-pollutant bill. Pursuing sharp reductions in CO_2 from the electricity generating sector alone would cause a dramatic shift from coal to natural gas and thus would run the risk of endangering national energy security, substantially increasing energy prices, and harming consumers.

Unlike sulfur dioxide, nitrogen oxides, and mercury, carbon dioxide is not a pollutant. Addressing CO_2 is a question of climate change policy and separate from clean air policy, which the Administration's pending multi-pollutant proposal will address.

The Administration will not support any legislation that would cause a significant decline in our nation's ability to use coal as a major source of current and future electricity. At the same time, the Administration supports efforts to enhance the cleanliness of coal-fired electricity generation and promote a future for clean coal technology. In short, the Administration supports a clean coal policy as a critical component of our nation's energy and environmental policies, recognizing that other sources of energy also have a critical role to play.

The Administration recognizes the seriousness of the buildup of greenhouse gases in the atmosphere, even as scientists attempt to learn more about their actual effect on the earth's climate.

We know that the surface temperature of the earth is warming. We know that there is a natural greenhouse effect caused by atmospheric concentrations of carbon dioxide, water vapor, and other gases that contributes to this warming.

We know that the increases in atmospheric greenhouse gas concentrations since the beginning of the Industrial Revolution are due in large part to human activity.

Yet there is much we do not know. We do not know how much effect natural climate fluctuations have had on warming. We do not know how much our climate could, or will, change in the future. We do not know how fast change will occur, or even how many of our actions could impact it. We do not know the degree to which actions taken by one country, or group of countries, might be offset by the actions, or inactions, of other countries.

None of these uncertainties are cause for inaction, however. As President Bush said on June 11, 2001, "The policy challenge is to act in a serious and sensible way, given the limits of our knowledge. While scientific uncertainties remain, we can begin now to address the factors that contribute to climate change."

The Framework Convention on Climate Change, to which the United States is one of 186 signatories, sets the long-term goal of stabilizing future concentrations of greenhouse gases at a level that would avoid "dangerous anthropogenic interference with the climate system." There are two ways to achieve this stabilization. One is to avoid emitting greenhouse gases in the first place; the other is to capture and store them after they have been emitted.

While we are not now able to identify a concentration level that would pose "dangerous interference," the President's National Climate Change Technology Initiative, which he announced on June 11, will focus on cutting-edge technologies to avoid, capture and store carbon dioxide missions as we pursue the long term goal of stabilization.

The Nation's Power Industry

To understand the long-term need for an expanded menu of carbon management options for electric utilities, it is important to understand the current make-up of the Nation's electric power industry.

The U.S. power generating sector remains the envy of the world. On any given day, 3200 utility and 2100 nonutility generators can make available up to 775,000 megawatts of electricity for virtually every home and business in the country.

As the pie chart shows, fossil fuels supply about 70 percent of the Nation's requirements for electricity generation. Coal, alone, accounts for more than 50 percent of the electricity Americans consume. Primarily because of the power sector's use of abundant supplies of American coal and natural gas, consumers in the United States benefit from some of the lowest cost electricity of any free market economy.

U.S. Electricity Generation by Fuel

America's economic progress and global competitiveness have benefited greatly from this low cost electricity.

Electricity is an essential part of America's modern economy. As this chart shows, while the nation has made dramatic progress in "decoupling" overall energy consumption from economic growth, increased economic activity remains closely linked to the availability of affordable electric power—and is likely to remain so for well into the future.

The Nation's demand for electricity is projected to grow significantly over the next 20 years. Between now and 2020, the United States will likely have to add from 350,000 to 400,000 megawatts of new generating capacity to meet growing demand. This is equivalent to adding the entire power generation sectors of Germany and Japan, combined, to the U.S. power grid. Or put another way, to keep up with demand, the United States will have to build 60 to 90 new generation units of typical size each year for the next 20 years—in other words, adding more than one new plant every week.

Concurrent with this dramatic—and capital intensive—expansion of the Nation's power fleet, power generators will also be called upon to make new investments in pollution control technologies to meet tightening environmental standards.

Over the past 25 years, America's electric utility industry has invested billions of dollars in advanced technologies to improve the quality of our air. Each year, a substantial portion of normal plant operations costs—again amounting to several billions of dollars a year—are also associated with operating technologies that reduce air emissions.

The investment has returned dividends. By installing new technologies to capture particles of fly ash, the power industry has dramatically reduced particulate matter governed by the PM–10 national air quality standard. The power industry has also installed sulfur dioxide controls on more than 90,000 megawatts of capacity as part of a successful effort that has cut SO_2 emissions substantially since 1970. Many of the nation's coal-fired plants have also installed nitrogen oxide controls that have helped keep these emissions in check until more substantial controls are placed on these units in the future.

Energy and Economic Growth

In short, advanced technology—given the time to mature and be deployed—can be effective. Technological improvements have permitted the Nation's power sector to continue generating relatively low cost power and, at the same time, use the energy resources America has in most abundance. America's use of coal, for example, has actually tripled since 1970 even as our air has become cleaner. Advanced technology also offers a pathway toward the prospects of achieving even greater reductions in air pollutants in the future. An important question confronting policymakers today is: can the same cost-effective progress be made in reducing carbon emissions using improved technology?

Carbon Management Options for Power Generators

A number of factors—both natural and manmade—contribute to the greenhouse effect. Water vapor in the air, for example, has the largest greenhouse effect, but its concentration is determined internally within the climate system, and on a global scale, is not affected by human sources and sinks. Methane, ozone, nitrous oxide, and chlorofluorocarbons are other greenhouse gases in addition to carbon dioxide.

In terms of carbon dioxide, utilities currently account for about one-third of the CO_2 emissions released in the United States by human activity. One challenge is to decouple greenhouse gas emissions and the use of low-cost, reliable fuel resources—in other words, reduce emissions while avoiding the economic disruption of a massive overhaul of the Nation's energy supply system.

There are generally three approaches for accomplishing this "decoupling." One is to use energy more efficiently. The second is to place greater reliance on renewables, nuclear power, and low-carbon fuels such as natural gas (and eventually perhaps, hydrogen). The third is a more recent approach now gaining increasing momentum in the technical community: to capture carbon gases from energy systems and store them.

Approach 1—More Efficient Energy Use: Most people associate the term "energy efficiency" with the consumption of energy—i.e., more efficient automobiles, home appliances, and manufacturing equipment. Indeed, the United States has become a much more energy-efficient nation in the past quarter century. Had Americans continued to use energy as intensively as they did in 1970, the U.S. economy would today be consuming about 177 quadrillion Btus (quads) of energy, rather than the 99 quads we actually consume.

But as the President's National Energy Policy points out, "energy efficiency" improvements can also be applied at the point where power is generated—at the power plant itself.

Today, an average coal-fired power plant converts about 33 percent of the energy value of the incoming fuel into usable electric power. An average natural gas combined cycle turbine plant converts from 40 to 50 percent of its fuel into electricity. Most of the unused energy is discarded as waste heat.

This offers tremendous potential for energy savings—and corresponding carbon reductions—by improving the fuel-to-electricity efficiencies of both current and future power plants. For example, if we could boost just the average coal-fired power plant efficiency, alone, from 33 percent to 35 percent, the energy savings would be equivalent to:

- weatherizing 82 million homes—or roughly every home in the country that isn't currently weatherized, or
- replacing 300 million 100-watt incandescent light bulbs with fluorescents, or
- installing 7.4 million commercial heat pumps.

Such an efficiency gain would also reduce carbon emissions from power generators by nearly 26 million tons per year.

Achieving this modest efficiency improvement in today's power plants could be relatively cost-effective. In some cases, advances in computer systems—i.e., the use of artificial intelligence to optimize burner performance and other plant operations—might be sufficient to achieve the increased efficiencies.

Moreover, 66 percent of U.S. coal-fired power plants—representing 200,000 megawatts of power capacity—are 20 to 40 years old and could be candidates for "repowering" with improved, higher efficiency combustors or new, even more efficient power generating options.

A renewed interest in supercritical coal-fired power plants is occurring as power plant designers incorporate major improvements in materials for boilers and steam turbines that have occurred since the early 1980's. These plants, which operate at higher steam temperatures and pressures, will show significant efficiency advantages over older "sub-critical" units.

As important as these incremental advances in efficiency will be, in actuality, we believe they are only a small step toward what might ultimately be feasible. With technology development underway in the United States and overseas, the power industry is now preparing for a major step forward with a new generation of even more efficient power plants.

We see the potential for coal-based power technologies emerging within this decade with efficiencies in the range of 40–45 percent; and by the middle of the next decade, we could have technologies in place to boost efficiencies to as much as 60 percent.

One of the best prospects for achieving these significant boosts in power efficiencies is coal gasification combined cycle—an emerging technology in which coal is converted into a combustible gas, rather than burned directly, and the gas is cleaned and burned in a gas turbine. The exhaust from such a system remains hot enough to drive a conventional steam turbine, producing a second output of power—accounting for the name combined cycle—and resulting in the significant boost in efficiencies.

The Tampa Electric Coal Gasification Combined Cycle Plant

The first pioneering coal gasification combined cycle plants are already operating. Two are in the United States. Built as government-industry "clean coal technology" partnerships, commercial-scale (250-megawatt class) power plants are running near Tampa, FL, and West Terre Haute, IN. They are the cleanest coal-fired power plants in the world. Their first-of-a-kind efficiencies are already approximately 40 percent or more, and they are providing the essential "real-life" data that engineers can use to make further efficiency improvements in the future.

Natural gas systems are also benefiting from gains in efficiencies brought about by recent R&D. Within the last 2 years, as a result of DOE-industry technology partnerships, U.S. turbine manufacturers have introduced advanced turbines that will top the 60-percent efficiency mark for combined cycle operation—a threshold once considered the "four minute mile" of turbine technology.

Not only will advanced high-efficiency turbines be used in future gas-fired power plants—including plants now being built in New York and Florida—they also provide a means for enhancing the performance of future coal gasification power plants.

Even higher efficiencies may be possible by developing "hybrid" combinations of advanced gas turbines and fuel cells. The first prototype systems are being designed and tested. A 220-kilowatt solid oxide fuel cell/microturbine is being readied for operation in California. A 1-megawatt system is on the drawing boards for Ft. Meade, Maryland. If the current high costs of fuel cells can be reduced and the technical challenges of linking a fuel cell with a turbine can be overcome, it may be possible in the future to generate electric power from fossil fuels at efficiencies of 75 to 80 percent or higher.

The carbon reduction potential is significant. If power plant efficiencies can be increased by 50 percent over today's deployed plants, greenhouse gas emissions could be reduced by more than 340 million tons of carbon per year by 2050.

Approach 2—Greater Reliance on Low-or No-Carbon Fuels: Natural gas currently provides only 16 percent of U.S. electricity generation. But natural gas is projected to be the dominant source of fuel for new power plants in the next two decades. As much as 90 percent of capacity additions between 1999 and 2020 could burn natural gas. The amount of natural gas used in electricity generation is projected to triple by 2020.

Natural gas emits about half the carbon emissions of coal. Yet, the dominant growth of natural gas use in the power markets is neither certain, nor necessarily desirable from an energy diversity and economic standpoint.

Low natural gas prices in 1998 and 1999 caused the industry to scale back drilling and production. In 2000, natural gas prices quadrupled, which led to substantially higher prices for electricity generated with natural gas. While supplies are up this winter, these price fluctuations illustrate some of the difficulty of over-reliance on natural gas.

Natural gas will likely be the preferred fuel for new power capacity if natural gas prices remain below $3.00 per thousand cubic feet. If gas prices, however, rise much above $4.00 per thousand cubic feet, it is likely that many power generators will turn back to coal or other power generating options.

Nuclear energy accounts for 20 percent of all U.S. electricity generation. Nuclear power emits no carbon dioxide emissions at all; therefore it holds great potential for contributing to the long-term goal of stabilizing greenhouse gas concentrations. Yet, for a variety of reasons, including uncertain capital costs and length of construction, no new nuclear plants have been ordered in the United States since 1973.

Since the 1980's, nuclear power plant operations have substantially improved. While U.S. nuclear plants once generated electricity only 70 percent of the time, today's average plant is online close to 90 percent of the time, which has helped lower the cost of nuclear-generated power. As the President's National Energy Policy describes, by increasing operating performance to 92 percent, an additional 2,000 megawatts of electricity could be generated from existing plants, and by "uprating" current plants with new technologies and methods, another 12,000 megawatts of generating capacity might be possible.

Utilities are also considering nuclear energy as an option for new generation. The Nuclear Regulatory Commission has certified three standardized nuclear power plant designs, and Congress enacted legislation in 1992 to reform the nuclear licensing process. Advanced reaction designs offer the enhancements to safety and economics needed for these technologies to come to market in the next decade and beyond. New nuclear generators could also be built on existing sites; many current sites were designed for 4–6 reactors, and most operate only 2–3.

Renewable energy, although a relatively small contributor to current U.S. power generation, could play a major role in achieving greenhouse gas stabilization. Wind energy, for example, currently accounts for only 0.1 percent of total electricity supply; however, technological advances have helped cut wind energy's costs by more than 80 percent during the last 20 years. The President's National Energy Policy supports activities that could lead, by mid-century, to a national energy system comprised increasingly of distributed energy generation devices that use wind, solar, biomass, hydroelectric and geothermal sources, and some of which would be supplied by natural gas. Renewable energy technologies could also be used for baseload power in central stations or to produce hydrogen. For this to occur, advanced technologies will need to be developed. These include biopower technologies that can be fueled by biomass or perhaps a combination of coal and biomass fuels, advanced hydropower such as micro-hydro systems (less than 100 kilowatts), biomass-fuel cell power technology, advanced wind energy, geothermal energy, and advanced photoconversion power systems.

Approach 3—Carbon Sequestration: Barely 5 years ago, virtually no one discussing climate change mitigation options used the term "carbon sequestration." The concept of removing carbon dioxide from either manmade emissions or the atmosphere, then safely and permanently storing it or converting it to value-added products was thought too farfetched for serious discussion.

Today, however, there has been a remarkable turnaround in the scientific and engineering community.

Carbon sequestration is now considered to be a viable "third option" for future greenhouse gas reductions. President Bush gave it special attention in his June 11, 2001, remarks, saying "We all believe technology offers great promise to significantly reduce [carbon] emissions—especially carbon capture, storage and sequestration technologies."

Carbon sequestration, if it can be developed to the point where it is practicable, affordable and environmentally safe, offers the potential for dramatic CO_2 reductions over the long-term, perhaps even more than would be possible through efficiency improvements and low-carbon fuels together.

The following shows one possible pathway to the long-term goal of stabilizing atmospheric concentrations of greenhouse gases. This scenario is but one of many which could be envisioned. In it the growth in greenhouse gas emissions is slowed over the next 20 years and eventually stopped at the reference case 2010 level. The upper arrow refers to current Energy Information Administration projections for efficiency advances and low-carbon fuel use; the lower arrow, consistent with atmospheric stabilization, assumes a combination of additional efficiency gains and a large contribution from carbon sequestration.

By working with growth and natural capital stock turnover, this pathway to stabilization allows time for new technology and low-cost options and the long-term introduction of carbon sequestration. It also prevents a rapid increase in greenhouse gas emissions over the next 20 years, thus reducing the need for steep, economically harmful reductions in the future.

Why the recent surge of interest in carbon sequestration? There are three primary reasons.

First, many in the technical community now believe it will be possible to develop carbon capture and storage technologies which will add less than a 5 percent increase in energy system costs—equivalent to only 2/10ths of a cent per kilowatt-hour to today's average cost of electricity.

Second, the past 5 years have seen a wealth of high-potential concepts emerge from the scientific and engineering community, and many of the "blue sky" ideas of four or 5 years ago are now maturing into actual processes on the threshold of their first field trials.

A third reason may be the realization of many in the energy industry that carbon sequestration may be geographically and economically practical, and in some cases, could actually become a revenue-generating venture. For example, from a geographic standpoint, storing CO_2 in underground saline formations has the benefit of being in close proximity to many large power plants. From a revenue standpoint, storage of CO_2 in oil reservoirs and unmineable coal seams could lead to increased oil and natural gas recovery, generating additional cash-flow.

Five years ago, the Department of Energy offered modest, $50,000 grants to proposers who might have worthwhile ideas for carbon sequestration. Twelve grants were awarded, but the number of good proposals far exceeded the funding available. Today, the Department's Office of Fossil Energy has more than 50 carbon sequestration research projects, with an fiscal year 2002 budget of more than $32 million.

Partners in our carbon sequestration program range from small entrepreneurial developers to large energy companies such as BP and environmental organizations such as The Nature Conservancy.

Today our development program encompasses five major technological "pathways:" (1) carbon separation and capture, (2) geologic storage, (3) terrestrial storage, (4) ocean storage, and (5) novel sequestration systems.

Progress is being made in all five. For example:

- We now have empirical evidence that advances in sodium carbonate technology can capture 50 percent of the CO_2 emission from a power plant at cost of $15 per ton of carbon—a 10fold reduction in costs compared to previously available technology.

- An innovative "CO_2 Wash" process is being used at the New Jersey EcoComplex to capture CO_2 before its escapes from a nearby landfill and use it to clean impurities from the landfill gas, which can then be used as a clean fuel.
- Preparations are underway to begin monitoring the injection of carbon dioxide from the Great Plains Coal Gasification Plant in North Dakota into the Weyburn oil field in southeastern Saskatchewan. Although 30 million tons of CO_2 are injected into geologic formations each year in the United States as part of enhanced oil recovery, this is will be the first large scale test to monitor the capacity, movement, and storage integrity of CO_2 injected into a geologic formation.
- Terrestrial carbon sequestration projects are underway in Pennsylvania and Kentucky, both using surface mine reclamation lands to determine if newly planted trees and vegetation can serve as "biological scrubbers" for carbon dioxide.
- Scientists at the Department's Albany Research Center have made dramatic breakthroughs in a process that converts CO_2 into an environmentally benign mineral by reducing processing times from weeks to under 30 minutes, an advance that greatly improves prospects for a future commercially viable process.

If it can be successfully developed, carbon sequestration could ultimately lead to a fossil fuel-fired power plant that has virtually no net emissions of any type.

As described in Approach 1—More Efficient Energy Use, gasification combined cycle technologies are becoming increasingly attractive for the next fleet of coal-fired power plants. Not only do these plants offer the potential for 99 percent or greater reductions in air pollutants (such as sulfur dioxide, nitrogen oxides, and particulates), most configurations will also produce a highly concentrated stream of CO_2 (in contrast to a conventional coal-burning plant in which the CO_2 is diluted with large quantities of nitrogen from the air). This makes processes for separating and capturing CO_2 much easier and more cost-effective. Future concepts using gasification to produce hydrogen will separate the CO_2 as part of the production process.

The concept of an emission-free fossil fuel energy plant is far from unreasonable. In fact, the Department, in collaboration with the power industry, has set a goal to develop the basic configuration of such a plant by 2015.

Termed Vision 21, the new energy plant would virtually eliminate concerns over emissions of regulated air pollutants. Combined with carbon sequestration, such a plant could virtually eliminate all environmental concerns over carbon dioxide build-up from fossil fuel power generation.

A Question of Timing

As I've described in this testimony, there are a wide range of potential options for reducing greenhouse gas emissions from power generating plants and other energy facilities. Most are in various stages of development, and none by themselves offer a "silver bullet" to resolving climate change concerns.

Even if they did, requiring sharp reductions in CO_2 before new technologies can be developed and deployed can have major negative ramifications for both America's economy and our energy diversity. Imposing compliance requirements before a wider range of options is available would drive many power suppliers to shift away from coal to natural gas and, to a lesser extent, renewable fuels.

This sudden and sharp change in fuel mix would inevitably drive up prices. Analyses by the Energy Information Administration of S. 556 show the likelihood that a CO_2 emission cap could increase electricity prices by 43 percent in 2010 and by 38 percent in 2020 over the reference case. As much as $80 billion in 2010 and $63 billion in 2020 could be diverted from other areas of the economy to pay the Nation's increased electricity bill. The Administration strongly urges the Congress to take a more prudent, deliberative approach to climate change mitigation. We strongly request that Congress work with the Administration to create a technology R&D and investment climate that will produce low cost options to address climate change.

Finally, a program that focuses exclusively on power plants ignores opportunities for cheaper reductions in greenhouse gas emissions that may exist elsewhere in the economy and around the world. While electric power generation represents a large portion of direct emissions—and reducing those emissions will be a necessary part of a long-term solution—it does not follow that they represent the only or even greatest opportunity for inexpensive emission reductions in the shorter term. A reasonable and balanced approach to climate change should consider this broader universe of opportunities.

This concludes my prepared statement. I will be pleased to answer any questions Members may have.

STATEMENT OF EDWARD LOWE, GAS TURBINE-COMBINED CYCLE PRODUCT LINE MANAGER, GENERAL ELECTRIC POWER SYSTEMS

Good morning, Mr. Chairman and members of the Subcommittee. My name is Ed Lowe. I am the Gas Turbine-Combined Cycle Product Line Manager for GE Power Systems. I appreciate the opportunity to testify this morning.

I am pleased to be here today to share with you our views about the benefits that Integrated Gasification Combined Cycle (IGCC) technology can deliver. IGCC can cost effectively produce power from solid fuels, such as coal, with substantial environmental benefits over other coal power generation technologies. If IGCC is adopted as the preferred coal based power generation technology, it will help the country and our customers meet the environmental goals of reducing NOx, mercury and other air pollutants, while also advancing sound energy policy goals of retaining a secure and diverse mix of fuels for electric power generation and improving the efficiency of coal based power generation.

OVERVIEW OF IGCC TECHNOLOGY

IGCC is a process that converts low value fuels such as coal, petroleum coke, orimulsion, biomass, and municipal wastes into a high value, low Btu, environmentally friendly natural gas-type fuel, also called "synthesis gas" or simply "syngas." When used to fuel a combined gas turbine and steam turbine plant, known as a combined cycle system, coal based syngas fuel produces electricity more efficiently and with lower emissions than traditional direct fire coal boilers.

Coal gasification is not new, although there have been many technological improvements over its development cycle. The first mention of using coal gasification in the United States to produce "Town Gas" was by the Baltimore Gas Company in 1842, and by the 1910's, commercial coal gasification was commonly used in the United States and Europe to provide cities with gas for streetlights and domestic consumption.

However, the combination of gasification with gas turbine power plants—the IGCC concept—had to wait until gas turbine combustion technology had advanced to the point that it was ready to accept the significant technical challenge of combusting low Btu IGCC fuels. Gas turbines for IGCC are markedly different from the vast majority of gas turbines that are fueled by natural gas. IGCC gas turbines must be specifically engineered to achieve highly efficient and reliable service on syngas. These design enhancements relate primarily to the combustion and fuel systems, but also encompass special safety, packaging, and controls modifications.

IGCC's roots trace back to GE's Global Research Center in Schenectady, NY. In the early 1970's pilot testing demonstrated poor fuels could be converted to clean syngas, and that it was possible to integrate a gas turbine and a chemical gasification plant. Further work, at GE's Schenectady laboratories, continued in the early 1980's on gas cleanup and with full-scale combustion development. This work led to the first large commercial coal IGCC Plant, the 120 MW Cool Water Plant located in California. This was a partnership funded project with EPRI and other participants that utilized GE's innovative gas turbine combustion technology. Commissioned in 1984, Cool Water demonstrated the technical feasibility of IGCC.

In the 1990's commercial IGCC plants were successfully built and operated with steady improvements in reliability, efficiency and cost. Two examples of current coal IGCC plants are Tampa Electric Company's Polk 250 MW IGCC plant in Florida, commissioned in 1996, and the Public Service of Indiana's (now Cinergy) Wabash River 250 MW IGCC plant in Indiana, commissioned in 1995. These two plants, utilizing GE gas turbines, have successfully logged over 50,000 operating hours on coal synthesis gas.

Since GE pioneered IGCC nearly three decades ago, we have developed a broad IGCC product line of gas turbines with matching steam turbines spanning the 100 to 400 MW module range. GE has sold over 23 IGCC gas turbines and attained over 400,000 gas turbine operating hours on syngas. GE is committed to developing new and improving existing IGCC gas turbine designs. New York continues to serve as the central hub of our efforts to advance this technology. The development of concepts for further improvement in emissions is continuing at our Global Research Center in Schenectady, and we recently strengthened our commitment to advance IGCC technology with the commissioning of a new combustion development facility in Greenville, South Carolina.

ENVIRONMENTAL ADVANTAGES OF IGCC

IGCC is inherently less polluting and more efficient than any other coal power generation technology. In IGCC, harmful pollutants are removed from the syngas before they reach the gas turbine; therefore, end-of-pipe/ stack cleanup is not necessary. IGCC efficiently removes ash, sulfur compounds, ammonia, mercury, other metals, and any particulate matter to reduce air pollution. Emissions of SOx, NOx, mercury, heavy metals, and particulate from an IGCC plant are fractions of the emissions from conventional, coal power plants.

For example:

- IGCC NOx emissions are approximately half those of modern pulverized coal steam-boiler plants. About 0.07 lb/million Btu NOx emissions can be achieved through IGCC. This is approximately a 60 percent reduction in NOx emissions from the average coal plants operating today. Since 1980, the can-annular combustors employed by GE have been continuously improved to handle a wide variety of fuels and to reduce NOx emissions. Beginning with the Cool Water Coal IGCC test program, NOx emission performance was demonstrated at less than 0.125 lb/million Btu using "E" class gas turbine technology. The recent TECO Polk and PSI Wabash plants, have achieved similar NOx values (less than 0.1 lb/million Btu), using higher efficiency "F" class technology. Similarly, full pressure and temperature laboratory test programs using various process diluents, including N_2, H_2O, and CO_2, lead us to believe that the challenging target of single digit NOx emissions (0.04 lb/million Btu) may be possible. GE is evaluating whether to implement a development program with the goal of achieving this challenging target, and the support of EPA, or legislative changes, would encourage our initiation of such a program.
- 95 percent mercury removal is being achieved by a gasification plant in Kingsport, Tennessee. Similar mercury removal systems can be used to economically and reliably remove mercury for new IGCC plants.
- Sulfur can be recovered from the syngas either as elemental sulfur or sulfuric acid in pre-combustion cleanup. Both elemental sulfur and sulfuric acid are marketable industrial by-products depending on local economics. With little sulfur remaining in the syngas stream that enters the gas turbine, the emissions of SOx for an IGCC plant are less than half of those of even state-of-the-art direct combustion coal boiler plants.

GE's emphasis on improving turbine and combined cycle efficiencies has directly benefited IGCC emissions performance. High IGCC efficiencies yield CO_2 greenhouse gas emissions that are 12 percent lower than those of state-of-the-art coal steam-boiler plants. These emissions are approximately 30 percent lower than those of average coal plants operating today, for comparison purposes. Additionally, in the gasification process carbon can be removed from the syngas to create a hydrogen-rich fuel that can further reduce CO_2 greenhouse gas emissions. In our combustion development programs, GE has successfully demonstrated combustion of 90 percent hydrogen syngas fuel to demonstrate the technical feasibility of power plants with ultra low CO_2 emissions.

Let me emphasize this key point: In the IGCC process harmful pollutants are removed from the syngas stream before combustion, rather than in post combustion flue gas treatment. The pressurized syngas stream represents less than 1/100 of the volume of flue gas from direct coal combustion and the contaminants in syngas are concentrated. Therefore, IGCC pre-combustion clean-up is far more effective and much lower cost than the post-combustion clean-up employed in direct combustion coal steam-boiler plants.

And there is another important environmental benefit: In IGCC coal ash is converted in the gasifier into a solid, vitreous slag which is chemically inert. This non-leaching slag can be employed in the construction industry as road fill or as strengthening aggregate for building concrete. IGCC does not require secure landfill sites for ash storage and ash-landfill pollutant leaching into the groundwater is not an issue.

ENVIRONMENTAL REGULATION SHOULD NOT BE A BARRIER TO IGCC DEPLOYMENT

In spite of these significant environmental benefits, we are concerned that permitting bodies may burden IGCC with duplicative and reliability reducing end-of-pipe controls for NOx, such as SCR (selective catalytic reduction). These systems cannot work as reliably on IGCC as they do on natural gas fired units. The pollution prevention combustion technology on GE's IGCC gas turbines delivers NOx emissions below that of alternative coal technologies and we strongly believe that IGCC must be evaluated as a coal technology with consideration given for its total environmental benefits when setting emission targets.

OPTIMAL USES OF IGCC

Gasification is a steady state chemical process and therefore IGCC plants perform best in base-load applications. IGCC gas turbines require natural gas or distillate as a startup fuel; so that all IGCC gas turbines must be dual fuel capable. As a consequence, IGCC plants can switch to the backup fuel when syngas is unavailable or co-fire when syngas is limited. With the availability of backup fuels and combustion design flexibility, IGCC plant power availability can approach that of natural gas combined cycle plants.

IGCC must be optimized based on the design requirements, which is primarily defined by the fuel characteristics—there is no universal IGCC design that will satisfactorily meet all expectations. A myriad of technical possibilities must be balanced for each gasifier type and each syngas fuel to optimize IGCC systems for specific fuel type and site conditions. Through cycle optimization studies and by incorporating lessons learned from successful operation of many IGCC units, GE has optimized system configurations for all major gasifier types and most GE heavy-duty industrial gas turbine models.

GE is conducting continuous improvement programs, which endeavor to further enhance the overall performance level of IGCC plant designs. Working with various process technology suppliers, GE is helping to facilitate, define and develop lower cost and higher efficiency IGCC plant designs.

FAVORABLE ECONOMICS

The cost to build large IGCC plants has steadily decreased over the last 25 years; the installed turnkey Engineer Procurement Construct (EPC) price is now projected to be $1200 per kW. This makes the superior IGCC technology cost competitive with other modern coal power plant options such as Circulating Fluid Bed, or super critical and ultra-super critical pulverized coal boiler plants with state-of-the-art emission control systems.

Continuous gas turbine technology improvements raise the prospect for further economic improvements as output power and plant efficiencies increase. As additional IGCC plants go operational, improvements in system performance and plant design cost can be expected from a growing and maturing technology experience base.

CONCLUSION

IGCC clearly becomes the superior coal technology option when its higher plant efficiency—5 percentage points above other coal technologies—and significant environmental advantages are considered.

Coal IGCC offers superior environmental performance while projected to produce electricity at prices competitive with modern direct-fired coal power plants. IGCC also provides an inherent capability to cost effectively meet future environmental needs because contaminates are removed in a low volume, high concentration, precombustion fuel gas steam. We look forward to exploring options with you and with regulatory agencies to ensure that appropriate laws and policies are in place to allow IGCC's environmental and efficiency benefits to be achieved.

RESPONSES OF EDWARD D. LOWE TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question 1. In your company's October 2000 review of this technology, it wrote that "[t]he economics of IGCC systems now allow the technology to successfully compete in competitive power bidding situations where low cost indigenous gas is not available." It also stated that "[t]he introduction of the next generation of gas turbine technology is expected to further reduce the cost of IGCC systems. What is the prognosis for the introduction of the next generation of turbine technology? Do you expect to be competitive, even with low cost natural gas?

Response. The prognosis is excellent for GE to develop and commercially introduce enhanced gas turbine technology that will further reduce IGCC cost. GE is making significant investment in a Multi-Generation Product Plan (MGPP) for IGCC. GE's commitment is underscored with our investment in a state-of-the-art IGCC combustion development facility at Greenville, SC.

GE's MGPP for IGCC has three major goals—1) increasing the output of our heavy duty gas turbines with syngas firing, 2) increasing efficiency through higher firing temperatures and 3) developing fuel systems and combustors that can handle multiple fuels. All significantly affect the cost factors considered in utility decisions for new power generation.

Increased power output decreases overall specific capital cost ($/kW) because fixed plant costs are spread over higher power output. This additional output is achieved at a small cost penalty to the overall plant. GE's MGPP for IGCC also targets further efficiency improvements. Higher efficiency reduces the fuel component of the cost of electricity. The first commercial plants at Polk and Wabash achieved 38.5 percent and 40.2 percent efficiency respectively. A current IGCC plant using a 7FA+e turbine would achieve a 42 percent efficiency, which compares favorably to 40.1 percent for a supercritical PC plant.

Fuel flexibility further reduces fuel cost. The robustness of a gas turbine to handle gases produced from a wide range of feedstocks expands IGCC's ability to use lower cost, opportunity fuels. This compliments the ability of gasification to deal with a wide variety of feedstocks. GE's state-of-the-art combustion facility at Greenville provides capability to test full size combustors over a wide range of fuel compositions.

A cost-of-electricity analyses based on current machines shows IGCC to be competitive with natural gas combined cycle plants for natural gas price at a $2.50/MMBTU price premium over the IGCC fuel stock. Therefore, at a coal price of $1.00-$1.25/MMBtu, IGCC is competitive with $3.50-$3.75/MMBtu natural gas.

Question 2. I have been told that commercial financing is readily available for the IGCC installations that have been built recently in the US and abroad. Doesn't this suggest that investors believe that any technical risks associated with this technology are no greater than conventional technology?

Response. Yes—investors have been willing to finance projects. However, this source of financing currently comes at a high price based on IGCC's relatively short history compared to traditional coal technologies. Investor financing is contingent upon receiving significant additional long-term performance and operating guarantees compared to those provided for traditional coal technologies. These requirements impose a significant cost burden on an emerging technology such as IGCC.

Question 3. I noted your objection to the imposition of technology-based permitting on IGCC plants. One of the beauties of the multi-pollutant legislation we are talking about here today is that it does not require permitting bodies to pick and choose technologies; rather, it allows industry to decide the best way forward, as long as they meet the caps. Do you support a move to this sort of regulatory system? Do you believe that IGCC will succeed under such a system?.

Response. GE supports a system that gives industry maximum flexibility to choose the most efficient technologies over a reasonable time period at a reasonable cost. The benefits of IGCC in reducing pollutants make it a logical choice for efficiently burning coal under a cap system. Our country's abundant, recoverable coal reserves are key to achieving energy security through a robust and diverse energy system. Any cap system limits must allow continued use of coal, albeit more efficiently and in a less polluting manner.

If IGCC is subjected to moving regulatory permit demands that would later impose add-on controls (like SCR—selective catalytic reduction) not appropriate for this technology, the resulting reliability, efficiency and cost uncertainties would chill investments in IGCC plants. Innovative technology development is better attained through incentives that reward pollution reduction and allow recapture of investments than through rigid regulatory imposition of one-size-fits-all, end-of-pipe technologies.

Question 4. It has been my experience that to stimulate the development of clean air technologies, we must impose a cap on emissions. That was certainly the case with the 1990 Clean Air Act, where the market-based caps on acid rain causing pollutants has triggered the widespread adoption of advanced scrubbers, at much less cost than was first projected. Would the maturation of IGCC benefit from such regulatory certainty?

Response. IGCC technology is available for widespread commercialization now. Investment in IGCC and many other advanced new technologies should benefit from a greater degree of regulatory certainty.

Question 5. I noticed that several IGCC plants, including Mr. Amick's plant in Indiana, were retrofitted for IGCC. Would it be possible to apply this technology to these grandfathered plants that are causing all this controversy over new source review.

Response. Yes, IGCC can be used as a retrofit technology; however, the cost for any repowering application is very site-specific. A few key parameters that would make repowering an existing older coal fired unit economically viable are: (1) sufficient work area to easily remove the existing boiler equipment and accommodate the new gasifier equipment, (2) a boiler that needs significant maintenance and has no existing SO_2 scrubbers, and (3) a steam turbine of at least 100 MW.

Question 6. I noted that your IGCC facilities can also burn natural gas. If you located an IGCC facility near a supply of natural gas, could you use both fuels depending on the pricing between the fuels? If so, wouldn't this buttress the fuel diversity of our nation's utilities?

Response. An IGCC plant requires a backup fuel—either natural gas or distillate—for startup of the gas turbine. The combustor design for IGCC turbines allows for firing of either 100 percent natural gas or syngas, or for co-firing a mixture of syngas and natural gas. Co-firing enables an IGCC plant to provide full output when the gasifier is either out of service or unable to provide full syngas output during plant maintenance work. The plant.–4-owner could switch to 100 percent natural gas provided that economics were favorable; however, given the already-invested capital in the gasification plant, natural gas would have to fall to below the $1.50/MMBTU range to economically justify a switch.

RESPONSES OF EDWARD C. LOWE TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. Please describe the equipment changes that are necessary to install an IGCC unit. Can new equipment be added to an existing coal plant, or must the facility be razed and a new one constructed? What is the economic impact of this plan?

Response. It is not necessary, nor economically advisable, to raze an entire existing plant to install an IGCC unit. Depending upon age and condition, much of the major equipment from an existing plant, including the coal delivery, storage, preparation and handling equipment, steam turbine(s), water supply, water treatment, reusable electrical substation equipment, stack and foundations, could be reused. For a pulverized coal (PC) plant, the boiler, ductwork and air pollution control equipment, including sludge dewatering and ash handling equipment, would be removed or retired-in-place as appropriate. Sludge and ash ponds would be closed. New equipment would include the gasifier, slag handling equipment, quench and associated piping, acid-gas removal system, filters, sulfur recovery system, ductwork, gas turbine, fuel skid, heat recovery steam generator, controls and additional substation equipment to handle the increased output.

The economic impact is site-specific. The key factors that would make repowering economically viable are: (1) sufficient work area to easily remove the existing boiler equipment and accommodate the new gasifier equipment, (2) a boiler that needs significant maintenance and has no existing SO_2 scrubbers, and (3) a steam turbine of at least 100 MW. The capital cost of repowering could be 10 percent lower than a new "Greenfield" IGCC plant.

There are other questions that need to be answered to determine if repowering is economically justifiable. How profitable is the existing power plant? The repowered plant will have up to 200 percent greater output based on the ability to match gas turbine exhaust energy to existing steam turbine needs. How does the profitability of the larger repowered plant compare to the base existing plant and does it justify the significant capital investment? Lower cost, higher sulfur coal can be used. The potential sales of sulfur and slag byproducts provide additional income streams. Also, the superior environmental performance of IGCC can provide additional revenue through generation of emissions credits.

Question 2. What potential problems does installing scrubbers or requiring the use of biomass present for an IGCC unit? How does the possibility of a State requiring the addition of scrubbers or the use of biomass as a fuel source, impact a utility's decision to use IGCC technology?.

Response. It is not necessary to install separate, post-combustion scrubbers on an IGCC plant. Sulfur is very effectively removed from the syngas by the acid gas removal (AGR) process. The AGR system would include either scrubbing or filters for particulate removal. Typical sulfur removal efficiencies are 98 percent or higher.

IGCC would be included in a utility's consideration of options for biomass. IGCC is suitable for use of biomass either as a primary fuel or co-gasified with coal. These would generally be smaller plants that are consistent with the fuel availability. GE's products include smaller gas turbines—starting with the GE10 at 10MW—that are syngas capable and well suited for biomass plants. Also, an alternative approach would be co-gasification of biomass with coal as has been successfully demonstrated at the Polk IGCC plant.

Question 3. What is our view of the deadlines in Jeffords/Lieberman and would utilities use new technologies like IGCC to meet deadlines, or do it with more traditional technologies and fuel switching?

Response. GE does not offer a view on the specific deadlines in Jeffords/Lieberman, other than noting that they are aggressive and would require rapid, substantial changes by generators, at substantial cost. We believe that generators would use all available means to meet the proposed deadlines, including short term fuel switching and traditional technologies, as well as IGCC. As natural gas prices rise, new coal technologies, such as IGCC, will become more attractive to the marketplace. Coal will play a key role in our energy security for decades to come, and commercially available and proven IGCC technology provides the most environmentally sound way to use coal.

STATEMENT OF PHIL AMICK, VICE PRESIDENT, COMMERCIAL DEVELOPMENT GLOBAL ENERGY, INC.

Good morning. My name is Phil Amick and I am Vice President, Commercial Development for Global Energy Inc., headquartered in Cincinnati, Ohio. I would like to thank the chairman and the other members of the Subcommittee for allowing me to appear at this hearing.

Global Energy owns and operates the Wabash River Energy Ltd. gasification facility in Terre Haute, Indiana. The affiliated power generation plant is owned and operated by Cinergy. This 262 MW facility powers about 250,000 homes while utilizing local high sulfur coals, and even petroleum coke feedstocks, with sulfur content of 5.5 percent and more. More to the point for this hearing, it is the cleanest coal fired power plant in the world, of any technology.

The Wabash River IGCC is a repowering of a 1953 vintage pulverized coal plant, one that was operating on compliance coal and had precipitators but was unscrubbed. Compared to the performance prior to repowering, based on 1990 data for the older plant, the new facility makes almost six times as many megawatt hours of electrical power yet has reduced emissions of SO x by over 5500 tons per year, NO x by 1180 tons per year and PM_{10} particulates by 100 tons per year.

The Wabash facility, and the Tampa Electric Polk Power Station in Florida, are the first of a new class of coal-based electrical generation facilities with superior environmental performance compared to other technologies such as pulverized coal and fluidized bed. Wabash has been operating since 1995 with emissions lower than coal plants that are now being permitted for operation in 2005.

Wabash is a power plant using high sulfur coal that has SO_2 emissions as low as one fortieth of the Clean Air Act Year 2000 standard. Sulfur is chemically extracted from the syngas and sold for use in the fertilizer industry, about a railcar per day of pure sulfur that used to go into the atmosphere.

It's a coal power plant where the coal ash products emerge as a vitrified black sand byproduct and are marketed as construction material. There are no solid wastes from the coal gasification process—no scrubber sludge, fly ash or bottom ash.

In this plant, the wastewater stream from the chemical process meets current National Drinking Water Standards.

Carbon dioxide emissions are 20 percent lower than conventional unscrubbed coal fired plants because of the inherent efficiency of the gasification combined cycle process. The plant, with no additional special equipment, also has a mercury removal rate of about 50 percent.

One of the keys to this superior environmental performance is the fact that the gasification process takes place at high pressure. This facilitates the chemical processes that remove the pollutants.

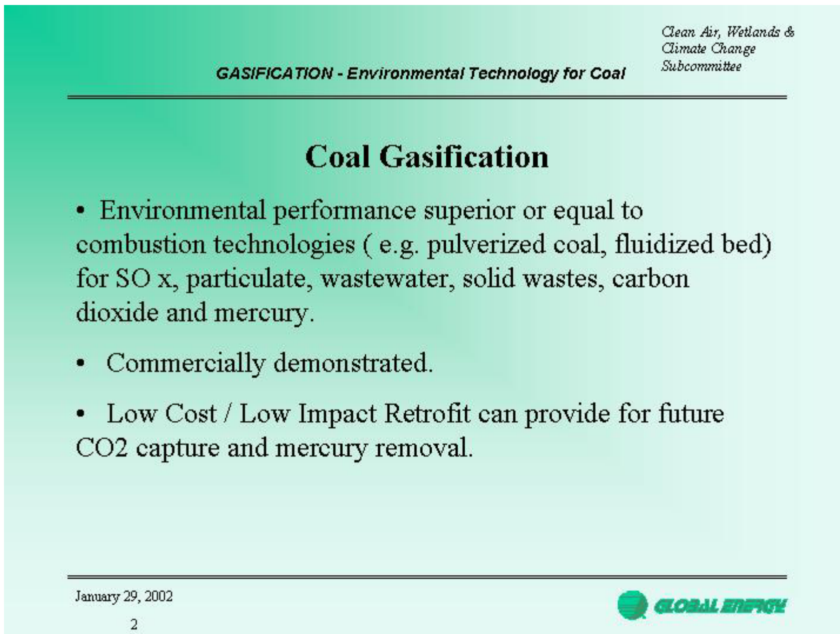
High pressure operation also will facilitate additional carbon reduction and mercury removal measures on future plants. Department of Energy and industry studies indicate that significant reductions can be achieved with much less cost and performance impact than possible with coal combustion technologies that operate near atmospheric pressure.

While carbon dioxide emissions already 20 percent less than conventional units, this emission can be reduced more than 75 percent by shifting the syngas to hydrogen. This technology, already in use at some hydrogen production facilities, can be retrofit to a gasification facility for as little as 2 percent of the original capital cost. The plant output reduction for this additional process step is a fraction of what would be seen in a conventional technology plant. In a gasification facility, it can be retrofit at any time in the future.

Mercury removal is also much simpler in the gasification process. A plant like the Wabash River facility could be upgraded to 80 percent or better mercury removal by the addition of a single carbon bed vessel, at a cost of less than $1 million dollars. Other facilities, such as the Tennessee Eastman gasification plant for chemical feedstock production in Kingsport, Tennessee, achieve better than 90 percent mercury removal to meet their process constraints, and have been doing it for nearly two decades.

Gasification technology for coal based power generation is being commercially marketed by ourselves and others. We feel that it is the most environmentally friendly solution for diversifying the fuel mix of new electrical power plant capacity. Through repowering, much of the existing, aging coal generation base can be upgraded as well, as was done at Wabash River.

Thank you, Mr. Chairman, that concludes my oral statement. With your permission, I have additional materials that can be included in the record.



The Wabash River plant is the Cleanest Coal Fired Power Plant in the World

- Introduction
- Air
- Water
- Sold Waste
- Carbon Dioxide
- Mercury

Wabash River Energy Fact Sheet

- Started operation in 1995
- Sell syngas and steam to PSI/Cinergy
- E-Gas™ technology employed in gasification combined cycle repowering of Unit #1 at the Wabash River Generating Station
- $417MM project co-funded by the DOE CCT program
- 2500 tpd bituminous coal or 2000 tpd petcoke
- Up to 7% sulfur feeds
- 262 MWe net output (power for 250,000 homes)

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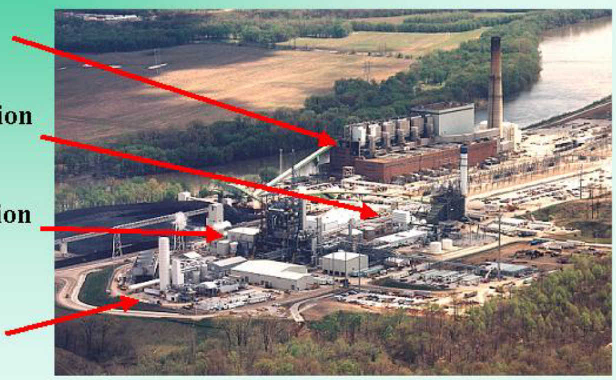
Wabash Facility Location



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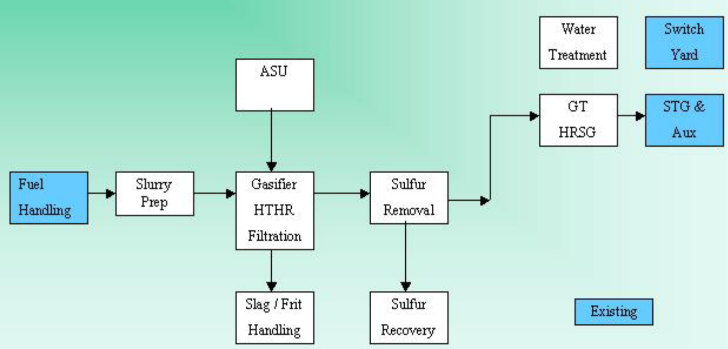
WABASH REPOWERING



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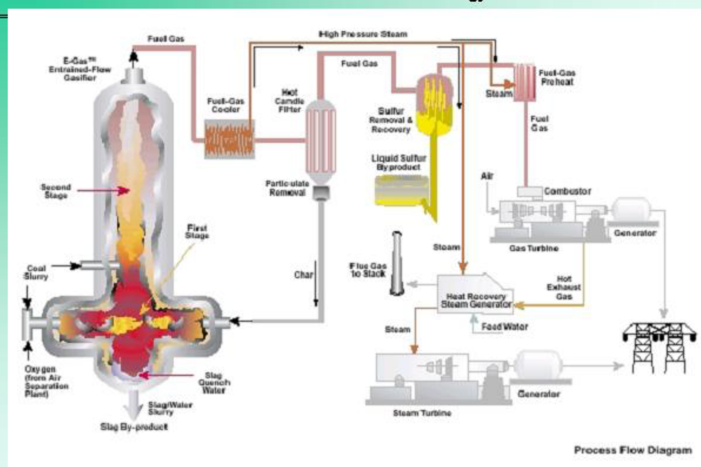

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GASIFICATION - Environmental Technology for Coal

WABASH RIVER
AIR

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AIR EMISSION POINTS

Gas Turbine/HRSG Stack	225 Ft. Elevation
Auxiliary Boiler Stack	50 Ft.
Tail Gas Incinerator Stack	310 Ft.
Flare	180 Ft.
Cooling Tower	30 Ft.

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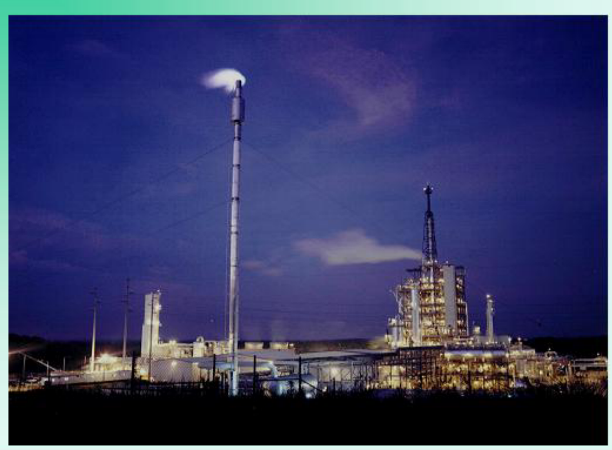

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SO x Control

IGCC is permitted for 0.25 lb SO2/MMBtu (split between GT and TGI stacks)

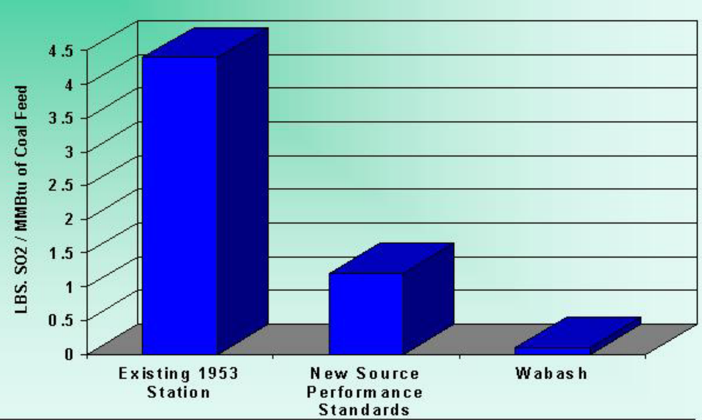
Sour syngas goes through a COS catalyst and then an amine based acid gas removal stage.

Tailgas from SRU is recycled to gasifier

Normally running at ~0.10 lb SO2/MMBtu

As low as 0.03 lb SO2/MMBtu has been achieved

SO_2 EMISSIONS



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NO x Control

GE 7FA combustion turbine with steam injection (1992 purchase order)

Permitted for 25 ppm NO x

Has run as low as 18 ppm

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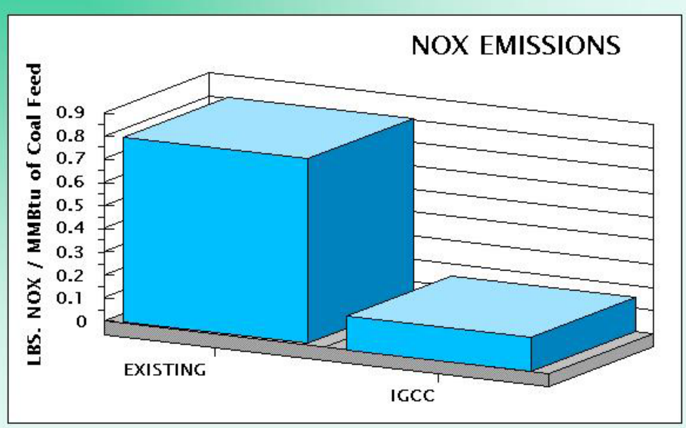

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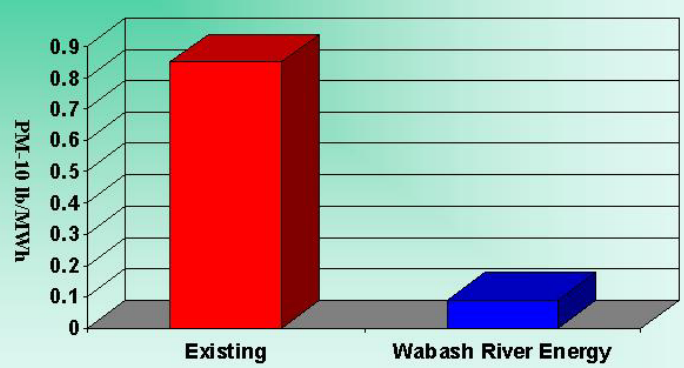
PARTICULATE EMISSIONS

None added and measurable in HRSG Stack

Syngas passes through dry barrier filter, 3 scrubbers and 2 catalyst beds – no particulate breakthrough

Particulate Emissions



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Wabash Monitored Emissions, All sources (Air Permit received in 1993)			
	1997	1998	Average
SO2 Lbs/MMBtu	0.13	0.13	0.13
Lbs/MWhr	1.07	1.037	1.0535
NOX Lbs/MMBtu*	0.116	0.089	0.103
ppmvd* (25 permit)	29	22	25
CO Lbs/MMBtu	0.056	0.033	0.0445
Lbs/MWhr	0.459	0.263	0.361
VOC's Lbs/MMBtu	0.002	0.0021	0.00205
Lbs/MWhr	0.016	0.0167	0.01635
PM10 Lbs/MMBtu	0.012	0.011	0.0115
Lbs/MWhr	0.098	0.088	0.093
Calculated Emissions			
CO2 Lb/MWhr	2008	Environmental Assessment / FONSI	

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EMISSIONS COMPARISON - WABASH

Emissions, lb/MWh

	SO2	NO x	CO	PM-10	VOC
Unit 1 before Repower	38.2	9.3	0.64	0.85	0.03
IGCC (1999 annual average)	1.075	0. 75	0.555	0.09	0.09

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EMISSIONS COMPARISON

Emissions, lb/MWh

	SO2	NO x	CO	PM-10	VOC
Unit 1 before Repowering	38.2	9.3	0.64	0.85	0.03
IGCC (1999 annual average)	1.075	0. 75	0.555	0.09	0.09
Emissions Reduction TPY	**5505**	**1179**	**(83)**	**101**	**(25)**

Comparing 100 MW PC unit running 35% availability and

262 MW IGCC running 75% availability

(5.6 X more megawatt hours produced)

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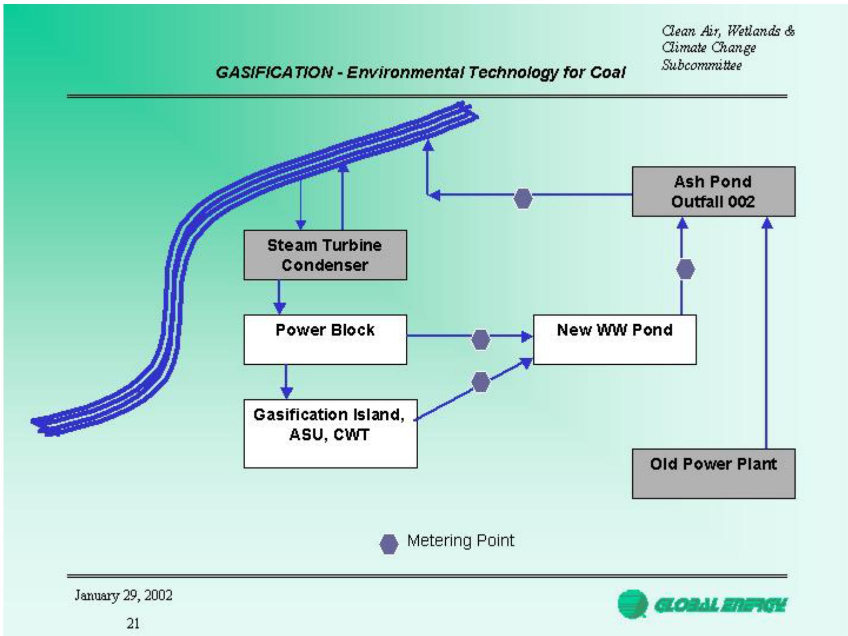
WABASH RIVER WATER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Ash Pond Outfall 002
Steam Turbine Condenser
Power Block
New WW Pond
Gasification Island, ASU, CWT
Old Power Plant
Metering Point
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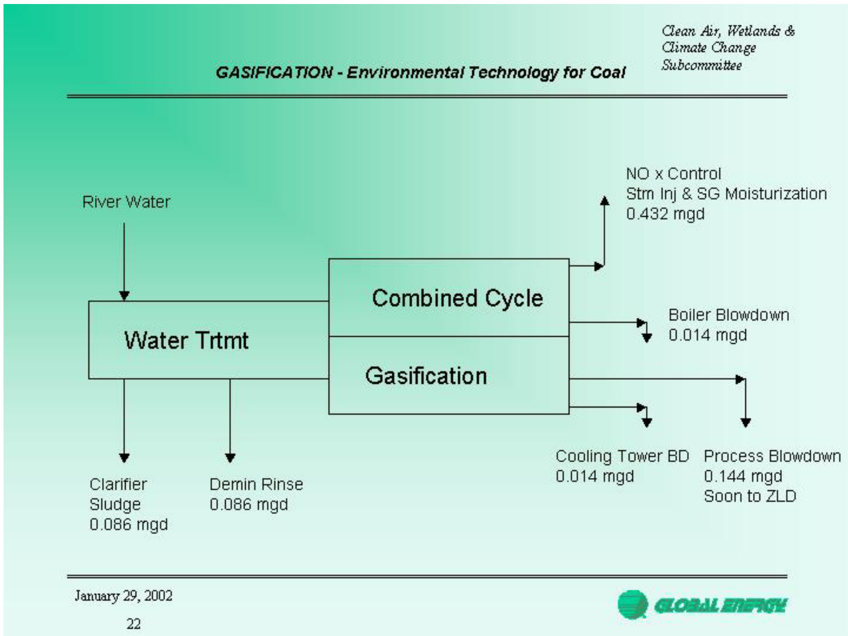
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River Water
NO x Control
Stm Inj & SG Moisturization
0.432 mgd
Combined Cycle
Water Trtmt
Gasification
Boiler Blowdown
0.014 mgd
Cooling Tower BD
0.014 mgd
Process Blowdown
0.144 mgd
Soon to ZLD
Clarifier
Sludge
0.086 mgd
Demin Rinse
0.086 mgd
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Process Wastewater Analysis

Comparison of process wastewater quality of E-Gas gasification compared to typical PC based power generation for Group I metals and Cyanide:

Contaminant	E-Gas		PC Power Plant*
	Coal	Petcoke	(Median Values)
Arsenic, ppm	<0.05	<0.04	0.17
Cadmium, ppm	<0.005	<0.005	0.005
Chromium, ppm	<0.010	<0.010	0.049
Mercury, ppm	<0.0002	<0.0002	0.0008
Nickel, ppm	<0.02	<0.04	0.10
Selenium, ppm	<0.20	<0.10	0.13
Cyanide, ppm	<0.2	<0.1	No Data

*Extracted from the "Technical Background Document for the Report to Congress on Remaining Wastes from Fossil Fuel Combustion: Waste Characterization March 15, 1999"

Interim Pond (102) Discharge Limits

Interim Pond established as part of the Repowering Plant and as an add-on to Cinergy's NPDES permit for the main Generating Station

Maximum monthly average discharge limitations set for critical coal contaminants for the interim pond are less than National Drinking Water Quality Standards (40 CFR 141.62)

Contaminant	Permit Limit (Monthly Average)	NDWQS
Arsenic, ppm	0.018	0.050
Cyanide, ppm	0.019	0.200
Selenium, ppm	0.017	0.050

WABASH RIVER SOLID BYPRODUCTS

Sulfur

- Removed from the syngas chemically after the gasification process
- Produced as 99.99% pure elemental sulfur
- Leaves plant in railcars
- Sold to Broker for agricultural applications, over 40,000 tons to date

Slag

Black, glassy sandlike material

Inert, passes TCLP

Generally 3-10% Carbon in Coal Operations

Marketed for asphalt, construction backfill, landfill cover applications

Production is proportional to ash & flux content in feed

Coal Slag Analysis – Leachability

Component	RCRA Limit	UTS Limit	Wabash
Antimony	-----	2.1 mg/l	not tested
Arsenic	5 mg/l	5.0 mg/l	below UTS
Barium	100 mg/l	7.6 mg/l	below UTS
Beryllium	-----	0.014 mg/l	not tested
Cadmium	1 mg/l	0.19 mg/l	below UTS
Chromium (total)	5 mg/l	0.86 mg/l	below UTS
Cyanides (total)	-----	590 mg/kg3	below UTS
Mercury (non WW)	0.20 mg/l	0.20 mg/l	below UTS
Mercury (all other)	0.02 mg/l	0.025 mg/l	below RCRA
Nickel	-----	5 mg/l	below UTS*
Selenium	1 mg/l	0.16 mg/l	below UTS
Silver	5 mg/l	0.3 mg/l	below UTS
Thallium	-----	0.078 mg/l	not tested
Vanadium	-----	0.23 mg/l	below UTS*
Zinc	-----	5.3 mg/l	not tested

Single pass and recycle (* single pass only)

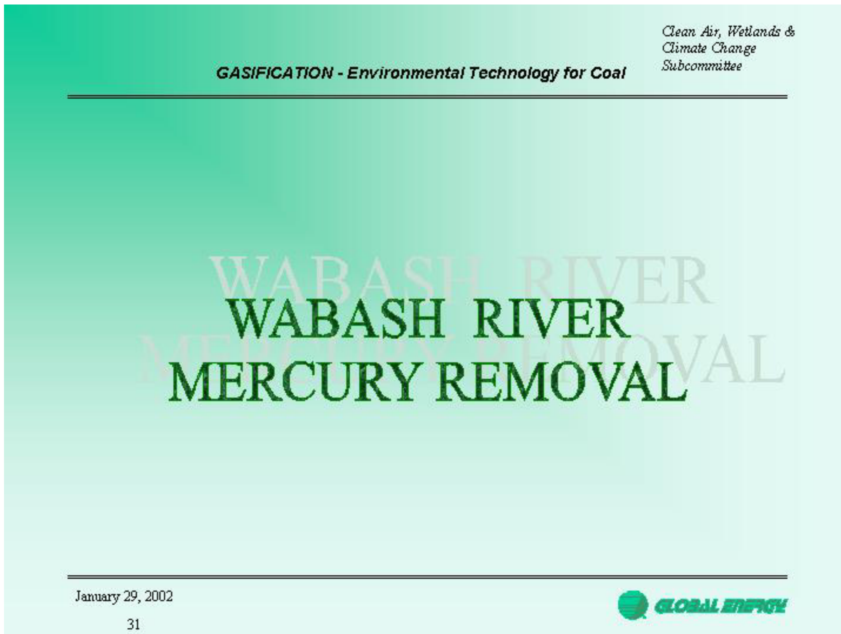
WABASH RIVER CO2 EMISSIONS

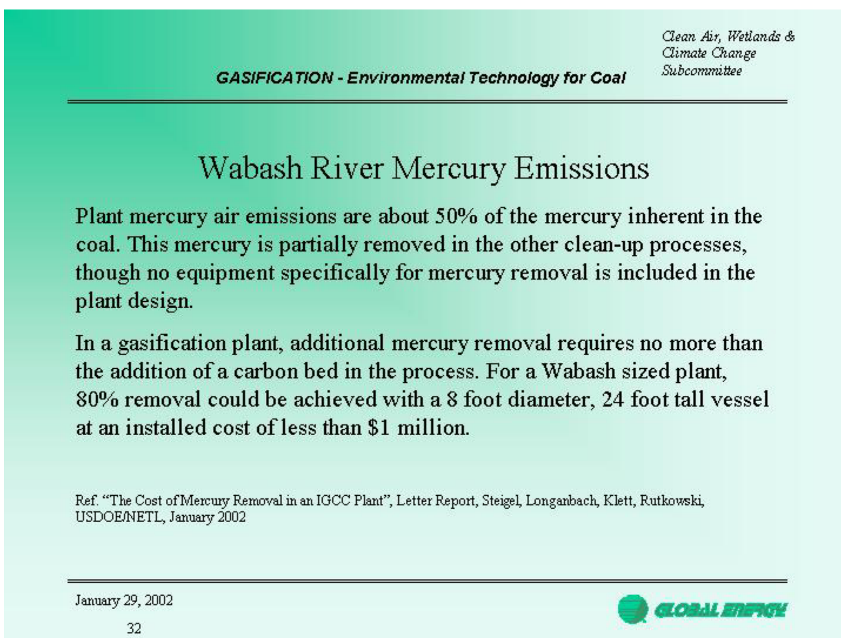
Wabash River CO2 Emissions

For the 1993 design and equipment, CO2 emission is about 2000 lbs/MWh

New plants under current regulations will have CO2 emissions of about 1780 lb/MWh (compared to 2000 lb/MWh for PC/FGD plants and about 1900 lb/MWh for fluidized bed plants). This advantage for IGCC is because of its greater thermal efficiency.

Additional process units can reduce the IGCC emission rate at new plants by 75%, with minimal cost and performance impact. This equipment can also be retrofit to previously built IGCC facilities.





RESPONSES BY PHIL AMICK TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question 1. We have heard from Mr. Lowe about the continuing development of this technology. If you were faced with new clean air legislation requiring steep reductions in NOx, SOx, mercury and CO_2, what technology would you choose to produce electricity from coal?

Response. Integrated Gasification Combined Cycle (IGCC) is the environmentally superior technology for producing electricity with coal and many other carbonaceous fuels. The Wabash River facility, as mentioned in my testimony, is the cleanest coal fired power plant in the world of any technology. Global Energy has committed itself to developing applications for IGCC facilities since the early 1990's to provide this type of environmental solution for new power generation.

The next generation of IGCC facilities (which could be on line 2006–2010) will be able to operate at NOx, SOx and mercury levels approaching those set forth in DOE's Vision 21 guidelines for 2015 designs (2020 implementation).

Carbon dioxide emission reduction of approximately 20 percent (compared to conventional combustion technologies) is achieved with gasification combined cycle due to efficiency improvements. Further reductions can be achieved through additional process units which will separate the carbon components in the syngas produced. This has been technically achieved in other industries where there is a need to have the syngas further converted to hydrogen for chemical feedstock usage. However, implementation of these technologies in the power generation industry is constrained because there are no practical economic choices for either marketing or sequestration of the carbon dioxide in nearly all plant locations.

Question 2. It is been my experience that to stimulate the development of clean air technologies, we must impose a cap on emissions. That was certainly the case with the 1990 Clean Air Act, where the market-based caps on acid rain causing pollutants has triggered the widespread adoption of advanced scrubbers, at much less cost than was first projected. Would the maturation of IGCC benefit from such regulatory certainty?

Response. The Clean Air Act, incorporating a market based system for trading SO_2 emission credits beneath its cap, was indeed very effective. However, this was due as much, or maybe even more so, to the electric utilities switching to low-sulfur western coals as it was to new scrubber applications.

In today's market, even the viability of existing coal plant operation on western coals is threatened by regulatory uncertainty. Capital expenditures for new coal plant generation has been at a near standstill for more than a decade for this same reason. A planned implementation of any level of standards, especially a multi-pollutant approach, will benefit the decisionmaking process for new coal based generation. Implementation of tighter standards will support the market penetration of IGCC technology because of its superior environmental performance compared to coal combustion technologies.

Question 3. I noted that your IGCC facilities can also burn natural gas. If you located an IGCC facility near a supply of natural gas, could you use both fuels, depending on the pricing between the fuels? If so, wouldn't this buttress the fuel diversity of our nation's utilities?

Response. The combustion turbines installed at IGCC facilities are always supplied with dual fuel capability (i.e., the ability to operate on syngas, or on either natural gas or fuel oil.) This is necessary for the startup of the facility, because the combustion turbine does not operate well at low loads (less than 20 percent) with low-to-medium Btu fuels.

Aside from the short duration of the startup however, the plant would have the ability to run at full capacity with either fuel. Both the Tampa and Wabash IGCC's currently have this capability, and can utilize natural gas as fuel when the syngas supply is unavailable. This enhances the power plant availability. Having said that, one must realize that the plant must operate with coal as the preferred fuel in order to justify the additional expense of the gasification facility. In most of the planned IGCC facilities that Global is aware of, additional equipment is provided in the gasification facility to enhance its availability (extra gasification trains for instance) rather than rely on natural gas for any large portion of the annual operation. This decisionmaking is driven by concerns of natural gas pricing volatility.

Question 4. I noticed that your plant was retrofitted for IGCC. Would it be possible to apply this technology to these grandfathered plants that are causing all this controversy over New Source Review?

Response. At Cinergy's Wabash River Generating Station, the Unit 1 steam turbine was repowered with the addition of a new combustion turbine and heat recovery steam generator, and the new syngas production facility. Net output of this unit increased from about 100 MW to 262 MW, annual operating hours were increased and yet emissions of SOx, NOx and particulate were reduced by thousands of tons per year.

Many of the older coal fired generating plants in the United States are also candidates for repowering with gasification. Technically, the best candidates will have steam turbines over 100 MW in rating and steam pressure levels from 600 psig to 2000 psig. The plants must also have sufficient area available in close proximity of the steam turbine for the new construction. However, even if little of the existing power station equipment can be incorporated into the new design, there remain advantages of using existing sites which have significant transmission and coal handling infrastructures.

Economically, the best candidates will be those plants where major investments have not been made in cleanup of the current flue gas stream. Plants where scrubber additions have not yet been made, for instance. Also plants where the boiler, which will be decommissioned in an IGCC repowering, is due for significant repairs or costly maintenance. Avoiding these costs helps offset the cost of the new IGCC facility. Many of these facilities (which may have avoided scrubber additions by switching to low sulfur compliance coals) will also be able to return to operation with coal from local mines, reducing transportation costs and boosting local economies while still reducing SOx emissions. With gasification, local sulfur coal with 3–6 percent sulfur can be utilized and the facility can achieve SOx emission levels as low as 0.04 lb/MMBtu, which would be an improvement over the SOx emissions of an unscrubbed plant with even 0.5 percent sulfur western coal.

The older and dirtier the existing plant is, the more advantage there is to be gained by gasification repowering, both in improvement of operation and output and in reduction of emissions.

STATEMENT OF DR. RICHARD SANDOR, CHAIRMAN AND CEO, ENVIRONMENTAL FINANCIAL PRODUCTS, LLC

Context

The debate over appropriate actions to address the risks arising from changes in the Earth's climate—the "greenhouse effect"—suffers from two major information gaps. The first is a lack of consensus regarding the damages that could occur to the environment without action to reduce greenhouse gas (GHG) emissions. The scientific process may not precisely predict the nature and implications of climate changes that would occur if society does not make significant changes in energy and land use patterns associated with higher levels of GHG emissions. That is, the costs of inaction and the benefits of taking mitigation actions are uncertain.

The second information gap is lack of understanding of the monetary costs associated with undertaking mitigation to reduce greenhouse gasses. The absence of hard, proven data on greenhouse gas mitigation costs reduces the quality of the climate policy debate.

The nature of the implied cost-benefit analysis underlying the climate debate suggests that for any particular level of benefits accruing from action to mitigate climate change, a high cost of mitigation will lead policymakers to take less action. If mitigation costs are proven to be low, it appears policymakers would support stronger action to address climate change. At this time, however, we lack the data for realizing the costs involved in pursuing climate mitigation actions.

To help fill this gap, Environmental Financial Products, in collaboration with the Kellogg Graduate School of Management at Northwestern University, received a Millennium grant of $374,000 from the Chicago-based Joyce Foundation in May 2000. With $900 million in assets, the Foundation has been a longtime and well-respected funder of efforts to protect the natural environment of the Great Lakes region. The grant, part of a series supporting work on significant intergenerational issues, enabled us to explore the feasibility of designing a voluntary market to help answer the second question: the cost of steps to reduce climate change. A second grant to fund the design phase of the market was granted in August of 2001.

The ultimate objective of the proposed Chicago Climate Exchange is to generate price information that provides a valid indication of the cost of mitigating greenhouse gases. By closing the information gap on mitigation costs, society and policymakers will be far better prepared to identify and implement optimal policies for managing the risks associated with climate change.

Overview and Methodology

This report presents a feasibility analysis and initial architecture for a voluntary pilot greenhouse gas emissions trading program that would be launched in the Midwest and expanded over time. The objectives of the pilot program—hereafter called the Chicago Climate Exchange (CCX)—are:

Proof of Concept

- demonstrate the ability to cut and trade greenhouse gases in a market system involving multiple industrial sectors, mitigation options and countries;
- initiate greenhouse gas reductions through a modest size but scalable program;
- form a basis of experience and learning for participants;
- introduce a phased, efficient process for achieving additional GHG reductions in the future.

Price Discovery

- provide realistic information signaling the cost of mitigating greenhouse gases;
- enhance the quality of climate policy decisionmaking by providing hard data on mitigation costs to the public and policymakers.

The strategy used to assess the feasibility of a pilot GHG market relied on several research methodologies. A theoretical economic assessment accompanied by quantified data guided the structure of the study. The proposed market architecture was influenced by lessons from other successful emissions, financial, and commodity markets. The successful USEPA SO_2 emissions trading program to reduce acid rain served as a model for the design of key elements of the Chicago Climate Exchange.

The research is a continuing work in progress. The current stage of the process is to incorporate industry input to refine the initial proposed market terms and conditions. This process will yield a working prototype for which an attempt to build a consensus will be initiated. That consensus design would represent a functional architecture for the first phase of a market. Implementing the proposed market design and incorporating lessons from practical experience are core elements of the program.

Market Architecture and Participants: Theory and Design

The negative effects caused by the release of greenhouse gases are currently not priced. Consumers and businesses do not fully take account of such effects in their economic decisionmaking because there is no price on the use of the atmosphere. The goal of the proposed pilot greenhouse gas trading program is to establish the market for discovering the price for reducing emissions. The core steps are to limit overall consumption of the atmosphere (GHG emissions) and establish trading in instruments that allow participants to find the most cost-effective methods for staying within a target emission limit. The market price of those instruments will represent a value signal that should stimulate new and creative emission reduction strategies and technologies. Emissions trading is a proven tool that works with and harnesses the inventive capabilities of business.

Various market architecture design options were considered. A market could include emission limits taken by fossil fuel producers and processors—the “upstream” entities in the carbon emissions cycle—or by major “downstream” sources that burn fossil fuels, such as electric power generators, factories, and transport firms. An “intermediary” level approach could focus on firms that produce energy consuming devices, such as automobiles, or other intermediaries such as fuel distributors. Based on responsiveness (the ability of participants to directly cut emissions), administrative costs and existence of successful precedents, the recommended approach is a predominantly “downstream” approach. Accordingly, the research findings suggest the CCX should aim to include participation by large emission sources at the downstream level (e.g., power plants, refineries, factories, vehicle fleets).

In order to incorporate other mitigation projects that add to the flexibility of the market (and which are gaining international recognition as valid projects), the proposed design would also allow crediting for a range of offset projects that encourage micro-level GHG mitigation actions. Reflecting international consensus and successful precedent, the items to be traded in the pilot market—GHG emission allowances and offsets—are instruments representing one ton of carbon dioxide (CO_2) or their equivalent (CO_2e). For every ton of CO_2 emitted, a participating emission source must relinquish one allowance or offset.

Potential For A Market Initiated in the U.S. Midwest

The Midwest represents a microcosm of the United States. The region’s economy is as large as the economies of the United Kingdom (UK) and the Netherlands combined and has annual GHG emissions equal to those of the UK plus France (1.375 billion tons CO_2). The region’s industrial diversity—including a broad range of energy, heavy manufacturing, transport, agriculture, pharmaceuticals, electronics and forestry—make it well-suited as a starting point for a robust and representative greenhouse gas emissions trading market.

The feasibility analysis suggested a hypothetical target market covering 20 percent of all Midwest emissions. The scale of such a market and the proposed GHG mitigation goals are summarized in Table A. The Table portrays a proposed GHG reduction schedule calling for emissions in the first year of a pilot market, 2002, to be 2 percent below 1999 levels (the baseline year) and falling a further 1 percent each year from 2003 through 2005.

Table A

Scale of a Hypothetical Midwest GHG Market and Mitigation During 2002–2005
(in million metric tons CO_2 equivalent)

Estimated Midwest 1999 emissions	1,375
1999 emissions of a hypothetical 20 percent coverage market	275
Cumulative baseline emissions during 2002–2005 under for the 20 percent coverage scenario.	1,100
Cumulative 2002–2005 CCX emissions target for hypothetical 20 percent coverage program (2 percent below 1999 levels during 2002, 3 percent below 1999 in 2003, 4 percent below in 2004, 5 percent below in 2005).	1,061.5
Four-year Mitigation Demand (baseline emissions—target)	38.5 mil. tons CO_2e

The hypothetical 20 percent coverage Midwest market appears to provide sufficient scale for a pilot market that could be representative of a larger market. Total emissions covered in such a market would equal the emissions of Scandinavia (Denmark, Finland, Norway and Sweden) and would be more than double the emissions covered in the successful internal GHG market operated by BP. While broad coverage is an ultimate goal, the main benefits of a pilot—proof of concept and price discovery—can be realized with a modest size but a diverse set of participants.

Proposed Market Architecture and Mechanics

Table B summarizes the core elements of the proposed market architecture.

Table B—Indicative Term Sheet

Market Architecture for the Chicago Climate Exchange

Geographic Coverage	2002: emission sources and projects in seven Midwest states (IA, IL, IN, MI, MN, OH, WI), offsets accepted from projects in Brazil; 2003–2005: emission sources and projects in United States, Canada and Mexico, offsets accepted from projects in Brazil.
Greenhouse Gases Covered	Carbon dioxide, methane and all other targeted GHGs
Emission Reduction Targets	2002: 2 percent below 1999 levels, falling 1 percent per year through 2005
Industries and Firms Targeted	Primarily ''downstream'' participants: power plants, refineries, factories, vehicle fleets; approximately 100 firms initially targeted; individual entities or operating groups must produce over 250,000 tons CO_2e to become a participating emission source
Tradable Instruments	Fully interchangeable emission allowances (original issue) and offsets produced by targeted mitigation projects
Eligible Offset Projects	• Carbon sequestration in forests and domestic soils • Renewable energy systems activated after 1998 • Methane destruction in agriculture, landfills and coalbeds • Offset projects must be over 100,000 tons CO_2e; smaller offset projects must aggregate reductions to meet the requirement
Annual Public Auctions	2 percent of issued allowances withheld and auctioned in ''spot'' and ''forward'' auctions, proceeds returned pro rata
Central Registry	Central data base to record and transfer allowances and offsets; interfaces with emissions data base and trading platform
Trading Mechanisms	Standardized CCX Electronic Market, private contracting
Trade Documentation	Uniform documentation provided to facilitate trade
Accounting and Tax Issues	Accounting guidance suggested by generally accepted accounting principles; precedent exists for U.S. tax treatment
Market Governance	Self-governing structure to oversee rules, monitoring and trade

The following summarizes the mechanics of the proposed system:

1. Participating emission sources agree to the prescribed emission limits and standardized emissions monitoring and reporting rules.

2. Participating emission sources receive a 4-year stream of emission allowances equal to their target emission level.

3. Emission offsets may be generated by independently verified GHG mitigation projects.

4. Starting in 2002, annual allowances and offset holdings must cover annual emissions.

5. Participants can comply by cutting their own emissions or purchasing emission allowances from those who make extra emission cuts or from offset projects.

6. Failure to fulfill commitments triggers automatic non-compliance penalties.

7. Periodic auctions and organized trading will reveal market prices.

Tradable emission allowances and offsets exist and are transferred as records in a publicly accessible computerized tracking system called the Registry. Each unit is assigned a unique identification number. A variety of best-practice methods for measuring or calculating GHG emissions will be applied, including continuous emissions monitoring, fuel records and mass balance calculations. Methods for addressing new entrants and facilities and partial ownership of emission sources have been proposed but need further refinement based on industry input.

Emission offsets reflect mitigation actions generated by individual projects undertaken by entities not qualified to be emission sources (generate less than 250,000 tons CO_2e emissions reductions per year). When possible, standard rules and conservative reference emission values can be used to determine offset project effectiveness. Offsets are earned by undertaking specified mitigation projects that must be independently verified. Multiple small offset projects will be grouped into 100,000 ton pools. Offset projects must follow standardized registration, reporting and verification processes. This design feature is intended to produce fungible instruments that will be recognized in other emerging carbon markets.

Examples of eligible offset projects include:

- Carbon sequestration from forest expansion, and domestic no-till agricultural soils and agricultural tree and grass plantings;
- Electric power generated by wind, solar and geothermal systems;
- Methane capture and destruction (e.g., from agricultural waste, landfills and coal mines).

Selected categories of offsets can be implemented in Brazil. This feature allows the pilot market participants to develop expertise on issues associated with cross-border transactions, including the opportunity to develop trading across differing legal and regulatory systems. Brazil also represents a natural location as it has extensive linkages to many Midwest businesses, presents a variety of low-cost mitigation opportunities, and its policymakers are actively preparing for the international carbon market.

Annual auctions of emission allowances will be held to help stimulate the market and publicly reveal prices. To complement private contracting, an electronic mechanism for hosting CCX trading will provide a central location that facilitates trading and publicly reveals price information. Several existing trading systems will be considered for use in the CCX market. Trading will be encouraged by provision of uniform trade documentation and by listing standardized spot and forward contracts on the CCX electronic market.

Market Administration Issues, Public Policy Context

Administration of the CCX market by an efficient, corporate style governance system, with an elected Board of Directors and a strong Chief Executive, is recommended. The rules structure and decisions of the governing body should be codified through a Rulebook. Under the guidance of the Board and the Rulebook, a professional staff should be responsible for making most operational decisions and managing outside vendors. In order to assure the market incorporates current best practices, several expert advisory committees will be convened, including committees on rules and enforcement; market operations and technical specifications; and emissions and project monitoring, verification and audits.

The capabilities of various service providers who might construct and/or operate an emissions and emissions trading registry were examined. In order to assess the options available for implementing important elements of the CCX market, EFP staff has examined the capabilities of various service providers who might construct and/or operate an emissions and emissions trading registry. Discussions have been held to assess the capabilities of such vendors ranging from multi-national providers of trading technology to vendors of specific technology. EFP also met with a B2B trading platform for the forest products sector, which is used and recommended by two CCX participants. Each group offers potentially attractive features that will be further examined. Negotiations with potential trading system partners should commence as soon as possible to enable a second quarter 2002 system activation. Conversations have also been ongoing with clearing organizations, including an organization that has achieved a AAA credit rating from Standard & Poor's, a $100 million default insurance policy and a credit facility of $200 million. EFP has also worked to build links to other emerging GHG markets (e.g., the UK), multi-lateral organizations, national governments, corporations, non-governmental organizations and financial and commodity exchanges.

Professional research on the accounting and tax issues associated with participating in the CCX was conducted under subcontract by PricewaterhouseCoopers LLP. An extensive body of guidance on both accounting and tax issues associated with emissions trading has been established in the U.S. Preliminary indicative guidance is provided on proper accounting and income tax treatment for issues associated with enrollment in the market, trading, swaps, auctions and participation costs.

A variety of legislative proposals have provided further indication that participation in CCX will help position participants to intelligently influence and benefit from possible future regulations. Legislative proposals to require reductions in power plant CO_2 emissions, and to assist or reward farm and forest carbon sequestration, could introduce a policy environment that provides competitive advantages to CCX participants.

Industry Outreach, Response

In order to identify potential CCX participants, a data base containing salient information on major Midwest emission sources was assembled and screened based on various criteria. Many Midwest businesses have already initiated climate change programs, and some industries, including the electric power industry, are already involved in emissions trading. Approximately 100 companies met the screening criteria. Additional screening identified forty firms that received first-round invitations to participate in forming the market. Sectors represented in this list include: electric power, auto manufacturers, petroleum refining, transport, pharmaceuticals, forest and paper, chemical manufacturers, and computers and telecommunications.

The outreach and communications effort has also included speeches and presentations, authored articles and dissemination of the CCX message through the media. This has resulted in four published articles authored by EFP executives, coverage in twenty-seven print and electronic media sources, five radio interviews, one web cast and twenty-five presentations at industry conferences, congressional hearings and other events in eight countries (United States., Canada, Mexico, Brazil, Germany, Morocco, Switzerland, and the United Kingdom).

Environmental Financial Products LLC initiated empirical research to assess interest among potential participants in the Chicago Climate Exchange. That effort, which is continuing, has included extending invitations for participation to a diverse group of entities. The invitations asked for a response consisting of a letter indicating a non-binding intent to help form final rules for CCX, and, provided the rules are consistent with the entity's interests, a non-binding intent to participate in the CCX market. To date forty-six targeted entities have given affirmative responses. Included are major manufacturers such as DuPont and Ford Motor Company, leading diversified energy companies such as American Electric Power and Cinergy, major international financial entities such as Swiss Re, agricultural businesses such as Growmark and Agriliance, and the two largest forest products companies in the world, International Paper and Stora Enso. The international presence in the CCX includes major Mexican corporations such as CEMEX and Grupo IMSA and a leading generator of electricity in Brazil (Cataguazes-Leopoldina). A new sector has been added: two major municipalities in North America (Chicago and Mexico City) have also agreed to participate in the design phase. We believe this new sector will add some important dynamics to the market and allow for incentives to achieve environmental improvements in cities. Appendix A provides a brief description of the entities from which a positive response has been received to date.

High-Level CCX Advisory Board

The Hon. Richard M. Daley, Mayor of the city of Chicago, accepted the invitation to become the Honorary Chairman of the CCX. A high-level Advisory Board has been formed to receive strategic input from top world experts from the environmental, business, academic and policymaking communities. Members of the Board include internationally recognized environmental leaders such as Maurice Strong and Israel Klabin, former Governors of U.S. States (James Thompson and David Boren), and individuals who have served in senior positions in major businesses and academic institutions, such as Donald Jacobs and Jeffrey Garten. The dignitaries serving on this Board can help inform corporate and governmental decisionmakers and contribute to the formation of a robust group of CCX market participants. Appendix B provides a brief biographical summary of each of the individuals who have agreed to serve on the CCX Advisory Board.

Research Methodology

The research methodology applied a "bottom-up" approach. The investigators focused their initial analysis at the micro level. The research identified six major sectors: electric power, energy (oil and gas systems), manufacturing, forest products, waste/landfills and agriculture. Individual interviews and discussions were then held with representatives of these sectors to gather input on a set of draft market rules. The researchers also considered two categories of offsets, those generated domestically (e.g., agricultural soil sequestration and renewable energy systems) and those offsets created in Brazil (e.g., forestry-based projects, fuel switching).

The decision to build the model from the micro to the macro level is based on a philosophical framework that has become a cornerstone of the CCX design: the creation of a set of common standards that can facilitate the operation of a market. An apt analogy might come from monetary policy theory. Policymakers are often faced, when setting a monetary regime, with choice of following a "rules" or "discretion"-based approach. It is our belief that the CCX should strive to be as much of a rules-based system as possible. Our experience as professional market inventors and participants is that a system that makes use of common practices and a set of standard rules has greater chances of being viable.

Current activities

Current activity in the design phase involves building consensus on the initial architecture by further incorporating industry input through a Technical Committee comprised of experts, including representatives of the entities identified in Appendix A. Meetings of the Technical Committees for the Agriculture, Electricity, Industry, Landfill and Forestry Products sectors were held in December 2001 and January 2002. These detailed discussions with participants and service providers are being undertaken in order to identify a consensus on the market architecture and implementation plan. This effort will aim to finalize emission baselines, targets, timetables, as well as rules on emissions monitoring, non-compliance penalties, new entrants, and jointly owned facilities. Proposed rules must be finalized for emission offset standards, mechanics of aggregating offsets and project verification.

A simultaneous effort is being undertaken to select vendors for the registry and trading platform, and to enroll project verifiers. The consensus market design will be codified in the CCX Rulebook, which will also establish the responsibilities and operating procedures of the CCX governance structure.

Next steps

The subsequent steps will be preparation and launch of the first phase of the pilot market. Further iteration will involve refinement of market operations based on actual experience with the market, and expansion to allow increased participation and broader geographic coverage.

Pre-launch preparation of the market will entail official enrollment of participating emission sources, activation of the Registry, and placing emission allowances in the accounts of participants. Launch of the market will require initiation of the emission monitoring and reporting procedures, accepting applications from offset projects, and activation of the electronic trading mechanism.

Operation of the market during the first year will include execution of the first auction, acceptance of quarterly emission monitoring reports, issuance first-year offsets based on independent verification reports, and the compliance "true-up" subsequent to year end. A process for expanding the market will be established in order to allow for orderly growth of participation.

APPENDIX A

Entities participating in the design phase of the Chicago Climate Exchanges

Agriliance: Agriliance is a partnership of agricultural producer-owners, local cooperatives and regional cooperatives. Agriliance offers crop nutrients, crop protection products, seeds, information management, and crop technical services to producers and ranchers in all 50 states as well as Canada and Mexico. It has sales and marketing offices in St. Paul, Minn., and Kansas City, Mo. Agriliance, LLC was formed on February 3, 2000, as an agronomy marketing joint venture between Cenex Harvest States Cooperatives, Farmland Industries, Inc. and Land O'Lakes, Inc.

Alliant Energy: Alliant Energy Corporation is a growing energy-service provider with both domestic and international operations. Headquartered in Madison, Wis., Alliant Energy provides electric, natural gas, water and steam services to more than two million customers worldwide. Alliant Energy Resources Inc., the home of the company's non-regulated businesses, has operations and investments throughout the United States, as well as Australia, Brazil, China, Mexico and New Zealand.

American Agrisurance represents the third largest crop insurance company in the United States. From its home office in Council Bluffs, Iowa, the company writes business in 37 states. American Agrisurance markets crop insurance coverage to producers as a source of risk protection. Its extensive product line includes Multiple Peril Crop Insurance, Market PricePlus^{tm}, Crop Revenue Coverage, Crop Revenue CoveragePlus®, Revenue Assurance, Income Protection, MVP wheat^{tm}, MVP corn^{tm}, MVP soybeans^{tm}, Crop Hail Insurance, Companion Hail Insurance, Field Grain Fire, and Named Peril Insurance.

American Electric Power (AEP) is a multinational energy company based in Columbus, Ohio. AEP owns and operates more than 38,000 megawatts of generating capacity, making it America's largest generator of electricity. The company is also a leading wholesale energy marketer and trader, ranking second in North America in wholesale electricity and wholesale natural gas volume. AEP provides retail electricity to more than 7 million customers worldwide and has holdings in the United States and select international markets. Wholly owned subsidiaries are involved in power engineering and construction services, energy management and telecommunications.

BP p.l.c. is the holding company of one of the world's largest petroleum and petrochemicals groups. BP's main activities are exploration and production of crude oil and natural gas; refining, marketing, supply and transportation; and manufacturing and marketing of petrochemicals. BP has a growing activity in gas and power and in solar power generation. BP has well-established operations in Europe, North and South America, Australasia and Africa.

Calpine: Headquartered in San Jose, CA, Calpine has an energy portfolio comprised of 50 energy centers, with net ownership capacity of 5,900 megawatts. Located in key power markets throughout the United States, these centers produce enough energy to meet the electrical needs of close to six million households. Calpine was ranked twenty-fifth among FORTUNE magazine's 100 fastest growing companies and it was recently ranked by Business Week as the 3rd best performing stock in the S&P 500.

Carr Futures/Credit Agricole Indosuez: Carr Futures, a subsidiary of Credit Agricole Indosuez, is a global institutional brokerage firm headquartered in Chicago. Carr holds memberships on all major futures and equity markets worldwide, and consistently ranks among the largest futures brokerage firms in the world.

CEMEX is a leading global producer and marketer of cement and ready-mix products, with operations primarily concentrated in the world's most dynamic cement markets across five continents. CEMEX combines a deep knowledge of the local markets with its global network and information technology systems to provide world-class products and services to its customers, from individual homebuilders to large industrial contractors.

Cinergy Corp.: Based in Cincinnati, Ohio, Cinergy Corp. is one of the leading diversified energy companies in the United States. Its largest operating companies, The Cincinnati Gas & Electric Company (Ohio), Union Light, Heat & Power (Kentucky), Lawrenceburg Gas (Indiana), and PSI Energy, Inc. (Indiana), serve more than 1.5 million electric customers and 500,000 gas customers located in a 25,000-square-mile service territory encompassing portions of Indiana, Ohio and Kentucky. The interconnections of Cinergy's Midwestern transmission assets give it access to 37 percent of the total U.S. energy consumption. Chicago is the fourth largest city in the United States and the Midwest's major industrial and financial center. The city is home of world-renowned financial exchanges and international corporations. Approximately 8 million people live in Chicago's metropolitan area.

CMS Generation is the tenth-largest U.S.-based company developing and operating independent power projects around the world. CMS Generation owns interests in independent power plants totaling more than 9,742 gross megawatts and more than 4,621 megawatts are under construction. CMS Generation currently operates plants in 10 countries, including the United States, India, Morocco, Argentina, Chile and Thailand. Three of its plants—in North Africa and Australia—are the largest independent power plants on their continents.

Cia Força e Luz Cataguazes-Leopoldina is a 100-year old holding company, and a major shareholder on five regional electricity-service providers—CFLCL, CENF, CELB, SAELPA and ENERGIPE, located in four different Brazilian states, with assets valued at U.S. $1 billion and over 1.6 million customers. Headquartered in Cataguazes, Minas Gerais, the company supports, among other initiatives, an extensive power generation program, consisting mostly of hydro and combined-cycle thermal power plants.

Ducks Unlimited—The mission of Ducks Unlimited is to fulfill the annual life cycle needs of North American waterfowl by protecting, enhancing, restoring, and managing important wetlands and associated uplands. Since its founding in 1937, DU has raised more than $1.6 billion, which has contributed to the conservation of almost 10 million acres of prime wildlife habitat in all 50 states, each of the Canadian provinces and in key areas of Mexico. Some 900 species of wildlife live and flourish on DU projects, including many threatened or endangered species. DU is the leading land restoration organization in North America and has much experience partnering with private landowners to deliver projects. Restoration activities such as reforestation and establishing grasslands serve to sequester carbon.

DuPont: DuPont is a science company, delivering science-based solutions that make a difference in people's lives in food and nutrition, health care, apparel, home and construction, electronics, and transportation. Founded in 1802, the company operates in 70 countries and has 93,000 employees.

DTE Energy is a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. DTE Energy's principal operating subsidiaries are Detroit Edison, an electric utility serving 2.1 million customers in Southeastern Michigan, and Michigan Consolidated Gas, serving 1.2 million customers in Michigan.

Exelon Corporation is one of the nation's largest electric utilities with approximately five million customers and more than $15 billion in annual revenues. The company has one of the industry's largest portfolios of electricity generation capacity, with a nationwide reach and strong positions in the Midwest and Mid-Atlantic. Exelon distributes electricity to approximately five million customers in Illinois and Pennsylvania and gas to 425,000 customers in the Philadelphia area. The company also has holdings in such competitive businesses as energy, infrastructure services and energy services. Exelon is headquartered in Chicago.

FirstEnergy, headquartered in Akron, Ohio, is a registered public utility holding company whose subsidiaries have annual revenues of more than $12 billion, and electricity sales of approximately 124 billion kilowatt-hours. Its seven electric utility operating companies—Ohio Edison, The Cleveland Electric Illuminating Company, Toledo Edison, Metropolitan Edison, Pennsylvania Electric, Pennsylvania Power and Jersey Central Power & Light—comprise the nation's fourth largest investor-owned electric system, based on serving 4.3 million customers in a 36,100-square-mile service area that stretches from the Ohio-Indiana border to the New Jersey shore. FirstEnergy subsidiaries and affiliates provide a wide range of energy and energy-related products and services, including the generation and sale of electricity; exploration and production of oil and natural gas; transmission and marketing of natural gas; mechanical and electrical contracting and construction; energy management; and telecommunications.

Ford Motor Company is the world's second largest automotive company. Its Automotive operations include: Ford, Mercury and TH!NK brands; wholly owned subsidiaries Volvo, Jaguar, Aston Martin and Land Rover; Mazda (33 percent ownership); and Quality Care and Kwik-Fit. Ford Financial Services, providing automotive financing and other services, and The Hertz Corporation, providing car rental services, are the other major components of Ford Motor Company. Ford's vision is to become the world's leading consumer company for automotive products and services. Ford Motor Company cares about preserving the environment for future generations, and is dedicated to providing ingenious environmental solutions that will position them as a leader in the automotive industry of the 21st century and contribute to a sustainable planet.

GROWMARK, Inc.: GROWMARK, headquartered in Bloomington, Illinois, is a federated regional cooperative that provides agriculture-related products and services primarily in Illinois, Iowa, Wisconsin and Ontario, Canada. FS-brand farm supplies and related services are marketed to farmers in these areas by nearly 100 GROWMARK member cooperatives. Visit the GROWMARK Web site at www.fssystem.com.

Grupo IMSA, a holding company, was founded in 1936 and is today one of Mexico's leading diversified industrial companies. The Group operates in four core businesses: steel processed products; automotive batteries and related products; aluminum and other related products; and steel and plastic construction products. With manufacturing facilities in Mexico, the United States and throughout Central and South America, Grupo IMSA currently exports to all five continents. In 2000 Grupo IMSA's sales reached US$2.2 billion, of which close to 45 percent was generated outside Mexico. Grupo IMSA shares trade on the Mexican Stock Exchange (IMSA) and on the NYSE (IMY).

Interface, Inc. is a global manufacturer, marketer, installer and servicer of products for the commercial and institutional interiors market. The Company is the worldwide leader in the modular carpet segment, which includes both carpet tile and two-meter roll goods. The Company's Bentley, Prince Street, and Firth brands are leaders in the high quality, designer-oriented sector of the broadloom segment. The Company provides specialized carpet replacement, installation and maintenance services through its Re:Source Americas service network. The Company's Fabrics Group includes the leading U.S. manufacturer of panel fabrics for use in open plan office furniture systems. The Company's specialty products operations produce raised/access flooring systems, antimicrobial additives, adhesives and various other specialty chemical compounds and products.

International Paper: With over 12 million acres of land managed in the United States alone, International Paper is one of the world's largest private landowners. International IP has significant global businesses in paper and paper distribution, packaging and forest products, including building materials.

Iowa Farm Bureau Federation: The Iowa Farm Bureau is a Federation of 100 county Farm Bureaus in Iowa. The organization was founded in 1918 and is currently comprised of more than 154,000 member families throughout the state. Numerous legislative, educational and service-to-member programs are provided for the members' benefit. The Iowa Farm Bureau's mission is to help farm families prosper and improve their quality of life. It is an independent, non-governmental, voluntary organization. It is local, statewide, national and international in its scope and influence and is nonpartisan, nonsectarian and nonsecret in character.

IT Group, Inc. is a provider of diversified, value-added services in the areas of consulting, engineering and construction, remediation and facilities management. Through the Company's diverse group of highly specialized companies, clients can take advantage of a single, fully integrated delivery system and expertise to meet their global environmental needs. Its broad range of services includes the identification of contaminants in soil, air and water and the subsequent design and execution of remedial solutions.

Manitoba Hydro is a major energy utility headquartered in Winnipeg, Manitoba serving 403,000 electric customers throughout Manitoba and 248 000 gas customers in various communities throughout southern Manitoba. Virtually all electricity generated by the provincial Crown Corporation is from self-renewing water power. We are the major distributor of natural gas in the province. The Corporation's capital assets-in-service at original cost exceed $8 billion, making it the fourth largest energy utility in Canada.

Mead Corporation a forest products company with $4.4 billion in annual sales, is one of the leading North American producers of coated paper, coated paperboard and consumer and office products, a world leader in multiple packaging and specialty paper, and a producer of high-quality corrugating medium. In management of the company's more than two million acres of forests, Mead is committed to practicing principled forest stewardship and using resources in a responsible and sustainable manner. Headquartered in Dayton, Ohio, Mead has more than 15,100 employees and offices and operations in 32 countries.

Mexico City is Mexico's capital and its seat of government. The city is also the country's major center of commerce, finance and the arts. Mexico City is the world's largest metropolis, with over 20 million people. Midwest Generation: Headquartered in Chicago, Midwest Generation, a subsidiary of Edison Mission Energy, owns 13 electricity generating units in Illinois and Pennsylvania. With a total generating capacity of over 11,400 megawatts, Midwest Generation can generate enough electricity to meet the needs of more than 13 million homes.

Midwest Generation is exclusively in business to sell wholesale power in competitive electricity markets. The company is currently undertaking a major program to reduce emissions from its coal-fired plants.

National Council of Farmer Cooperatives: NCFC's mission is to protect the public policy environment in which farmer-owned cooperative businesses operate, promote their economic well-being, and provide leadership in cooperative education. NCFC remains the only organization serving exclusively as the national representative and advocate for America's farmer-owned cooperative businesses.

Navitas Energy is an independent power producer that develops, owns and operates renewable energy production facilities in the United States. Navitas currently has over 650 MW of clean energy under development, leveraging the environmental benefits of wind energy with the dispatchability of combustion turbines to produce a cleaner blend of affordable electric energy.

NiSource Inc., is a holding company with headquarters in Merrillville, Ind., whose operating companies engage in all phases of the natural gas and electric business from exploration and production to transmission, storage and distribution of natural gas, as well as electric generation, transmission and distribution. Its operation companies provide service to 3.6 million customers located within the high-demand energy corridor that stretches from the Gulf of Mexico through the Midwest to New England.

NUON is one of the largest multi-utility companies in the Netherlands, serving more than 2.5 million residential and business customers with electricity and, in many instances, with gas, water and heat as well. The company is in the forefront in the marketing of green energy and renewable energy generation in the Netherlands and is extending its knowledge and experience in the area of renewable energy internationally. Nuon's activities in the field of renewable energy include wind power, small hydropower, thermal and photovoltaic solar energy, landfill gas, biogas, biomass and ambient heat.

Ontario Power Generation (OPG) is an Ontario based company, whose principal business is the generation and sale of electricity to customers in Ontario and to interconnected markets. OPG's goal is to be a premier North American energy company while operating in a safe, open and environmentally responsible manner. OPG's focus is to produce reliable electricity from competitive generation assets, power trading, and commercial energy sales activities.

ORMAT: ORMAT is the world leader in distributed reliable remote microturbine power units (also known as Closed Cycle Vapor Turbo Generators). ORMAT's operations use locally available heat sources, including geothermal energy (steam and hot water), industrial waste heat, solar energy, biomass, and low grade fuels.

Pinnacle West Capital Corp: Based in Phoenix, Ariz., Pinnacle West is the parent company of APS and Pinnacle West Energy. APS is Arizona's largest and longest-serving electric utility, serving more than 857,000 customers, and Pinnacle West Energy is the company's unregulated wholesale generating subsidiary. Among the utilities listed in the S&P 500, Pinnacle West is ranked in the top 10 percent for environmental performance by an international investment advisory firm. The Company also is ranked in the top 10 percent by Fortune magazine for total shareholder return over the last 5 years.

PG&E National Energy Group, headquartered in Bethesda, Md., develops, owns and operates electric generating and gas pipeline facilities and provides energy trading, marketing and risk-management services in North America. The National Energy Group operates power production facilities with a capacity of about 7,000 megawatts, with another 10,000 megawatts under development, and more than 1,300 miles of natural gas transmission pipeline with a capacity of 2.7 billion cubic feet per day. (PG&E National Energy Group is not the same company as Pacific Gas and Electric Company, the California utility, and is not regulated by the California Public Utilities Comission. Customers of Pacific Gas and Electric Company do not have to buy products or services from PG&E National Energy Group in order to continue to receive quality regulated services from Pacific Gas and Electric Company.)

STMicroelectronics: STMicroelectronics is the world's third largest independent semiconductor company whose shares are traded on the New York Stock Exchange, on Euronext Paris and on the Milan Stock Exchange. The Company designs, develops, manufactures and markets a broad range of semiconductor integrated circuits (ICs) and discrete devices used in a wide variety of microelectronic applications, including telecommunications systems, computer systems, consumer products, automotive products and industrial automation and control systems. In 2000, the Company's net revenues were $7.8 billion and net earnings were $1.45 billion.

Stora Enso: Domiciled in Finland, Stora Enso is an integrated global forest products company producing magazine papers, newsprint, fine papers and packaging boards, areas in which the company holds a leading global market position. Stora Enso is the world's second largest papermaker and also conducts extensive sawmilling operations. Stora Enso's global sales total approximately EUR 13 billion, with annual paper and board production capacity of about 15 million tonnes. The company has some 45,000 employees in more than 40 countries. Its shares are listed in Helsinki, New York and Stockholm. Stora Enso North America (formerly Wisconsin-based Consolidated Papers, Inc.) a Division of Stora Enso Oyj, is North America's leading producer of coated and supercalendered printing papers for the printing and publishing industries and is a premier producer of specialty papers, paperboard and paperboard products.

Suncor Energy, Inc. is a Canadian integrated energy company that explores for, acquires, produces, and markets crude oil and natural gas, refines crude oil, and markets petroleum and petrochemical products. Suncor has three principal business units: Oil Sands, Exploration and Production, and Sunoco. Oil Sands produces light sweet and light sour crude oil, diesel fuel and various custom blends from oil sands and markets these products in Canada and the United States. Exploration and Production explores for, acquires, develops, produces and markets crude oil in Canada and natural gas throughout North America. Sunoco refines and markets crude oil and a broad range of petroleum and petrochemical products in Ontario and the United States.

Swiss Re: Founded in 1863 in Zurich, Switzerland, Swiss Re is the world's second largest reinsurer, with roughly 9,000 employees and gross premiums in 2000 of CHF 26 billion (USD$15.3 billion). Standard & Poor's gives the company its AAA rating; Moody's rates it Aaa. Swiss Re does business from over 70 offices in 30 countries. The world over, Swiss Re offers insurers and corporates: classic (re)insurance covers, alternative risk transfer (ART) instruments, and a broad range of supplementary services for comprehensive risk management.

Temple-Inland Inc. is a diversified forestry, forest products and financial services company. Its three main operating divisions include a Paper Group, which manufactures corrugated packaging products; a Building Products Group, which manufactures a wide range of building products and manages the Company's forest resources consisting of approximately 2.2 million acres of timberland in Texas, Louisiana, Georgia and Alabama; and the Financial Services Group, which consists of savings bank, mortgage banking, real estate, and insurance brokerage activities.

The Nature Conservancy: The Nature Conservancy, a nonprofit organization founded in 1951, is the world's largest private international conservation group. TNC has protected over 12,089,000 acres of land in the United States.

TXU Energy Trading is a player in the highly competitive energy trading market. Through its headquarters in Dallas and regional offices across the country, it sells natural gas and electricity to more than 6,700 retail commercial and industrial customers across the United States. The company also offers a wide selection of other energy products and services including comprehensive risk, asset and portfolio management.

Waste Management, Inc. as a leading provider of comprehensive waste management services, Waste Management serves municipal, commercial, industrial and residential customers throughout North America. Headquartered in Houston, Texas, the Company's network of operations includes 284 active landfill disposal sites, 16 waste-to-energy plants, 73 landfill gas-to-energy facilities, 160 recycling plants, 293 transfer stations and more than 1,400 collection facilities. Combined, these resources allow Waste Management to offer a full range of environmental services to approximately 25 million residential and two million commercial customers nationwide.

Wisconsin Energy Corporation, headquartered in Milwaukee, Wis., is an $8.4 billion holding company with a diversified portfolio of subsidiaries engaged in electric generation; electric, gas, steam and water distribution; pump manufacturing and other non-utility businesses. The corporation's utilities subsidiaries serve more than one million electric and 950,000 natural gas customers in Wisconsin and Michigan's Upper Peninsula.

APPENDIX B

Biographies of the CCX Advisory Board

David L. Boren is the President of the University of Oklahoma. Mr. Boren has had a distinguished career in public service as a member of the Oklahoma House of Representatives (1967–1975), Governor of Oklahoma (1975–1977) and as a U.S. Senator (1979–1994). As a U.S. Senator, Mr. Boren was the longest-serving chairman of the Senate's Select Committee on Intelligence. Mr. Boren was educated at Yale and attended Oxford University as a Rhodes Scholar. He also earned a law degree from the University of Oklahoma College of Law.

Lucien Y. Bronicki is the chairman of Ormat International, an Israeli company leader in the field of innovative technology solutions to geothermal power plants, power-generation from industrial waste heat and solar energy projects. Mr. Bronicki has been chairman of Ormat since he founded the company in 1965. Mr. Bronicki holds various professional affiliations and memberships, including chairman World Energy Council's Israeli National Committee, Member of the Executive Committee of the Weizmann Institute of Science and member of the Board of Ben Gurion University. He is also the recipient of several business and science related awards.

Ernst Brugger is Founding Partner and chairman of Brugger Hanser & Partner Ltd. in Switzerland, a business consulting firm with international experience and range. He is also a professor at the University of Zurich, chairman and member of the board of various companies and a member of the International Committee of the Red Cross (ICRC). Dr. Brugger serves as chairman of the Board of Directors of Sustainable Performance Group, an investment and risk management company which invests in pioneering and leading companies which have taken up the cause of sustainable business.

lizabeth Dowdeswell is internationally recognized for her global and highly diverse experience in building consensus and managing change. She advises both public and private sectors on environmental issues worldwide. Ms. Dowdeswell is a former Executive Director of the United Nations Environment Programme (UNEP). Before joining UNEP, Ms. Dowdeswell was the Assistant Deputy Minister of Environment Canada. In that capacity she played a leading role in global efforts to negotiate the treaty on climate change adopted at the 1992 United Nations Conference on Environment and Development. She was Canada's permanent representative to the World Meteorological Organization, principal delegate to the Intergovernmental Panel on Climate Change, and Canadian chairman of the Great Lakes Water Quality Board. She is currently a Visiting Professor at the University of Toronto, a senior associate at Royal Roads University and an associate fellow of the European Centre for Public Affairs. She also serves on the governing and advisory boards of several institutions. Ms. Dowdeswell is the author of numerous publications in both the popular press and professional journals.

Jeffrey E. Garten is dean of the Yale School of Management. Formerly undersecretary of commerce for international trade in the first Clinton Administration, he also held senior economic posts in the Ford and Carter Administrations. From 1979—1992, he was a managing director first at Lehman Brothers, where he oversaw the firm's Asian investment banking activities from Tokyo, and then at the Blackstone Group. Currently a monthly columnist for Business Week, his latest book is "The Mind of the CEO" (2001)."

Donald P. Jacobs is Dean of the Kellogg Graduate School of Management and its Gaylord Freeman Distinguished Professor of Banking. Under his leadership, the Kellogg School has become a leader in the field of business and finance and is consistently ranked as one of the top five business schools in the United States. Dean Jacobs is a former chairman of the Board of Amtrak (1975–1979) and currently serves on several corporate boards. His work on banking, corporate governance and international finance has been published in many scholarly journals and he holds several honorary degrees and professional awards.

Dennis Jennings is the Global Risk Management Solutions Leader for PricewaterhouseCoopers' (PwC) Global Energy and Mining Industry Practice. Mr. Jennings previously served as the Dallas/Fort Worth Energy Industry Market Leader; Co-Chairman of the U.S. Oil and Gas Industry Program; and on Steering Committee of the International Energy Practice. Mr. Jennings is experienced in all sectors of the petroleum industry (upstream, downstream, domestic and international) and the service industry. His responsibility have included leading PwC's global risk management practice for the energy and mining industry, providing financial advice and performing due diligence reviews on numerous merger, acquisitions and divestiture efforts by major international corporations.

Joseph P. Kennedy II is chairman and President of Boston-based Citizens Energy Group. Before returning to Citizens Energy, Mr. Kennedy represented the Eighth Congressional District of Massachusetts in the U.S. House of Representatives for 12 years. Mr. Kennedy founded the non-profit company in 1979 to provide low-cost heating oil to the poor and elderly. Under his leadership, Citizens grew to encompass seven separate companies, including the largest energy conservation firm in the United States. Mr. Kennedy also advises and serves on the boards of several companies in the energy, telecommunications, and health care industries. Mr. Kennedy is the son of the late U.S. Senator Robert F. Kennedy.

Israel Klabin is the president of the Brazilian Foundation for Sustainable Development, a major Brazilian non-governmental organization devoted to issues of environmental and sustainable development policy. Mr. Klabin is the former chairman of Klabin SA, one of the largest forestry companies in Latin America. He is a former mayor of Rio de Janeiro and was one of the main Brazilian organizers of the United Nations Conference on the Environment (Rio 92). He is also actively involved in several philanthropical activities.

Bill Kurtis has had a distinguished career in broadcasting for over 30 years, as a news anchor in Chicago and later of the national CBS Morning News. He started his own company, Kurtis Productions, when he returned to Chicago in the mid 1980's and currently hosts shows on the Arts and Entertainment network. Mr. Kurtis is involved in The National Science Explorers Program, Electronic Field Trips and the Electronic Long Distance Learning Network, all aimed at teaching children about science. Mr. Kurtis and his shows have been the recipients of several awards. He serves on the board of directors of organizations devoted to natural history and the environment, including the National Park Foundation, the Nature Conservancy and the Kansas State Historical Society.

Jonathan Lash is President of the World Resources Institute (WRI), a Washington, DC-based non-governmental organization that provides solutions to global environment and development problems. From 1993 until 1999, Mr. Lash served as co-chair of the President's Council on Sustainable Development, a group of government, business, labor, civil rights, and environmental leaders that developed recommendations for national strategies to promote sustainable development. For 2 years before joining WRI, Mr. Lash directed the environmental law and policy program of the Vermont Law School. From 1987 to 1991, Mr. Lash headed the Vermont Agency of Natural Resources, having served the previous 2 years as Vermont's Commissioner of Environmental Conservation. He is the author of several books on environmental topics.

Thomas E. Lovejoy, is a world-renowned tropical and conservation biologist. Dr. Lovejoy is generally credited with having brought the tropical forest problem to the fore as a public issue, and is one of the main protagonists in the science and conservation of biological diversity. In 1987, he was appointed Assistant Secretary for Environmental and External Affairs for the Smithsonian Institution and is Counselor to the Smithsonian's Secretary for Biodiversity and Environmental Affairs. Dr. Lovejoy is also Chief Biodiversity Advisor to the President of the World Bank and the Bank's Lead Specialist for the Environment in Latin America. From 1989 to 1992, he served on the President's Council of Advisors in Science and Technology (PCAST), and acted as scientific adviser to the Executive Director of the United Nations Environment Programme (1994–97). He was the World Wildlife Fund's Executive Vice President from 1985 to 1987. Dr. Lovejoy is the author of numerous articles and books.

David Moran is vice president of ventures for the Electronic Publishing group of Dow Jones & Company and president of Dow Jones Indexes. Mr. Moran became president of Dow Jones Indexes on a full-time basis in June 1998. He was elected to a 1-year term as chairman of STOXX, Ltd., an index creator that is a joint venture of the German, Paris and Swiss stock exchanges and Dow Jones, in April 1999. He is also chairman of Dow Jones Sustainability Group Index GmbH. Prior to joining Dow Jones, Mr. Moran was an associate with Patterson, Belknap, Webb & Tyler, a New York City law firm, from 1979 to 1985.

Dr. R.K. Pachauri is the Director-General of the Tata Energy Research Institute (TERI) which does original work and provides support in energy, environment, forestry, biotechnology, and resource conservation to governments, institutions, and corporates worldwide. Dr. Pachauri is currently a Vice-Chairman of the Intergovernmental Panel on Climate Change; a Director of the Indian Oil Corporation Limited (a Fortune 500 company); and a member of the Board of Directors of the Institute for Global Environmental Strategies, Japan. He has been President (1988) and Chairman (1989–90) of the International Association for Energy Economics and is President of the Asian Energy Institute since 1992. He has been a member of numerous committees and boards, including those of the International Solar Energy Society, World Resources Institute, World Energy Council, and has acted as an Advisor to the Government of India, reporting directly to the Prime Minister. Dr. Pachauri has also served as a member of the faculty of several prominent academic and research institutions and has published 22 books and several papers and articles. He was recently awarded the Padma Bhushan, one of India's highest civilian awards. In July 2001 Dr. Pachauri was appointed a member of the Economic Advisory Council to the Prime Minister of India, which is chaired by the Prime Minister.

Les Rosenthal is a former chairman of the Chicago Board of Trade (CBOT) and a principal of Rosenthal Collins, a leading Chicago-based commodities and futures trading firm. During his time as member of the Board and chairman of the CBOT, Mr. Rosenthal was instrumental in advancing the cause of new and innovative exchange-traded products such as Treasury Bond futures and insurance derivatives.

Mary L. Schapiro is President of NASD Regulation, Inc. (NASDR) and a member of the Board of NASD, Inc. NASDR was created as an independent National Association Securities Dealers, Inc. (NASD) subsidiary responsible for regulating 5,500 member brokerage firms, 670,000 individual registered representatives and oversight of The Nasdaq Stock Market. Ms. Schapiro was formerly the chairman of the Commodity Futures Trading Commission. Ms. Schapiro also served as a Commissioner of the Securities and Exchange Commission (SEC). Ms. Schapiro was an active member of the Technical Committee and the Developing Markets Committee of the International Organization of Securities Commissions (IOSCO) and has worked extensively with developing markets on capital markets regulatory structure. In May 2000, Ms. Schapiro was named the Financial Women's Association Public Sector Woman of the Year.

Maurice Strong is a former Secretary General of the 1992 United Nations Conference on Environment and Development (the Rio Earth Summit) and Under-Secretary General of the United Nations. He is currently the chairman of the Earth Council, a non-governmental organization dedicated to the cause of sustainable development. In June 1995, he was named Senior Advisor to the President of the World Bank. From December 1992 until December 1995, Mr. Strong was chairman and Chief Executive Officer of Ontario Hydro, one of North America's largest utilities. Mr. Strong is an advisor to the United Nations, and has been a director and/or officer of a number of Canadian, U.S. and international corporations.

James R. Thompson is a former four-term Governor of Illinois and currently a managing partner of Winston and Strawn. During his last term as Governor, Mr. Thompson was involved in the implementation of the sulfur dioxide (SO_2) market created by the 1990 Clean Air Act. During his last term as Governor he was the Head of the Global Climate Change Task Force at the National Governors' Association (1988–1989). Governor Thompson is also a director of the Chicago Board of Trade (CBOT).

Sir Brian Williamson is the chairman of the London International Financial Futures and Options Exchange (LIFFE), one of the world's largest exchanges. Mr. Williamson has been involved in trading financial futures for almost three decades in London, New York and Chicago. He held senior executive positions for prominent trading firms and was a member of the International Advisory Board of the Nasdaq Stock Market, becoming chairman in 1996. He was also Governor-at-Large of the National Association of Securities Dealers in Washington DC. (1995–1998).

Robert K. Wilmouth is President and CEO of National Futures Association (NFA). NFA, the industry-wide, self-regulatory organization for the futures industry. Mr. Wilmouth has served as NFA's President since 1982. Formerly, he served as President and CEO of the Chicago Board of Trade for approximately 5 years following a 27-year career in the banking industry, which included a term as President of the Crocker National Bank of San Francisco. He was chairman of LaSalle National Bank for over two decades, is currently a member of the Economic Club of Chicago, the chairman of the Consultative Committee of IOSCO, a Lifetime Trustee of the University of Notre Dame and a former chairman of its Investment Committee. Mr. Wilmouth is a graduate of Holy Cross College and holds a Masters degree from the University of Notre Dame.

RESPONSES OF DR. RICHARD L. SANDOR TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question 1. Let me first say that I appreciate all the work that you have done with Northwestern University and wish you much success with the Chicago Climate Exchange. In your written testimony, you state "Emissions Trading is a proven tool that works with and harnesses the inventive capabilities of business." Could you expand on the statement a bit for us? S. 556 contains cap-and-trade provisions for carbon dioxide, nitrogen oxides, and sulfur dioxide, and we would appreciate your insights.

Question 2. I noticed that several electric power companies that are heavy users of coal are active participants in the Chicago Climate Exchange process. Can you talk about their participation and whether they have agreed to reduce their CO_2 emissions?

Response to Questions 1 and 2. We believe the evidence is now quite convincing that a well-designed emissions trading program—that is, one where the commodity is well-defined, monitoring protocols are specified, rules are clear and stable, transaction costs and other trade impediments are minimal, and a diverse participant group is present—can yield faster emission reductions at lower cost to society. I would note that while these conditions are present in the highly successful sulfur dioxide allowance trading system adopted in the acid rain provisions of the 1990 Clean Air Act Amendments, but have been absent in several other "trading" programs that have been attempted.

Over the past decade the management of emissions and emission allowance accounts have become a routine business matter. Businesses are attempting to optimize their compliance strategies in much the same way they manage fuel consumption and electricity sales. Exposure to emissions markets is being approached as an asset or liability to be managed in much the same way other commodities and financial accounts are handled. By establishing a price on pollution where none existed before, we have seen the emergence of a variety of creative techniques for mitigating pollutants at lower cost. Some companies have also uncovered profit opportunities through intelligent management of emission allowances. For example, fuel vendors, scrubber manufacturers, investment banks and others have found creative ways to package emission allowances with their products to provide convenient and cost-effective techniques that power companies can use to meet their reduction commitments.

1. At this stage none of the entities that are participating in the design phase of the Chicago Climate Exchange (CCX) has been asked to accept to specified emission reduction commitments. We do not feel it is logical to ask them to accept such commitments until they can assess the full package of emission limits, mitigation options and market rules to be employed in the program.

However, once the rules of the CCX are set, emissions sources will be invited to accept such a commitment. To date, the participation of the electric power companies has seen a very strong and good faith effort to identify fair and functional rules for the exchange. Naturally, each company has specific design features they wish to include (e.g., credit for mitigation actions taken prior to launch of the market), so the design process must weigh these varying preferences and settle on a fair program that achieves the goals set out for the pilot market.

RESPONSES OF DR. RICHARD L. SANDOR TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. How do the limits on trading of carbon credits found in the Jeffords/ Lieberman bill impact your recommended approach to carbon trading in general? Would enough credits be available if we limit the trading just to the utility industry?

Response. Because the climate protection benefits realized from effective mitigation actions are realized regardless of how and where such mitigation occurs, to achieve cost-effectiveness we believe that greenhouse gas mitigation should be encouraged in the maximum range of sectors and activities, provided they can be monitored with reasonable cost and accuracy. It is likely that requiring that emissions mitigation occur in a single targeted sector would yield higher mitigation costs compared to a system that allowed mitigation to occur in a larger number of sectors and activities.

Question 2. Would the Jeffords/Lieberman bill do anything to encourage technology sharing with other nations to solve problems like "black soot carbon" in India or China?

Response. It is not possible to answer this question without having detailed information on the rules and regulations to be applied in the implementation of the proposed legislation. It is conceivable that the rules could allow for credits to be earned in other sectors and countries, and this latitude could cause the search for low-cost emission credits to result in actions that address the specific problems addressed in your question.

RESPONSES OF DR. RICHARD L. SANDOR TO ADDITIONAL QUESTIONS FROM SENATOR CORZINE

Question 1. There are a variety of sectors represented by the companies that are participating in the Chicago Climate Exchange. Do you think that protocols, standards and calculation tools for measuring GHG emissions are mature enough to enable all of these sectors/companies to accurately estimate their GHG emissions? What about the protocols, standards and calculation tools for measuring emissions reductions and carbon sequestration?

Response. We believe that emission quantification protocols for a variety of emitting industries are now sufficiently mature to warrant their use in a pilot greenhouse gas trading program. Protocols for the main emission sources—fossil fuel combustion and process emissions from chemical reactions in industrial processes—have been developed in the private and non-governmental sectors and by governments and international panels.

At this time we believe there are adequate protocols for quantifying limited-scale reforestation carbon sequestration projects. In addition, there is a growing wealth of scientific findings and modeling techniques that, with proper discounting, can allow one to form reasonable estimates of the agricultural soil carbon sequestration benefits associated with certain widely practiced best management practices (e.g., conservation tillage). As a general rule we will adjust such procedures to make them conservative. For example, a technique called overcollateralization, which is frequently used in the capital markets, can be used as an adjustment methodology to overcome measurement uncertainties. We should note that currently there is not an industry-accepted standard technique for quantifying annual carbon sequestration increments in large-scale industrial forests. We continue to examine options for addressing this important issue.

The historical experience shows that emissions trading systems (as well as other financial and commodity markets) can succeed even when measurement protocols are known to be subject to error. Provided the protocols are fundamentally sound, accepted by market participants, and applied consistently, trading can succeed in such a rules-based system. In response to potential cost savings or profit opportunities, participants may be incented to devise superior quantification techniques.

Question 2. Many of the companies participating in the Chicago Climate Exchange are multi-nationals. Are any of them already doing GHG emissions reporting or planning to do GHG emissions reporting outside the United States?

Response. Many of the multi-nationals participating in the CCX are required to report GHG emissions under the programs now being adopted in the United Kingdom and under voluntary programs in place in Canada.

STATEMENT OF MICHAEL D. DURHAM, PH.D., MBA, ADA ENVIRONMENTAL SOLUTIONS

Good morning, Mr. Chairman, I am Dr. Michael Durham, President of ADA Environmental Solutions (ADA-ES). ADA-ES is a company that develops and commercializes novel air pollution control technology for the power industry. We are currently managing a $6.8 million program involving a team of the-nations leading engineers and scientists to scale-up and demonstrate sorbent-based mercury control technology. The Department of Energy National Energy Technology Laboratory (NETL) is providing two thirds of the funding for the program. The remaining funds are provided by co-funding team members including: PG&E National Energy Group, Southern Company, Wisconsin Electric-Wisconsin Gas (WE-WG), EPRI, Ontario Power Generation, FirstEnergy, TVA, and Kennecott Energy Company as well as ADA-ES and other equipment suppliers.

During 2001 we successfully completed two short-term programs that represent the first full-scale demonstrations of sorbent-based mercury control technology in the U.S. power industry. Tests were conducted on both bituminous and subbituminous coals. I have submitted detailed documents describing our program and am presenting results from these two demonstrations. These results provide us with an early indication of both the high potential and limitations of this technology. This morning I will briefly summary results and discuss plans for the continued development of this technology.

I. Summary

Sorbent injection technology represents one of the simplest and most mature approaches to controlling mercury emissions from coal-fired boilers. It involves injecting a solid material such as powdered activated carbon (PAC) into the flue gas. The gas phase mercury in the flue gas contacts the sorbent and attaches to its surface. The sorbent with the mercury attached is then collected by the existing particle control device along with the other solid material, primarily fly ash. This combined material is then either disposed of or beneficially used in building materials.

Two demonstrations were conducted during 2001. The first program was completed in the spring at the Alabama Power E.C. Gaston Station. This unit burns a low-sulfur bituminous coal and uses a COHPAC baghouse to collect the carbon and flyash. The second program was conducted during the fall at the WE-WG Pleasant Prairie Power Plant. This unit burns a subbituminous Powder River Basin (PRB) coal and uses an electrostatic precipitator (ESP) to collect the carbon and flyash.

These programs demonstrated that it is possible to design, build, and operate equipment at a scale capable of treating power plant flue gas. To date, the injection equipment has operated successfully at both sites. The results from the short-term (8 hour) parametric tests from both programs are plotted in Figure 1. We are encouraged by the potential shown by the PAC technology during these two successful demonstrations in that short-term removal levels in excess of 90 percent were achieved in the case where COHPAC was used. These tests also proved that activated carbon was effective on both forms of mercury, elemental and oxidized. Elemental mercury has been proven to be the most difficult form of mercury to capture. It is the dominant species in PRB coal (83 percent at Pleasant Prairie) but it is also found in bituminous coals (40 percent at Gaston).

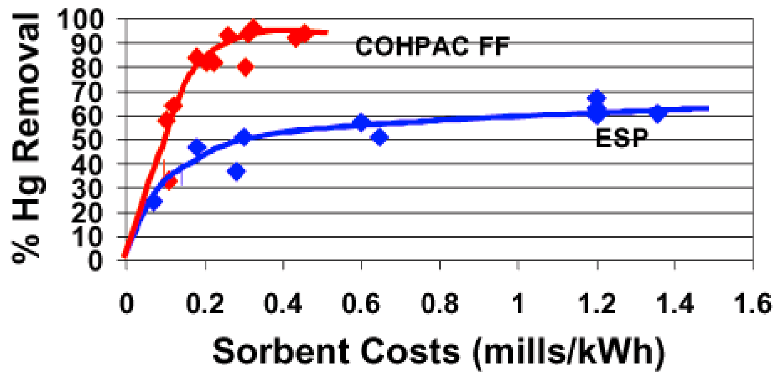


Figure 1. Results of Parametric Tests of Mercury Control by Injecting Powdered Activated Carbon at Two Power Plants

However, these results also documented several limitations of the technology. From the data in Figure 1 it is obvious that the downstream particle control is the dominating factor in determining removal efficiency. While removal levels of 90 percent were obtained with the fabric filter (baghouse), even with spray cooling the ESP collecting PRB ash was limited to levels of 50–70 percent. Since only 10 percent of the plants have baghouses, capital expenditures of $40–50/kW would be required to achieve the higher levels. Operating data obtained at Gaston also showed that PAC injection produced increased pressure drop in the baghouse. This will require that COHPAC baghouses designed for use with PAC will have to be larger to accommodate the increased mass. At Pleasant Prairie, it was discovered that the presence of activated carbon in the ash prevented WE-WG from selling the ash for use in concrete. This represents a significant cost that must be incorporated into the economics of the technology.

It must also be noted that these tests only ran for very short periods of time with the longest continuous runs being 2 weeks. During the test program, the plants accommodated the needs of the R&D program by operating at full load conditions. This produces more of a steady state condition than is found during their typical load cycling operations. Even with constant load conditions, with variations in coal characteristics, it was not possible to maintain the 90 percent removal levels over a 5-day continuous run, with the average dropping to 80–85 percent.

II. Background on Sorbent Injection

Sorbent injection technology involves the injection of a dry sorbent, such as activated carbon powder, into the flue gas duct somewhere between the air preheater and the ESP or fabric filter (FF), as shown in Figure 2. This is typically in the 250–350 degree F range. Vapor-phase mercury is adsorbed onto the activated carbon, which is then collected in the ESP or FF. The mercury-activated carbon interaction continues to occur in the ESP or FF. The technology can be used in conjunction with flue gas temperature control, usually accomplished through the injection of water (spay cooling) droplets into the flue gas.

A variation of the configuration shown in Figure 2 using a high air-to-cloth Pulse-Jet Baghouse installed downstream of the existing ESP was developed and patented by EPRI. This configuration, without carbon injection, is called COHPAC. When a sorbent is injected into the baghouse for pollutant control, the process is called TOXECON. This approach focuses on improving the efficiency of sorbent injection by providing high efficiency particulate collection as well as a good “contact” scheme for the sorbent and mercury (e.g., the FF). This technology also minimizes the amount of the fly ash that can be contaminated by the mercury sorbent.

The most commonly studied sorbent for mercury control has been activated carbon. This material has been successfully used as a sorbent in municipal and hazardous waste combustors. Activated carbon is carbon that has been “treated” to produce certain properties such as surface area, pore volume, pore size. Activated carbon can be manufactured from a variety of sources, (e.g., lignite, peat, coal, wood, etc.). More commonly, steam is used for activation, which requires carbonization at high temperatures in an oxygen-lean environment. As some carbon atoms are vaporized, the desired highly porous activated carbon is produced. Commercially, activated carbons are available in a range of particle sizes, as well as other characteristics that are needed for a specific application.

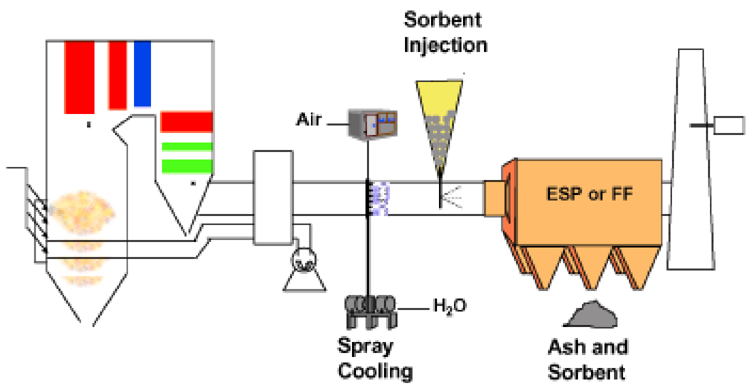


Figure 2. Schematic Diagram of Sorbent Injection Process

Laboratory, pilot scale and modeling programs have indicated that the following parameters can affect the ultimate performance of the technology:

- Particulate control device: ESP vs. fabric filter,
- sorbent type and properties,
- gas-phase mercury species (Hg_0 or $HgCl_2$),
- temperature,
- concentration of acid gases (HCl, SO_2, NO, NO_2) in the flue gas, and
- residence time.

The type of particulate control equipment is a key parameter defining both the amount of sorbent that is required and provides the ultimate limitation of the amount of mercury that can be removed. When the sorbent is injected into the flue gas it mixes with the gas and flows downstream. This provides an opportunity for the mercury in the gas to contact the sorbent where it is removed. This is call “in flight” capture. The sorbent is then collected in the particulate control device where there is a second opportunity for sorbent to contact the mercury in the gas.

In an ESP, the carbon is collected on plates that are spaced parallel to the gas flow. Although the residence time in the ESP can be several seconds long, there is a limited amount of contact between the gas and the collected particles because the gas can be as far as four inches from the plates. On the other hand, the fabric filter provides the ideal opportunity for good interaction between the gas and the sorbent as the gas makes intimate contact with the sorbent collected on the filter. Therefore, sites with fabric filters will achieve higher levels of mercury removal and higher levels of sorbent utilization. Unfortunately, only 10 percent of the coal-fired power plants in the United States have fabric filters.

III. Conclusions and Future Plans

The injection of powdered activated carbon offers a promising approach for mercury control for coal-fired boilers. The injection equipment is relatively inexpensive ($2/kW) and can be installed with minimal downtime of the plant. It is effective for both bituminous and subbituminous coals and when interfaced with a fabric filter it is capable of high levels of mercury removal. It is versatile in that it could also be integrated with a wet scrubber to remove elemental mercury that escapes the scrubber.

However, a great deal of additional testing is required to further characterize the capabilities and limitations of this technology. It is important to determine performance on a wider variety of fuels and plant operating configurations. Long-term testing will be necessary to discover if there are any negative impacts of the PAC on downstream components. Impacts such as deposition, fouling of the ESP, corrosion, and shortened bag life often take months to years to be observed or measured.

As with all other air pollution control technologies, sorbent-based mercury control is a developing technology that needs to go through a phased approach as it matures to become accepted as commercially viable. This approach to implementation of new technology has evolved from 30 years of lessons learned by the power industry from applying new technology.

The schedules announced by EPA and Federal and State legislatures to require widespread implementation of mercury control for the coal-fired boiler industry by 2007 represents an extremely challenging schedule. To advance the sorbent injection technology to meet this tight timeframe, we plan to participate in partnerships with DOE and power companies in risk-shared programs such as the Clean Coal Power Initiative (CCPI). The following schedule will allow us accomplish this in a controlled manner that doesn't put generation capacity at risk:

- Short-term full-scale evaluations (2000–2003)
  - Parametric evaluations
  - Multiple sites to evaluate different configurations and fuels
- Long-term full-scale demonstrations (2003–2005)
- First commercial installations at a few early adopters (2005–2007)

In addition, there are two other areas where advancements must be made to assure the ultimate success of this technology. In order to respond to changes in fuel and operating conditions, it is critical to have a reliable continuous measurement of the mercury in the flue gas. This is important from both a process control and a compliance monitoring perspective. The other area involves increasing the production of activated carbon to a level sufficient to supply the power industry. Current capacity of U.S. suppliers is only 10 percent of what may be required for widespread implementation of the technology.

Full-Scale Evaluation of Mercury Control with Sorbent Injection and COHPAC at Alabama Power E.C. Gaston

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Abstract

The overall objective of this project was to determine the cost and impacts of mercury control using sorbent injection into a COHPAC baghouse at Alabama Power's Gaston Unit 3. This test is part of a program funded by the Department of Energy's National Energy Technology Laboratory (NETL) to obtain the necessary information to assess the costs of controlling mercury from coal-fired utility plants that do not have scrubbers for SO_2 control. The economics will be developed based on various levels of mercury control.

Gaston Unit 3 was chosen for testing because COHPAC represents a cost-effective retrofit option for utilities with existing electrostatic precipitators (ESPs). COHPAC is an EPRI patented concept that places a high air-to-cloth ratio baghouse downstream of an existing ESP to improve overall particulate collection efficiency. Dry sorbents such as activated carbons were injected upstream of COHPAC, downstream of the ESP to obtain performance and operational data. Residue hopper ash and carbon samples were collected to evaluate the impact ash properties. A series of parametric tests were conducted to determine the optimum operating conditions for several levels of mercury control up to 90 percent mercury removal. Based on results from these tests, a longer-term test with one sorbent and optimized conditions was conducted to assess impacts to COHPAC and auxiliary equipment.

Introduction

In December 2000 EPA announced their intent to regulate mercury emissions from the nation's coal-fired power plants. In anticipation of these regulations, a great deal of research has been conducted during the past decade to characterize the emission and control of mercury compounds from the combustion of coal. Much of this research was funded by the Department of Energy, EPA, and EPRI. The results are summarized in the comprehensive AWMA Critical Review Article[1]. As a result of these efforts, the following was determined:

1. Trace concentrations of mercury in flue gas can be measured relatively accurately;
2. Mercury is emitted in a variety of forms;
3. Mercury species vary with fuel source and combustion conditions; and
4. Control of mercury from utility boilers will be both difficult and expensive.

This latter point is one of the most important and dramatic findings from the research conducted to date. Because of the large volumes of gas to be treated, low concentrations of mercury, and presence of difficult to capture species such as elemental mercury, some estimates show that 90 percent mercury reduction for utilities could cost the industry as much as $5 billion per year[1]. Most of these costs will be borne by power plants that burn low-sulfur coal and do not have wet scrubbers as part of the air pollution equipment.

With regulations rapidly approaching, it is important to concentrate efforts on the most mature retrofit control technologies. Injection of dry sorbents such as powdered activated carbon (PAC) into the flue gas and further collection of the sorbent by ESPs and fabric filters represents the most mature and potentially most cost-effective control technology for power plants.

Under a DOE/NETL cooperative agreement, ADA-ES is working in partnership with PG&E National Energy Group (NEG), Wisconsin Electric, a subsidiary of Wisconsin Energy Corp., Alabama Power Company, a subsidiary of Southern Company, EPRI, and Ontario Power Generation on a field evaluation program of sorbent injection upstream of existing particulate control devices for mercury control[2]. The test program, which will take place at four different sites during 2001 and 2002, is described in detail in the July 2001 EM Journal[3]. Other organizations participating in this program as team members include EPRI, Apogee Scientific, URS Radian, Energy & Environmental Strategies, Reaction Engineering, Inc, Southern Research Institute, Hamon Research-Cottrell, and Norit Americas. Gaston Unit 3 was chosen as the first test site because COHPAC represents a cost-effective retrofit option for utilities with electrostatic precipitators (ESPs). COHPAC is an EPRI patented concept that places a high air-to-cloth ratio baghouse downstream of an existing ESP to improve overall particulate collection efficiency. The advantages of this configuration are:

1. Sorbents are mixed with a small fraction of the ash (nominally 1 percent) which reduces the impact on ash reuse and waste disposal.
2. Pilot plant studies and theory[4] indicate that compared to ESPs, baghouses require one-tenth the sorbent to achieve similar removal efficiencies.
3. Capital costs for COHPAC are less than other options such as replacing the ESP with a baghouse or larger ESP.
4. COHPAC requires much less physical space than either a larger ESP or full-size baghouse system
5. Outage time can be significantly reduced with COHPAC systems in comparison to major ESP rebuilds/upgrades.

E.C. Gaston Site Description

The E.C. Gaston Electric Generating Plant, located in Wilsonville, Alabama, has four 270 MW balanced draft and one 880 MW forced draft coal fired boilers. All units fire a variety of low-sulfur, washed, Eastern bituminous coals.

The primary particulate control equipment on all units are hot-side ESPs. Units 1 and 2 and Units 3 and 4 share common stacks. In 1996 Alabama Power contracted with Hamon Research-Cottrell to install COHPAC downstream of the hot-side ESP on Unit 3. This COHPAC system was designed to maintain Unit 3 and 4's stack opacity levels below 5 percent on a 6-minute average[5].

The COHPAC system is a hybrid pulse-jet type baghouse, designed to treat flue gas volumes of 1,070,000 acfm at 290°F (gross air-to-cloth ratio of 8.5 ft/min with on-line cleaning). The COHPAC baghouse consists of four (4) isolatable compartments, two compartments per air-preheater identified as either A- or B-Side. Each compartment consists of two bag bundles, each having a total of 544, 23-foot long, PPS felt filter bags, 18 oz/yd^2 nominal weight. This results in a total of 1,088 bags per compartment, or 2,176 bags per casing[5]. The evaluation was conducted on one-half of the gas stream, nominally 135 MW. The side chosen for testing was B-side. A-side was monitored as the control unit.

The hot-side ESP is a Research-Cottrell weighted wire design. The specific collection area (SCA) is 274 ft^2/1000 acfm. Depending on the operating condition of the hot-side ESP, nominally 97 to 99+ percent of the flyash is collected in the ESP. The remaining flyash is collected in the COHPAC system. The average inlet particulate mass concentration into COHPAC between 1/97 and 4/99 was 0.0413 gr/acf[5]. Hopper ash from both the ESP and baghouse are sent to a wet ash pond for disposal. A hydrovactor system delivers the flyash to the pond.

Figure 1 shows a diagram of the location of the various components of the air pollution control train. Design parameters for Gaston Unit 3 are presented in Table 1. For the mercury control program, carbon-based dry sorbents were injected upstream of COHPAC, downstream of the ESP over an 8-week period.

Figure 1. Flow Schematic of Gaston Unit 3, Showing Injection and Measurement Locations

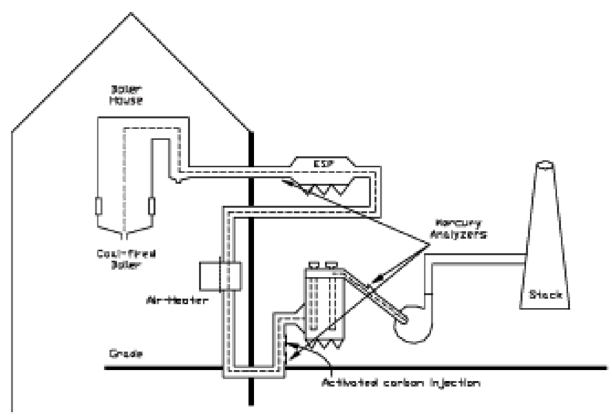


Table 1. Site Description Summary, Gaston Unit 3

Parameter Identification	Description
Boiler Manufacturer	**B&W wall-fired**
Burner Type	B&W XCL
Low NOx Burners	Yes
NOx Control (Post Combustion)	None
Temperature (APH Outlet)	290°F
Coal (Typical – this unit fires a variety of coals)	
Type	Eastern Bituminous
Heating Value (Btu/lb)	13,744
Moisture (%)	6.9
Sulfur (%)	0.9
Ash (%)	13.1
Hg (µg/g)	0.06
Cl (%)	0.03
Control Device	
Type	Hot-Side ESP with COHPAC
ESP Manufacturer	Research Cottrell
Design	Weighted Wire
Specific Collection Area (ft^2/1000afcm)	274
Flue Gas Conditioning	None
Baghouse Manufacturer	Hamon Research-Cottrell
Design	Pulse-Jet, Low Pressure – High Volume
Air-to-Cloth Ratio (acfm/ft^2)	8.5:1 (gross), On-Line Cleaning

Site-Specific Equipment

The critical elements of the program were the actual field tests and measurements, which relied upon accurate, rapid measurements of mercury concentration and an injection system that realistically represented commercially available technology.

Near real-time vapor phase mercury measurements were made using a Semi-Continuous Emissions Monitor (S-CEM) designed and operated by Apogee Scientific. This instrument was developed with EPRI funding to facilitate EPRI research and development efforts[6]. The locations of the analyzers are shown in Figure 1. The S-CEMs operated continuously for over 7 weeks providing speciated, vapor phase mercury concentrations at the inlet and outlet of COHPAC.

Norit Americas' supplied a portable dilute phase pneumatic injection system that is typical of those used at Municipal Solid Waste (MSW) facilities for mercury control with activated carbon. ADA-ES designed the distribution and injection components of the system.

Sorbent requirements for various levels of mercury control were predicted based on empirical models developed through EPRI funding[4]. The values used were based on a uniform sorbent size of 15 microns and a bag cleaning frequency of 2 pulses/bag/hr (also assumed all bags were cleaned at the same time when in practice, the bags are cleaned in sections or rows). Rates used to design equipment for the Gaston test are presented in Table 2. The system was sized for a maximum injection rate of 100 lbs/h.

Table 2. Predicted Injection Rates for FGD Carbon on B-Side of COHPAC[3]

Target Hg Removal Efficiency (%)	Predicted Injection Concentration (lbs/MMacf)	Predicted Injection Rate[a] (lbs/h)
50	0.5	<30
75	1.5	45
90	3.0	90

a. Injection rate based on nominal flow at full load of 500,000 acfm.

Figure 2 is a picture of the portable injection skid supplied by Norit Americas and installed for use at Plant Gaston Unit 3B. Activated carbon delivered to the plant in 900 lb supersacks was loaded onto the skid by a hoist. The sorbent was metered by a variable speed screw feeder into an eductor that provided the motive force to carry the sorbent ?100 ft to the injection point.

Sorbent was pneumatically transported via flexible hose from the feeder to a distribution manifold at the injection level and injected into the flue gas through six injection probes (three/duct). Figure 3 is a photograph of the distribution manifold. The injection system operated without plugging while injecting carbon based products with D50 particle size of 18 micron. The distribution system plugged once while feeding a finer material with a D50 of 6–7 microns.

Figure 2. Carbon Injection Skid Installed at Plant Gaston

Figure 3. Distribution Manifold for Injection Lances at Plant Gaston

Test Results

PRE-BASELINE TESTS

The first field measurements were made prior to installing the injection equipment. The objectives for the pre-baseline tests were to:

1. Document mercury emissions across COHPAC; and
2. Perform screening tests for mercury adsorption characteristics of several activated carbons that were candidate sorbents for the full-scale tests.

Table 3 presents vapor phase mercury measurements during the pre-baseline tests in January on Unit 3. Two analyzers were used for these tests. The analyzers were set-up to measure simultaneously either across the hot-side ESP or COHPAC. The results show that vapor phase mercury varied between 7 and 10 µg/dNm^3 at all three locations. There was no measurable removal of vapor phase mercury across either the hot-side ESP or COHPAC.

Table 3. Pre-Baseline Mercury Measurement Results (S-CEM)

Location	Total Mercury µg/dNm^3 @ 3% O_2	Oxidized Mercury %
ESP Inlet	7 – 10	5 - 33
ESP Outlet/COHPAC Inlet	7 – 10	29 – 51
COHPAC Outlet	7 – 10	52 - 76
Mercury Removal Across ESP	0%	
Mercury Removal Across COHPAC	0%	

These results are comparable to those made during ICR measurements on Unit 1 for total mercury concentrations and removal efficiencies. ICR measurements showed total mercury concentrations between 6.0 and 7.5 µg/dNm^3 and no mercury removal across the hot-side ESP[7].

No mercury removal was measured across COHPAC without the addition of sorbents. Review of data collected through the ICR at other plants shows that there was significant natural mercury capture on units with conventional type baghouses when firing bituminous coals[7]. This natural collection is assumed to occur because of exposure of the flue gas to ash on the bag dustcake. The ash at Gaston was tested for mercury adsorption capacity by URS Corporation. Analysis of the ash showed high carbon content throughout the total size distribution and an adsorption capacity that was reasonable when compared to other ashes. However, since COHPAC is downstream of the hot-side ESP and the ESP was in excellent condition at the time of the tests, the inlet loading to COHPAC was very low (0.04 gr/acf on average and less than 0.01 during the tests), so there was a relatively small amount of ash present on the bags to react with the mercury.

The portion of vapor phase mercury in the oxidized state increased in the direction of flow. There was a greater percentage of elemental mercury at the hot-side inlet (economizer outlet) than there was at either the COHPAC inlet or outlet. The most significant oxidation occurred across the COHPAC baghouse. Similar phenomena have been documented across baghouses with fiberglass and PPS fabric bags[8].

BASELINE TESTS

After equipment installation and checkout, a set of baseline tests were conducted immediately prior to the first parametric test series to document current operating conditions. During this test boiler load was held steady at "full-load" conditions during testing hours, nominally 7 am to 7 pm. Mercury across B-Side of COHPAC was measured using two separate methods:

1. S-CEMs; and
2. Modified Ontario Hydro Method.

In addition to monitoring mercury removal, it was also important to document the performance of COHPAC during sorbent injection. The primary COHPAC performance indicator at this site was cleaning frequency. Pressure drop/drag is controlled by the cleaning frequency. It was expected that cleaning frequency would increase with the increased particulate loading from sorbent injection. Cleaning frequency was monitored before, during and after sorbent injection.

Results from the Ontario Hydro tests conducted by Southern Research Institute are presented in Table 4. Similar to pre-baseline measurements, there was no measurable mercury removal across COHPAC. The average of the inlet and outlet total mercury measurements was about 15 µg/dncm. Coal analyses showed mercury levels in the three coal samples varied between 0.06 and 0.17 µg/g. Since Gaston burns coals from several different coal sources each day it is difficult to correlate mercury level in the coal to a specific flue gas measurement; however, the higher coal mercury values correlate well with mercury measured in the flue gas.

The Ontario Hydro measurements also showed oxidation across COHPAC. At the inlet the average fraction of oxidized mercury was 61 percent, and increased to 77 percent at the outlet. Flue gas temperatures during this tests were nominally 255°F.

Table 4: Baseline Ontario Hydro Measurements at COHPAC Inlet and Outlet

Date/Location	Particulate (µg/dncm[1])	Oxidized (µg/dncm[1])	Elemental (µg/dncm[1])	Total (µg/dncm[1])	Percent Oxidized
3/6/01 Inlet	0.03	11.56	6.64	18.23	63
3/6/01 Inlet	0.03	8.01	7.02	15.05	53
3/7/01 Inlet	0.22	9.05	4.26	13.53	67
Average Inlet	0.09	9.54	5.97	15.60	61
3/6/01 Outlet	0.01	10.19	4.60	14.79	69
3/6/01 Outlet	0.02	12.48	2.99	15.48	81
3/7/01 Outlet	0.01	10.91	2.44	13.35	82
Average Outlet	0.01	11.19	3.34	14.54	77

PARAMETRIC TESTS

A series of parametric tests was conducted to determine the optimum operating conditions for several levels of mercury control up to 90 percent mercury removal, for several activated carbon products. To minimize permitting issues, only coal-based sorbents were considered at this site. Norit Americas lignite-based PAC, Darco FGD, was chosen as the benchmark sorbent. Sorbent type and injection concentration for the long-term tests were chosen based on results from these tests.

In all, 15 different parametric conditions were tested. The primary variables were carbon type and target mercury removal level. Other variables included COHPAC cleaning settings and flow through the baghouse. Although lower flue gas temperatures have been correlated with increased mercury removal, temperature was not a variable during these tests because normal operating temperatures at this plant were between 250µF and 270µF, which is cool enough for acceptable removal. A summary of the parametric tests is presented in Table 5. Unless noted, all tests were conducted with the boiler at full load conditions and COHPAC cleaning at a drag initiate setpoint of 0.6 inches w.c./ft/min. A description of the different carbons used in these tests is presented in Table 6.

Table 5. Summary of Parametric Test Conditions

Test Series	Carbon Name	Target Hg Removal Efficiency (%)	Non Standard Conditions
1-5	Darco FGD	50, 75 and 90	Standard
6-9	Norit PAC2B	50, 75, 90	Standard
10	None	Baseline	Standard
11	Darco Insul	90	Standard
12	HydroDarco-C	90	Standard
13 a-c	Darco FGD	75	Change to pressure drop initiate clean
14	Darco FGD	50	Lower A/C to 4 ft/min

Table 6. Description of Norit Carbons Used in Parametric Tests

Name	Description	Particle Size Distribution[a]		
		D95	D50	D5
Darco FGD	Lignite AC	52	15-20	<3
Norit PAC2B	Subbit/Bit Blend AC	52	15-20	<3
Darco Insul	Fine chemically washed specialty product	25	6-7	<2
HydroDarco-C	Coarser FGD	100	30	3

a. Percent of particles less than size in microns

Parametric testing measured mercury removal as a function of injection concentration and sorbent type, and the impact of sorbent injection on COHPAC performance. Feedback from the S-CEMs were invaluable in making timely, real-time decisions on test conditions. Examples of the data provided from the S-CEMs are presented in Figure 4. These data are from the first week of parametric tests, test numbers 1—5, with Darco FGD. Reduction in outlet mercury concentration can be seen to correlate with relative injection rates.

Figure 4. S-CEM Mercury Measurements During the First Week of Parametric Tests with Norit Darco FGD PAC

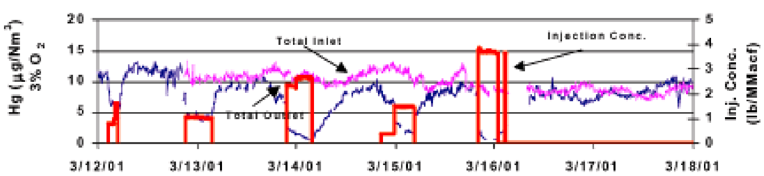
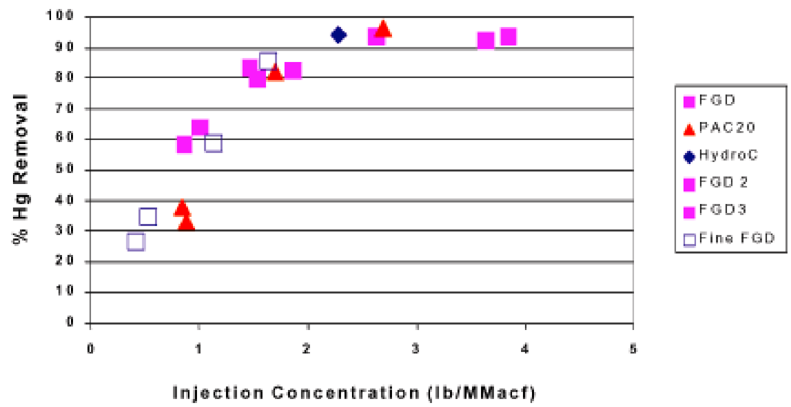


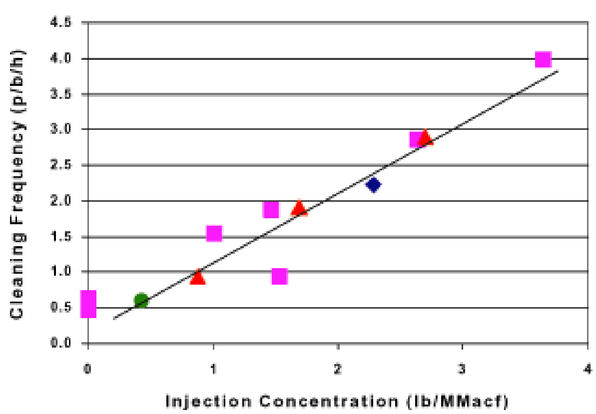
Figure 5 presents mercury removal efficiencies as activated carbon injection concentrations were varied during the parametric tests for several activated carbons (see Tables 5 and 6 for description of test conditions). This figure shows that mercury removal increased nearly linearly with injection rate up to 2 lbs/MMacf and then leveled off at about 90 percent removal with higher injection providing no additional benefit. This figure also shows that there was no measurable performance difference between the different PAC's.

Figure 5. Mercury Removal Trends Across COHPAC as a Function of PAC Injection Concentrations. Measurements Made During Parametric Tests, March 2001



Carbon injection significantly increased the cleaning frequency of the COHPAC baghouse. Figure 6 presents actual cleaning frequencies at different carbon injection concentrations. At an injection concentration of 2.0 lbs/MMacf the cleaning frequency increased from 0.5 to 2 pulses/bag/hour, or a factor of 4. Acceptable cleaning frequencies at this site has been set at 1.5 pulses/bag/hour, to maintain long-term bag life.

Figure 6. COHPAC Cleaning Frequency in Pulses/Bag/Hour as a Function of PAC Injection Concentration. Measurements Made During Parametric Tests, March 2001



LONG-TERM TESTS

Long-term testing at "optimum" plant operating conditions as determined from the parametric tests, was planned to gather data on:

1. Mercury removal efficiency over time;
2. The effects on COHPAC and balance of plant equipment of sorbent injection; and
3. Operation of the injection equipment to determine the viability and economics of the process.

During these tests, carbon was injected continuously 24 hours per day, for 9 days. Based on results from the parametric tests, Darco FGD activated carbon was chosen as the sorbent for these tests. Injection rate was determined taking into consideration both mercury removal and the projected increase in COHPAC cleaning frequency. An injection concentration of 1.5 lbs/MMacf was chosen to maintain COHPAC cleaning frequency below 1.5 pulses/bag/hour.

Similar to the baseline test series, mercury was measured by both the S-CEMs and manual methods (Ontario Hydro). COHPAC performance, coal and ash samples, plant CEM data were collected. During these tests an EPA audit of the manual measurements was performed. The long-term tests started on April 18 and carbon was injection continuously until April 26. Full load boiler conditions were held between the times of 0700 and 2000, with load following at other times for the first 5 days. During the 3 days when the Ontario Hydro tests were conducted, full load was maintained 24 hours/day. At the beginning of the tests time was needed to work out a COHPAC cleaning logic issue and there was a short period when load was lowered to fix a mill problem. The final 7 days of the test were conducted at the optimized PAC feedrate and COHPAC cleaning logic.

Three sets of Ontario Hydro measurements were made at three locations: 1) inlet of the hot-side ESP, 2) COHPAC inlet and 3) COHPAC outlet. Southern Research Institute conducted tests across COHPAC and Arcadis G&M Inc. made the measurements upstream of the hot-side ESP. The hot-side measurements were made using an experimental in-duct, quartz thimble to minimize sampling artifacts often seen with this method. Artifacts have been known to occur when the particulate collected on the filter captures vapor phase mercury, resulting in higher particulate phase mercury than is really present. Sampling artifacts from particulate on the filter were not as much of a concern at the other two locations because most of the particulate was already removed by either the hot-side ESP or COHPAC.

Table 7 presents the results from each of the Ontario Hydro measurements. These data show that the inlet to the hot-side ESP and the inlet to COHPAC have similar, average mercury concentrations and speciation, and that mercury is oxidized across COHPAC. The outlet mercury concentrations show the effect of carbon injection with overall low mercury emissions for all species. Table 8 presents average, speciated mercury removal across COHPAC. The overall average reduction in total mercury is 90 percent. At the outlet the predominate species of mercury is the oxidized form; however, it is still 85 percent less than what was present upstream of PAC injection.

Figure 7 presents inlet and outlet mercury concentrations as measured by the S-CEMs, boiler load, and PAC injection concentration during the last 5 days of the long-term test. Periods when Ontario Hydro measurements were made are also identified. The S-CEMs indicate that mercury removal was nominally 87, 90, and 88 percent during the Ontario Hydro tests. This correlates well with the manual measurements. However, it is important to note that the S-CEMs showed that the average mercury removal efficiency over the multi-day time period was 78 percent, with variations between 36 percent to over 90 percent. This difference is probably due to varying coal and operating conditions over time. Figure 7 also shows that during this 5-day period inlet mercury concentration varied by nearly a factor of five. Outlet concentrations can be seen to follow the inlet and there are times during these transitional periods when removal efficiencies are fairly low. During the period when the Ontario Hydro tests were run, inlet mercury levels were low and fairly steady. These tests were conducted under ideal conditions and may show the best case condition for mercury control at this injection rate.

During the test program sorbent was injected at a constant rate with no attempt to increase sorbent when the inlet mercury concentration increased. However, the data in Figure 7 highlight the importance of having CEMs to use as process control for a permanent mercury control system.

Table 7: Long-Term Ontario Hydro Measurements at Hot-Side ESP Inlet, COHPAC Inlet and COHPAC Outlet

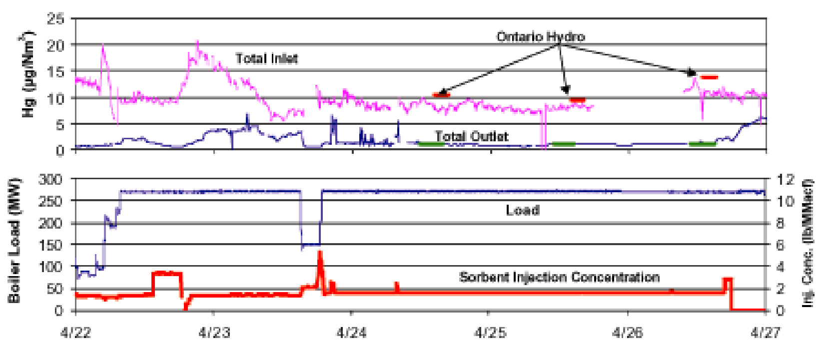
Date/Location	Particulate (μg/dncm[1])	Oxidized (μg/dncm[1])	Elemental (μg/dncm[1])	Total (μg/dncm[1])	Percent Oxidized
4/24/01ESP Inlet[2]	0.51	2.90	5.59	9.01	32
4/25/01 ESP Inlet[2]	0.03	7.30	3.68	11.01	66
4/26/01 ESP Inlet[2]	0.07	6.17	3.04	9.27	66
Average ESP Inlet	0.20	5.46	4.10	9.76	55
4/24/01 COHPAC In	0.12	4.95	5.24	10.31	48
4/25/01 COHPAC In	0.41	5.60	3.36	9.37	60
4/26/01 COHPAC In	0.16	8.55	5.17	13.88	62
Average COHPAC Inlet	0.23	6.37	4.59	11.19	56
4/24/01 COHPAC Out	0.11	0.93	0.09	1.03	91
4/25/01 COHPAC Out	0.19	0.88	0.05	1.12	78
4/26/01 COHPAC Out	0.07	0.93	-0.05	1.00	93
Average COHPAC Outlet	0.12	0.91	0.03	1.05	87

1. Normal: T = 32°F
2. Tests conducted by Arcadis using an in-stack (heated) quartz thimble.

Table 8: Average Mercury Removal Efficiencies Across COHPAC as Measured with Ontario Hydro Method

Sampling Location	Particulate (μg/dncm[1])	Oxidized (μg/dncm[1])	Elemental (μg/dncm[1])	Total (μg/dncm[1])
COHPAC Inlet	0.23	6.37	4.59	11.19
COHPAC Outlet	0.12	0.91	0.03	1.05
Removal Efficiency (%)	45.6	85.7	99.3	90.6

Figure 7. Inlet and Outlet COHPAC Mercury Concentrations, Boiler Load and PAC Injection Concentration During Long-Term Tests, April 2001



The most challenging time for COHPAC performance was during the period with continuous full-load operation and PAC injection. The cumulative cleaning frequency increased to a high of 1.3 pulses/bag/hour, but was mostly maintained at levels less than 1.0 pulses/bag/hour.

COAL AND ASH CHARACTERIZATION

Coal and ash samples were collected daily during the baseline, parametric and long-term tests. Gaston fires a variety of washed, low sulfur eastern bituminous coals. Because several different coals can be fired in a day, the daily coal samples provide relative mercury concentrations, but may not be representative of specific test periods. Standard ultimate and proximate analyses were conducted, plus measurements for mercury, chlorine, and sulfur.

Ash samples were collected from the hot-side ESP, control side (A-side) COHPAC, and test side (B-side) COHPAC hoppers. Ash generated from the E.C. Gaston Plant is impounded using a wet ash handling system. The ash is not currently beneficially reused, therefore ash characterization testing concentrated on measuring mercury and carbon content.

The mercury content of coal samples taken during the long-term tests varied between 0.09 and 0.21 μg/g. This is consistent with flue gas mercury measurements that showed considerable variability in mercury concentration. This variability has implications on how mercury control technologies will be implemented.

The B-side ash, mixed with sorbent, showed about 30 percent carbon content as compared to 12 percent on the A-side ash. The sorbent-ash mixtures from the B-side had about 30 times the mercury of the A-side hopper ash, indicating removal of mercury by the sorbent across COHPAC.

Cost Analysis

The requirements and costs for full-scale, permanent, commercial implementation of the necessary equipment for mercury control using PAC injection technology are being finalized for Gaston Unit 3. Preliminary capital and sorbent costs for 80 percent mercury removal have been developed.

The estimated uninstalled cost for a sorbent injection system and storage silo for the 270 MW unit is about $350,000. Sorbent costs were estimated for nominally 80 percent mercury control based on the long-term PAC injection concentration of 1.5 lbs/MMacf. For Gaston Unit 3, this would require an injection rate of nominally 80 lbs/h. Assuming a unit capacity factor of 80 percent and a delivered cost of $0.50/lb for PAC, the annual sorbent cost for injecting PAC into the existing COHPAC baghouse would be $270,000. Additional cost information is being developed for balance of plant impacts.

Conclusions

A full-scale evaluation of mercury control using activated carbon injection upstream of a COHPAC baghouse was conducted at Alabama Power Company's Plant Gaston Unit 3. Results and trends from these relatively short term tests were encouraging.

- Effective mercury removal, up to 90 percent efficiency, was obtained for short operating periods (8 hrs) by injecting powdered activated carbon upstream of COHPAC.
- A significant increase in the cleaning frequency of the COHPAC baghouse occurred with the injection of activated carbons. At this site, the maximum acceptable cleaning frequency and pressure drop limited the amount of sorbent that could be injected and therefore the maximum mercury removal actually achievable. Based on these results, it will be necessary to take into consideration the sorbent injection rate in the design of future COHPAC baghouses and perhaps design the baghouses more conservatively.
- On average, around 78 percent mercury removal was obtained when PAC was injected into COHPAC 24 hr/day during long-term tests. Mercury removal varied throughout the period and ranged from 36 percent to 90 percent.
- To verify S-CEM measurements during the long-term tests, mercury removal across COHPAC was measured following the draft Ontario Hydro method. Results show an average 90 percent removal for the three tests periods. These results confirm the high mercury removal measured with the S-CEMs.
- Actual mercury removals were in reasonably close agreement with theoretical model predictions for 80 to 90 percent removal (1.5 to 2 vs 3 lbs/MMacf) considering that the model is based on a uniform PAC particle size of 15 microns when in fact the actual FGD carbon used has a wide size distribution with significant numbers of particles below 15 microns. The model also assumed a cleaning frequency of 2 pulses/bag/hr (all bags cleaned at the same time) whereas the bags were actually cleaned at ? 1 to 2 pulses/bag/hr (bags cleaned 15 (one row) at a time) during the tests.
- Additional testing over longer periods (up to a year) need to occur to determine the impact of carbon injection on bag life (pressure drop and bag strength) and outlet particulate emissions.

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[From EM Magazine, July 2001]

CONTROLLING MERCURY EMISSIONS FROM COAL-FIRED UTILITY BOILERS: A FIELD TEST

(By Michael D. Durham, C. Jean Bustard, Richard Schlager, Cameron Martin, Stephen Johnson, and Scott Renninger)

This article is based on a presentation given at A&WMA's 94th Annual Conference & Exhibition in June in Orlando, FL. It describes a comprehensive multisite test program to demonstrate mercury control at four full-scale power plants. Tests results from three of these sites will be presented for the first time at A&WMA's Specialty Conference on Mercury, "Mercury Emissions: Fate, Effects, and Control," which will be held at the Arlington Heights Sheraton in Chicago, IL, August 21–23, 2001. For more details on the conference, see p 33.

INTRODUCTION

On December 14, 2000, the U.S. Environmental Protection Agency (EPA) announced that it plans to develop regulations to reduce mercury emissions from coal-fired utility boilers (see "EPA Studies on the Control of Toxic Air Pollution Emissions from Electric Utility Boilers," EM, January 2001, pp 30–36). This decision is based on growing concerns of adverse health effects due to current levels and potential buildups of methylmercury in lakes and rivers. Methylmercury is capable of bioaccumulation, resulting in higher levels being found in game fish. Mercury is a neurotoxin that impacts rapidly developing cells; people at greatest risk of exposure are pregnant women who consume fish with elevated levels of mercury.

The following article describes a field test program being conducted by ADA-ES that represents EPA's first step toward defining technology to be used by power-generating companies in meeting new mercury regulations. The company is working in partnership with several organizations to design and engineer systems to maximize effectiveness and minimize costs in order to reduce mercury emissions from coal-fired utility boilers.

The levels currently being found in lakes in several areas of the country are sufficiently high that state health agencies are issuing advisories to restrict fish consumption. Over the past 10 years, much effort has been directed toward reducing the use of mercury in consumer products. In addition, new emission control technologies have been implemented on medical waste and municipal waste incinerators. As a result, coal-fired electric generators now represent the largest single source of anthropogenic mercury emissions in the United States. In anticipation of potential regulations, considerable research has been conducted during the past decade to characterize the emissions and control of mercury compounds from coal combustion. The U.S. Department of Energy (DOE), EPA, and the Electric Power Research Institute (EPRI) funded much of this research. These research efforts are summarized in A&WMA's 1999 Critical Review, entitled "Mercury Measurement and Its Control: What We Know, Have Learned, and Need to Further Investigate."[1]

PROGRAM OBJECTIVES

With stricter regulations imminent, it is important to concentrate the development effort on the most mature control technologies. Injection of dry sorbents (e.g., such as activated carbon) into the flue gas and further collection of the sorbent by conventional particulate control devices, such as electrostatic precipitators (ESPs) and fabric filters, represents the most mature and potentially most cost-effective control technology for power companies. However, work has been limited to bench-scale and pilot experiments.[2] [3] Although these reduced-scale programs provide valuable insight into many important issues, they cannot fully account for impacts of additional control technology on plantwide equipment. For example, it has been possible to measure high mercury capture at relatively low temperatures in small pilot systems for relatively short periods. However, these lower temperatures may not be practical in a full-scale system continuously without deposition and corrosion in cold spots of ducting and particulate control equipment. Therefore, it is necessary to perform full-scale field tests to document actual performance levels and determine accurate cost information. The objectives of this field test program are to

- accelerate the availability of commercial mercury control systems for coal-fired plants;
- obtain data on the control systems'operability, main-tainability, and reliability;
- determine maximum mercury removal for various plant configurations; and
- determine the total costs associated with mercury control as a function of fuel and plant characteristics.

The program is intended to provide critical data that will be used by many different groups: It will provide EPA with accurate information on the levels of control that can be reasonably attained for different plants; it will complement the emission inventory data obtained during the 1999 EPA Information Collection Request (ICR) data collection effort; and it will provide power-generating companies with the means to estimate costs to perform strategic planning on a systemwide basis. The economic analysis will include capital costs; sorbent usage costs; impact on operation of particulate control equipment; balance of plant; waste disposal and byproduct utilization issues; enhancements, such as cooling; and operation and maintenance (O&M) requirements.

ADA Environmental Solutions (ADA-ES) has assembled a program team consisting of technical leaders in the areas of mercury measurement, transformation during coal combustion, capture by existing emission control equipment, and design of integrated emission control systems. The qualifications of individual team members were determined by their contribution to pioneering mercury control work in the United States over the past decade. Organizations represented on the team include URS Radian, Inc.; Physical Sciences, Inc.; Apogee Scientific; EPRI; Energy & Environmental Strategies; EnviroCare; Microbeam Technologies; Energy and Environmental Research Center (EERC); Environmental Elements Corp.; Consol Energy, Inc.; Hamon Research Cottrell; and NORIT Americas.

[1] Brown, T.D.; Smith, D.N.; Hargis, R.A.; O'Dowd, W.J. Mercury Measurement and Its Control: What We Know, Have Learned, and Need to Further Investigate; J. Air & Waste Manage. Assoc. 1999, 49, 628–640.

[2] Haythornthwaite, S.; Sjostrom, S.; Ebner, T.; Ruhl, J.; Slye, R.; Smith, J.; Hunt, T.; Chang, R.; Brown, T. Performance of Activated Carbon for Mercury Control in Utility Flue Gas Using Sorbent Injection. Presented at the EPRI-DOE-EPA Combined Utility Air Pollutant Control Symposium, Washington, DC, August 1997.

[3] Sjostrom, S.; Smith, J.; Chang, R.; Brown, T. Demonstration of Dry Carbon-Based Sorbent Injection for Mercury Control in Utility ESPs and Baghouses. Presented at the 90th Annual Meeting & Exhibition of A&WMA, Toronto, Ontario, June 1997.

TEST SITES

The program is directed at providing sufficient data to determine costs and capabilities for plants that do not have flue gas desulfurization (FGD) systems. This group represents not only the largest proportion of coal-fired power generators (83 percent by number or 75 percent by generation capacity), but it also represents the most difficult application for mercury control. To gather data on the application of sorbent injection for removal of mercury from coal combustion flue gas that can be used for as many plants as possible, sites were selected to take into account factors related to the fuel characteristics, the operating conditions of the unit, and interactions with other air pollution control devices. Sites that burn both eastern bituminous and western subbituminous coals were included because of differences in speciation of mercury in the flue gas, which greatly affects the efficiency of mercury removal in air pollution control devices. Measurements of the concentration of mercury species taken in the stacks of pilot and full-scale coal combustion systems reported anywhere from 10 percent to 95 percent Hg^0 upstream of the air pollution control device.1 Oxidized mercury, particularly when present as $HgCl_2$, is far easier to capture than is mercury in elemental (Hg^0) form.

In addition to differences in the forms of mercury produced by different coals, the fly ash produced by bituminous and subbituminous coals result in different mercury capture characteristics. For example, subbituminous ashes produce higher absorption rates of mercury at higher temperatures and lower levels of carbon than do ashes from bituminous coals. There are other important differences between the flue gas produced by eastern and western coals. For eastern bituminous coals, a small proportion (2 percent to 3 percent) of the sulfur dioxide (SO_2) is converted to sulfur trioxide (SO_3). SO_3 is important because it reacts with the water vapor to form sulfuric acid. The gas stream for a low-sulfur eastern coal will have sufficient SO_3 that sulfuric acid will begin to condense at 270°F. This means that the gas stream cannot be cooled for enhancement of mercury capture without first eliminating the SO_3, or else severe corrosion of ducting and ESP components would be expected. On the other hand, the higher alkali content of a western subbituminous coal neutralizes all of the SO_3, resulting in a dew point of 120°F. This means that a flue gas cooling system could be operated without sulfuric acid corrosion. If an SO_3 injection system is used to control particle resistivity in the ESP, its operation must be integrated with the gas cooling system to provide both resistivity and control without causing corrosion problems.

Although fabric filters represent only 10 percent of the current power plant applications, they are an important part of the program because the number of fabric filters could increase significantly as a result of stricter mercury control regulations. If a high level of mercury removal is mandated, a baghouse may be the most economical choice. Meserole[4] predicts that achieving 80 percent mercury removal at a plant with an ESP would require 10 times the amount of sorbent as would be required if a fabric filter were installed. The difference in the cost of the additional sorbent would be greater than the annualized cost of a new fabric filter. In addition, a number of power plants use ESPs with small specific collection areas (SCAs) that would have difficulty dealing with the additional loading of the difficult-to-collect carbon sorbent.

As a result, we decided to include a COHPAC baghouse in the test program, a cost-effective retrofit option for power plants with ESPs. COHPAC, EPRI's patented Compact Hybrid Particulate Collector concept, places a high air-to-cloth ratio baghouse downstream of an existing ESP to improve overall particulate collection efficiency.

[4] Meserole, F.B.; Chang, R.; Carey, T.R.; Richardson, C.F. Estimating Electric Utility Mercury Control Costs using Sorbent Injection. Presented at the EPRI-DOE-EPA Combined Utility Air Pollutant Control Symposium, Atlanta, GA, August 1999.

Table 1. Mercury emissions data from three of the host sites.

Table 1. Mercury emissions data from three of the host sites.

Plant and Unit Sampling Location	Particle Bound	Oxidized Hg^{2+}	Elemental Hg^0	Total Hg
Brayton Point U3				
Inlet (μg/dscm)	1.58	2.53	<1.18	5.3
Outlet (μg/dscm)	0.39	2.09	<1.19	3.67
Removal efficiency (%)	76.46	16.93	-3.25	31.92
Salem Harbor U3				
Inlet (μg/dscm)	2.83	0.10	0.29	3.22
Outlet (μg/dscm)	0.0554	0.0925	0.2501	0.3980
Removal efficiency (%)	97.96	-23.07	8.62	87.28
Gaston U1[a]				
Inlet (μg/dscm)	2.26	1.72	2.81	6.80
Outlet (μg/dscm)	0.60	3.99	2.06	6.65
Removal efficiency (%)	73.45	-131.98	26.69	2.21

[a]Measurements made across hot-side ESP not COHPAC baghouse.

Dry sorbents can be injected upstream of the COHPAC and downstream of the ESP. There are three main advantages to this configuration: 1. sorbents are mixed with a small fraction of the ash (nominally 1 percent), which reduces the impact on ash reuse and waste disposal; 2. sorbent requirements are reduced by a factor of 10 relative to the existing ESP; and 3. capital costs for COHPAC are less than other options, such as replacing the ESP with a baghouse or installing a larger ESP. Four power plants are participating in the field test program: Alabama Power Co.'s Gaston facility; Wisconsin Electric Power Co.'s Pleasant Prairie facility; and PG&E National Energy Group's Salem Harbor and Brayton Point facilities. These four plants provide a means to document the performance of mercury control technology for both subbituminous Powder River Basin (PRB) coals and low-sulfur bituminous coals. Three of the plants have ESPs, while the fourth plant has both a hot-side ESP and a COHPAC baghouse. Table 1 presents data on mercury emissions from three of the four plants as determined during the ICR testing. Additional details on the four plants are provided below.

Alabama Power's Gaston Unit 3 is a 270 MW B&W wall-fired boiler that burns a washed Alabama bituminous coal. The coal has a heating value of 13,700 BTU/lb, with a mercury content of 0.06 g/g and 0.03 percent chlorine. Particulate is captured by a Hamon Research Cottrell hot-side weighted-wire ESP with an SCA of 274 ft_2 /kacfm. A Hamon Research Cottrell COHPAC baghouse is used with an air-to-cloth ratio of 8.5:1 gross; the temperature of the baghouse ranges from 240 to 300°F. During the test program, the sorbent will be injected downstream of the ESP and air preheater and upstream of the baghouse. This test program was conducted during spring 2001.

Wisconsin Electric's Pleasant Prairie Unit 2 is a 600 MW Riley Stoker balanced-draft, turbofired boiler that burns PRB coal. The coal has a heating value of 11,897 BTU/lb, with 0.1 μg/g mercury and 0.0015 percent chlorine. Particulate is captured by a Hamon Research Cottrell coldside weighted-wire ESP with an SCA of 468 ft_2 /kacfm. A Wahlco SO_3 system is used to condition the fly ash. The unit operates in a temperature range of 280 to 310°F. Mercury control testing will be conducted during September and October 2001.

PG&E's Salem Harbor Unit 1 is an 85 MW B&W radiant boiler that fires a South American bituminous coal. The coal has a heating value of 11,300 BTU/lb, with 0.0?g/g mercury and 0.03 percent chlorine. Particulate is captured by an Environmental Elements cold-side rigid-electrode ESP with an SCA of 474 ft_2 /kacfm. A

FuelTech urea-based selective noncatalytic reduction system is used to control levels of nitrogen oxides (NOx). The ESP operates at temperatures as low as 250°F. Tests were scheduled to be completed in spring 2001.

PG&E's Brayton Point is a 122 MW CE tangential, twin-furnace boiler burning a low-sulfur eastern bituminous coal. The coal has a heating value of 12,319 BTU/lb, with 0.05 µg/g mercury and 0.08 percent chlorine. A pair of ESPs is used in series to capture particulate: a Koppers weighted-wire cold-side ESP with an SCA of 156 ft_2 /kacfm and a Hamon Research Cottrell rigid-electrode ESP with an SCA of 403 ft_2 /kacfm. An EPRICON SO_3 system is used to condition the fly ash. The plant uses Separations Technology equipment to process the collected fly ash by electrostatically separating carbon from the fly ash.[5] These tests are scheduled for fall 2002.

SORBENT SELECTION AND SCREENING

The test program at each site allows for the evaluation of two sorbents: a lignite-derived activated carbon supplied by NORIT (referred to as Darco FGD carbon) and one alternative sorbent. FGD is considered the benchmark for these tests because of its wide use in DOE/EPRI/EPA-sponsored testing. Because of the economic impact of sorbent costs on the overall cost of mercury control, it is desirable to find either less expensive sorbents, such as fly ash-derived products, or a less expensive form of activated carbon. Sorbent selection criteria have been developed so that sorbent vendors/developers can clearly understand the needs and requirements of this program. In summary, an alternative sorbent must be

- at least 25 percent less expensive than FGD carbon;
- available in quantities of at least 15,000 lbs (and potentially as high as 250,000 lbs) for site tests;
- available in sufficient quantities to supply at least 100,000 tons per year by 2007; and
- demonstrate a capacity for mercury capture of at least 100 µg/g as measured by URS.

Sorbents will be tested on a slipstream of flue gas for site-specific mercury capacity using URS' fixed-bed mercury absorption device. This device was developed with funding from EPRI and has been used to screen dozens of sorbents. Adsorption tests are conducted by saturating sorbents with either elemental mercury or mercuric chloride in the presence of simulated flue gas. The test apparatus is illustrated in Figure 1. In the laboratory, simulated flue gas is prepared by mixing heated nitrogen gas streams containing SO_2, hydrochloric acid (HCl), NOx, carbon dioxide, water, and ozone. Mercury is injected into the gas by contacting nitrogen carrier gas with either recrystallized mercuric chloride solids or an elemental mercury permeation tube housed in a mercury diffusion vessel; mercury concentration is controlled by the temperature of the diffusion vessel and the nitrogen carrier gas flow rate. During field tests, actual flue gas is drawn into the apparatus.

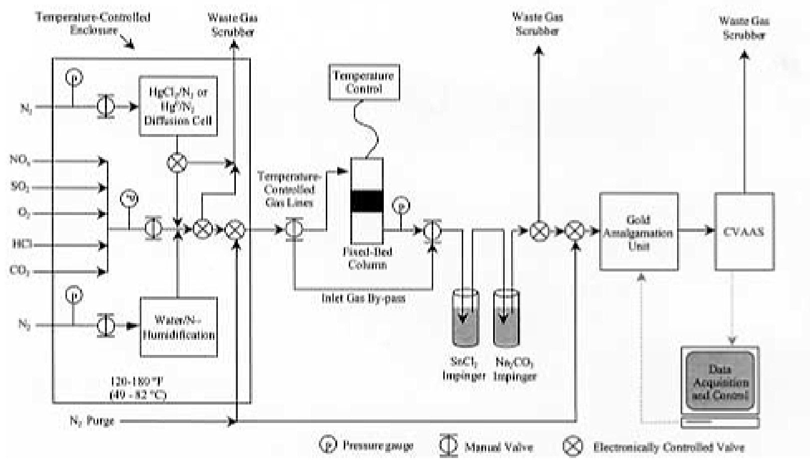
The amount of mercury exiting the sorbent column is measured on a semi-continuous basis. Gas is passed through the column until 100 percent of the inlet mercury is detected at the outlet (100 percent breakthrough). The 100 percent breakthrough (equilibrium) capacity of the sorbent µg Hg/g sorbent) is determined by summing the total mercury adsorbed until the outlet mercury concentration is first equal to the inlet concentration.

SEMI-CONTINUOUS EMISSIONS MONITOR

Semi-continuous gaseous mercury analyzers built by Apogee Scientific will be used during this program to provide near realtime feedback during baseline, parametric, and long-term testing. Continuous measurement of mercury at the inlet and outlet of the particulate collector, where mercury levels fluctuate with boiler operation (temperature, load) and decisions must be made concerning parameters such as sorbent feedrate and cooling, is considered a critical component of a field mercury control program. The analyzers that will be used for this program consist of a commercially available cold vapor atomic absorption spectrometer (CVAAS) coupled with a gold amalgamation system (AuCVAAS). One analyzer will be placed at the inlet and one at the outlet of the particulate collector during this test program.

[5] Gasiorowski, S., Bittner, J., Willauer, C., and Vasiliauskas, A. Reliability and Quality through Processing: Beneficiation of High LOI Fly Ash for Concrete. Presented at the 1998 Conference on Unburned Carbon on Utility Fly Ash, Pittsburgh, PA, May 1998.

Figure 1. Bench-scale, fixed-bed mercury adsorption system



Although it is very difficult to transport nonelemental mercury in sampling lines, elemental mercury can be transported without significant problems. Since the Au-CVAAS measures mercury by using the distinct lines of ultraviolet absorption characteristic of elemental Hg^0, the nonelemental fraction is either converted to elemental mercury (for total mercury measurement) or removed (for measurement of the elemental fraction) near the sample extraction point. This minimizes any losses due to the sampling system. For total vaporphase mercury measurements, all nonelemental vapor-phase mercury in the flue gas must be converted to elemental mercury. A reduction solution of stannous chloride in HCl is used to convert Hg 2+ to Hg^0. The solution is mixed as prescribed in the draft Ontario Hydro Method for manual mercury measurements.[6]

To measure speciated mercury, an impinger of potassium chloride solution mixed as prescribed by the draft Ontario Hydro Method is placed upstream of the stannous chloride solution to capture oxidized mercury. Unique to this instrument is the ability to continuously refresh the impinger solutions to assure continuous exposure of the gas to active chemicals. The Au-CVAAS system is calibrated using elemental mercury vapor, by injecting a metered volume of mercury-laden air from the air space of a vial containing liquid mercury at a precisely measured temperature into the analyzer.

The Au-CVAAS can measure mercury over a wide range of concentrations. Since the detection limit of the analyzer is a function of only the quantity of mercury on the gold wire and not the concentration in the gas, the sampling time can be adjusted for different situations. Laboratory tests with stable permeation tube mercury sources and standard mercury solutions indicate that the noise level for this analyzer is 0.2 ng mercury. To sample at 50 to 100 times the noise level during field testing, the sampling time is set so at least 10 ng mercury is collected before desorption. For example, if the mercury concentration is 5 $\mu g/m_3$, a 1-minute sample time would be required, where as for a concentration of 0.5 $\mu g/m_3$, 10 minutes of sample time would be required.

Particulate is separated from the gas sample using a self-cleaning inertial gas separation arrangement modified for use with this mercury analyzer under an EPRI mercury control program. This arrangement uses a system where excess sample flow continuously scours particulate from a secondary filter so as to minimize any mercury removal or conversion due to the presence of particulate.

[6] American Society for Testing and Materials. Standard Test Method for Elemental, Oxidized, Particle-Bound, and Total Mercury in Flue Gas Generated from Coal-Fired Stationary Sources (Ontario Hydro Method); ASTM draft method; American Society for Testing and Materials, October 1999.

SORBENT INJECTION EQUIPMENT

The sorbent injection equipment is a skid-mounted, portable, dilute-phase pneumatic system. The activated carbon will be delivered to the plant in 900-lb supersacks, which will be stored on pallets adjacent to the injection skid. The reagent is metered by a variable-speed, screw feeder into an eductor that provides the motive force to carry the reagent to the injection point. A positive displacement blower provides the conveying air. A programmable logic controller is used to control system operation and adjust injection rates. Flexible hoses will carry the reagent from the feeder to a distribution manifold located upstream of the particulate collector feeding multiple injection probes inserted into the duct to distribute the sorbent evenly across the flue gas.

FIELD TESTING

Prior to installing injection equipment, preliminary system operation, performance, and mercury-level measurements will be made. Mercury will be measured using a semi-continuous emissions monitor (S-CEM) across the particulate control device, which will be run continuously for a minimum of 24 hours at each site. These measurements will be used to expedite the parametric evaluation and provide insight as to current mercury removal efficiencies during "normal" operation with varying boiler load. These data will be used to design the parametric tests with the minimum number of uncontrolled variables.

After installation of the sorbent injection equipment, a second set of baseline tests will be conducted to fully document baseline conditions. During this test, boiler load will be held steady at "full-load" conditions during testing hours (7:00 a.m. to 7:00 p.m.). Mercury levels across the particulate control device will be measured using two separate methods: the S-CEM and standard Ontario Hydro Testing. This baseline test is expected to run for 1 week. Following the baseline test, a parametric series of tests will be conducted to document mercury removal levels as a function of injection rate and gas temperature. The flue gas temperature will be lowered at each condition to document the effect of a 10 to 20°F decrease in temperature on mercury removal efficiencies. The maximum sorbent injection rate will be established using either a 90 percent mercury removal level or a sorbent feed proportional to 30 lb/Macf, which is considered an economic maximum. The next series of parametric tests will be conducted using an alternative sorbent. Mercury removal as a function of injection rate will be measured at the optimum temperature measured during the previous test series. After this test the field crew will analyze the data and work with team members on establishing conditions for the long-term test. The final test will be a mercury removal validation program conducted for a maximum of 14 days at the "optimum" plant operating conditions (lowest cost/highest mercury removal) as determined from the parametric tests. The S-CEM will be used for continuous monitoring of mercury removal. Ontario Hydro measurements will be conducted at the inlet and outlet.

During each field test program, samples of the ash/sorbent mixture from the hoppers will be collected and analyzed. The standard testing technique used for assessing hazardous waste characteristics is the Toxicity Characteristic Leaching Procedure (TCLP). A 100-g sample of ash is exposed to 1 liter of acidic solution (acetic acid- or acetate-based) for 24 hours. The solution is then analyzed for several metals (including mercury) to determine how much of each target metal was leached from the solid sample. Results are compared against limits established by regulation. In the case of mercury, a maximum leachable level of 0.2 μg/liter has been established.

A second series of tests will be performed by EERC to answer the question of the stability of the mercury. The potential long-term environmental impact of the mercury-laden ash will be determined using two techniques: leaching and thermal desorption. Leaching tests are done using a method known as the synthetic groundwater leaching procedure (SGLP).[7] This test is modeled after the TCLP, but modified to allow for disposal scenarios. A shake-extraction technique is used to mix the solid sample with an aqueous solution; aliquots of the liquid are analyzed after 18 hours, 2 weeks, and 4 weeks. Thermal desorption tests will be performed using a special test fixture that is heated using a programmable temperature controller. The temperature of the ash sample is ramped to 500°C at a rate of 20°C per minute. Mercury that is released by the sample is swept into a spectrophotometer for mercury measurement as a function of time and temperature.

[7] Hassett, D.J.; Pflughoeft-Hassett, D.F.; Laudal, D.L.; Pavlish, J.H. Mercury Release from Coal-Combustion By-Products to the Environment. Presented at the Mercury in the Environment Specialty Conference, Minneapolis, MN, September 1999.

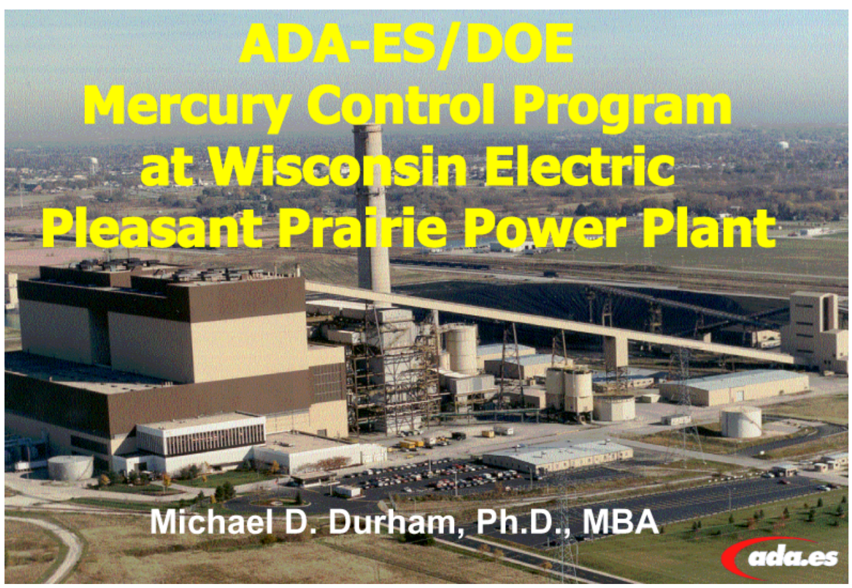
After completion of testing and analysis of the field data, the requirements and costs for full-scale, permanent commercial implementation of the necessary equipment for mercury control using sorbent injection technology will be determined. The following need to be considered: the size and design of process equipment, based on test results and plant-specific requirements (reagent storage capacity, plant arrangement, retrofit issues, winterization, controls interface); modifications to existing plant equipment, including the particulate collector, ash handling system, compressed air supply, electric power capacity, other plant auxiliary equipment, utilities, and other balance of plant engineering requirements; and type and source of reagent to determine the most cost-effective reagent(s) for the site.

TECHNOLOGY TRANSFER

Transferring the information generated during this field test program to the coal-fired power-generation industry will be an important part of the program. This will be accomplished through technical papers presented at various forums, including A&WMA's Annual Conference and Specialty Conference on mercury, Institute for Clean Air Companies (ICAC) meetings, and the EPRI/ DOE/EPA Mega Symposium (see opposite). In addition, results from the test programs will be made available to the public via the ADA-ES Web site, www.adaes.com as soon as DOE approves them.

ACKNOWLEDGEMENTS

Such a large-scale field test program could not be conducted without technical and administrative support from a large number of people at the various power-generating companies. The authors would like to acknowledge all of these individuals and especially the following key personnel: Dr. Larry Monroe, Southern Company Services; Herb Stowe, PG&E; and Dick Johnson, Wisconsin Electric. Also, the authors acknowledge the valuable input provided by Dr. Ramsay Chang, EPRI, and James Kilgroe, EPA.



ADA-ES Hg Control Program

- Full-scale field testing of sorbent-based mercury control on non-scrubbed coal-fired boilers
- Primary funding from DOE National Energy Technology Laboratory (NETL)
- Cofunding provided by:
  - Wisconsin Electric
  - EPRI
  - Southern Company
  - PG&E NEG
  - Ontario Power Generation
  - TVA
  - First Energy
  - Kennecott Energy

Objective

- Determine the cost and impacts of sorbent injection into the cold side ESP for mercury control.
  - Conduct tests on ¼ of Unit 2 gas stream (150 MW).
  - Evaluate mercury removal as a function of sorbent injection rate.
  - Evaluate impacts including ESP performance and ash marketability.

Key Features of PPPP Tests

- Burns coals from the Powder River Basin
- One ESP chamber can be treated in isolation. (1/4 of unit ~ 150 MW)
- Baseline mercury removal (1999) showed no removal of mercury by the ash. High percentage of elemental mercury.
- Long duct runs provided good residence times for spray cooling and sorbent injection.
- Fly ash is currently sold as a valuable commodity. Impacts on ash re-use are important in determining the real costs of mercury control.

ada.es

Activated Carbon Storage and Feed System

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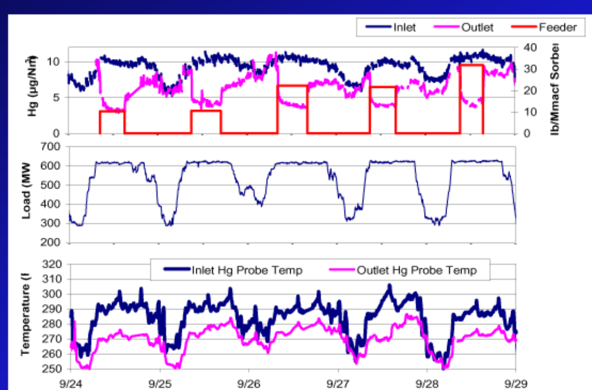
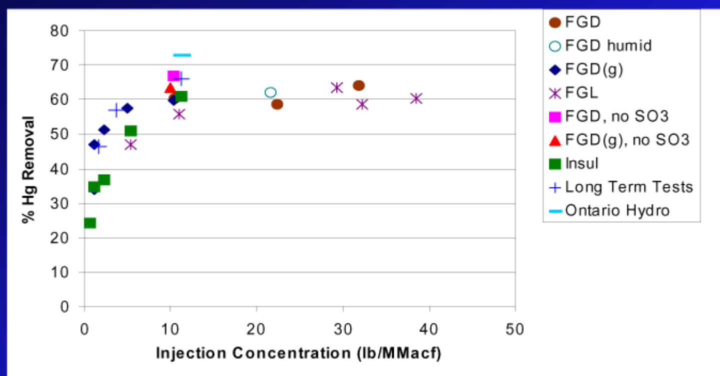
Powdered Activated Carbon Injection System

Mercury Trends Week 1



Carbon Injection Performance on a PRB Coal with an ESP



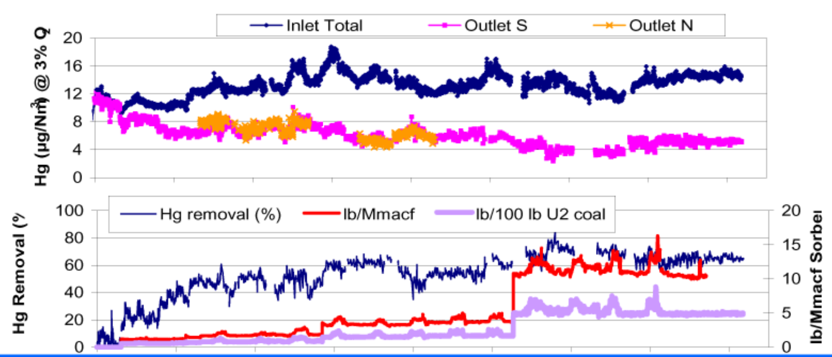
Parametric Test Conclusions

- Higher than expected removal observed at very low injection rates
- Hg removal improves rapidly with injection rates up to nominally 5 lbs/Mmacf
- Increase in performance minimal above 5 lbs/Mmacf
- No significant impact of SO_3 injection on Hg removal
- No improvement with spray cooling of 40 – 50°F
- No significant difference between carbons
- Smaller sized sorbent did not improve performance
- Achieving 60 – 65% removal at lower than expected injection rates (insignificant increase in removal by injecting additional carbon)

Long-Term Test Plan (5 days each)

- All tests conducted with Norit Americas Darco FGD
- Very Low Rate of 1 lb/MMacf
  - Minimize impact on ash
  - What is removal efficiency at very low rate?
- Low Rate of 3 lbs/Mmacf
  - Logarithmic "middle" point
  - Will removal efficiency increase with time?
- Highest Removal at 10 lbs/MMacf
  - Ontario Hydro Tests
  - Impact on ESP

Long-Term Trend Data



Speciated Mercury Measured by S-CEM

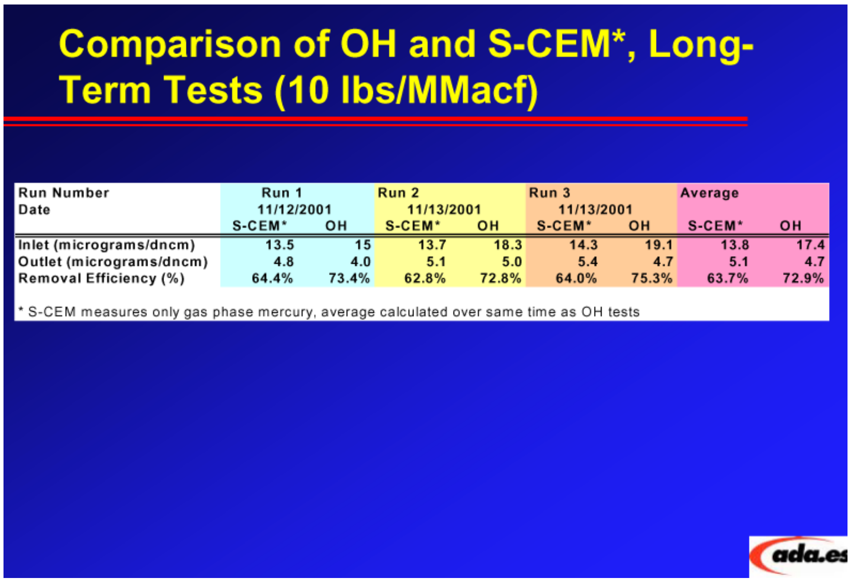
Species (microg/dncm)	1 lb/Mmacf Inlet	1 lb/Mmacf Outlet	3 lb/Mmacf Inlet	3 lb/Mmacf Outlet	10 lb/Mmacf Inlet	10 lb/Mmacf Outlet
Particulate	NA	NA	NA	NA	NA	NA
Elemental	10.7	4.9	11.7	4.5	11.0	3.2
Oxidized	1.3	1.9	2.2	1.5	2.6	1.3
Total	12.0	6.8	13.9	6.0	13.6	4.5
% Oxidized	11	28	16	25	19	28

Note: Total and elemental mercury measured directly, oxidized mercury calculated from the difference.

Speciated Mercury Measured by Ontario Hydro Method (10 lbs/MMacf)

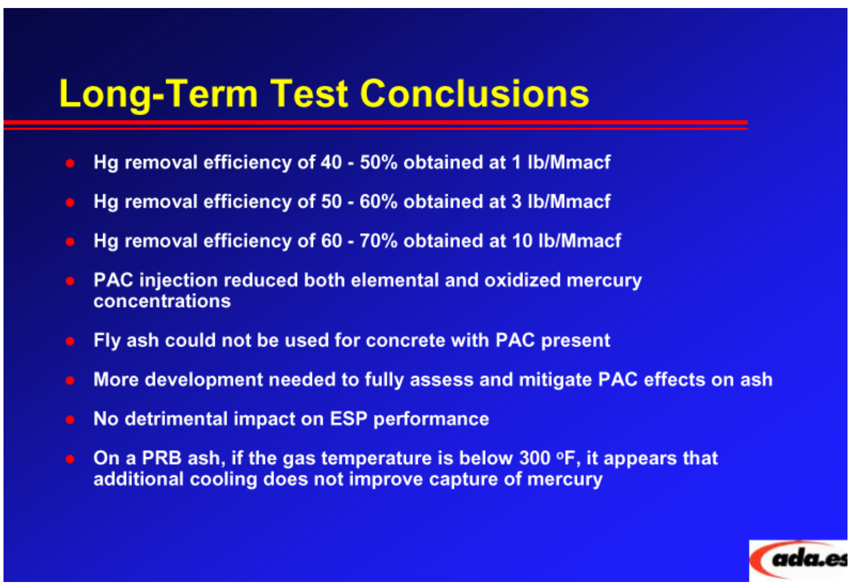
Ontario Hydro Results Summary (microgram/dncm)

	Baseline Inlet	Baseline Outlet	Long Term Inlet	Long Term Outlet
Particulate	1.97	0.01	0.98	0.00
Elemental	12.22	9.80	14.73	4.27
Oxidized	2.51	6.01	1.73	0.44
Total	16.71	15.82	17.44	4.71
% Oxidized	15.0%	38.0%	9.9%	9.3%



Run Number Date	Run 1 11/12/2001		Run 2 11/13/2001		Run 3 11/13/2001		Average	
	S-CEM*	OH	S-CEM*	OH	S-CEM*	OH	S-CEM*	OH
Inlet (micrograms/dncm)	13.5	15	13.7	18.3	14.3	19.1	13.8	17.4
Outlet (micrograms/dncm)	4.8	4.0	5.1	5.0	5.4	4.7	5.1	4.7
Removal Efficiency (%)	64.4%	73.4%	62.8%	72.8%	64.0%	75.3%	63.7%	72.9%

* S-CEM measures only gas phase mercury, average calculated over same time as OH tests



RESPONSES OF MICHAEL DURHAM TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question 1. Your testimony indicates that carbon injection is much more effective when power plants have fabric filter systems in place, but that only 10 percent of electric power plants have those systems in place now. Why is there such a low percentage of those systems in place now? Are there other benefits besides higher mercury removals levels available to companies who install fabric filter systems?

Response. Since the first installation of an electrostatic precipitator (ESP) on a pulverized-coal-fired boiler at the Detroit Edison Company Trenton Channel Station in 1924, ESPs have been an integral part of coal-fired-boilers. ESPs were specified for most coal-fired boilers because they offered several attractive advantages over other particulate control equipment: ESPs can be designed to provide very high collection efficiency for virtually all sizes of fly ash particles; they have low power requirements, virtually no pressure drop, and require minimal maintenance; they can be successfully scaled to treat very large gas flows; they are flexible in that they can operate over a large range of temperatures, pressures, and gas characteristics; and they can continue working for the life of the boiler. In 1977, there were more than 1300 fly ash precipitator installations treating over 500 million actual cubic feet per minute of flue gas.

ESPs were especially well suited for higher sulfur coals, which was the coal fired by many older plants. When newer plants started firing lower sulfur coals to meet the requirements of the Clean Air Act in 1970, performance difficulties with ESPs on this new type of ash became apparent. These operating limitations were overcome by making the ESPs larger and adding flue gas conditioning.

Because of the difficulties encountered by ESPs collecting ash from low-sulfur coals, power companies began to consider the use of fabric filters or baghouses. Fabric filters control particulate matter by passing the flue gas through a tightly woven fabric that collects the particles in the form of a dust cake. These devices are relatively insensitive to the differences in ash characteristics produced by low-and high-sulfur coals. Although fabric filters were common in smaller industrial applications, the flue gas produced from burning coal creates a number of challenges because of high volumes, high temperature, and presence of acid gases.

The first fabric filter on a coal-fired boiler was built in the early 70's. More FFs were installed in the 80's and 90's when plants started firing low-sulfur coals and had to meet more stringent particulate emission standards. However, ESPs continued to be the choice in most cases based on economics. Even though the fabric filters are capable of achieving lower particulate emissions, often Public Utility Commissions (PUC) would not approve the purchase of a more expensive piece of capital equipment if it exceeded the performance required by current regulations.

Are there other benefits besides higher mercury removal levels available to companies who install fabric filter systems?

There are several benefits of a fabric filter. For plants burning low-sulfur coal, especially western subbituminous coals, fabric filters can operate at very high collection efficiencies and are insensitive to changes in ash characteristics that can impact ESP performance. For most low-sulfur coals, the fabric filter will produce lower particle emissions than an ESP. However, for high-sulfur bituminous coals, the ESP may still be the control device of choice as the gas stream produces many challenges for performance and survival of the fabric material.

Another benefit of the fabric filter occurs when it is used in the EPRI COHPAC configuration. This allows the ash to be collected separately from the activated carbon so that the plant can sell their ash for use in concrete. The ability to continue to sell their ash and avoid land disposal costs could save a large power plant as much as $10 million per year.

Question 2. Your testimony notes that the mercury reduction levels and the timing of those reductions are very challenging for the industry. It seems to me that a mandatory reduction in mercury emissions would greatly facilitate the development of further technology developments. Could you comment on that?

Response. One of the biggest benefits of a definitive regulation is providing certainty. This will help the power companies as they perform long-term planning. It will help the technology developers target and refine their control devices. When the target removal level is unknown, the R&D must proceed in a wide variety of directions. However, with a well-defined target, many approaches will be dropped as impractical allowing the developers to focus on only those concepts capable of achieving the target levels. This should result in more rapid development of effective, lower-cost approaches.

Another positive impact of an explicit regulation is that it will encourage investment in the infrastructure that will be necessary to supply the industry with powdered activated carbon for mercury control. A significant barrier to the PAC technology will be the cost of building new kilns and furnaces that will be necessary to increase the production of activated carbon to meet the potential market for coal-fired boilers. The current market for activated carbon in the US is 250,000 tons/yr. Once mercury regulations are fully implemented, this could increase the demand to 2–3 million tons/yr. Activated carbon suppliers will be very hesitant to invest capital resources to increase capacity based on only the promise of a new regulation. Several years ago, the carbon industry increased capacity when EPA announced that they were going to tighten up drinking water standards. After the new capacity was added, EPA did not followup with new regulations thus producing a glut of activated carbon. Some companies went out of business because of this, and the industry as a whole is just now recovering.

Another positive result would occur if the regulation rewarded early adopters. Technology is best introduced into the power industry in a stepwise orderly fashion. With a few early adopters, it is possible to address problems that arise by making a limited number of modifications to equipment and processes. There are many examples of new technology being brought into the power industry where lessons learned from the early adopters have been critical to the success of the broad-based implementation across a large number of plants. Since the bioaccumulation of mercury in fish results from the cumulative impact of emissions from a variety of sources, credits provided for early reduction of emissions would provide both a potential environmental effect as well as greatly assisting the maturing of the control technology.

Question 3. It appears that you initial tests have been very promising. What are the next steps for test in order to move forward?

Response. There will be two additional short-term demonstration programs conducted at two plants in Massachusetts during 2002 under our current program funded by the Department of Energy National Energy Technology Laboratory (NETL). The short-term tests have identified a need for additional testing at sites representing different plant configurations and coal types. In addition, longer term tests at selected sites will be necessary to demonstrate that it is possible to maintain high levels of mercury removal over extended periods of time and for changing operations conditions such as load cycling and fuel changes. Completion of these tests will require continued funding from NETL and cost sharing from power companies. Two proposals were submitted to NETL in 2002 for this funding.

We are also identifying utility partners to participate in the Clean Coal Power Initiative. These programs would allow us to install and operate state-of-the-art equipment at plants to obtain performance and operating data for a few years. This will provide the mechanism to further define optimum operation, solve current problems, and address any new problems that may arise. This is a critical step in the development process and must be completed before any widespread implementation of the technology.

RESPONSES OF MICHAEL DURHAM TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. The Jeffords/Lieberman Bill requires 90 percent mercury reduction by 2007. In your testimony you state that the timeframe is extremely challenging and you lay out a plan to have the "first commercial installations at a few early adopters in 2005–2007." Even if no problems arise, I don't see how this would allow the entire industry to comply with the Jeffords' Lieberman Bill by 2007. Is it possible and what are the potential problems?

Response. There are several critical components to the implementation of this technology including the carbon injection equipment, the production and supply of powdered activated carbon, and the fabrication and installation of fabric filters.

The injection equipment if relatively simple and inexpensive and is based on experience gained from using similar technology for other applications. The equipment is not very specialized and can be fabricated offsite by a wide variety of manufacturers. Once built, the equipment can be installed with little or no downtime of the plant and requires only general labor skills. Therefore, I do not expect that the injection equipment will be a limiting factor in the widespread implementation of the technology.

As mentioned earlier, there is currently insufficient production of powdered activated carbon to meet the demands of the power industry for mercury control. It is unlikely that the carbon companies will invest in new production facilities until a new regulation requiring mercury control has been passed. Once a regulation is in place, the carbon companies will build new facilities to meet the demand created by the law, which they view represents a very desirable business opportunity. Their current business is seasonal and weather dependent. In contrast, mercury control in the power industry would create a base-loaded demand that is predictable, continuous, and relatively constant. Therefore, it would be easier to design production equipment to meet this type of demand.

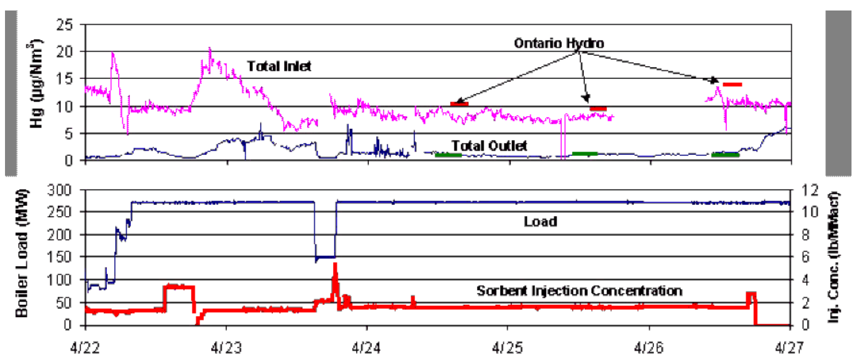
From our initial data, the injection of activated carbon can reduce mercury emissions by 50 to 70 percent with existing equipment (ESPs) found at the vast majority of the plants. However, if the target removal level is 90 percent mercury removal, it will be necessary to install fabric filters to provide the necessary contact between the carbon and the flue gas. The availability of fabric filters is the subject of Question 6.

Question 2. Your two test trials only ran for 2 weeks, and 90 percent reductions were only possible for 5 continuous days, then the reduction level dropped to 80–85 percent. What's to say it wouldn't drop more after 2 months or even 2 years?

Response. This can best be answered by referring to Figure 1, which presents the mercury removal measurements obtained during the 5-day test. The top graph shows the inlet and outlet mercury measurements. The bottom graph shows the plant load and the sorbent feed rate. During this program we asked the plant to maintain full-load operation, which they did for most of the time. The lower line shows the sorbent feed rate, which we held constant during this test period.

These results show that at certain periods, it was possible to obtain 90 percent mercury removal. This can be seen during the last 3 days of operation, which also corresponds to the period when the Quality-Assured Ontario Measurements were made. However when we look at the removal levels over the entire 5 day period, we see that the average is less than 90 percent, because during the first 2 days the inlet mercury levels went up unexpectedly due to a change in coal resulting in lower mercury removal.

Figure 1. Inlet and Outlet COHPAC Mercury Concentrations, Boiler Load and PAC Injection



Concentration During Long-Term Tests, April 2001

Therefore, it is not a matter that the technology deteriorated from 90 percent to 80 percent over the 5 days but that variations in plant operating conditions led to reduced collection efficiency during certain time periods. Because we are constantly putting in fresh sorbent to react with the mercury, we do not expect that performance will deteriorate over time, whether it be 2 months or 2 years. However, the challenge for this technology is to operate the sorbent injection system to achieve high levels of mercury removal under variable operating conditions, such as changing load and different coals, which are typical of the modern day power plant. We are planning for a 1-year test program at this site to resolve these issues.

Question 3. I understand that you must have a baghouse filter for the technology to work at the optimum level, and only 10 percent of the coal plants have baghouse filters. Considering labor and supply, as well as cost, how quickly could the other 90 percent install baghouse filters and can every facility do so?

Response. ADA Environmental Solutions only provides the carbon injection equipment and does not have the resources or experience to provide large capital equipment such as fabric filters. Therefore, I do not feel qualified to address this question. I would recommend contacting Mr. Jeff Smith of the Institute for Clean Air Companies, which represents several fabric filter manufacturers, or Mr. Rich Miller of Hamon Research Cottrell, who testified on the mercury panel on January 29, 2001.

STATEMENT OF RICHARD L. MILLER, HAMON RESEARCH-COTTRELL, SOMERVILLE, NEW JERSEY

Good morning, Mr. Chairman. My name is Richard Miller, Sales Manager for Fabric Filters and FGD Systems at Hamon Research-Cottrell (HRC) located in Somerville, New Jersey. For the past 25 years, I have been serving the air pollution control industry in various technical and managerial roles, with a specialty in fabric filter particulate removal systems. In addition, I have served as Fabric Filter Committee Chairman for the Institute of Clean Air Companies (ICAC) for the past 5 years and have authored dozens of technical papers and conducted numerous technical presentations during my career period.

I wish to take a few moments to share a little history about the company I work for. Dr. Frederick Cottrell who was the inventor of the first industrial electrostatic precipitator originally founded research-Cottrell in 1907. To support scientific research, Dr. Cottrell co-founded the non-profit Research Corporation in 1912. Forty years later, the Research Corporation gave birth to Research-Cottrell, which is now known as Hamon Research-Cottrell. To this date, our company continues the tradition of engineering excellence by designing, building, and servicing high quality air pollution control systems for the various industries and electric utilities of the world.

Our products range from particulate control devices such as electrostatic precipitators (ESP's) and fabric filter systems (FF's), also known as baghouses, to flue gas de-sulfurization (SO_2) systems, including both Wet FGD and Dry FGD type systems, Nitrogen Oxide (NOx) reduction systems and other supporting technologies such as U2A which is primarily designed to generate onsite ammonia from urea for SCR type NOx reduction systems. All of these technologies are designed to meet both current and hopefully future air pollution control legislations. We are but one of several highly skilled organizations in our industry who have developed air pollution control technologies designed to achieve the same goals. Currently HRC does not design or manufacture any type of CO_2 control technologies so I therefore will not address this pollutant in my testimony. I do wish, however to address the issue of mercury control for the remainder of this testimony.

SUMMARY

As testified by the Mr. Jeff Smith, Executive Director of ICAC during his previous testimony on November 15, 2001, I believe the air pollution control industry currently has the existing technologies required to achieve NOx, SO_2, and Mercury reduction levels as proposed under Senator Jeffords' bill (S. 556), and the required resources to further develop and deliver this technology within the timeframe outlined under this bill. This is consistent with the past history of the air pollution control industry to develop the technologies required to achieve emission control technologies regulated since the first Clean Air Act was enacted. Whether particulate emissions, sulfur dioxide, nitrous oxide, mercury or fine particulate (PM_{10} or $PM_{2.5}$) removal, we have found ways to meet the challenges established by regulations. These include the challenge of making it both technically feasible as well as economically available.

Effective mercury reduction has been measured and shown to occur naturally to various degrees across existing air-pollution control devices, and removal rates in excess of the ultimate goal of 90 percent reduction have been achieved across the entire train of existing emissions control devices or better stated as being from the coal pile to stack. ICR Emission summary data gathered by EPA, and made available to the public from dozens of electric utility power stations and firing various type of coal types, shows that even without additional control devices or enhancements, natural mercury removal rates are currently being accomplished with removal levels anywhere from zero to as high as 97 percent+. This data shows that it is easier to remove mercury from Eastern Bituminous coals than it is from Western Sub-Bituminous or even worse from poorer grade fuels such as lignite.

The success of many of these sites depends upon many variables, including; type of coals, operating temperatures, and especially which type of air pollution control devices are present. Most existing power stations have ESP's for removal of particulates, while a smaller but growing number of plants have fabric filter systems installed. Additionally, some of these installations have also installed SO_2 scrubbing systems and SCR systems, which can all jointly or independently help in the removal of mercury from the gas stream. So the control of multi-pollutants which requires many of these existing devices to be installed at the same time, can and do help together in reaching the goals of this bill. The best removal rates appears to be from fabric filter systems which generally remove a greater amount of particulates than electrostatic precipitators can by filtering the ash across a synthetic, high temperature filter media.

For those existing plants that have electrostatic precipitators installed, even if they do not currently provide effective mercury reduction levels, there does exist commercially available technology that has been proven to enhance these devices in the removal of total particulates and recently demonstrated mercury emissions with proven removal levels of 80 to 90+ percent. This technology is called COHPAC, which stands for a COmpact Hybrid PArticulate Control technology, which was originally developed by the Electric Power Research Institute (EPRI) in 1991 as a multi-pollutant control device. It involves the joining or marriage of both ESP and high velocity pulse jet type fabric filter technologies, with the fabric filter portion acting as a final collection polishing device. To date, significant improvements in the removal of particulates have been demonstrated at four existing coal fired power plant sites, as well as two refuse fired combustors utilizing this hybrid technology. Additionally, under an existing DOE/NETL sponsored test program which is being implemented by ADA-ES and co-sponsored by several electric utility generators, EPRI, as well as Hamon Research-Cottrell, it has been shown that on an existing utility coal-fired boiler that utilizes this COHPAC technology, with the simple addition of a dry sorbent such as pulverized activated carbon (PAC), an aging hot-side electrostatic precipitator can effectively achieve reduction levels of 80 to 90 percent. ICR data has shown that Hot-Side precipitator particulate collection devices, due primarily to the high flue gas temperature range they normally operate at, have shown to provide little if any natural mercury collection. Even though this power plant was firing an Eastern bituminous coal which tends to provide greater amounts of natural mercury reduction levels, the fact that it increased the total reduction levels from 0 percent to over 90 percent is remarkable in itself and demonstrates that it may be possible to achieve similar results on other fuels where higher initial mercury capture rates are already present. Additional longer-term research and demonstrations will need to be conducted in order to confirm these assumptions.

Even without the addition of the COHPAC technology, evidence suggests that existing power plants outfitted with electrostatic precipitators may also benefit from the injection of activated carbons. Fly ash removal rates of 50 to 70 percent can be reasonably expected to be achievable across these existing devices, while however requiring greater amounts of PAC sorbent injection levels. Although achievable, injection rates 10 to 30 times higher than fabric filters alone or when using COHPAC technology are expected with ESP's alone. Depending upon the initial cost of the PAC material, this higher injection feed rate could equate to a significant increase in annual operating costs of several millions of dollars per year.

Additional financial penalties to the utilities may also result due to the potential loss in the marketability of the ash from the injection of the activated carbon into either a conventional fabric filter and/or an electrostatic precipitator. The higher LOI content of the ash makes in unattractive to market as a concrete supplement. This results in the requirement to landfill the entire amount of fly ash, which depending upon the plants location, could be very expensive, thus potentially losing additional compensation and increasing the financial cost to the utility to remove the high mercury levels. However, with the use of the COHPAC technology, the majority or 96 to 98 percent of the fly ash is typically removed in the primary ESP particulate removal device. Only the remaining 2–4 percent of the total amount of ash is actually being treated with the activated carbon. Thus the majority of the ash could still be sold by the utilities and only the much smaller percentage of the ash which has now been treated for mercury reduction, can be disposed into a normal land fill or ash settling pond.

The initial installed cost on a flange-to-flange basis for the installation of the COHPAC technology appears to range anywhere from $20 to $30/KW, excluding any additional costs associated with the possible need for new or improved induced drafts fans, modified ductwork, additional foundations or engineering and in-house costs. However, for an example, on a typical 400 MW size coal-fired boiler facility, the difference in total annual levelized cost for pulverized activate carbon (PAC) injection to achieve 80 percent mercury removal across an existing ESP collector vs either a conventional fabric filter or COHPAC hybrid removal system is $13.5 Million vs $2.8 million, with the total injection system capital equipment cost equaling approximately $940,000 .

CONCLUSION

As an individual who has suffered with Asthma all his life and having a child who also has the same health disorder, it is important to me as well as all individuals to have the cleanest air possible available to us all. I have strived to achieve this throughout my career through the advancement of air pollution control technologies. However, without the enforcement resulting from tougher emission control legislation such as the multi-pollutant performance based approach reflected in the Jeffords bill (S. 556), current emission levels for all pollutants, including mercury, will not be reduced voluntarily by the electric power producers, nor will the advancement in pollution control technologies continue with any speed. Without the additional enforcement levels provided under this bill, current air pollution levels will remain as is, as the financial incentives needed to develop and demonstrate the required mercury control technologies and other pollutant controls will not be made available to the air pollution control industry.

Today, commercially available, cost effective air-pollution control technologies have already achieved 90 percent mercury removal reductions on certain coals. I am confident with the initiation of clean air regulations including reasonable deadlines for compliance; those 90 percent removal efficiencies can be achieved across a broad spectrum of available fuels. The Clean Air Industry has a well-documented history of successful response to regulatory initiative: when clear regulations have been enacted; the industry has achieved the desired results in a cost effective and commercially reasonable basis.

Failure to implement this legislation because of incomplete technical data creates the ultimate Catch 22. The Clean Air Industry cannot reasonably invest in the products or systems that will achieve the goals of the legislation without the regulatory drivers creating demand to justify investment but the regulations are being upheld because the products and systems have not been fully developed.

I am confident the goals can be achieved if the investment impetus of legislation exists.

We recognize that there is a cost to achieve the improved air quality, but you must also recognize that this investment has a high rate of return, not only in improved air quality but also as a highly efficient economic stimulus to our sluggish economy. Indeed, it is hard to identify a better government stimulus than air pollution control regulations in Power Generation. This is because:

- Cost is widely distributed and incurred by the entity/person using the power (as opposed to taxing everyone regardless of use)
- Electricity costs for the great majority of individuals and businesses are a small fraction of their operating expense.
- No risk of negatively impacting United States power generators because they are free from foreign competition in the United States. and they pass the cost on to their customers. The power is minimal, and can be addressed on case-by-case basis.
- No increase in government deficit and NO NEW Taxes
- The money must be spent within the US
- The liquidity exists in the capital markets to support this initiative-it just needs a stimulus for release
- Hundreds and thousands of jobs can be created in the United States, across a wide variety of businesses, not just for air pollution control companies like ourselves, but also architect and engineering companies, fabrication companies, steel companies, instrumentation and control companies and construction companies and their workers.

Thank you for this opportunity to testify. I look forward to any questions you may have.

RESPONSES OF RICHARD MILLER TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question. Mr. Miller, could you address some of the issues associated with controlling mercury emissions from different types of coal? It seems like there are a range of opinions on the control levels that are achievable for the three major types of coal. It seems like your bottom line is that you have faith in technology development in the context of mandated reductions to achieve pretty high levels of mercury control for all coals.

Response. The three major types of coals are:

- Western Sub-bituminous
- Eastern Bituminous
- Lignite

The difficulty in the removal of mercury from any of these coals depends in a large part on the amount or ratio of elemental vs. ionic (soluble) forms of mercury present in the coal. The higher the soluble portion, the easier it is to remove naturally in existing air pollution control equipment, or via the use of either dry or wet FGD systems.

The most difficult coal to remove high levels of mercury from is Lignite which has natural reduction levels in the area of only 10 percent. It also has the highest amount of elemental mercury and these boilers typically operate hotter than units firing more conventional coals. Some type of water spray type, humidification system would also be required to cool the flue gas down to levels more attuned for mercury reduction in the area of 275 to 320 F from common boiler/air heater exit flue gas operating temperatures of 340 to 400 F.

As you indicted, yes I am confident in technology development in the context of mandated reductions to achieve pretty high levels of mercury controls for all coals. As indicted previously, some coals may require either more or less control equipment in combination to achieve the proposed reduction levels.

Of the existing equipment present, fabric filters naturally remove the highest amount of elemental mercury across the filter cake, although in most cases under the targeted reduction rates. With the addition of an activated carbon injection system, high levels of mercury reduction is anticipated. The injection rates are anticipated to vary depending upon the type of coal and operating temperatures. For more difficult coals, the amount of activated carbon injected is expected to increase and the type of carbon may also be modified to enhance its properties. Higher costs would be expected for these modified sorbents and higher injection rates. Greater long-term studies would be required on the various types of coals and filtration systems to determine exactly what level of mercury reduction is feasible.

RESPONSE OF RICHARD MILLER TO ADDITIONAL QUESTION FROM SENATOR VOINOVICH

Question. In my opening statement I quoted a letter from Kansas City Power and Light which states that:

"Kansas City Power and Light just rebuilt a 550 megawatt unit, our Hawthorn 5 facility, using a state-of-the-art combination of SCR, dry scrubber and fabric filter and burning low sulfur sub-bituminous coal. This combination of equipment and fuel, making Hawthorn 5 the cleanest coal-fired power plant in the country, may be able to achieve a 45 percent level of mercury reduction, based on currently available information."

They can't do better than a 45 percent reduction in mercury. Should they rebuild their system again, and if so, what should they add to get to the 90 percent reduction level?

Response. To achieve higher mercury reduction levels on installations where an existing DFGD and fabric filter system is present, you would have to install a carbon injection system designed to inject activated carbon at the inlet to the fabric filter system. The installation of this enhancement to the system would not require rebuilding of the existing system, just the addition of an activated carbon injection system which includes a storage silo, metered feeder, blower, injection distributor and associated piping and hoses. This would be a fairly easy and relatively inexpensive system to install.

As there is a DFGD system present, a modified type activated carbon would most likely be required which involves the use of a iodine impregnated, activated carbon. This is commercially available, but at a higher cost than conventional activated carbon. The final amount of carbon required to meet the 90 percent requirement would have to be determined by field measurements. It is anticipated, however that by use of this type of technology that mercury reduction levels of up to 90 percent is achievable. A field demonstration program should be performed to confirm these assumptions.

STATEMENT OF FRANK ALIX, POWERSPAN CORPORATION

Chairman Lieberman and distinguished members of the Senate Subcommittee on Clean Air, Wetlands, and Climate Change, thank you for the opportunity to share Powerspan's perspective on compliance options for electric power generators to meet new limits on carbon and mercury emissions contained in S. 556.

My name is Frank Alix and I am the chairman and Chief Executive Officer of Powerspan Corp.

Powerspan is a clean energy technology company headquartered in New Hampshire. Our company was founded in 1994 and has grown to employ 50 scientists, engineers and other high-tech workers. In order to fund technology development, the company has raised over $29 million to date from private, institutional, and corporate investors.

Over the past 4 years, we have focused our resources on developing and commercializing a patented multi-pollutant control technology for coal-fired electric generating plants called Electro-Catalytic Oxidation, or ECOTM. Our ECO technology is designed to cost-effectively reduce emissions of sulfur dioxide (SO_2), nitrogen oxides (NOx), mercury (Hg), and fine particles ($PM_{2.5}$) in a single, compact system. Several leading power generators are investors in the company or partners in ECO development. These include FirstEnergy, American Electric Power, Cinergy, Ameren, and Allegheny Energy. In addition, the Department of Energy recently issued Powerspan a $2.25 million Cooperative Agreement to demonstrate the mercury removal capabilities of ECO under various conditions.

We have successfully tested our ECO technology in a 2-megawatt slipstream of a coal-fired plant owned by FirstEnergy. During this testing, ECO reduced emissions of mercury to below minimum detectable limits, representing an 81 percent reduction from incoming mercury levels. In addition, recent testing indicates that our ECO technology is capable of reducing sulfur dioxide by 99 percent and nitrogen oxides by 90 percent, thereby providing Best Available Control Technology—or BACT—removal levels in a single, multi-pollutant control system. Furthermore, ECO produces a commercially valuable fertilizer byproduct, avoiding the need for large, new landfill disposal sites to accept flue gas desulfurization (FGD) waste. Finally, our commercial cost estimates indicate that ECO capital and operating costs will be about half of the combined costs of FGD and selective catalytic reduction (SCR) systems, which are the closest alternative technologies for reducing SO_2 and NOx emissions.

Powerspan has begun installation of our first commercial ECO demonstration in a 50-megawatt slipstream at FirstEnergy's Burger Plant near Shadyside, Ohio. The project is being co-funded by a $3.5 million grant from the Ohio Coal Development Office within the Ohio Department of Development. Successful completion of this demonstration in early 2003 will lead to the availability of full-scale commercial ECO systems beginning in 2005.

As you consider compliance options for power generators to meet new limits on emissions of carbon and mercury, I would like to make the following points on the potential impact of new technology and the important role that regulations can play in promoting new technology:

1. Environmental technology development is driven by environmental regulations. Regulatory certainty and time are important factors that impact the degree to which environmental technology is deployed.
2. The cost of achieving environmental compliance is usually significantly less than estimated at the time regulations are developed.
3. Environmental regulations are not all created equal. Some are more likely to spur innovation than others.

Let me briefly address each of these points.

- Both the electric generating industry and the environmental technology community need long-term certainty in environmental regulation. For the capital-intensive electric generating industry, long-term regulatory certainty allows for the orderly improvement of generating assets without undue financial risk or threat to the availability of electricity supplies. For the technology community, regulatory certainty provides the incentive and time to deploy resources to develop and commercialize new technology that will meet the regulatory goals in the most cost-effective manner possible.
- In the process of crafting environmental legislation, the cost associated with the law's implementation is normally evaluated. These cost assessments are inevitably based upon what is known or commercially proven at the time. The objective of technology developers, however, is to make what is known and commercially proven obsolete. This they do on a regular and dependable basis. Therefore, it is important to remember that, given time, technology developers will ensure that environmental compliance costs are far less than predicted today.
- Our ECO technology could provide the environmental benefits of reductions in a number of air emissions, including mercury, years ahead of a typical regulatory schedule, and at a much lower cost than conventional pollution control technologies. However, the existing regulatory requirements significantly limit the generating industry's compliance flexibility, thereby making the use of lower cost, multi-pollutant approaches less viable.

Air regulations traditionally limit the emissions of a single pollutant independent of other regulated pollutants. Thus, a plant owner may need to install NOx controls today, Hg controls in 5 years, and SO_2 controls in ten. This approach does not serve the plant owner well, as it could require three separate outages to install control equipment; and it does not promote the use of more affordable multi-pollutant control technologies. Therefore, it is important that new regulations require that all regulated emissions be reduced during a similar, overlapping timeframe.

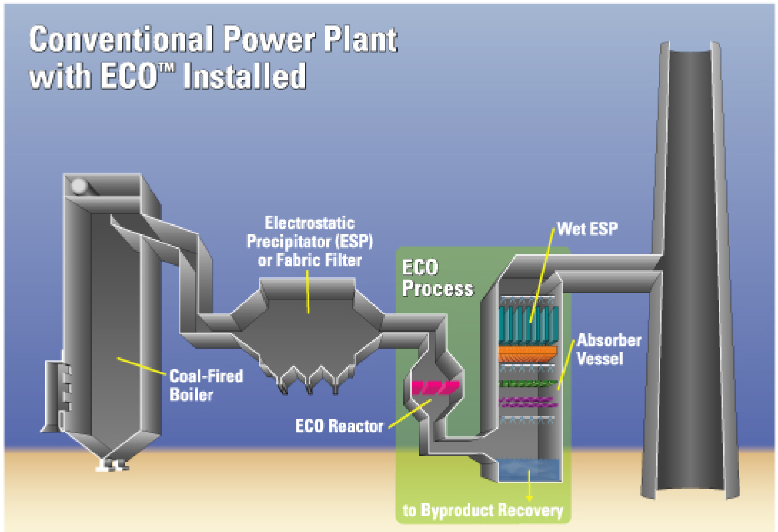
- Another potential problem with air regulations is that some reductions are made early, when credit is given for early compliance, and the remainder are made at the last possible moment to achieve compliance deadlines. While this makes good business sense for power generators, it puts the air pollution control industry in a feast or famine mode, and limits the available window to deploy new technologies. Therefore, I recommend a staged reduction approach for all new emission limits.

- Last, while there are many uncertainties related to mercury and carbon control technologies, one thing is certain. Until you require emission reductions, there will never be a commercially available control technology.

The extent to which mercury and carbon reductions can be made without threatening the availability of electricity supplies is also uncertain. However, the innovative use of ratchets, circuit breakers, and tolls may provide a reasonable approach to achieve the best possible outcome. With a ratchet, emission limits are continually reduced as long as the cost of reduction does not exceed a preset limit. With a circuit breaker, a stringent emission limit is set, but the EPA could provide relief if the compliance cost exceeds a certain threshold. And the toll, which might be best applied to carbon emissions, assigns a cost per unit emitted and thereby results in predictable compliance costs while, at the same time, providing a financial incentive to reduce emissions. One or more of these features, when combined with a cap-and-trade framework, could achieve the clean air goals desired at the lowest cost and with the least risk.

In summary, I believe that increasing our energy supply, and at the same time, improving our environment is not only possible, but also imperative for the future well-being of our society. Fortunately, our nation is blessed with an innovative and entrepreneurial spirit that will rise to such challenges. I believe that political leaders must exercise a degree of faith in order to establish the environmental laws that look out over a decade or more to protect public health. Given time and the right regulatory framework, the technology community will find an economical way to achieve the desired environmental benefits. History has demonstrated this time and again. And there are many companies like Powerspan full of talented individuals who are dedicated to this goal.

POWERSPAN®
Technology for a clean energy economy

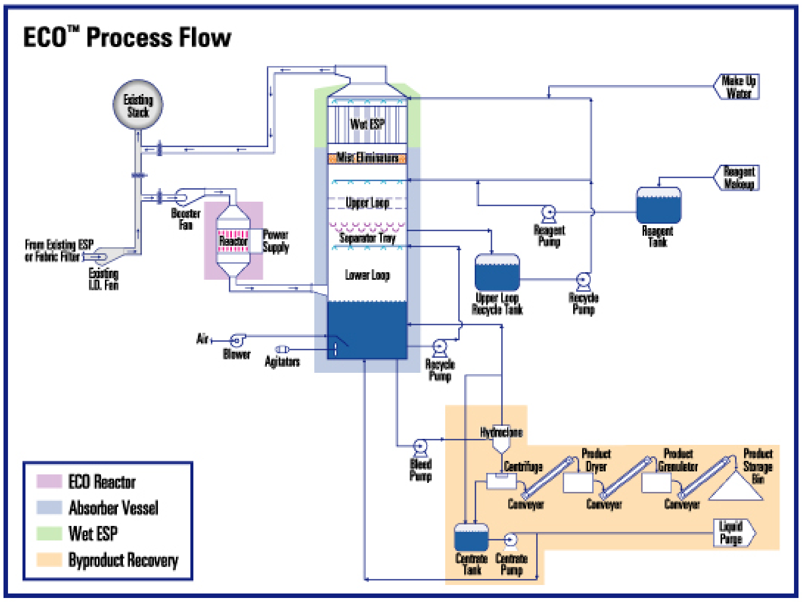


ECO™ Multi-Pollutant Control Technology

Electro-Catalytic Oxidation (ECO) technology removes sulfur dioxide (SO_2), nitrogen oxides (NO_X), mercury, and fine particulate matter ($PM_{2.5}$) from the flue gas of coal-fired power plants.

ECO Advantages

- **Removes four primary air pollutants—SO_2, NO_X, mercury, and $PM_{2.5}$—in a single unit**
- **Compared to alternative emission control systems:**
  - **– Equivalent or better removal efficiencies**
  - **– About half the capital cost with lower operating costs**
- **Adapts to various types and sizes of coal-fired power plants**
- **Connected to the plant during a short outage**
- **Integrates proven technologies**
- **Produces valuable byproducts**



ECO Commercial Demonstration

Demonstrated Removal Efficiencies	
Pollutant	***Removal Efficiency***
SO_2	99%
NO_x	90%
Mercury	> 81%*
PM < 3 microns	96-97%
Total Particulate	99.9%

Less than minimum detectable

The 50 MW slipstream at FirstEnergy's R.E. Burger Plant will:

- **Demonstrate commercial components and process scalability**
- **Produce a commercially marketable fertilizer byproduct**
- **Demonstrate removal efficiency and reliability during extended runs**

Sponsors include:

- **FirstEnergy and the Ohio Coal Development Office within the Ohio Department of Development**
- **The U.S. Department of Energy for further study of ECO's mercury removal capability**

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RESPONSES OF FRANK ALIX TO ADDITIONAL QUESTIONS FROM SENATOR LIEBERMAN

Question 1. Mr. Alix, your testimony noted that your technology is expected to cost significantly less than other control technologies to reduce SO_2 and NOx emissions from coal-fired power plants. What about the costs of reducing mercury emissions?

Response. The ECO technology removes high levels of SO_2, NOx and mercury (Hg) simultaneously, and therefore the costs of removing an individual pollutant are not easily distinguishable, as they are with single pollutant control technologies. The table below may prove helpful in understanding the estimated overall costs of ECO compared to the single pollutant control technologies required to obtain comparable emission reductions.

Table I: Efficiency and Capital / Operating Costs of Deploying Single Pollutant Technologies versus ECO Technology

Pollutant	Technology	Separate Technologies				ECO Technology			
		Percent Removal Efficiency	Capital Cost (per kW)	Total Capital Cost for 500 MW Plant ($mm)	Increase in Annual Production Costs ($mm)	Percent Removal Efficiency	Capital Cost (per kW)	Total Capital Cost for 500 MW Plant ($mm)	Increase in Annual Production Costs ($mm)
SO_2	1. FGD	95%	$ 175	$ 87.5	$ 9.0	99%	—	—	—
NOx	2. SCR	90%	$ 88	$ 44.0	$ 5.0	90%	—	—	—
Hg	3. Activated Carbon.	80%	$ 55	$ 27.5	$ 4.5	90%	—	—	—
			$ 318	$ 159.0	$ 18.5		$150	$ 75.0	$ 10.0

Source: SO_2 removal efficiency and costs based on EPA estimates. NOx removal efficiency and costs based on Northeast States for Coordinated Air Use Management (NESCAUM) estimates. Hg removal efficiency and costs based on Southern Company estimates. ECO technology estimates provided by the Company.

There is no accepted manner by which to allocate the ECO costs to individual pollutants, as multi-pollutant control technologies are relatively new. However, since ECO costs are about one half of the combined costs of the individual control technologies required for equivalent emission reduction of all three pollutants, it would be fair to characterize Hg pollutant control costs with ECO as about half the estimated costs of activated carbon control of Hg. This would be true when the plant is utilizing ECO for reductions of SO_2, NOx and Hg. In real dollars based on the estimates in Table I above, conventional Hg controls (i.e., activated carbon) would add costs of about 2.5 mils or $0.0025 per kilowatt-hour (kWh), and ECO costs allocated to Hg would be about half that cost. It is worth noting that the ECO system, which could provide all reductions in SO_2, NOx and Hg required by S. 556, would only add costs of approximately 6 mils, or about half a cent per kWh, to the cost of coal-fired power generation.

There are no specific ECO costs that could be attributed to Hg removal alone, unless the Hg regulation requires separate disposal of Hg. If the Hg removed from the flue gas stream by ECO is required to be isolated and disposed of separately from other coal-combustion byproducts, then the costs associated with separate Hg disposal can be estimated. In this scenario, we would use activated carbon adsorption to remove the mercury from our liquid effluent stream prior to processing the effluent into a commercial fertilizer byproduct. The operating costs for separate Hg disposal are estimated at $1,000 per pound of Hg, which includes both activated carbon material costs, and transportation and disposal costs at a hazardous waste facility. The increased capital cost for the equipment required to remove Hg from the ECO liquid effluent is about 1 percent of the ECO costs in Table I above, with a similar 1 percent increase expected for overall costs.

Question 2. Your testimony noted that environmental technology development is driven by environmental regulations. Could you talk a little bit more about that, especially in light of the proposed limits on 4 pollutants contained in S. 556 and the timing of those new limits?

Response. The proposed new limits for SO_2, NOx and Hg contained in S. 556 are strict, but I believe achievable with conventional pollution control technologies or ECO. While uncertainty exists with the cost and performance of Hg controls because they are in the early stages of commercial deployment, we and other Hg control technology developers believe that 90 percent reductions are achievable across the fleet without causing significant early retirement of existing coal-fired generating plants. Still, without a regulatory limit on Hg emissions, the Hg control technologies in development would likely never be commercialized.

The timing of proposed new limits for SO_2, NOx and Hg in S. 556 is too aggressive for either conventional technologies or new technologies. Currently, about 30 percent of existing coal-fired capacity has SO_2 scrubbers (FGD) installed and about 25 percent of the existing fleet will install SCRs to comply with the NOx SIP Call. We have modeled the reductions required by S. 556 and estimate that of the existing coal-fired generating capacity, 80 percent would require FGD levels of pollution control and 75 percent would require SCR levels of control to meet the S. 556 limits. Our model assumes growth in coal-fired generation per EIA estimates, no existing coal-fired plants are retired, and all new coal-fired plants have FGD and SCR installed.

Therefore, we assume that about 50 percent of the existing coal-fired fleet would have to add FGD, SCR and Hg controls, or ECO, to meet the S. 556 limits. In complying with existing Clean Air Act regulations, generating utilities have typically waited as long as possible to install pollution controls. Experience from this practice indicates that approximately 5 percent of the existing fleet can be upgraded with either FGD or SCR types of controls in a given year without jeopardizing generation reliability (i.e., having too many plants out of service at a time).

Therefore, our model combined with past utility practice would suggest that the generating utilities need about 10 years to upgrade 50 percent of their capacity to comply with the new limits in S. 556. Two years of up-front planning to begin plant modifications would also be required, or in total, about 12 years for compliance with limits in S. 556. Staged implementation of the new limits is desirable, as it would ensure that pollution control equipment is installed over the entire time period. In addition, this type of long-term reduction program is optimum to promote the development of new technologies, because time and certainty are required to devote the necessary resources to develop and deploy new technology.

Regarding timing and limits for CO_2 controls, our research indicates that there is no new technology on the horizon that could cost-effectively reduce CO_2 emissions from the existing coal-fired fleet. Without very substantial gains in energy efficiency, particularly from the transportation sector (i.e., much tougher CAFE standards) as an offset, the CO_2 limits in S. 556 risk causing substantial retirement of coal-fired generating plants, as a DOE analysis indicates. While combined-cycle generation based on coal gasification has the potential for significant gains in coal-fired plant efficiency (and consequently reduced CO_2 emissions), these plants take over 5 years to permit and build, meaning any shift from coal combustion to coal gasification would require significant time and capital.

It is clear, however, that technology will not be developed and deployed to make meaningful reductions in CO_2 emissions without some type of hard cap or economic penalty. Hard caps and deadlines do not always lead to the most technologically advanced solutions, as technology development (e.g., invention) is notoriously difficult to schedule. In addition, hard caps and deadlines, particularly those for CO_2 in S. 556, may have unpredictable economic consequences. Therefore, a more attractive alternative may be an economic penalty associated with CO_2 emissions, and one that does not discriminate on sources. For example, one could charge $1.00 per ton of CO_2 emitted, which would add about $0.001 per kWh to the cost of coal-fired generation (?5 percent increase), about half as much to gas-fired generation, and if applied to transportation, would add about $0.01 to the cost of a gallon of gasoline.

Such modest economic penalties would nonetheless serve as a clear, unambiguous incentive to develop technologies that can reduce CO_2 emissions. And the broader you apply the penalty, the more people and industries would be involved in developing innovative solutions to reduce CO_2 emissions. As more becomes known about the capabilities of technology or the climate change consequences of CO_2 emissions, the penalty amount could be increased or decreased, or a cap could be instituted at much lower risk. The total cost of such economic penalties on GDP could be accurately estimated, as well as the specific burden to any industrial or consumer segment of the economy, so the economic uncertainty with the regulation would largely be eliminated.

As with other emission reducing regulations, time is required to produce the best results. As a potential starting point, I would suggest a $1.00 per ton CO_2 emission penalty beginning in 2005, $2.00 per ton in 2010, $3.00 per ton in 2015 and $4.00 per ton in 2020. An increasingly stringent penalty would give technology developers a big, long-term target, so that resources (people and money) could be deployed to develop the best new solutions. This type of environmental regulation is best suited to promoting technology development.

STATEMENT OF GEORGE R. OFFEN, MANAGER, AIR EMISSIONS AND COMBUSTION BY-PRODUCT MANAGEMENT, EPRI

Mr. Chairman and members of the subcommittee: Thank you for inviting EPRI to address the Senate Committee on Environment and Public Work's Subcommittee on Clean Air, Wetlands, and Climate Change on the important subject of mercury reductions from power plants. I am George Offen and I manage EPRI's programs in air emission reductions and the beneficial use of combustion by-products. EPRI was established nearly 30 years ago as a non-profit, collaborative R&D organization to carry out electricity-related supply, delivery, end-use, and environmental R&D in the public interest. EPRI has been supported voluntarily since our founding in 1973. Our funders include electric power companies responsible for over 90 percent of the electricity sold in the US as well as over 60 companies worldwide. We also cooperate closely with government agencies in our research programs, including EPA and DOE. EPRI operates as an independent technical organization maintaining access to and engaging the best technical talent in the world, and I am both pleased and honored that you have selected two excellent examples from this community of experts to be co-panelists this morning.

For well over a decade, EPRI has been conducting research on all aspects of this environmental concern, from emission source characterization and atmospheric processes that transport, change, and eventually deposit some of the emitted mercury onto land and water bodies to the processes that allow the mercury to end up in fish and the health effects of eating fish containing different concentrations of mercury, to the search for methods to reduce mercury emissions from power plants. My remarks will address just the last topic, presenting you EPRI's conclusions on today's state-of-the-technology in mercury control. This written statement is supplemented by an updated version of a viewgraph presentation to staff of several members of the Environment and Public Works Committee in an informal briefing on October 17, 2001.

I just emphasized the word today because our understanding of the technology is changing, often dramatically, on a daily basis. In March, I would have said that the addition of selective catalytic reduction (SCR) for NOx control would improve the capture of mercury by an SO_2 scrubber for plants equipped with these devices. Now I'm not so sure. Up until October, I would have said that you need to inject large amounts of activated carbon into the flue gas of a boiler equipped with an electrostatic precipitator in order to capture even 30 percent mercury, but that you could theoretically capture over 70 percent of the mercury by injecting even larger amounts of carbon—neglecting the impacts that such large amounts of carbon would have had on the particulate collection device (electrostatic precipitator, ESP) and ash. Now, we think you can capture 30 percent of the mercury with much smaller amounts of carbon addition, but may never be able to exceed 50–70 percent capture in this configuration. Finally, all the data we have are short-term, mostly instantaneous snapshots in time, and in all cases no more than 7 days of sustained operation. One 7-day test showed that we could get up to 95 percent capture on a given day and hour but could only sustain 78 percent average over the whole week; we do not know if we could sustain that level over a month or a year. Clearly, there is a desperate need for more long-term, full-scale tests to resolve these uncertainties. EPRI thinks 20 such field tests are needed, and these should and could be conducted in the 2003–2005 timeframe in a public/private collaboration. EPRI is committed to seeking and coordinating the private partners for such a collaborative effort.

What do we believe is attainable today? 10–99 percent from existing particulate and SO_2 controls, depending largely on the fuel and air pollution controls. If we focus on units with the most common air pollution controls, the range is more like 40–80 percent mercury reduction. As a reminder of the percent reduction math, to achieve a total of 90 percent capture, these units would need to add supplemental technology capable of reducing mercury by an additional 50–83 percent.

As implied, we believe that it is premature to rely on the combination of SCR and SO_2 scrubbers to capture mercury. Tests on young catalysts do show benefits if enough catalyst is used—about twice as much as would be required to achieve NOx reduction requirements. However, we now have two tests showing a near total loss of benefit after several thousand hours of operation at units firing the popular western low sulfur coal called Powder River Basin, or PRB. EPRI, in collaboration with DOE and EPA, plans to revisit during 2002 and 2003 the sites that were tested in 2001, as well as to conduct laboratory and pilot-scale tests throughout the year, to resolve this uncertainty.

If additional reductions are deemed necessary beyond those that will be realized by controls for particulates, SO_2, and, maybe, NOx, the most likely choice in the near term would be the injection of activated carbon ahead of a particulate control. My co-panelists will (have) describe(d) results from two of the three full-scale tests conducted to date—the only full-scale tests of mercury controls on power boilers in the world; the third was an EPRI project on a small eastern bituminous fueled boiler equipped with an ESP that found similar results.

- Based both on these few results and our many smaller-scale studies, EPRI's tentative assessment is that activated carbon injection ahead of an ESP should be able to provide 50–70 percent mercury reduction, depending on the size of the ESP. EPRI and DOE are actively discussing possible tests in 2003 on representative small ESPs. Again, the ability to sustain this level over the long-term is unknown, and the addition of activated carbon to fly ash will make it expensive, if not impossible, to use the ash in concrete—the largest volume user of fly ash.[1]

- Activated carbon injection at a site with a conventional baghouse should provide 90 percent removals, or maybe somewhat more on an instantaneous basis. However, there is no experience to tell us if this level can be sustained. The unknown is whether the added fine carbon material will cause the resistance across the bags (called pressure drop in engineering terms) to increase too quickly. In the COHPAC configuration (compact baghouse—similar to a few thousand vacuum cleaner bags side-by-side—added after the ESP, and with activated carbon injected between the ESP and COHPAC unit), the 7-day test suggests that this configuration can achieve about 80 percent mercury removal at a unit where the baghouse is sized for particulate control. At a cost penalty, 90 percent reduction might be achievable with a larger COHPAC design, again with the uncertainty on sustainable operation. Here, too, EPRI and DOE are discussing a joint long-term evaluation at the COHPAC unit that was tested last year.

I have not yet referred to cost. In brief, capital costs range from a low of $1–3/kW for injection ahead of an ESP to as much as $45/kW for a COHPAC unit (e.g., one-third to one-half the cost of an SCR). Costs for the activated carbon could be around 2 mills/kWh (≈5M/yr for a 500 MW plant) with an ESP and about one-fifth that amount with COHPAC (see the back-up material). None of these figures include potential impacts—a need to enlarge the ESP to handle the added carbon, more frequent bag replacement, loss of ash sales, or other unknown impacts that could appear with longer term operation.

What can we expect in the future? In a nutshell, many more options. They will try to provide lower cost options than carbon injection, methods for taking advantage of the SO_2 scrubber, solutions for applications where carbon injection would be impractical, and/or methods that do not produce a waste. Many firms and institutions—including EPRI and, of course, DOE—are actively engaged in this challenge. While some of these processes are quite innovative and look very promising, all are still in the early stages of development. The recent experience with a simple add-on to an SO_2 scrubber for NOx reduction, however, does remind us that the path to commercialization can have many barriers. In addition, the experience with new technology across all industries tells us that the costs of the commercial systems will be several times greater than the initial projections. Equally important, this experience has shown that the cost of the "nth" installation can be reduced significantly if incentives and implementation timetables are managed in a way that allows rapid feedback from the initial experiences into the final designs. As with carbon injection, multiple long-term, full-scale field tests will eventually be required to determine the sustainable performance and costs of these emerging technologies.

In summary, about 40 percent of the potential mercury emissions are being removed now by air pollution controls already in place across the electric power industry (more if one considers the mercury removed during coal cleaning), and further reductions are expected as additional NOx and SO_2 controls are added to meet current regulatory programs. Activated carbon injection, if applied today, could be expected to capture about 50–90 percent of the potential mercury emissions, but a number of long-term, full-scale tests are needed to determine its ability to sustain these reduction levels; associated costs and impacts also need further study. Emerging technologies offer the promise of lower cost and solutions for difficult plant configurations. However, recognizing this promise will require substantial research investment, and, thus, we cannot predict availability dates, performance, and final costs until the research is further along.

Thank you, again, for giving EPRI the opportunity to provide these comments.

STATEMENT OF JAMES CHILDRESS, EXECUTIVE DIRECTOR, GASIFICATION TECHNOLOGIES COUNCIL

Introduction

The Gasification Technologies Council wishes to submit this statement regarding the opportunities that Integrated Gasification Combined Cycle (IGCC) power plants offer coal based electric power generators to meet more stringent SO_2 and NOx emissions standards as well as possible new limitations on carbon and mercury emissions.

[1] Replacing Portland cement with fly ash reduces CO_2 emissions by nearly one ton for every ton of cement replace.

The Council's member companies own, operate or provide technologies, equipment or services to plants that account for more than 95 percent of the world's gasification capacity.

This summary statement is based upon technical papers, studies and data available on the Council's web site—http://www.gasification.org.

Gasification is a Commercially Proven Technology

Gasification is a widely used, commercially proven technology. Today there are approximately 130 gasification plants in operation around the world with some 35 additional facilities in various stages of development, design and construction. When all of these plants are operating they will have the capacity produce the energy equivalent of 750,000 barrels per day of clean gas for use in power generation as well as for the production of fuels and chemicals. In the United States there are 20 gasification plants in operation producing a variety of products including electricity; at least one-half again that many are in the pipeline.

The commercial value of gasification is based on its strong environmental performance and its ability to convert a variety of low-, or negative-value feedstocks such as coal, petroleum coke and other petroleum residues, and waste materials into commercial products. The greatest level of interest in the United States today, and the focus of this statement, is in the use of modern, high temperature gasification technologies in IGCC power plants to produce clean gas for generation of electricity. This application accounts for more than 90 percent of planned new U.S. gasification capacity.

The Gasification Process is Inherently Clean

Gasification is a process technology that reacts coal and other carbon-containing materials at high temperature and pressure under controlled conditions that convert the coal into a "synthesis gas" (syngas). The syngas is composed primarily of carbon monoxide, hydrogen and carbon dioxide and can be burned to recover its energy value or, using other commercial processes, converted into a variety of chemicals and fuels.

An IGCC plant is generally configured with a gasifier, oxygen plant, gas cleanup system(s) and a high efficiency combined cycle power island. Most commercially available systems can range in size from 250–300 megawatts of capacity to more than 1,000 megawatts, using multiple gasifiers.

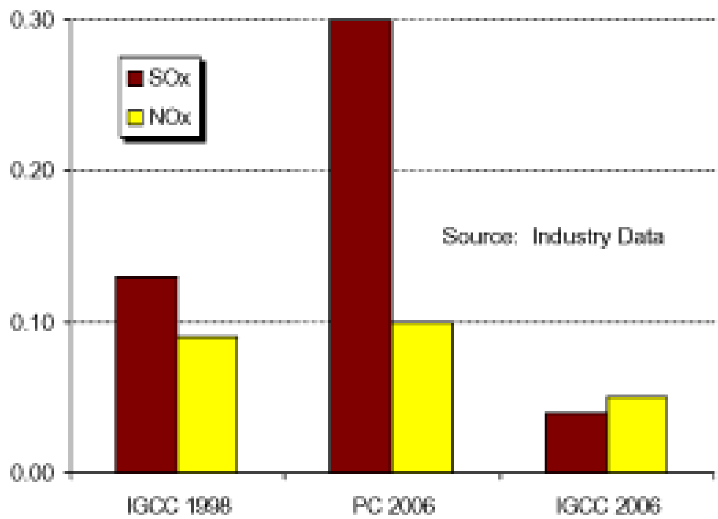
During the gasification process, the syngas is cleaned of particulates, sulfur and other potential pollutants using proven, commercially available processes. The sulfur is recovered in its elemental state or as sulfuric acid, both widely traded commodities. The temperature of the gasification process turns ash and other inert material in the feedstock into a molten liquid that, when cooled, is an inert, non-leaching, sand-like material—called frit or slag—that has construction uses. If the frit is landfilled, it exhibits none of the leaching characteristics of scrubber wastes from conventional pulverized coal (PC) plants that can cause water pollution problems.

At the end of the process, a modern, high temperature slagging gasifier provides a clean gas that can be sent to a highly efficient combined-cycle power block without the need for post-combustion emissions controls. This obviates the need for baghouses, scrubbers and other "end of the pipe" cleanup methods used on PC plants that generate large volumes of wastes and reduce plant efficiency. It also reduces significantly the size of equipment needed for removal of sulfur, particulates, and other potential pollutants.

IGCC Criteria Pollutant Emissions Are Well Below Even Newest PC Plants

Because the syngas is cleaned prior to combustion, criteria pollutant emissions for a coal-based IGCC plant are well below those of even the most modern pulverized coal plants with post combustion cleanup.

Figure 1. Air Emissions for Coal-Based Power Plants



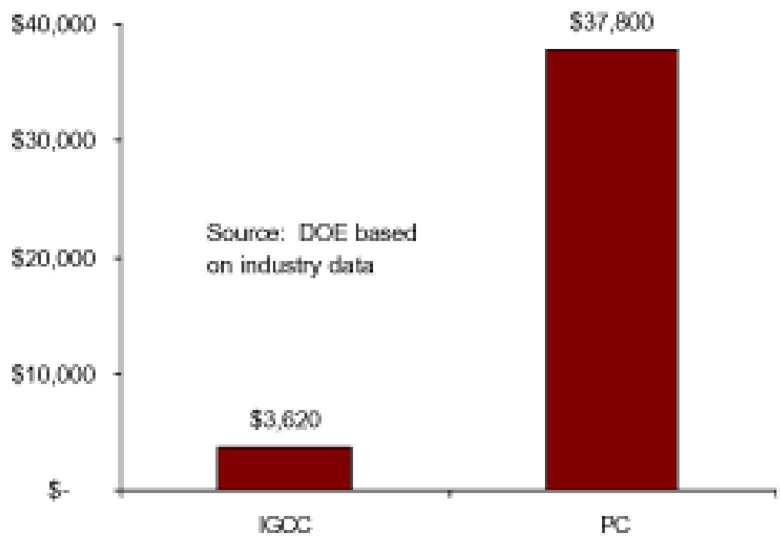
The chart above compares air emissions from three coal-based power plants. It illustrates the actual 1998 emissions for an IGCC plant that began operating in 1995 (IGCC 1998). Its emissions of SOx and NOx are below those of a new, "state-of-the-art" PC plant (described as the "cleanest coal plant of its size east of the Mississippi") being proposed to startup in 2006 (PC 2006).

The next generation of IGCC employing the same technology (IGCC 2006), but reflecting improvements made through actual operating experience, will have SOx emissions that are only 13 percent of those of the PC plant and NOx emissions that are 50 percent lower.

IGCC Provides Cost-Effective Mercury Emissions Reductions

An IGCC plant will also have a significant economic advantage over a PC plant if limitations on mercury emissions are placed on coal-based power generation. Because the gasifier operates under high pressure, the syngas stream is compressed to a volume that is approximately 1–2 percent that of the post-combustion flue gas from a similar-sized pulverized coal plant. This concentrates the mercury in the syngas, making its removal less costly and more efficient than doing so from the much larger volume of flue gas of a PC plant.

Figure 2. Cost of Mercury Removal from Coal-Based Power Generation



A recently completed economic analysis by the Department of Energy found that, to achieve 90 percent removal of mercury from the syngas, the cost to remove a pound of mercury in a coal-based IGCC plant using an activated carbon bed is less than one-tenth the cost of removing the same amount from the flue gas of a PC plant.

Mercury removal from coal-based syngas is being practiced commercially today. Removal of mercury from the flue gas of a PC plant is still in the R&D phase and may not be commercially available for years.

IGCC Can Reduce Carbon Dioxide Emissions from Coal-Based Power Generation

Carbon dioxide emissions from an IGCC plant are typically 15–20 percent below those of a comparably sized PC plant because of the IGCC's greater efficiency. If additional CO_2 emissions reductions are required, an IGCC plant can be configured to convert most of the carbon in the syngas into CO_2. The fuel for the combustion turbine then becomes mostly hydrogen and water. The concentrated CO_2 in the pre-combustion gas stream can be captured. In a PC plant CO_2 capture is post-combustion, more costly and inefficient.

Conclusion

Gasification is a proven technology, being widely practiced commercially in the United States and around the world. Integrated Gasification Combined Cycle Power Generation is the cleanest, most efficient means of generating electricity from coal. Because gasification technologies are inherently clean, an IGCC reduces criteria pollutants to levels not economically achievable in pulverized coal plants. Mercury and carbon emissions reductions are also available if limitations on these emissions are required.

NATURAL GAS SUPPLY ASSOCIATION,
November 14, 2001.

Hon. JAMES M. JEFFORDS, *Chairman,*
Committee on Environment and Public Works,
U.S. Senate,
Dirksen Senate Office Building,
Washington, DC 20510.

DEAR MR. CHAIRMAN: Our two trade associations, the Natural Gas Supply Association and the Interstate Natural Gas Association of America, represent both natural gas producers and interstate pipelines. We are proud that natural gas has been used for over 130 years to heat our homes, cook our food, and provide comfort to residential customers. We are equally proud that natural gas plays an important role in our future energy needs. Today, U.S. companies are spending hundreds of millions of dollars developing 21st century electricity generating technology based on natural gas because it is clean, domestic, reliable and efficient. The market, not the government, has decided that we need to move forward to improve our energy security by using natural gas to replace our aging electricity infrastructure.

We applaud your efforts to clean up power plants using a market-based trading program that allows flexible implementation. We are also writing to respond to some accusations that were made about the natural gas industry in a letter to you, from several labor leaders, dated October 24 of this year.

We want to challenge the notion, implied in the labor letter, that the U.S. power generation industry is becoming too dependent on natural gas. This statement is disingenuous, given the nation's dependence on coal—not natural gas—to generate 51 percent of its electricity. And that reliance is even greater in certain regions of the country, such as the Midwest, where coal-fired generation is 75 percent of total generation (some states depend on coal for as much as 99 percent of total generation). Natural gas-fired generation, on the other hand, accounts for only 15 percent of the market nationwide.

We agree with the labor leaders that fuel diversity is an important public policy goal. It is true that natural gas is the leading fuel source of new generation units, but even after all these natural gas units are built, coal will still dominate the electric generation market. In other words, in moving to natural gas the market is diversifying away from coal's inferior environmental performance.

Furthermore, less than 10 percent of all new natural gas-fired plants will operate as baseload facilities. And many of these new baseload plants are replacing older inefficient natural gas-fired plants, not replacing coal.

We do have enough natural gas to meet future demand. According to the National Petroleum Council Study titled "Natural Gas, Meeting the Challenges of the Nation's Growing Natural Gas Demand," the natural gas resource base in the lower 48 states is 1,466 Trillion cubic feet. At current consumption levels this is enough natural gas to last us 77 years. Similar conclusions were reached by the Gas Technology Institute and Energy Information Administration. In addition, Canada has substantial reserves and provides the United States with over 15 percent of our natural gas. And liquefied natural gas is becoming an increasingly important part of our supply and may grow from less than 1 percent today to over 5 percent in 2005. When combined, all of these factors show that the United States has a robust natural gas supply that will continue to meet our energy needs today and in the future.

We also need to respond to the statement that the natural gas delivery system is not up to the job. Quite the opposite. While it is true that significant natural gas pipeline and distribution expansions are needed in order to keep up with anticipated demand, those expansions are currently taking place at an unprecedented level. The natural gas pipeline industry expects to spend $4.5 billion per year between now and 2015, just on new pipeline expansions. We can, and are, meeting the challenge. The current delivery system is more than adequate to meet demand, and we will take the steps necessary to continue that level of performance.

We appreciate the opportunity to set the record straight. Natural gas is an important component in meeting your goal of lower power plants emissions. With our brethren in the coal, nuclear and renewable communities, we can meet the challenge of providing low-cost, reliable, clean electricity.

Respectfully,

R. SKIP HORVATH, *President,*
Natural Gas Supply Association.

JERALD V. HALVORSEN, *President,*
Interstate Natural Gas Association of America.

GOVERNOR JOHN A. KITZHABER,
State of Oregon,

GOVERNOR GARY LOCKE,
State of Washington, November 14, 2001.

Hon. JAMES JEFFORDS,
Hon. BOB SMITH,
Dirksen Senate Office Building,
U.S. Senate,
Washington, DC 20510.

DEAR SENATORS JEFFORDS AND SMITH: Washington, Oregon and other western states have been assessing the concepts and implications of national multi-pollutant legislation. Discussions have been occurring in many forums including the Western Regional Air Partnership (WRAP), Western States Air Resources Council (WESTAR), between neighboring states and within individual states. Although these discussions have been valuable and some principles seem to be emerging, at this point there is not a "western" consensus on the appropriate scope or design of such legislation. We are writing to share our perspective and urge you to consider the following in crafting multi-pollutant legislation for utilities and industrial boilers.

While we see merit in the concept of multi-pollutant legislation, we cannot support any version of this legislation that would force our states to suffer air quality degradation, and we could not support legislation that would exclude us from receiving a reasonable share of the projected air quality benefits. Further, we oppose any multi-pollutant legislation that establishes an emissions trading program in lieu of existing pollution control requirements for utilities and other industrial boilers, unless such legislation includes safeguards to ensure protection for public health and the environment.

Presently, we rely on New Source Review, New Source Performance Standards, Maximum Achievable Control Technology, and other existing programs to ensure that new and modified industrial facilities are well controlled. If these programs are replaced with a cap-and-trade approach, the cap and trading procedures must ensure that new and modified facilities achieve, on average, significantly better levels of pollution control in the west than they would achieve under existing programs. In particular, the legislation should ensure that national trading does not penalize western utilities nor interfere with progress in meeting air quality goals in the west.

In addition, it is very important that the legislation does not prevent more stringent state requirements if needed to meet ambient standards, protect public health or solve other local air quality problems. Older and dirtier power plants and boilers should not be allowed to indefinitely trade out of more stringent controls. Although timelines for compliance would not necessarily have to be the same, any national program should provide an emissions ceiling for each type of affected facility based upon the available technology. Such an emissions ceiling would serve as a uniform maximum emission rate or backstop to the cap-and-trade program and help to prevent the occurrence or continuation of more localized pollution problems.

Western states and tribes are working hard to meet the requirements of the Environmental Protection Agency's Regional Haze rule. States and tribes, through WRAP, have developed a set of emission milestones and a contingency emissions trading program for major industrial sources of SO_2—including utilities and boilers—to reduce haze on the Colorado Plateau. We are comfortable with the agreement reached regarding the Colorado Plateau. The WRAP is working to expand this program to include additional western areas and to address nitrogen dioxide emissions. It is important that any national multi-pollutant legislation for utilities and boilers builds upon the WRAP's program.

However, because the multi-pollutant legislation would potentially address a much larger set of air quality concerns (ozone, acid rain, global climate change, eutrophication, fine particulates, mercury contamination) beyond just regional haze, the WRAP's work should not be viewed as a substitute for—or the western version of- the national legislation. In addition, any national program should consider the unique concerns of economic fairness that have been expressed by tribal governments.

When crafting your legislation, we urge you to consider the unique air quality conditions of different regions of the country but also be cautious to not exacerbate equity concerns between states, tribes, affected industries and regions.

Thank you for your consideration of these important issues.

Sincerely,

JOHN A. KITZHABER, M.D.
Governor of Oregon.

GARY LOCKE,
Governor of Washington.

CLEAN POWER ACT

WEDNESDAY, JUNE 12, 2002

U.S. SENATE,
COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS,
Washington, DC.

The committee met, pursuant to notice, at 9:38 a.m. in room 406, Dirksen Senate Building, Hon. James M. Jeffords [chairman of the committee] presiding.

BENEFITS AND COSTS OF MULTI-POLLUTANT LEGISLATION

Present: Senators Jeffords, Bond, Smith, Voinovich, Chafee, Graham, Wyden, and Lieberman.

OPENING STATEMENT OF HON. JAMES M. JEFFORDS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator JEFFORDS. The committee will come to order.

Today, we will take another look at the benefits and cost of multi-pollutant legislation and the Clean Power Act. This is a busy morning in the Senate and we have many witnesses, so I will ask that everyone try to keep their opening statements to 5 minutes. That will give us plenty of time for questions.

So far in this Congress, the committee and subcommittee leaders have tried twice to reach an agreement on principles for action on multi-pollutant legislation. Both times policy announcements by the White House interrupted that process but we cannot afford to let the momentum die there without further action. This is too important to the public health and the health of the planet.

Given the testimony the committee has received at many hearings on the problems of acid rain, mercury contamination, global warming, and ozone pollution, it is our responsibility to act and our duty to lead. There is no time for delay. Working together we can move a strong pollutant bill through the committee and the Senate this year. Unfortunately, there appears to be little interest in moving any kind of multi-pollutant legislation in the House and we are still awaiting the Administration's legislative proposal on their three fee approach. So to maintain some momentum on this critical issue and without any counterproposal to the Clean Power Act which could make for fruitful discussion, the committee will proceed to mark up S. 556 at the end of this month. That leaves us with about 40 or less working days in the Senate to get it done. I am an optimist so I don't think we will need a lame duck session to finish it. At least, I hope not.

In January of last year, EPA gave information to the committee about the cost of the bill similar to the Clean Power Act. That estimate included the renewable portfolio standards, RPS, similar to now what is in the Senate Energy Bill. EPA came up with a $14.5 billion incremental cost above business as usual and conservative benefits of $75 billion annually. The cost due to the RPS was about $3 billion. EPA said that a comprehensive approach covering all four pollutants would cost approximately $11.5 billion in the 2010. Addressing them in piecemeal fashion would cost closer to $16 billion annually.

People may question these numbers as they do all modeling exercises but I use them just to show that there is one or more scenarios in which a four-pollutant bill costs less than dealing with each pollutant independently. Some advise taking that less efficient route and dealing with three pollutants now, leave carbon dioxide for later action but there is no perfect way to predict how the future technology will unfold. Utilities today do a far more cost effective job in reducing sulfur dioxide under the 1990 amendments than anyone expected. That happened because Congress changed the investment dynamic and the future. That is what we must do again in this legislation.

It wasn't in our national interest in 1990 to let acid rain and its health threatening precursors rise unchecked. Now, it isn't in our national interest to let carbon dioxide emissions rise 43 percent by the year 2020 as projected in the Administration's Climate Action Report. The potential consequences are just to serious. Some cost estimates are $100 to $300 billion annually in the year 2060.

We have an opportunity to change the future. Our actions on this matter can positively affect investment for decades to come. Plants built to the performance standards we will set out in this legislation will last for more than 40 years if the current fleet is any indication. We cannot afford not to be ambitious.

I am pleased to welcome Congressman Kucinich, who is here.

I will now yield to the Senator from New Hampshire.

OPENING STATEMENT OF HON. BOB SMITH, U.S. SENATOR FROM THE STATE OF NEW HAMPSHIRE

Senator SMITH. Thank you very much, Mr. Chairman.

I know this is an issue that you and I share a deep commitment to and I really appreciate you calling this hearing.

A couple of years ago, I began a process as chairman of a committee with all stakeholders on this issue to begin the goal of trying to achieve bipartisan consensus to reduce emissions and to provide the National with cleaner, healthier air. It was very clear to me as we held those meetings that without any bipartisan consensus on the issues we agree on, it would be very difficult to pass legislation on the Senate floor.

I think back to MTBE which with your help we passed this committee, brownfields last year, the restoration of the Everglades, and there were many, many differences but what we kept the common ground on the issues where we agreed and moved the legislation forward and kept that bipartisan consensus even though on some cases people on the left would want more in or out in some cases on the right, I would want more in or out; we kept it on common ground and stayed with the approach and were successful. I am proud of that. Providing clean, healthy air is no different. This is a worthy goal.

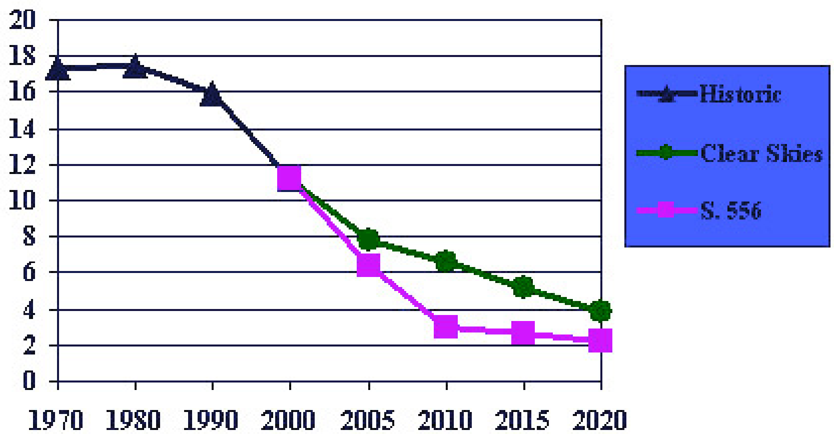
It is amazing and may not seem obvious but with one exception, we are not that far off. The exception is carbon. There is a difference of agreement, difference of opinion on carbon but other than that, the Democratic proposal, your proposal, and the President's proposal, are very similar and will dramatically reduce unhealthy emissions. I would hope we don't let our disagreement on carbon stop us from moving forward on the common ground that we have.

Let me make an observation. I think prior to the election of President Bush, if somebody had said he would come forth with a proposal to reduce by 70 percent NOx, SOx and mercury from our Nation's power plants, we probably would have heard howls of disbelief from the other side, but that has happened. Now we are hearing howls that it is not enough.

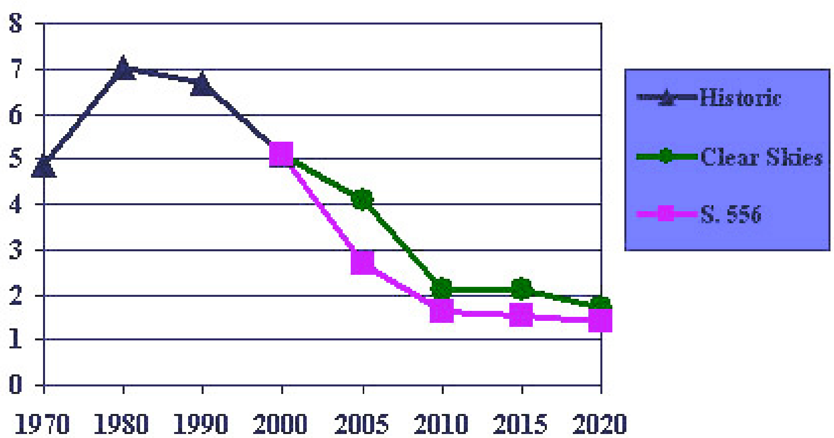
We are working closely with the White House to make this effort a success. Senator Voinovich has just been tremendous in his support as we have worked together. Even though we have differences in my State and his State in terms of the air problems, we have worked together as I have said many times in this committee with a company from New Hampshire, New Durham Power Span, working with a utility in Ohio to reduce NOx, Ox, and mercury and having tremendous success. I commend you, Senator Voinovich, for your cooperation on this with me.

We do need to have an honest discussion, Mr. Chairman, on the clear skies initiative. I have told the President that to me it is a starting point that would get us into the debate which is why I support bringing this initiative forward. If we do, I am optimistic that we will get a bipartisan consensus. The proposal will do the job, the Clear Skies proposal will do the job that it was designed to do, reducing emissions. I think, with all due respect, it will do it faster and cheaper than current law. It is worth just taking a brief comparison with the President's proposal with Senator Jeffords' bill.

This chart shows the reductions of SO_2 under the Jeffords proposal and the President's proposal. The red is Clear Skies and the dark is the Jeffords proposal. As you can see, when we get down to 2020, they are very close. So it is not so far apart that we can't reach some consensus if that is the difference where those two come together. I just want to point out that in the end, Clear Skies calls for a 73 percent reduction and Jeffords calls for 79 percent reduction, so we are talking about 6 percent in the year 2020.



Senator SMITH. The second chart that I have relates to nitrogen oxide emissions, NOx. Again look at the comparison in 2020, the President's proposal reduces the emissions by 67 percent and Senator Jeffords' proposal by 70 percent. So clearly, there is enough common ground that we could work a compromise on that one.



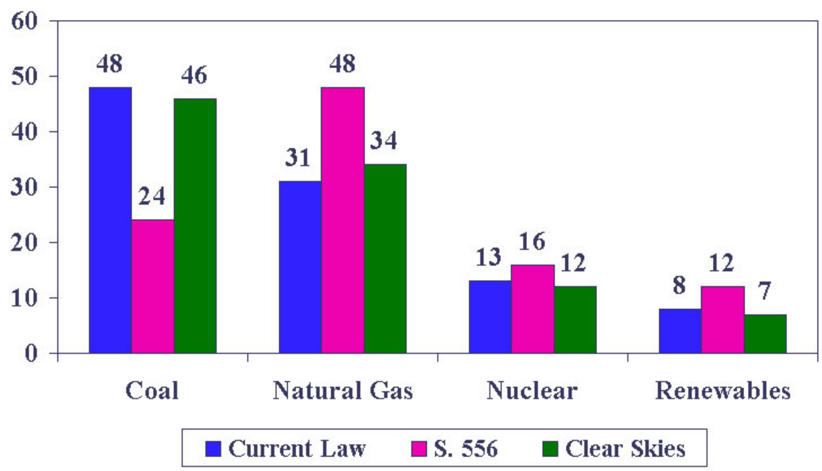
Senator SMITH. We don't have any particular charts for mercury, however, as I mentioned some of the new pilot projects that are going on, there are some dramatic reductions in mercury being done by some of the new technology. So when it comes to the protection of public health, Clear Skies and S. 556 are close enough that we can find the common ground we need.

Currently, EPA estimates that 305 counties failed the new ozone standards and 140 failed the new soot standards. Under Clear Skies, both of these numbers dropped to 27 counties. That is a pretty big gain in healthy counties under the President's proposal.

Under Senator Jeffords' proposal, it drops to 21. There again, we are very, very close, similar results.

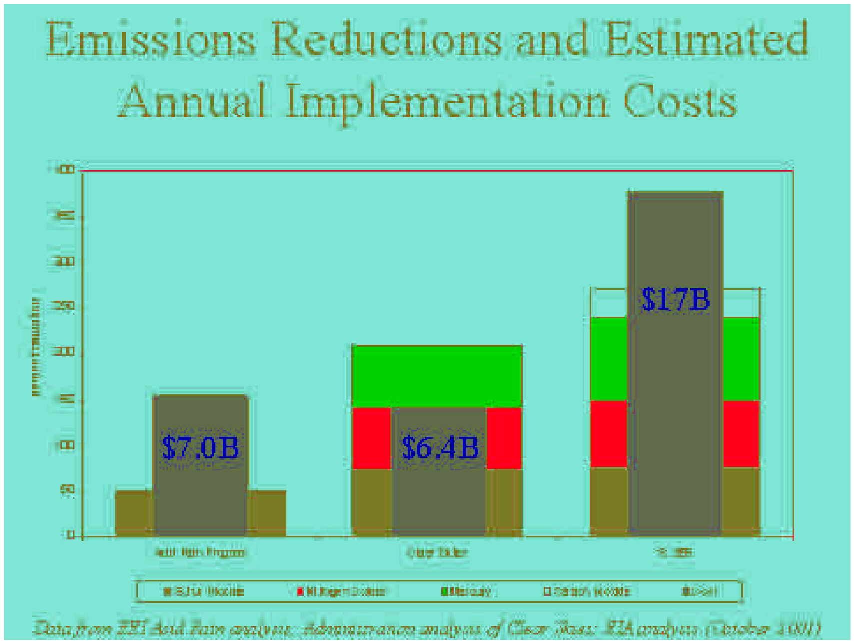
If there is a major difference between the two proposals, I think it is cost. That is something I hope we can look. While the reductions in emissions are similar under Senator Jeffords' proposal, there is a greater burden on the economy and more important than the cost is the effect on our national security. We have 460 years worth of coal reserves in this country versus 65 years worth of natural gas. Let me say that again, depending on the estimates you use, but certainly 300 to 400, a minimum of 300 depending who you talk to, it might be 460 years of good coal reserves and 65 years of natural gas.

Now, look at the fuel mix under this chart. S. 556 would cause fuel switching from coal to natural gas. You can see in the first chart where it says coal, second is natural gas and natural gas spikes and coal goes down. So we are not keeping that diversification that we have had in our fuel mix for sometime. We are taking a dramatic turn in the fuel mix and taking natural gas, which is somewhat limited, and coal, which is much more prevalent.



Senator SMITH. I respect your commitment, Mr. Chairman. I have no issue here with that, but I hope we can move toward energy independence and not increase our dependence on foreign sources which I think would ultimately happen.

I think there is one more chart on the cost and then I will wrap up here. Coal is abundant and cheap. It needs to be cleaner and we are doing a lot to do that. If you can see here, the green is the cost, the Clear Skies Initiative is in the middle with $6.4 billion, cleaning up the emissions that are out there and $17 billion under S. 556. So it is almost triple the cost.



Senator SMITH. I know that Senator Jeffords' cost proposal does have carbon in the mix, to be fair, and that is correct, but even if you take out carbon, the Jeffords proposal is still about 55 percent more expensive.

Let me conclude on the issue of carbon. No bill that includes a mandatory carbon piece is going to pass the U.S. Senate, whether we like it or not. So I would say, Mr. Chairman, let us pass a bill that will reduce three emissions dramatically, come to an agreement and then let the Senate work its will, if we need an amendment or whatever. If the Senate passes it, it passes it; if it rejects it, it rejects it. The point is we can then move to a further discussion of carbon later on.

During the debate on the energy bill a couple of months ago, three times the Senate voted against carbon limitations. It is worth nothing they were bipartisan votes; it is not going to pass. It is too important to have us get bogged down because of this one issue where we have some dramatic disagreements. The fact is mandatory carbon caps will kill an emissions reduction bill. I do not want to kill an emissions reductions bill. I do not see any reason why, if we disagree on carbon, we should continue to inhale more mercury, more NOx and more SOx over the next 20 years. It makes no sense to me.

If we care about the health of our children, care about the cleaner air, let us do the right thing and go forward where we agree and fight over what we do not agree on. Why fight over what we do not agree on and not move forward with what we do agree on. I am the first to admit, I did not get everything I wanted in the brownfields bill. I voted against amendments right here in this chair that I supported because I knew if we passed them, it would have broken the compromise and right now we are cleaning up brownfields all over America.

I will accept my fair share of the blame for it in the sense that we kept brownfields locked in with Superfund, we could not get Superfund reformed for 20 years, so all the brownfields were becoming Superfund sites and nobody was cleaning them up. We took it out, we passed it and that is what we need to do here.

I did not get everything with MTBE either. The guys in the ethanol industry got more than I wanted them to have but I needed to get MTBE out of the water in my State and we accomplished that with the legislation that passed that is now part of the energy package.

I think, Mr. Chairman, I would ask you, let us work together to pass a bill that makes our air cleaner and healthier and one we know can we signed into law. I think that would be bipartisan on the three emissions I spoke of.

Thank you.

Senator JEFFORDS. Senator Graham.

OPENING STATEMENT OF HON. BOB GRAHAM, U.S. SENATOR FROM THE STATE OF FLORIDA

Senator GRAHAM. Thank you, Mr. Chairman.

I have an opening statement I would like to file for the record and just a few comments.

[The prepared statement of Senator Graham follows:]

STATEMENT OF HON. BOB GRAHAM, U.S. SENATOR FROM THE STATE OF FLORIDA

Thank you, Mr. Chairman, for calling this hearing today. There is a lot of information before this committee regarding multi-pollutant legislation. Today's hearing provides the much-needed opportunity for this committee to obtain more information on this complex issue and to take a closer look at the details of proposed legislation.

Preserving and protecting the environment is vital for both the physical health and economic health of our nation. This is dramatically illustrated in my homestate of Florida where our economy is linked with our environment. It is our beaches, parks, and other places that fuel our No. 1 revenue generator—tourism.

Balanced with the need for a clean and healthy environment is the need for affordable and reliable energy.

This morning's hearing will provide the Environment and Public Works Committee the opportunity to weigh all of these interests and find the best way to make progress in each area. I have reviewed the written testimony of today's witnesses, and I look forward to hearing what they have to say this morning. Thank you, Mr. Chairman.

Senator GRAHAM. I think the issue of science has now been resolved. I found the EPA study that was submitted as the United States official document to the United Nations to be compelling and it is consistent with the vast majority of science on this issue over the past decade.

The question today is also not one of whether we are going to take action on that science. I happen to have a parochial stake in this. If the science in the EPA study is correct, and I think it is, a good section of my State will be under water three generations from now. So we have an immediate concern about whether we are going to act on this. Are we going to act on it like the Dutch and build walls around our coastal areas in order to protect the dry land or are we going to take a more global perspective of how we are going to defend ourselves against rising seas and the other consequences of a warming clime?

This is also a generational issue. Which generation is going to face the matter? We have the option of deferring it to our great grandchildren to face and there are many attractive reasons to let the great grandchildren deal with the consequences as opposed to our generation. I think that would be generationally irresponsible. We can do it today without the kinds of severe threats of dislocation that our great grandchildren are going to face and at considerably less cost than it would be to them if we defer this matter for a century

The issues I am going to be interested in hearing about today are what are the consequences of a generational shift of this forward to our great grandchildren, what would be the cost to them as opposed to the cost to us today, what are the dislocations of that generational movement of responsibility, and what will be the consequences to the United States in its role of leadership to the world as the only power with the combination of economic, cultural, political and military influence that we have essentially saying this is an issue that we will consciously elect to forget.

I look forward to the testimony, Mr. Chairman.

Senator JEFFORDS. Thank you.

I will interrupt here briefly to note that we have six members of the committee present, including two from the minority. Pursuant to Committee Rule No. 2, this constitutes a quorum for the purpose of approving a committee resolution which is I think agreeable. Pursuant to Committee Rule No. 1(d), I now make a motion that the committee resolve to conduct a closed hearing on the top of nuclear security. This will be a classified hearing which it will be necessary that matters disclosed are kept secret in the interest of the national defense. The hearing date and location will be the subject of an official committee notice in the near future. Is there a second to the motion?

Senator SMITH. Second.

Senator JEFFORDS. All those in favor, say aye.

[Chorus of ayes.]

Senator JEFFORDS. Opposed?

[No response.]

Senator JEFFORDS. The ayes have it and the motion is adopted.

I am sorry, but we have to have a roll call vote on this. The Clerk will call the role.

The Clerk. Mr. Baucus?

[No response.]

The Clerk. Mr. Bond?

Mr. BOND. Aye.

The Clerk. Mrs. Boxer?

[No response.]

The Clerk. Mr. Carper?

Mr. CARPER. Aye.

The Clerk. Ms. Clinton?

[No response.]

The Clerk. Mr. Corzine?

[No response.]

The Clerk. Mr. Crapo?

[No response.]
The Clerk. Mr. Domenici?
[No response.]
The Clerk. Mr. Graham?
Mr. GRAHAM. Aye.
The Clerk. Mr. Inhofe?
[No response.]
The Clerk. Mr. Lieberman?
[No response.]
The Clerk. Mr. Reid?
[No response.]
The Clerk. Mr. Smith?
Senator SMITH. Aye.
The Clerk. Mr. Specter?
[No response.]
The Clerk. Mr. Voinovich?
Senator VOINOVICH. Aye.
The Clerk. Mr. Warner?
[No response.]
The Clerk. Mr. Wyden?
Senator WYDEN. Aye.
The Clerk. Mr. Jeffords?
Senator JEFFORDS. Aye.
The Clerk. The vote is 7 Ayes, no Noes.
Senator JEFFORDS. The motion carries. Thank you.
Senator Bond?

OPENING STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Senator BOND. Thank you for holding this hearing and also for scheduling the classified hearing.

On S. 556, I think it is vital for everyone to know the high price that American families would have to pay for electricity under S. 556 with very little clear benefit to the environment or public health over and above the President's Clear Skies proposal. Independent experts appearing before this committee have testified that S. 556 would cause American consumers to spend an extra $40-$60 billion a year on electricity; would force power plants to cut their use of coal by 40–50 percent costing thousands of jobs in the coal sector; threaten tens of thousands more jobs across the country through higher energy costs; and force total U.S. economic activity or GDP down by almost $100 billion in 2007 alone.

The high cost of S. 556 will hurt those most in need. S. 556 would disproportionately harm low income families, struggling even to pay their current utility bills. The EPA estimates that a bill similar to S. 556 would raise electricity prices between 20 and 50 percent by 2015, and the EIA estimates that natural gas prices at the wellhead would jump 20 percent by the year 2020.

We may not care that we are forcing big utilities to pay higher costs but we should care that they will have to pass these costs on to their consumers. In the end, that will hurt all who are consumers. That means our families, single mothers, elderly; all will be faced with much higher electric utility bills. Consumers will pay about $11 billion more per year under S. 556 than under the President's Clean Skies Initiative.

What do we get in return for raising electricity rates on American families by 30 to 50 percent? Are there any significant benefits from S. 556 to the health of our families or the environment above and beyond the President's Clear Skies plan? The astonishing answer is no.

The ranking member, Senator Smith, has already pointed out the significant reductions under the President's Clear Skies plan, how it would reduce major air pollution levels, would reduce them by 75 percent and would achieve virtually identical dramatic results as S. 556. The EPA has estimated that 2,981 counties would meet EPA clean air health standards under Clear Skies and 2,987 counties would meet the standards under S. 556. That is an additional 6 counties out of 2,980 plus, a difference of less than .2 of a percent.

Both the President's plan and S. 556 would do great things. They would reduce premature deaths from air pollution, multi-emission legislation would achieve the goals of the Clean Air Act much faster and for less money than current law, and there is a strong bipartisan agreement, as already pointed out, for reducing air pollution in the form of SO_2, NOx and mercury. Unfortunately, some of my friends are more interested in going for another bite, the fourth bite, than they are in giving the American families a chance at clean air. These good friends would include carbon dioxide in the multi-pollutant bill.

The main reason we have taken so long to bring S. 556 to mark up is the refusal to accept the reality that, as Senator Smith pointed out, no legislation can pass Congress with mandatory carbon dioxide caps. Just this spring, there were three climate-related proposals rejected on a bipartisan basis and there is no reason for us to go down that road when we know the Senate is going to reject it. I am going to be strong in opposition to it.

Another area where some refuse to face reality is in mercury reduction levels. We have a problem in that the technology simply does not exist to reduce mercury in Missouri power plants to the levels called for in S. 556. Even if Missouri residents wanted to pay electric bills 30 to 50 percent higher than current rates and switched to natural gas burning power plants, the pipeline capacity in my State of Missouri simply does not exist to supply these plants.

I urge my colleagues to lay aside political differences and don't try to do the impossible. Let us work together to avoid imposing unnecessary billions of dollars in higher electric costs for very little gain. We can debate, we can pass an important, significant, three-pollutant bill.

I look forward to working with all of my colleagues on this committee to get past our differences and bring cleaner air to millions of Americans. There is one way to do it, go for three, not four.

[The prepared statement of Senator Bond follows:]

STATEMENT OF HON CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI

Thank you, Mr. Chairman, for holding another hearing on S. 556. I think it is vital for everyone to know the high price that American families would pay for electricity under S. 556, with very little benefit to the environment or public health versus the President's Clear Skies proposal.

Independent experts appearing before this committee testified that S. 556 would:

- cause American consumers to spend an extra $40 billion to $60 billion on electricity;
- force power plants to cut their use of coal by 40 to 50 percent, costing thousands of jobs in the coal sector;
- threaten tens of thousands more jobs across the country through higher energy costs;
- force total U.S. economic activity, or GDP, downward by almost $100 billion in 2007 alone.

The high costs of S. 556 will hurt those most in need. S. 556 will disproportionately harm low-income families struggling to pay even their utility bills.

EPA estimates that a bill similar to S. 556 would raise electricity prices between 30 and 50 percent by 2015. The EIA estimates that natural gas prices at the wellhead will jump 20 percent by 2020.

We may not care that we are forcing big utilities to pay higher costs. We should care that they will pass these costs on to their consumers. In the end, we will hurt our families, our single mothers, our elderly, with higher electric bills.

Consumers will pay $11 billion more per year under S. 556 than under the Presidents Clears Skies Initiative. What do we get in return for raising electricity rates on American families by 30 to 50 percent? Are there any benefits from S. 556 to the health of our families or the environment above and beyond the President's Clear Skies plan? The astonishing answer is no!

The President's Clear Skies plan to reduce major air pollution levels by 75 percent would achieve virtually identical, dramatic results as S. 556. EPA estimates that 2,981 counties would meet EPA clean air health standards under Clear Skies and 2,987 counties would meet the standards under S. 556. That's a difference of 2/10th of a percent.

Both the President's plan and S. 556 would avoid thousands of premature deaths from air pollution. Multi-emissions legislation would achieve the goals of the Clean Air Act much faster and for far less money than current law.

There is strong bipartisan agreement and support for reducing air pollution in the form of SO_2, NOx, and Mercury. Unfortunately, my friends on the opposite side of the aisle are blocking American families' chances at cleaner air.

The Democrats insist on including carbon dioxide in their pollutant bill. The main reason we have taken so long to bring S. 556 to markup is the other side refuses to accept the reality that no legislation can pass this Congress with mandatory carbon dioxide caps.

Just this Spring during the Energy Bill debate, the Senate on a bipartisan basis rejected 3 climate-related proposals. I would hate to think that some are still willing to make carbon dioxide a priority over our health.

Another area where some refuse to face reality is in mercury reduction levels. The technology simply does not exist to reduce mercury in Missouri power plants to the levels called for in S. 556.

Similarly, even if Missouri residents wanted to pay electric bills 30 to 50 percent higher than current rates and switch to natural gas burning power plants, the pipeline capacity in Missouri does not exist to supply these plants.

So, I urge my colleagues to lay aside political differences.

I urge my colleagues lay aside the impossible. I urge my colleagues to lay aside plans that will impose billions of dollars in higher electric bills for very little gain in public health or the environment.

We can debate and pass a three-pollutant bill. I look forward to working with my colleagues to get past our differences and bring cleaner air to millions of Americans.

Thank you.

Senator JEFFORDS. Senator Wyden?

OPENING STATEMENT OF HON. RON WYDEN, U.S. SENATOR FROM THE STATE OF OREGON

Senator WYDEN. Thank you.

I look forward to working with you and all our colleagues on a bipartisan basis. I want to particularly make clear that I think it would be a tragedy to not push for significant limits on carbon dioxide. I think it is clear that it is central to addressing this global warming issue. I would like to say, as we have talked about in this committee before, I think we can do this in a bipartisan way. For example, Senator Craig and Senator Brownback and I have keyed up on carbon sequestration efforts which allow us to use the agricultural sector and the forestry sector.

Science shows, for example, that we could address about a quarter of the global warming problem with significant carbon sequestration efforts that I think can get major bipartisan support in the U.S. Senate. These are approaches that bring together the environmental community, the industry and I think if we wash our hands of any effort to try to deal with carbon dioxide, No. 1, we are going to miss the boat with respect to global warming.

Second, we are going to miss out on an extraordinary opportunity to work in a bipartisan way. There is legislation, the bill done with Senator Craig and Senator Brownback is one approach but there are certainly other kinds of ideas. We are not going to solve the entire carbon dioxide problem that way but it would be a shame not to try when you have approaches that can bring together the environmental community, the industry, allow us to follow good science.

I am looking forward to working with you, Mr. Chairman, and Senator Smith because I think we can address some of these key issues in a bipartisan way. That is what we get an election certificate to do.

I thank you.

Senator JEFFORDS. Senator Voinovich?

OPENING STATEMENT OF HON. GEORGE V. VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Senator VOINOVICH. Thank you for holding this additional hearing on this multi-emissions legislation. I am glad we are having some of the witnesses I have requested in the past, specifically a representative of the chemical industry and an advocate for low income housing. I still believe we need to hear from public power and the electric coops before the committee attempts to move the legislation. The bill as drafted will have a great cost impact on coops and municipal power than investor-owned utilities.

It is my understanding that the chairman has announced the mark-up later this month. As we look today at the costs and benefits of the bill, it is important to keep in mind a few points. One, not a single utility in the country supports the Jeffords-Lieberman as drafted. Two, under S. 556 coal use would be cut in half decimating the manufacturing economy of the Mid West and therefore the country. The Midwest is responsible for 23 percent of U.S. manufacturing. In fact, when you compare Ohio's manufacturing production with the New England States, Ohio's Gross State Product for manufacturing is higher than all six of the New England States combined, $93.4 billion in Ohio compared to $83.8 billion for New England. Definitely there is a difference in our respective economies. If you want to put us out of business, the jobs we will lose will not go to other States, they will go overseas.

This legislation is a killer to the Ohio economy and is a terrible burden on a residential ratepayer, particularly the least of our brothers, the elderly, the poor and the disabled. Our Ohio General Assembly on March 28 passed a resolution by a vote of 86 to 5 in the House and 27 to 5 in the Senate opposing S. 556 due to concerns about fuel switching, cost to consumers, and economic impacts.

The bill will decrease the U.S. GDP by $75 billion by 2010. This is according to data by the Edison Electric Institute which is very similar to data calculated by the Energy Information Administration at DOE. The cost estimates we have for S. 556 are not even complete. They do not even involve the so-called birthday provision which requires all facilities over 30 years of age to install the latest control technology.

It is my understanding that 80 percent of our Nation's coal units would fall under this category by 2007 and 92 percent by 2012. Mr. Chairman, I have to ask, how are we going to get this equipment installed on 80 percent of our units nationwide by 2007? Who will build the equipment on time? Who will install the equipment on 80 percent of our units all at the very same time? We also know the National Governors Association has endorsed a three-pollutant, not a four-pollutant, strategy.

With these facts in mind, we need to look at the rationale for marking up this bill as it is currently written. Personally, I remain committed to a multi-emissions approach as the one laid out by Senator Smith and others. As I said before, I want to work together to pass meaningful legislation which will make significant emission reductions and which will secure our safe, efficient, reliable and cost effective energy supply for the American consumer.

However, we have less than 50 legislative days left and zero chance of the Jeffords-Lieberman bill being signed into law this year. Therefore, we can take one of two general approaches. We can either identify those issues which we can agree on and move a bipartisan bill forward with some hope of passage, or we can mark up a partisan bill which stands no chance of passing. Unfortunately, it appears that the chairman has decided to mark up a partisan bill with no chance of passing all because of carbon. Three times this year, the Senate has rejected mandatory carbon controls, as Senator Bond just said, twice on votes regarding CAFE on the energy bill and once when the Senate rejected the mandatory carbon registry in the energy bill and replaced it with a voluntary program.

I would like to say to Senator Wyden about the carbon, the compromise that came up on the energy bill with the voluntary carbon filing for 5 years with credits for reducing carbon to those that adopt those credits and if people are not compliant after the 5 years voluntarily, make it mandatory might be a good compromise to deal with the carbon issue so that we can move on and deal with the other three pollutants that we all agree on.

The fact of the matter is if this committee does not vote out this bill, if you decide to mark it up, there will not have to be a single Republican hope because members of your own party will put a hold on this bill. Mr. Chairman, I have said it right from the very beginning, I really want to work on a bipartisan bill. I think it is vital that we aggressively reduce levels of NOx, SOx and mercury. These pollutants cause real health concerns and there is no reason why we cannot move forward on these reductions this year.

Senator Schumer and Clinton introduced the Acid Rain Control Act which is championed by the Adirondack Council. This bill will actually make real reductions in utility emissions. I met recently with representatives from the Adirondack Council because we both have been named villain of the month by the Clean Air Trust and I wanted to understand why. After talking to them, I realized that we both received the so-called award because we both want to make real reductions now, now, in emissions. We don't want to sacrifice real emission reductions because of the politics surrounding CO_2.

Mr. Chairman, I implore you not to turn your back on real emissions reductions just for political debate on CO_2. This committee should be concentrating, sitting down and dealing with the real issues which will get us real reductions in emissions and provide reliable, cost effective energy for the American consumers. We should be dealing with the three pollutants: NOx, SOx, and mercury—the 126 petitions.

Mr. Chairman, you also know that I joined with Senator Conrad in a letter to the Administration calling for NSR reform. That has to be done. Twenty-five of us, nine Democrats and the rest Republicans said do something about NSR because everything today is in limbo because of the fact that we don't have any authoritative information coming out on new source review.

I really believe, and I have said it over and over again, it is time, if we really want to do something about this, that we get into a room and sit down and try and hack this out to come up with a piece of legislation that is going to get the job done. If we want to make a political statement, fine. You an make the political statement and say the majority of this committee is for climate control and go on and on, knowing full well nothing is going to happen. We make a political statement. In the meantime, we are not doing anything to reduce emissions in this country and this will go on and on and on. It is time to take action now, make the compromise and move on.

Thank you.

[The prepared statement of Senator Voinovich follows:]

STATEMENT OF HON. GEORGE VOINOVICH, U.S. SENATOR FROM THE STATE OF OHIO

Mr. Chairman, thank you for holding this additional hearing on multi-emissions. I am glad that we are having some of the witnesses I have requested in the past, specifically a representative of the chemical industry and an advocate for low-income housing. I still believe we need to hear from public power and the electric Coops before the committee attempts to move legislation.

The Jeffords/Lieberman bill as drafted will have a greater cost impact on Coops and municipal power than the investor-owned utilities. I understand from the Public Power Association that those cities who generate their own power will have a very difficult, if not impossible time complying with S. 556. As the former head of a muni, Cleveland Power, I know firsthand the problems that they have.

It is my understanding that the chairman has announced a markup of S. 556 for later this month. As we look today at the costs and benefits of the Jefffords/Lieberman bill, it is important to keep a few points in mind:

1) Not a single utility in this country supports the Jeffords/Lieberman bill as drafted.

2) Under S. 556, coal use would be cut in half, decimating the manufacturing economy of the Midwest, and therefore the country. (Midwest is responsible for 23 percent of U.S. manufacturing) In fact, when you compare Ohio's manufacturing production with the New England states, Ohio's GSP for manufacturing is higher than all six of the New England States combined. (93.4 billion for Ohio, compared to 83.8 billion for all of New England.) If you want to put us out of business, the jobs that we will lose will not go to other States, they will go overseas.

3) The Jeffords/Lieberman bill will decrease the U.S. GDP by $75 billion by 2010. This is according to data by the Edison Electric Institute, which is very similar to data calculated by the Energy Information Administration at DOE.

4) The cost estimates we have for S. 556 are not even complete. They do not include the so-called "birthday provision" which requires all facilities over 30-years old to install the latest control technology. It is my understanding that 80 percent of our nation's coal units would fall under this category by 2007, and 92 percent by 2012. Mr. Chairman, I have to ask how would we get this equipment installed on 80 percent of our units nation-wide by 2007? Who will build the equipment in time? Who will install the equipment on 80 percent of our units all at the very same time?

5) We also know that the National Governor's Association has endorsed a 3-Pollutant strategy, not the 4-Pollutant strategy found in the Jeffords/Lieberman bill.

With these facts in mind, we need to look at the rationale for marking this bill up, as it is currently written.

Personally, I remain committed to a multi-emissions approach and as I have said before I want to work together to pass meaningful legislation which will make significant emission reductions and which will secure our safe, efficient, reliable and cost-effective energy supply for the American consumer. However, we have less than 50 legislative days left and zero chance of the Jeffords/Lieberman bill being signed into law this year. Therefore we can take one of two general approaches. We can either identify those issues in which we can agree and move a bipartisan bill forward, with some hope of passage, or we can mark up a partisan bill which stands no chance of passing.

Unfortunately it appears that the chairman has decided to markup a partisan bill with no chance of passing, all because of carbon.

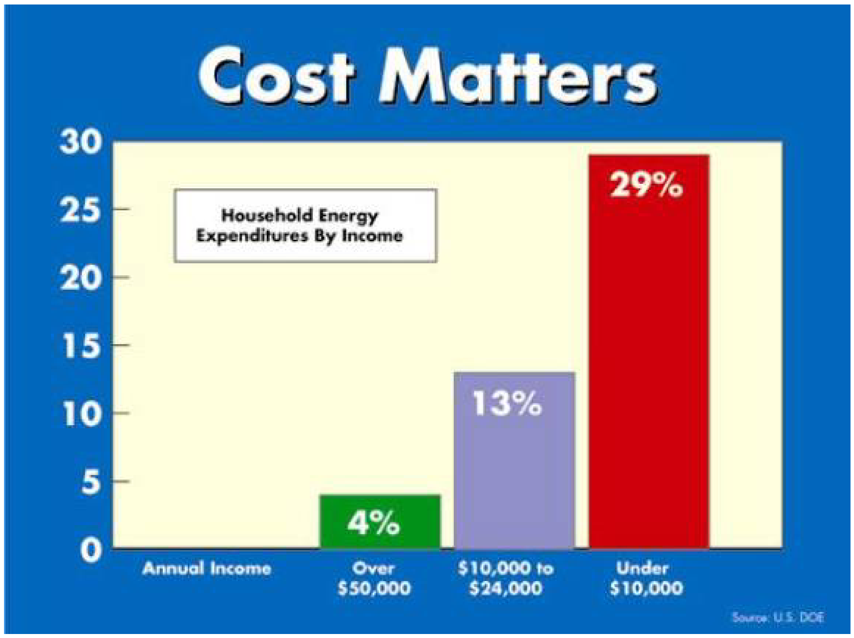
Three times this year the Senate rejected mandatory carbon controls. Twice on votes regarding CAFE on the Energy bill and once when the Senate rejected the mandatory carbon registry in the Energy bill and replaced it with a voluntary program. For this committee to report out a mandatory CO_2 provision ignores what the Senate as a whole has done this year. And the fact of the matter is Mr. Chairman, if this committee does vote out this bill, there will not have to be a single Republican hold because members of the Democratic caucus will kill this bill.

Mr. Chairman, I have said it right from the very beginning, I really want to work together on a bipartisan bill. I think it is vital that we move aggressively to reduce the levels of NOx, SO_2, and mercury. These pollutants cause real health concerns and there is no reason why we can not move forward to make those reductions this year.

Senator's Schumer and Clinton have introduced the Acid Rain Control Act which is championed by the Adirondack Council. This bill will actually make real reductions in utility emissions. I met recently with representatives from the Adirondack Council because we both had been named Villain of the Month by the Clean Air Trust and I wanted to understand why. After talking to them I realized why we both received the so-called award, its because we both want to make real reductions now in utility emissions. We don't want to sacrifice real emissions reductions because of the politics surrounding CO_2. Mr. Chairman, I implore you not to turn your back on real emissions reductions just for a political debate on CO_2.

What this committee should be concentrating on is sitting down and dealing with the real issues which will get us real reductions in emissions and provide reliable and cost-effective energy for the American consumers. We should be dealing with the three pollutants, NSR, the NOx SIP Call and the 126 petitions. Mr. Chairman, last month I joined Senator Conrad in a letter to the Administration calling for NSR reform. We had 25 signatures on that letter including 9 democrats calling for reform, in fact I would like to submit the letter for the record. If we, as a committee, can make these changes then we can reduce utility emissions significantly and provide low-cost energy to our people.

Mr. Chairman, I do appreciate you holding this additional hearing, and I hope we can reach a bipartisan agreement to reduce the utility emissions. Thank you.



Senator JEFFORDS. Senator Chafee?

OPENING STATEMENT OF HON. LINCOLN CHAFEE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator CHAFEE. Thank you.

I will be brief. I believe the Australian Prime Minister is going to be here and I know we want to get to the witnesses.

I do think the science is getting more and more solid on the subject. Even the Administration itself is recognizing that with the EPA study and it is a matter of us being on a freight train headed down the tracks toward the bridge that is out. Are we going to put on the brakes now or are we going to put them on later when it is much more difficult for the economy. Senator Voinovich says this bill is a killer to the economy. Think of what we have to do down the road if we are going to address the carbon emissions. That is the issue. Everybody recognizes that. Are we going to have carbon in this bill and limit it, and what is the timetable going to be?

As to whether this bill will never pass, we will engage in the debate, let us talk about the limits and the timetable rather than just saying we will not consider carbon as a pollutant. That is what I would say to those who oppose this bill. I think there is room for debate on it, I think we can pass it, I think the Administration is coming around to recognizing the cataclysmic consequences of not addressing this issue.

Thank you.

Senator JEFFORDS. Thank you very much.

We now have a request to testify and I really appreciate your coming over, Mr. Congressman Kucinich from Cincinnati. Please proceed.

STATEMENT OF HON. DENNIS J. KUCINICH, U.S. REPRESENTATIVE FROM THE STATE OF OHIO

Mr. KUCINICH. I thank the Chair. It would be fun to represent Cincinnati but I am the Congressman from Cleveland.

Senator JEFFORDS. Sorry about that.

Mr. KUCINICH. I am glad to be here on behalf of your bill. I also want to acknowledge the presence of my good friend, Senator Voinovich, who followed me as Mayor of Cleveland. We thank him for his service in the U.S. Senate and also to let your co-sponsor on the bill, Senator Lieberman, know how much I have appreciated working with him on environmental issues. He and I were representing the United States in Buenos Aires at the Conference of Parties a few years ago. I thought that was very productive.

I want to thank the committee for the opportunity to testify today regarding the Clean Power Act, S. 556. This legislation addresses the fundamental issue of ethics and justice, how our nation should use natural resources, and how our use of them affects each other and our surroundings for air, like water or food, is a basic human need. It is a work of mercy to give water to a thirsty person or to give food to a hungry person. It is a work of justice to help people breathe who cannot get air. Do we not praise the heroism of one who resuscitates a drowning swimmer or prevents a child from choking. Why not then is ensuring that all of us can breathe easily on a day-to-day basis, not just in an emergency, subject to debate?

In his 1967 encyclical, Pope Paul VI gave an address "Popularum Progressio" and the development of peoples and he said, "Development cannot be limited to mere economic growth. In order to be authentic, it must be complete, integral, that is. It has to promote the good of every man and a whole man. As an imminent specialist has rightly and emphatically declared, we do not believe in separating the economic from the human, nor development from the civilizations in which it exists. What we hold important is man, each man, and each group of men, and we include the whole of humanity."

As our country moves forward with greater and greater economic progress, how can we call this development when it withholds a basic human right for many of our citizens? How can we call this development when it makes families poor from health costs, when it debilitates children from filling their lungs, when it leads to early deaths among the sick and the elderly?

I strongly support the Clean Power Act as do many of my constituents in the Cleveland area for the sake of their health and the environment. My constituents have good reason to support it. Unfortunately, the Cleveland area suffers from severe air pollution and two summers ago, had 39 violations of the Smog Standard in a period of 64 days. That means that two-thirds of the time during the summer when people and children are most likely to be outside, they are breathing air that is dirtier than what the EPA considers safe. As a result, summer smog in the Midwest triggers 34,000 emergency room visits, 14,700 hospitalizations, and 1.4 million asthma attacks each year. At these levels, air pollution can have a life or death effort, especially on vulnerable populations.

A study reported in the Journal of the American Medical Association this past March proved the association between the day to day air pollution and the increased risk of lung cancer, cardiopulmonary death and other adverse health effects. Children have lifelong health problems as a result of air pollution. It will cause senior citizens to suffer premature deaths.

The Center for disease control estimates that 4.8 million children have asthma nationally. A conservative estimate is that for every child, about $500 is spent on medications, physician care, hospital treatment, not including other costs such as school absenteeism, psychological effects and others. Power plant pollution is responsible for over 6,000 premature deaths per year, more than from all the deaths due to non-use of seatbelts.

Health cost is a very real part of the discussion of costs and benefits. Because they are so enormous, they are impossible to ignore. The medical community is increasingly reporting public health implications of polluted air and global climate change. Just last month, the Medical Student Journal of the American Medical Association devoted its entire issue to the topic.

Some opponents of the Clean Air Act made rather exaggerated claims such that compliance will mean an massive shift to other fuel sources and that compliance costs will be extremely burdensome, especially for low income families. These opponents are, for the most part, the utility industry. The industry claims that the Clean Power Act and similar legislation mandates a switch away from coal. This is a myth. It does not forbid the use of coal as an energy source. There are a number of options for reducing power sector carbon emissions. These include replacing inefficient coal plants with advanced, highly efficient coal generation; shifting generation from coal to low carbon natural gas or no carbon renewable sources, captured and geological sequestration of carbon dioxide from fossil power plants.

The fact is there are many options for reducing power sector carbon emissions. This means there is considerable flexibility for meeting a carbon cap and deep carbon reductions do not require substantial reductions in the use of coal. The industry also complains that compliance costs will also be extraordinary. On the contrary, an October 2001 report by the Department of Energy's Energy Information Administration who that scenarios similar to the Clean Power Act, households will actually save money.

As time goes on, they will continue to save even more money. Specifically., the average annual household expenditures would be $40 less in 2010, $200 less by 2020; nationwide consumers would save $27 billion on their electric bill and in 2010 if the Clean Power Act were enacted, and save $60 million by 2020.

I think the answer to today's hearing are weighing of the costs and benefits of most pollution legislation is overwhelmingly in favor of benefits. Practically, it will mean more efficient use of resources, lower energy costs over the long term and improvement in public health.

As a Member of Congress, I think we are obligated to consider the principles of this legislation without acting in favor of multipollutant legislation. Increased energy use results in a disproportionate burden of suffering and costs on the young, the sick, the low income who cannot afford to move away from polluted areas or for the sake of the Health Care they desperately need.

From a principles' perspective, it is the responsible, ethical and just policy to support. I thank the chairman for the opportunity to testify.

Senator JEFFORDS. Thank you for an excellent statement.

I have no questions. Does anyone?

Senator WYDEN. Just one. I too thought the Congressman made an excellent statement. I am wondering if there are any significant bipartisan discussions going on now in the House particularly on this question of limiting carbon dioxide? I think that Senator Voinovich made the key point which is to try to get people together. That is why when I talked about efforts to limit carbon dioxide, I stressed the efforts that Senator Craig and Senator Brownback and I have made for a number of years. I think there are some significant possibilities for making real reductions in carbon dioxide in a way that is good for the environment and good for key industries.

Because I agree with Senator Voinovich's point about bipartisanship and getting people together, I am curious about what is going on in the House with respect to any discussions to try to bridge this polarized divide?

Mr. KUCINICH. I would say that we certainly want to avoid making clean air a partisan issue and there are members of the House on the Republican side of the aisle that I have been in discussions with to try to see if we can come to some kind of a bipartisan position. These hearings help to lead us to some areas where we might be able to find some agreement.

I have the greatest respect for Senator Voinovich. We may have a difference of opinion on this but I have every confidence in his goodwill and his intention to try to find a bipartisan approach.

Senator WYDEN. How many members are involved in these discussions over there? Is it a significant number?

Mr. KUCINICH. I am not going to exaggerate, it was a few, but hope springs eternal in the heart of men.

[Laughter.]

Senator WYDEN. Thank you, Mr. Chairman.

Senator JEFFORDS. Senator Graham?

Senator GRAHAM. I was also impressed with your remarks, particularly the fact that you elevated our discussion to an ethical context as you have on so many other issues in the past. I stated my concern that this is an issue that cannot be avoided, it is just a question of which generation is going to have to face the consequences. Do you share that view and what do you think are the ethical implications of our essentially saying to our great grandchildren, largely yet unborn, they are the ones we expect to deal with this unavoidable issue?

Mr. KUCINICH. To answer your question, there are ethical implications. In reading from this papal encyclical on the "Development of Peoples," I was struck by a quote which I did not use in my testimony. The Pope had quoted St. Ambrose where he said, "You are not making a gift of your possessions to the poor person, you are handing over to him what is him for it has been given in common for the use of all. You have relegated it to yourself." There is an economic component to this debate where the profits of a few can create the suffering of the many. This relates not only on an economic level but also relates to the concerns we should have for future generations.

Senator JEFFORDS. Further questions

[No response.]

Senator JEFFORDS. Thank you very much for an excellent statement. We appreciate your appearance.

Mr. KUCINICH. I want to thank the members of the committee for their indulgence.

Senator JEFFORDS. If the panel would come forward.

I appreciate the panel being here to help us out. I would urge the panel if possible to keep your statements to 5 minutes. We will have questions.

We will start at the far right with Ron Methier. Please introduce yourself and proceed.

STATEMENT OF RONALD C. METHIER, BRANCH CHIEF, GEORGIA DEPARTMENT OF NATURAL RESOURCES, ENVIRONMENTAL PROTECTION DIVISION, AIR PROTECTION BRANCH ON BEHALF OF STAPPA AND ALAPCO

Mr. METHIER. Good morning. I am Ron Methier, Chief of the Air Protection Branch, Georgia Environmental Protection Division. I am testifying today on behalf of STAPPA and ALAPCO, the two national associations of air quality officials in 54 States and territories and over 165 major metropolitan areas across the country. The members of these associations have the primary responsibility under the Clean Air Act for implementing our Nation's air pollution laws and regulations.

While we have made significant progress over the last three decades in cleaning up our air, our nation continues to face substantial public health and environmental problems as a result of air pollution. Approximately 121 million people still reside in areas that exceed at least one of the six health-based national ambient air quality standards, including over 80 million in areas that monitor violations of the new 8 hour ozone standard and 75 million in areas that, based on the most current monitoring data available, violate the new $PM_{2.5}$ standard. Moreover, millions more live in areas where hazardous air pollutants continue to pose a serious and pervasive health threat and many regions of the country experience significant visibility impairments that obscure our beautiful vistas.

Electric utilities are one of the most significant sources of harmful air emissions that contribute to all these problems. These sources are responsible for 64 percent of annual sulfur dioxide emissions, acid rain and the formation of $PM_{2.5}$. Their emissions also account for 26 percent of nitrogen oxide emissions which are not only a precursor to ground level ozone but also a contributor to such public health and welfare threats as secondary $PM_{2.5}$, acid rain, eutrophication of water bodies and regional haze.

In addition, electric utilities are responsible for 37 percent of U.S. carbon dioxide emissions and emit 67 hazardous air pollutants including mercury. The magnitude of these emissions from power plants and the serious public health and welfare implications these emissions have make controlling electric utilities a top priority.

Fortunately, there are tremendous opportunities for doing so in a very cost effective manner. Among the most important steps Congress can take to address air pollution is to establish a comprehensive, national, multi-pollutant approach for cleaning up outdated power plants and ensuring that new plants are dramatically cleaner.

STAPPA and ALAPCO strongly endorse the concept of a comprehensive strategy for reducing emissions from electric utilities, and to that end recently adopted a set of principles upon which we believe a viable multi-pollutant approach should be based. I have attached a copy of these principles to my testimony and would like to highlight these now.

First, our associations believe that a multi-pollutant strategy for controlling power plants should address all significant emissions from electric power generation. If properly structured, such an approach can increase and accelerate protection of public health and the environment, reduce pollution more cost effectively and offer greater certainty to both industry and regulators.

Second, the strategy should set expeditious deadlines. It is essential that utilities meet their requirements prior to the time States and localities must comply with the health-based air quality standards. To ensure steady progress toward the final compliance deadline, interim deadlines should be established with the first interim compliance requirements taking effect quickly.

Third, the multi-pollutant strategy should supplement, not supplant, provisions of the existing Clean Air Act. We believe that programs like New Source Review, Regional Haze and Utility Maximum Achievable Control Technology must be retained. On the matter of NSR, our associations have suggested certain reforms to the program with respect to existing sources.

Fourth, we believe emissions should be capped at levels reflecting the installation of technology no less stringent than best available controls on all existing units nationwide with existing power plants required to meet a minimum level of control by the final compliance deadline.

In meeting these emissions goals, the regulated community should be afforded flexibility, including an emissions trading mechanism with appropriate limitations and protections against any adverse health or environmental impacts.

Fifth, any multi-pollutant approach should strongly encourage energy efficiency and conservation. Further, it should support efforts to develop and deploy consistent approaches for distributed resources to mitigate the impacts of small units not otherwise covered by a national multi-pollutant strategy.

Finally, a viable multi-pollutant strategy must ensure that regions, States and localities retain their authority to adopt and/or implement measures including local offset requirements that are more stringent than those of the Federal Government.

Once again, on behalf of our associations, thank you for the opportunity to present our views.

Senator JEFFORDS. Thank you.

I am going to go through each of the witnesses and have their testimony before we get into questions. That was excellent on the timing and I hope everyone sticks within the 5 minutes and we will get through expeditiously.

Mr. PAGE.

STATEMENT OF ROBERT PAGE, VICE PRESIDENT OF SUSTAINABLE DEVELOPMENT, TRANSALTA CORPORATION

Mr. PAGE. Thank you, Mr. Chairman.

My name is Robert Page, Vice President, Sustainable Development for the Transalta Corporation headquartered in Calgary, Canada. As a Canadian company, we feel privileged to provide testimony to this committee which is highly respected in Canada for its important work. We have been invited to present on our climate change program.

Transalta is Canada's largest private sector electric generating utility. We produce electricity in Canada, the United States, Mexico and Australia. We recently purchased the Centralia Power Plant in Washington State to give one example. Our generation mix includes coal, hydro, gas and wind. We believe that coal is an essential resource for North American power generation for the future.

Also, environmental stewardship is one of our core values as a company and our company has received national and international recognition for climate change programs. Our principles are clear in our climate change strategy; as a company we accept that climate change is a significant public concern that must be addressed. This means stabilizing and then reducing CO_2 emissions because society is moving toward a carbon constrained future. We must seek cost effective means to manage carbon in the interest of both our shareholders and our customers.

In following this philosophy, we have created a blueprint for sustainable thermopower generation which will enable Transalta to achieve zero net emissions of greenhouse gases in our Canadian operations by the year 2024. With the right government policies and programs, we believe we can meet this very ambitious goal.

Our blueprint involves two integrated strategies. First, in the near and medium term, we will stabilize our current emissions and through a combination of improved plant efficiency, offset projects, including sinks, renewable energy, and emissions trading and over the longer term, we will work toward developing, testing and applying new coal combustion technologies which when combined with SO_2 sequestration underground can substantially curtail atmospheric releases.

We are committed to implementing these strategies through voluntary action, market mechanisms and sectorial agreements. Our company does not support mandatory carbon controls.

Components in our program. It becomes important to look outside our plants to the surrounding carbon regimes to find cost effective opportunities for carbon reduction or capture through offsets, through credits, and through emissions trading. These are essential features of our program. Currently, we have a portfolio of projects and credits totaling 60 million tons over 25 years of CO_2. This is both in North America and abroad.

A major focus has been methane emission reduction since methane is a very potent greenhouse gas and cost effective reductions can be achieved through things like landfill and coal mine methane recovery. We are also a leader in emissions trading and have done important trades between the European Union, the United States, Canada and Japan including trades with U.S. energy companies like Murphy Oil or Entergy.

We are focusing on this long-term technology renewal in order to change our capital stock. Our objective is a commercial scale retrofit unit in operation by 2007 and greenfield plant by 2010.

The lessons from the Canadian experience which we hope may be of some significance to your committee, our near term requirements with capped CO_2 emissions substantially below current levels may force premature investment in current technology which in our opinion may become obsolete resulting in stranded costs when new clean coal technology will be available within a decade.

As we address Kyoto implementation in Canada, the Alberta government is working in a flexible fashion with us.

As with U.S. policies which integrate greenhouse gas reduction goals with the control of conventional pollutants, we feel we have much to offer. Because piecemeal approaches in our Canadian experience have hindered this long-term technology change, we are opposed to CO_2 action on its own and are in favor of a Canadian policy covering all the major emissions for the electricity sector.

Programs to reduce CO_2 emissions need to reflect normal cycles of capital stock renewal, natural gas repowering has limited potential in our experience because of price volatility because there are better uses for natural gas from industrial points of view and also in terms of the supply questions we have dealt with. We have 900 years of coal supply in Alberta.

Commitment to clean coal technology offers important social benefits for the communities that we serve with our mines and also added energy security for North America. We support government incentives for technology development and we are very concerned with the application of Kyoto protocol in Canada and the constraints that it would force on us.

Mandatory systems for emission reporting, we are certainly in favor of, as discussed earlier this morning and we recognize and support efforts to develop an integrated approach.

I appreciate the committee's consideration of my testimony and will welcome later questions.

Thank you.

Senator JEFFORDS. Thank you.

Mr. Tyndall?

STATEMENT OF WILLIAM F. TYNDALL, VICE PRESIDENT, ENVIRONMENTAL SERVICES AND FEDERAL AFFAIRS, CINERGY CORPORATION ON BEHALF OF EDISON ELECTRIC INSTITUTE

Mr. TYNDALL. Thank you.

My name is William Tyndall, Vice President, Environmental Services and Federal Affairs, Cinergy Corporation.

My employer is a regional utility with 13,000 megawatts of capacity. We serve 1.5 million electric customers and 500,000 gas customers in Ohio, Indiana and Kentucky. Our portfolio of generation includes 37 coal fired units. Of importance for today, 30 of which will be more than 30 years old in 2007.

I am here today on behalf of Cinergy and also behalf of EEI. Cinergy has long been a supporter of multi-pollutant legislation. Our support stems from the reality that this industry faces a myriad of new piecemeal regulatory requirements under the Clean Air

Act. The net result is a planning nightmare making it impossible for the industry to assess which plants should be retrofit with controls, which plants should be switched to natural gas, which plants should be retired, and when any of this should take place.

Nor does the present system advantage the environmental community. The piecemeal approach involves many, many scientific and technical decisions that may not be resolved in their favor. Regardless, all regulatory decisions are typically late in being made and then taken to court by all sides, causing further delay. I would add that consumers lose. The piecemeal approach doesn't allow us to synchronize control installation so that we can get two pollutants with one installation as we might be able to if we knew what the full picture was.

As discussed, the committee's task is to find a set of reduction targets that will satisfy both existing clean air requirements and create a workable road map for the industry. I too am an optimist and believe there is a series of timetables and targets that may be acceptable to both sides. I agree with the observation of Senator Smith and others that the President's numbers are really not that far afield from the numbers in 556. Apparently the President's proposal doesn't include CO_2 which has caught the attention of some members of the committee but it goes further on mercury which is predicated on a 90 percent reduction, something that in my judgment isn't going to come out of existing MAC process since the MAC process by definition has to be based on what is out there in place in utilities and there are no mercury controls for controlling aimed at mercury out there right now. So I don't see the MAC reaching 90 percent.

One of the provisions of the bill I want to make sure the committee focuses on as it moves forward is the provision regarding what is called the outdated power plant provision, what I call the birthday provision. This provision requires state-of-the-art controls on all units over 30 years old regardless of the environmental need. Since as pointed out by Senator Voinovich 80 percent of the generation will already be over this limit when the bill goes into effect, this provision will essentially make the cap-and-trade system pointless. By 2010 or 2012, almost all the units in the country will be subject to individual non-tradable emissions caps and all the advantages of trading we have seen under the acid rain program will be lost.

The other thing that obviously is different and what we feel very strongly should be included in the bill is that 556 does not make any attempt to pair what is in the bill with what is in the existing Clean Air Act. Rather, all the new requirements are added on top of the existing morass adding to the complexity of an Act that already can give the Tax Code a run for the title of most byzantine and confusing and therefore most likely to be implemented through litigation, and I might add, employing a lot of people in this room.

The committee has already heard a lot of testimony about the macro impacts. I would like to talk briefly about what it means for Cinergy.

Already we are spending approximately $200 million a year on our generation, approximately $300 million on our transmission. We are in the middle of an $800 million expenditure on the NOx controls. These NOx controls will take care of the summer ozone issue that has been discussed by some of the witnesses. The $800 million is essentially the outer reach of what we can afford to do over a 5-year timeframe.

S. 556, as written, requires, overlaying the same 5 year timeframe, expenditures of an amount more than five times this sum we are already spending right now. The $800 million we are already spending is more than the entire northeast is spending combined to meet NOx controls. We are being asked in this bill in a shorter timeframe to locate the money and get all this technology in place within 5 years. It cannot be done, cannot be done by a company the size of Cinergy, can't be done by the coops, the publics, the smaller investor utilities.

This is not to say the committee can't construct timetables and timeframes that do better than what is going to happen under the Clean Air Act and that provide us with a workable road map but 556 is not that bill.

Senator JEFFORDS. Thank you.

Mr. Hawkins?

STATEMENT OF DAVID G. HAWKINS, DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Mr. HAWKINS. Thank you.

I am David Hawkins, representing the Natural Resources Defense Council. I am pleased to testify on behalf of our 500,000 members in support of the Clean Power Act, S. 556.

Today in America, air pollutants from power plants—sulfur dioxide, nitrogen oxide, mercury and carbon dioxide—are causing major health and environmental damages. Fine particles alone resulting mostly from power plant sulfur dioxide pollution are calculated as causing 30,000 premature deaths a year.

On the easel is a map that shows the distribution of premature deaths from the current power plant pollution levels using the contractors used by EPA in analyzing the health benefits of air quality standards. It shows a huge toll and a very widespread toll, extending even to places that are thought to have quite clean air like Florida.

The committee has before it the Clean Power Act which is a comprehensive response to power plant pollution. The bill combines emission caps with energy efficiency and renewable energy programs to clean up this pollution promptly and affordably.

Some have argued, and you have heard it argued today, that the Administration proposal should be adopted instead but that proposal would leave more pollution in the air with a very heavy toll on health and on the environment. The Administration proposal completely ignores global warming pollution, even though the Government officially acknowledged 2 weeks ago that the very large threat to Americans that are posed by global warming and the role pollution from sources like power plants play in this threat.

You will see on the chart about to be on the easel, the Clean Power Act does a much better job of cutting the pollution burden than the so-called Clear Skies Initiative that has been outlined but not actually drafted by the Administration. Under the CSI option, Americans would be exposed to more than 40 million tons of excess sulfur dioxide between now and 2020 than under the committee's Clean Power Act.

According to EPA's own reports, this added pollution alone would cause about 10,000 more premature deaths each year for about 10 years than the Administration proposal. I would submit that is not a small difference. You have heard arguments that there really are small differences between the Clean Power Act and the CSI approach. Ten thousand deaths a year is not a small difference, 1,000 deaths a year is not a small difference. These are big differences.

As my testimony indicates acidification would also be larger under the Administration approach than it would be under the Clean Power Act. Cumulative toxic mercury pollution would be about five times higher under the CSI approach after the control period begins than under the Clean Power Act.

With respect to NOx, my testimony has an incorrect figure. The excess pollution for the Administration proposal should be 9 million tons of additional NOx, not 13 million. I will submit corrected testimony for the record.

Finally, CO_2, completely ignored under the CSI approach, would be nearly 10 billion tons higher than under the Clean Power Act. Importantly, that added CO_2 will have consequences that Americans must live with for hundreds of years, the grandchildren that Senator Graham has talked about will be living with the consequences of the extra pollution that is put into the air under the CSI approach if that approach were adopted.

The next chart shows how much more SO_2 would be released in the DSI approach in various States compared to a proposal the Administration rejected from EPA. I don't have a comparison to the Clean Power Act because EPA has not yet run that State by State analysis. It shows dramatic larger pollution loadings in various States under the Administration approach. The dark brown bar shows what the 2010 levels are under the CSI approach.

It is important to note the fine print in the Administration proposal. They want you to focus on their 2018 second stage proposals but in the fine print the Administration says that is subject to an additional rulemaking, the very kind of process that Bill Tyndall has said is going to be complicated and overrun by lawyers. The only thing Congress can count on in the Administration proposal as it is drafted is the first stage of reductions which allow much higher pollutants.

The next chart will also indicate what the additional pollution loadings for mercury are under an approach that was higher and allow more pollution than under the Clean Power Act. Again, very much larger cumulative loadings. Those additional tons of mercury will stay in the environment for decades and decades, contaminating more fish, creating more threats to children and pregnant women.

Finally, I want to say a bit about the importance of the global warming emissions. As Senator Graham and others pointed out, it is critical that we get started now. One of the things the science has shown is there is a budget for the amount of carbon added to the atmosphere that the planet can tolerate. The point of this graphic is that delay is not our friend. Delay consumes the budget. In the next 10, 20, 30 years, we are going to consume, the plant is going to consume the budget we have to keep global warming a manageable problem.

We have the opportunity now to preserve our ability to manage this problem. If we wait 10 years, we will have in developing countries around the world as well as in the United States, a very rapid consumption of a finite budget and the problem will become unmanageable.

Thank you very much for the opportunity to testify.

Senator JEFFORDS. Thank you.

Mr. Hughes?

STATEMENT OF LEE HUGHES, VICE PRESIDENT, CORPORATE ENVIRONMENTAL CONTROL, BAYER CORPORATION ON BEHALF OF AMERICAN CHEMISTRY COUNCIL

Mr. HUGHES. Good morning.

My name is Lee Hughes, Vice President, Corporate Environmental Control, Bayer Corporation. I am here today representing the American Chemistry Council. The Council represents the leading companies engaged in the business of chemistry.

Council members have a significant stake in the continued success of environmental programs including the Clean Air Act. Our steady and dramatic emissions reductions have occurred while we have increased our production. While we have improved our energy efficiency for decades, we remain an energy intensive industry.

Not only do we generate, use and purchase significant amounts of electricity, we are also a significant consumer of natural gas, both as a critical raw material and as a fuel. This makes our businesses very sensitive to both the availability of adequate supplies of natural gas and the fluctuations in energy prices.

We support the national goal for continuing improvements in our air quality, building on the significant progress we have made to date. We also support the use of market-based mechanisms to achieve air quality goals. However, we are very concerned about S. 556 and its potential impact on our industry and the broader economy.

We believe this bill, as currently written, will drive many utilities to switch to natural gas and cause a significant impact on its availability and on energy prices. We think it is important to set goals and timetables for additional emission reductions in a way that minimizes the sort of economic impacts while at the same time delivering improved air quality.

I would like to discuss our three primary concerns. First, S. 556 adversely impacts fuel diversity. It is critical to the business of chemistry that multi-pollutant legislation not increase our reliance on natural gas to generate electricity without simultaneous congressional action to ensure adequate supplies of natural gas.

For many utilities, natural gas becomes the fuel of choice to cost effectively meet the stringent targets and timetables currently in S. 556. In fact, even without S. 556, the Energy Information Agency predicts the use of natural gas by utilities will increase threefold by the year 2020.

When natural gas prices rise, the U.S. chemical industry's cost of production correspondingly rises to the point where we cannot compete globally. We have just been through such a period. When the U.S. companies cannot compete in the global market, we lose jobs and investment in the U.S. Given the levels of reduction for SOx, NOx and mercury currently embodies in S. 556 and the time lines for meeting these levels, we can come to only one conclusion, S. 556 as currently written will adversely impact natural gas availability. Including carbon dioxide in these targets and timetables would only exacerbate the situation.

Second, combined heat and power units are unique. The U.S. chemical industry continues to make significant investments in the use of combined heat and power technology. A typical CHP unit produces power twice as efficiently as a traditional utility and emits less than half the pollution.

Under Carper's leadership and with your support, the Senate recently voted overwhelmingly to support both current and expanded use of CHP units. Including these units in S. 556 will erode incentives for their use. CHP units should therefore not be included in multi-pollutant legislation.

Third, multi-pollutant legislation must be harmonized with the existing Clean Air Act. We support S. 556 using market driven approaches to achieve Clean Air Act goals. However, the Clean Air Act's existing command and control provision and S. 556 target the same emissions. The existing provisions apparently would remain in effect under S. 556. This undermines the legislation's market mechanism. The ability to direct investments to the most cost effective reduction under a market-based approach would be seriously compromised.

In summary, Council members believe that a carefully crafted, multi-pollutant program could work and could provide air quality benefits to the nationwithout serious economic disruption. To succeed, however, the program must first avoid creating supply demand imbalances for critical fuel such as natural gas, avoid significant increases in electricity cost, not include combined heat and power units but allow combined heat and power and other sources not covered to voluntarily opt in, to address three pollutants—SOx, NOx and mercury, and last, harmonize these provisions with the existing Clean Air Act requirements to ensure the market-based mechanisms function properly.

We would be happy to work with the committee to amend or develop an alternative to S. 556 to assure these critical points are addressed.

Thank you.

Senator JEFFORDS. Thank you.

Mr. Barger?

STATEMENT OF DON BARGER, SENIOR DIRECTOR, NATIONAL PARKS CONSERVATION ASSOCIATION, SOUTHEAST REGIONAL OFFICE COUNCIL

Mr. BARGER. Thank you very much for the opportunity to testify today.

Our nation creates and preserves national parks because of their inspirational, scientific and historic value to America's natural and cultural heritage. They are priceless and irreplaceable. Air pollution is among the most significant threats facing the parks.

NPCA fully supports S. 556, the Clean Power Act, as a vehicle to require effective, timely and necessary reductions of the four key pollutants emitted by power plants.

The air pollution in our national parks is a disaster in slow motion. A quarter of a century after Congress declared our national parks should have the Nation's cleanest air, they have some of the dirtiest. It is important to note this is not just a visibility problem in our parks. Our support for S. 556 is based on our belief that major reductions in all four of the key pollutants will be necessary for the long term health of our parks and for the people who visit them.

Great Smoky Mountains National Park serves as an unfortunate poster child of Class I areas harmed by air pollution nationwide. This park has recorded the highest level of nitrogen deposition of any monitored site, anywhere in North America, urban or rural.

Historic views of 113 miles annual average have been reduced to 25. Researchers have documented at least 30 different species of plants being directly impacted by ground level ozone. The National Park Service has had to issue unhealthful air notices to staff and visitors on over 140 days in the last four summer seasons.

While we were having the ozone red alert yesterday here in Washington, I checked the ozone levels both here and at the Great Smoky Mountains National Park. Bottom line, it would have been a lot healthier to run to work yesterday in Washington than it would have been to hike on the Appalachian Trail in the Smokies.

The report recently delivered to the United Nations by the U.S. State Department documents the many dire consequences in the future with global warming. As Senator Graham noted, the sea along the Florida Coast is rising today at a rate of six to ten times faster than the average rate in this area over the last 3,000 years. This could mean that most of the Everglades National Park would essentially become an extension of Florida Bay, washing away the $7.8 billion Everglades restoration system which this committee helped to design.

Carbon dioxide comprises 82 percent of the greenhouse gases emitted in the United States and power plants are responsible for 40 percent of that. We believe mandatory reductions clearly are needed to reduce these impacts.

Mercury is a potent neurotoxin that persists in the environment and bioaccumulates in the food chain. As such, it demands an aggressive policy response, one which does not include trading that will allow its additional accumulation. Attachment 5 in your packet we gave out shows the atmospheric deposition of mercury at sites across the country with the Everglades registering some of the highest in the country.

Preliminary monitoring data just begun at Mammoth Cave National Park indicates that episodic plumes of mercury many times expected background levels are entering that park.

There is simply no combination of emission reductions that will clear the air in our parks without cleaning up the old grandfathered plants. Accordingly, a birthday provision requiring all power plants to install modern controls by a date certain is an essential component of multi-pollutant legislation if we are to clean up the air in our national parks.

Based on the information and studies presented in our written testimony, we believe emission reductions at or beyond those proposed by S. 556 will be necessary. While emissions nationwide have been reduced, emissions affecting many Class I areas have actually increased. A cap-and-trade program instituted in lieu of, not in addition to, the current effect-based standards of the Clean Air Act cannot protect Class I areas from existing and future impairment.

The proposal to draw 50 or even 100 kilometer circles around Class I areas would provide less protection than proper implementation of the current Clean Air Act provisions. While it would provide limited effect-based analysis within those zones, such a proposal would also create free fire zones outside those circles allowing large sources to proliferate without regard to their individual or cumulative Class I impacts.

We have included a number of cites in our written testimony that speak to the quantified benefits of cleaning up the air in our national parks. In conclusion, I want you to know that scientists have recently found a bacterium in the pool in Mammoth Cave they believe may produce an important anticancer agent. The benefits we can count from preserving these places intact are exceeded only by what we have not yet discovered. I believe if we save our parks, they may very well save us.

Thank you.

Senator JEFFORDS. Thank you.

Mr. Mullen?

STATEMENT OF TOM MULLEN, PRESIDENT AND CEO, CATHOLIC CHARITIES HEALTH AND HUMAN SERVICES. DIOCESE OF CLEVELAND

Mr. MULLEN. I really want to spend a little time, 5 minutes, to create the spirit I saw that occurred among the committee itself and also saw in my Congressman Kucinich alluding to bipartisan collaboration around this issue and for a simple reason, I would ask that we consider clearly those persons that may be impacted, I was about to say indirectly, but they would be directly by the enactment of S. 566 as it exists in its current fashion and from the numbers and understanding that I know economically it could impact on persons and families.

I think a good way to highlight that would be to let me tell you about two people. One, a woman I know and talked with as recently as 10 days ago named Millie is 82 years old. Millie is a retired domestic. At 82, her fixed income is around $680 a month. She pays for rent and utilities $510 a month in Cleveland. We all can do the math. That leaves her about $170 a month or $5.66 a day for food, clothing, minimal public transportation and other needs a person of 82 may have.

I know Millie cannot absorb any further costs, particularly in energy, and we at Catholic Charities in the Diocese of Cleveland have seen clearly a 200 percent increase in emergency needs of the last year and a half. So I think it critical we take into consideration those things.

Another quick example would be a person who actually well be in our employ. We have a number of people in the health and human service business that work as child care workers, nurses aides, housekeepers in our nursing homes or child care institutions. Those in northeast Ohio are $9 a hour jobs. At $9 a hour, an employee that could well be my own who is a single mother with two children 3 or 4 years old will make about $1,440 a month.

By the time her social security, taxes, Medicare and health costs for the family portion, she finds herself at about $935 a month. When you look at either a one or two bedroom rented apartment in the Cleveland area, we are looking at $500, on top of the utilities for gas, electric and water. These are older buildings and not very efficient. The average will run about $175 because we pay a number of those bills.

I think what you will find doing that math is that she ends up with about $7 a day for herself and her two kids. That is about $2.33 to feed, cloth and whatever other needs there may be in that family.

I raised those two cases and just say that as we work through this and as you look at an approach that I think has to take into consideration the older generation, not only in Ohio but across the country, that also takes into consideration low income and so many persons that have moved themselves into the work force and off the welfare systems but by the skin of their teeth as it exists today.

Any additional burden as it relates to any cost but particularly as S. 566 can impact energy, I would only ask and have you considered the Millies and the low income women and children I have presented to you today.

Thank you.

Senator JEFFORDS. Thank you. That is a very worthwhile statement to make us think and remember the consequences of what we do.

Mr. Methier, your testimony seems to support the birthday provision in the Clean Power Act. Would you explain a little further why that is so necessary?

Mr. METHIER. This actually is an issue our associations discussed and debated at length, whether or not to allow the full flexibility of market trading without any final controls of units at the end or what sort of control we might need.

In the end, our analysis was the same as many others, that old, outdated units at some point in time do need to have some minimum level of control at the end of their years of life of that unit or at the end of a compliance schedule that is in rule or law. But we are trying to deal with regional broad issues that you saw on the map this morning as well as local issues. I can speak from experience in Georgia and Atlanta that what happens locally is just as important as a broad reduction you can get across an area.

So we do agree that some minimum level of control for these units is necessary.

Senator JEFFORDS. Mr. Page, I am pleased to learn that your company has committed to the ambitious target of zero net emissions by 2024. That is a very positive step. What were the primary motivations to Transalta's decision to make this commitment?

Mr. PAGE. The reasons for our decision was one, the background in Canada which is a little different where we have the Canadian Government and our Prime Minister committed to ratifying Kyoto; we have considerable potential for sinks and offsets in the western prairies of Canada. We were very early active on the emissions trading front so we were seeking some cost effective solutions and we were fortunate enough to be able, in terms of our own work and our work with our partners, to put the Canadian Clean Power Coalition together.

Of all the major thermal utilities in Canada with backing from the Federal Government and some of our provinces we were able to put together our technology package, which is our key. Without the technology package of clean coal technology and the parallel sequestration of emissions, that goal would not be possible.

Senator JEFFORDS. Mr. Barger, could you please explain the difference between an effects-based standard and an emissions-based standard and why you believe that distinction is so important for the national parks?

Mr. BARGER. Yes. Effect-based standards are standards that measure the effect or the impact of a proposed source of pollution instead of just its rate of emission. The prevention of significant deterioration, or PSD, is an effect-based standard.

The only way to protect a Class I area is to determine whether a proposed new source is going to affect it. An effect-based standard measures not just how much are you putting into the air but where is it going and what is it doing. Therefore, if you are going to prevent those effects from happening in a Class I area, those kinds of standards have to be a part of the mix for any new proposed source.

Senator JEFFORDS. Mr. Hawkins, would you respond to any of the comments or testimony you heard so far with any suggestions you might have?

Mr. HAWKINS. I guess I would start with the point that you just asked Mr. Page from Transalta. Here is a company that operates coal-fired generation and it has committed to a birthday approach that says after a plant reaches 40 years of age, it either will achieve zero net emissions of carbon or it will be retired. That is a very interesting and ambitious commitment.

You asked what was the cause of that. I think I would like to restate the answer. I think the answer is that in Canada the government has committed to a binding limit on carbon emissions and the response is that one of the major electric utilities in Canada has said OK, we can do it, here is our plan.

The cause and effect relationship here is very important to recognize. A binding limit gets responses. Voluntary programs which we have tried in the United States for the last 10 years do not get responses, they get emission increases. That is not going to be a solution.

In response to Mr. Mullen's comments about the concerns of the less well to do, they are enormously important concerns. They are concerns this committee should certainly keep in mind as it drafts legislation. Two comments about those concerns.

He mentioned Millie who has expenditures on rent and utilities of over $500 a month. If Millie is like most renters, she lives in an apartment where the landlord has no incentive to design the apartments to save energy for the renters because the renters pay the costs.

Under the Clean Power Act, the structures would be put in place where landlords, power plant operators, private entrepreneurs all would have incentives to design in and rehab apartments so that the monthly electricity bills would go down, cutting pollution and actually cutting the amount they would pay.

The other comment I have is that I believe Mr. Mullen said Millie was an elderly woman and the reality of the pollution problem from power plants today is that the elderly are most at risk from premature mortality due to today's air pollution. You saw the maps we put up and Cleveland is in one of the hottest spots in the country for that kind of mortality.

We have to figure out a way where we can have a healthy life and affordable electricity and we think your bill will allow us to accomplish that.

Senator JEFFORDS. I am going to limit the members to 5 minutes so everyone can get a chance.

Senator SMITH. If each of you could comment quickly and briefly, since I only have 5 minutes.

Mr. Page, I notice you kind of nodding not affirmatively on Mr. Hawkins' comments about your timeline on reduction. Do you want to make a 30 second response to that?

Mr. PAGE. I appreciate that opportunity. I would like to make it very clear that Transalta Corporation is not in support of the current government's policy on Kyoto but we are faced with that and provincial regulations pressure which is forcing us to act.

My main point here is the issue of the timeframe. As I emphasized earlier, our clean coal technology and parallel sequestration systems will not be in place for the first Kyoto period, 2008 to 2012 as they would not be in place for this bill.

I think it is very important and wanted to make sure there was no misunderstanding that our company was supporting the Kyoto timeframe.

Senator SMITH. Mr. Tyndall, how would this legislation if it were to pass change the level of coal, if you had to move now from a basic dependence upon coal to produce the energy you are producing and having to go to natural gas or some other technique under this bill, how would that affect your company in terms of the infrastructure and the dollars?

Mr. TYNDALL. The macro numbers are that coal production or coal generation would fall 50 percent, natural gas generation would climb and natural gas production would need to double. The impact of that I think has been described both in terms of prices and utility natural gas purchases out competing industrial users and others and essentially forcing them out of the market.

In terms of looking at it from our point of view, we have 37 coal fired units. We have tried to figure out in a timeframe really so short as to defy belief that there is much we can do, we would be forced to essentially be saying which industry do we want to try to throw controls on and which units do we want to try to switch to natural gas.

The costs are roughly about the same in terms of the amount of money we would be out to try and do either. I think it is important to note that this birthday provision which kicks in right at the beginning of the program as well would require us to repermit every single one of our power plants subject to it which means we have to start all over in terms of trying to go through a very elaborate public process. You wouldn't even know what reductions, just what targets you are supposed to hit until you went through this multi-year process.

It is very difficult for me to answer your question in a more specific way because the bill as it appears to someone trying to run a utility business is utterly infeasible. I don't know how to put it any other way.

Senator SMITH. You heard the debate here in the beginning about the essential agreement on three pollutants and a dramatic disagreement on the fourth, with a lot of testimony about impact on people and so forth. Is it really any different than the situation one would face if a canoe with your four children flipped, you saw it all happen and you may a choice, you go out and save as many as you can as quickly as you can or you let them all drown because you may not be able to save them all.

The bottom line is, if you had no other choice, if the choice facing you is no bill and no reductions in anything or a bill that goes NOx, SOx and mercury reductions without carbon, would that be acceptable to you? I'm not asking you to comment on the politics of it, just on the results.

Mr. HAWKINS. I think the Administration proposal is like teaching three of your children to swim and ignoring the fourth.

Senator SMITH. Interesting point but you didn't answer my question. You are willing to let them all drown because you can't save all four?

Mr. HAWKINS. That is not the choice this committee or this Senate has.

Senator SMITH. I agree. It is not the choice the Senate has, the Senate can do it either way. The Senate can do three things, nothing, pass a four-pollutant bill, or pass a three-pollutant bill or something in between. The point is the numbers are not there.

I am not saying we should ignore the debate on carbon. I am saying we know we can get three pollutants passed through and gone and begin that process while we have the debate on carbon. Why not do that?

Mr. HAWKINS. We are going to do our best to try to persuade you and other members of the Senate that the four-pollutant approach is the appropriate one. We are confident that you and others will listen to the reasonable arguments. We think they are very strong arguments. Given the opportunity, we are confident you will see this is the right solution for the American public.

Senator SMITH. I would rather have that debate while the three children are safely on shore but we will move on.

Senator JEFFORDS. Senator Lieberman?

Senator LIEBERMAN. I cannot resist getting into this metaphorical contest.

I think the metaphor here is if there four different people pumping toxic material into the air around your house, would you try to stop only three of them or all four. I think you obviously would try to stop all four because all four were hurting your family and your kids.

Senator SMITH. If you could only stop three, would you stop them?

Senator LIEBERMAN. Yes, that is the basic premise. The premise of the Clean Power Act, which I am privileged to co-sponsor with the Chairman, Senator Jeffords, is that we can stop all four. I think if we get together here, we can.

It is well known that the President had earlier support of the four-pollutant bill, changed his position. I hope we can get the Administration to look again at this because the facts are so clear. Of course the other three pollutants have toxic effects. In the last month, two reports from the Administration have come out which argue powerfully for a four-pollutant bill. The first, EPA's study of health care risk from air toxins concluded that two-thirds of Americans living in nearly every part of the country are subjected to an increased risk of cancer from air pollutants. The second study more recently as part of our obligations internationally is a study on climate change and made a powerful case that the planet is warming.

I just want to give a sense of what motivates Senator Jeffords and I and others that we are not acting precipitously here. I had come across my desk a 1979 document for the National Academy of Sciences produced at the request of President Carter. The document says, "When it is assumed that the CO_2 content of the atmosphere has doubled, the more realistic of the modeling efforts predict a global surface warming of between 2 degrees and 3.5 degrees with greater increases at higher altitudes." That is eerily similar to this month's national communication which suggests the warming of 2.5 degrees to 4 degrees.

In one sense, we have known about the problem for at least 23 years, so I don't think you and I and others are being rash or jumping ahead sooner than we should. We are right to be stubborn about this but we are not stubborn on the details. I think we are happy to enter into negotiations. If folks are opposed to it, we will enter negotiations which lead us to a four-pollutant bill. Shame on us if 50, 100 or 200 years from now our kids or grandkids are living on a planet that is much less hospitable than ours is now and they ask, how could they have let this happen. That is what this is all about.

I want to ask Mr. Tyndall a question in that regard. A year ago May, Jim Rogers, the CEO of Cinergy testified on this question. He stated in a subcommittee of this committee, "My company seeks comprehensive multi-emission power plant legislation because we want long term clarity and certainty built into our environmental compliance planning process. Without some sense of what our carbon commitment might be over the next 10, 15 or 20 years, how can I or any other utility CEO think that we have the complete picture of what major requirements our plants may face."

Mr. Tyndall, I know you don't support the speed of reduction proposed in the Clean Power Act, but I wanted to ask whether, only with regard to Cinergy and not the Institute, does your company still support legislation that would give you a sense of what your carbon commitment might be over the next 10, 15 or 20 years?

Mr. TYNDALL. I am laughing because when you read a quote from my boss, I had better say I agree with that quote 100 percent. Second of all, you relieved a lot of peoples' nerves when you said I could answer on behalf of Cinergy and not EEI.

Senator LIEBERMAN. Feel free to answer on behalf of EEI if you like.

[Laughter.]

Mr. TYNDALL. Maybe it would spare me from ever having to testify again.

Cinergy is looking for certainty and it is absolutely fair to say that part of understanding what investments you want to make on NOx, SOx and mercury is understanding what is going to happen on carbon. I would also say that Transalta has put on the table a very strong example of what they are willing to do on a voluntary basis.

We joined EPA's climate leaders group earlier this year. We are in discussions along with a number of other companies around a proposal called the Chicago Climate Exchange which would have us managing our emissions at current levels and then decreasing 1 percent per year in a voluntary group.

I think the utility industry in general and Cinergy specifically, is looking at the carbon issue and trying to figure out how do we work this in.

I have to say there is sort of a hard way to do this and an easy way. If we could look at timeframes, if we could look at things like there is at least some evidence suggesting that black soot, that ozone reductions have a positive impact on carbon and the fact that my utility is spending $800 million right now putting on NOx controls which will reduce ozone which will have a positive impact on the climate situation according to the latest research, if we could look at what the utilities are doing voluntarily and trying to build a provision that works with all the capital demands, then I think there would be acceptance by Cinergy and others of it.

That is the reality from our business point of view. How that plays out in terms of your politics, the Senators of the committee are the ones that are going to have to decide that. If you look at the votes earlier this year, it is hard to get optimistic that we are going to get anything if we hold out for resolving the Kyoto issue in this bill.

Senator LIEBERMAN. My time is up. Thank you for the answer.

I would say finally the chairman is going to move to mark up on the bill. In a sense the train is moving out of the station but we need some of you, and the Institute is a perfect partner if you will, to come forward, sit and talk with us about how to do this right, so if I can complete this particular metaphor, there is a light at the end of this tunnel.

Thank you for your answer. Mr. Rogers is not the only utility executive that has said that to me, the value of certainty, so I think we can combine the two if we can start talking to one another.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. I would like to comment that if we look at the differences of opinion of the witnesses that have appeared before you, we would be here next year or maybe the year after and nothing will have been done to reduce the emissions that so many of us are concerned about.

Mr. Page, you are here as a witness for this legislation but you have also talked about you don't agree with the Kyoto provisions of the Canadian Government and some of the regulations, that you need some time to get on with what you want to do and you want to do it, most of the people here at this table want to go on and do some things. The issue is how do you deal with the carbon issue. Senator Lieberman made reference to that.

We discussed the carbon issue during the energy bill and came up with little compromise about voluntary filing of impact if within 5 years more than 60 percent did not voluntarily do it to make it mandatory, give companies credit for the work they do to reduce carbon. It seems there is a disconnect.

I met with a gentleman from the Park Service. I met with the Adirondack Council and they want to move forward with the Schumer-Clinton bill that says let us do NOx and SOx and do something mercury and we don't want to see this thing all delayed by carbon because we want to do something about our lakes and streams and deal with some of the problems you are talking about.

There just doesn't seem to be a reasonable kind of attitude that exists here at the table. Mr. Hawkins you talk about your concern about these issues and made reference to Mr. Mullen. You talk easily about you are going to have incentives for people to build new housing for poor people.

Mr. Mullen, I would like you to comment on how difficult it is to get anybody to do anything for poor people in terms of housing. It seems that some of the people in the environmental world don't understand the realities of some of how this impacts on human beings and the economy. Do we want to see the gas industry—Mr. Hughes you represent natural gas. When we had an uptake of natural gas prices 2 years, we almost put the chemical business out of business in the United States of America. It increased the cost of fertilizer.

In Mr. Mullen's community, tell us how much did the rates go up for the poor people in Cleveland? Share that with us.

Mr. MULLEN. In Cleveland particularly for the poor people, I think a key element is if the rate goes up for myself or Senator Voinovich, the percentage of that rate is significantly different than it is for the two people I cited, Millie or the 27 year old mom with two little children based on income.

We know with the people who have come to us, we have an information referral system and I alluded that it has increased in the last 18 months on emergency needs by 200 percent, that has increased for them twofold relevant to their income. So it is a substantial increase. There is no question.

Senator VOINOVICH. The other side of this is that the impact on the economy of a State like Ohio is devastating in terms of our manufacturing. These are people with good jobs but if we get legislation that forces fuel switching to natural gas, it will have a dramatic negative impact on the economy of a place like the State of Ohio.

The issue is how do we deal with reconciling trying to bring down our emissions and at the same time don't kill the goose that laid the golden egg. How do we take care of Mr. Hawkins' concerns. You made a good point about the health of elderly but at the same time you have the other side of the coin, how are they able to buy food and clothing if they see what they saw 2 years ago when their energy costs went up.

There has to be some place in here that we can figure out how some compromise can be derived to move forward. I think to go forward with 556, it is not going to happen. So all these people in this room, all the people in America who want to see emissions go down and people are concerned about reasonable energy costs and the jobs that would be impacted, somehow want us to get together and figure out how we get this done.

The issue is how can you at this table reconcile some of the differences you have so that we can move forward with these issues. That is the real question here.

Senator JEFFORDS. Mr. Tyndall, by how much does EEI think the price of electricity will increase by 2010 assuming there is no action on multi-pollution legislation?

Mr. TYNDALL. I don't know. I am not aware of any research that EEI has done on that but I would say that I don't subscribe to the school of thought that a lot is going to happen at EPA on these issues if we don't do anything with this committee with this bill.

I strongly believe that the history of this Act, the history of the sources, the various regulatory programs we are working with will keep chugging along but the results will be disappointing for everyone.

The existence of 556 is evidence that the environmental community has long viewed the reality that trying to resolve all these issues using the piecemeal provisions of the Clean Air Act isn't going to work in the near term. We can get into all sorts of debates about what different scenarios EPA looked at and compared but I can tell you when I was working for the House, I had a briefing by EPA under the Clinton Administration and they showed implementation of the fine particle standard continuing well into the teens of the next decade. I went to a Clean Air Advisory Committee last week and I saw a similar chart.

The Clean Air Act allows 12 years from when an area is designated nonattainment before it runs out of extensions and has to be finally in attainment. The 12 years hasn't even started running on the fine particle standard. So if this committee does nothing, if the Congress does nothing, I don't know what expenses we will incur by 2010, I don't know what kind of controls we will have to put on by 2010, but I think there is a pretty good chance that we will still all be debating these issues.

Senator JEFFORDS. Mr. Barger, you indicated the Tennessee Valley Authority emitted 300,000 tons of sulfur dioxide above the Phase II allocation last year. That is unfortunate particularly for a Federal agency that should be a model of environmental leadership and because it affects the Smoky Mountains, what do you think about the Administration's claim that NSR and other similar local air quality programs can be exchanged for emissions caps?

Mr. BARGER. The use of a cap-and-trade system by itself will not protect Class I areas and this is really a very good example. TVA made decisions strictly on a business sense to reduce the larger plants which are further away from the Great Smoky Mountains National Park as a Class I area. All of the east Tennessee plants actually increased their SO_2 output during that same period of time, making the haze situation, the visibility problem in the Great Smoky Mountains. During the decade of the 1990's when we were implementing Title IV, there was no improvement in visibility at Great Smoky Mountains National Park, in spite of the fact that emissions were being reduced nationwide.

Without those effect based standards that allow you to find out what the effect of a particular proposal is going to be on a Class I area, there is no way to protect them.

Senator JEFFORDS. Mr. Hughes, you indicated that my bill puts combined heat and power units in a competitive disadvantaged position of needing to buy credits. I don't think that is quite right since there is no specific overall allocation scheme in the bill right now.

Rather than doing what you suggested, it seems fair to me to reward cleaner, more efficient generators with more allowance of credits rather than less. Do you disagree?

Mr. HUGHES. I think rewarding people for performance is a beneficial direction to have gone, combined heat and power because of the nature of getting two values for the price of the energy you put into the system is inherently better from that overall approach but we feel rather than having those because of their inherent clean nature to begin with already included in the bill because of the megawatt cutoff and the fact they might sell from time to time materials to the grid would draw them into some potential offsetting in credits that if they choose not to get into that business, fine, but they ought to have an option if they want or if it is beneficial for them to be able to get in. It was just the issue of potentially mandatorily bringing them into the purview of the Act from that perspective that we were referring to.

Senator JEFFORDS. Mr. Methier, do you believe there is any level of emissions cap that obviates the need for NSR as Mr. Holmsted has suggested?

Mr. METHIER. No, we disagree. We believe that the stricter the cap, the better so that we can rely on those broad regional reductions. In the end, as Mr. Barger pointed out, NSR plays an important role. There are always the cases in urban areas or Class I areas where when major new sources are constructed, we need to look at those potential adverse impacts on either public health or visibility or other welfare issues. Major modifications at existing sources can have the same impacts. So we do not think that would be a good tradeoff.

Senator JEFFORDS. Senator Smith?

Senator SMITH. Mr. Page, in your written testimony, I pulled out the second paragraph from the bottom of page five for your reference. You say, "One response to a CO_2 cap could be repowering of coal units with natural gas. This approach has major problems. Existing supplies of low cost natural gas are constrained," and then you talk about the price volatility which could occur with that because there are better uses for natural gases than fuel for electricity generation.

Then you say, "Alberta has a 900 year supply of coal versus a 10 year supply of light conventional crude or a 20 year supply of natural gas. This comparison highlights the importance of investing in clean coal technology and not rely on natural gas repowering."

Will the timeframes in this bill allow clean coal technology to advance so that we can use those reserves?

Mr. PAGE. We could not use the new technology in the timeframe of 2007 or 2010. We are looking at a pilot retrofit in 2007, a greenfield plant in 2010, and an application of that technology in 2012 and beyond. So it is critical from our point of view in terms of the timing that in fact we have this leeway.

It is also critical in terms of emissions trading and credits and other things that the financial resources are available for us to make this heavy investment over a period of time when the results are only going to be coming in 10 years from now in terms of the actual emission cuts in our existing plants.

It is a complicated measure but it would not meet the timeframe for this bill which I believe was your original question.

Senator SMITH. So you do not support the mandatory controls in this bill?

Mr. PAGE. I do not.

Senator SMITH. We also have, which is pretty obvious, some major national security concerns right now. My concern here in the United States is if we have the fuel switching—I don't have anything against natural gas, I think it is a great product, but if we have the fuel switching that S. 556 calls for, how in the world, using Canada's example of 900 to 10 in terms of years, I don't know what it is in the United States, if somebody knows, please say it, but how are we going to be able to provide the natural gas that would be required for a fuel switching of the magnitude called for in this bill? Mr. Tyndall or Mr. Hughes?

Mr. HUGHES. This is a major concern as to infrastructure in this country to be able to handle the transmission, to be able to handle the receipt of potentially these materials needing to come in from offshore if we don't have enough adequate supplies within our own country to be able to move it. That goes to the timing issue of the bill. Not only do we not need to go through and potentially put controls on operations but also rebuilding infrastructure to change how we move those fuels to the various power plants and then the ports getting them capable to move LP gas into unloading situations which from a national security issue one might wonder about. That whole issue will play heavily on the timing needs as well.

Senator SMITH. Let me correct myself because I mentioned in the opening statement we had approximately, depending on whose estimates you use, 450 or 460 years of coal and the estimates are about 65 years of natural gas in the United States. Obviously if you look at that diversification, the fuel mix on that chart, looking at coal at 24 and natural gas to 48 under S. 556, we are looking at putting a lot of pressure on our own natural gas that we don't have to and where are we going to get it if we don't have it? That 65 years is going to diminish quickly. It is not going to be 65 years if we go under diversification of this legislation, correct?

Mr. HUGHES. That is correct.

Senator SMITH. Therefore, where are we going to get it? I think the answer is pretty obvious where we have to get it and that is why I think we have to look realistically at this. It is an environmental issue but it is also an economic issue and maybe a survival issue in more ways than just environmental.

I think we have to have balance here and to use this kind of logic and say we are going to squeeze out a resource that has 460 years of availability, assuming the technology advances and is going to do a lot of advancing in 400 years, why would we want to pass legislation that would make us dependent on foreign oil or natural gas and use up the 65 years of reserves in 25 years if we continue along that kind of schedule.

I am very, very concerned about this and I am hopeful that we can get some compromise.

Mr. HAWKINS. It is important to understand what the Energy Administration says is going to happen under status quo. The EIA is forecasting under business as usual between now and 2020 that there is going to be some 300,000 megawatts of new power plant capacity to be built; 90 percent of that is natural gas. The market is not looking to coal for new power generation today in the United States because of uncertainty. The 10 percent that the EIA modelers predict is going to be coal, most of the market analysts don't think is going to happen either.

This uncertainty is not promoting fuel diversity. It is promoting just doing what happens to be the cheapest in the short term interests of individual decisionmakers but is not in the long term interest of the United States. Today, it is technically feasible to build modern coal-fired capacity using gasification technology in a couple of States away in Delaware. There is a refinery operating a gasification technology that is using petroleum coke, just as hard a fuel to manage as coal, selling electricity into the grid but you won't find electric companies installing that because the logic of the market doesn't make sense unless you have a price for carbon and you won't have a price for carbon if you can dump it for free.

Senator SMITH. You are correct on the certainty issue but we don't have certainty largely due to the fact that we need to do something here. Clear Skies or a compromise between Senator Jeffords and Clear Skies will give the market that certainty, will give enough certainty to be able to move toward more diversity in terms of coal and less dependence upon other fuels.

Mr. HAWKINS. If I could only say adopting a three-pollutant bill will not provide certainty. It will leave a huge shoe, the carbon shoe, hanging in the air ready to drop.

Senator SMITH. I am not advocating leaving a carbon shoe hanging in the air; I am advocating moving now to move forward to get something done and then deal with the fourth issue.

Senator JEFFORDS. Senator Voinovich?

Senator VOINOVICH. In response to Senator Jeffords, you stated the States support controls on all facilities. I want to make clear, do you support the birthday provision as contained in the Jeffords bill which will require 80 percent of all of the coal units to upgrade within 5 years?

Mr. METHIER. Our associations have not been specific on when that would happen. We had considerable debate on this, whether or not we need that certainty, whether or not we need to allow the timing like the Administration's bill and at the end of that time, whether or not we should require some eventual minimum level of control.

What we need as air regulators is some certainty that either at certain points of time whether it is based on the age of the plant or the compliance deadline schedule that we come up with, we have a minimum level of control at every plant so that we can get the local air quality benefits that we need in addition to the broad regional effects.

Senator VOINOVICH. You talked about both new and existing plants continuing to be subject to NSR requirements. I suspect you are supportive of coming out with a clear statement on NSR from the Administration? Do you think that is important right now? We are looking for some new regulations to come out from the Administration. Is your organization anxious for those to come out?

Mr. METHIER. We are anxious to see what is proposed. We have been actively engaged in these issues for many, many years. We have testified in many forums and would be happy to supply that information. We do believe reform of new source review is required, there does need to be some more clarity and flexibility for major existing sources. We would like to see what is being proposed and would be ready to comment on that at the time.

Senator VOINOVICH. I understand that under the previous Administration, STAPPA endorsed many of the NSR reforms contemplated by the Clinton Administration, including the so-called off-ramp provisions for the utility industry. This off-ramp would have provided the utilities with a lot of flexibility. Do you still support providing the utilities with that NSR flexibility?

Mr. METHIER. We believe particularly for the existing plants, the existing units, that some more clarity and flexibility is warranted. We believe that for new sources, speaking for my State, Georgia, we had plenty of new power plants, plenty of new generation built and new source review requirements don't slow that down.

For the existing units, if there can be some way to get controls, the best time to control is at the time those modifications are made. If some period of time after that can be provided to allow certainty for other changes within that structure, we are on record supporting that.

Senator VOINOVICH. Would any of the witnesses want to comment on the issue of the uncertainty of NSR and the effect it is having on the utilities and other industries in this country in terms of going forward with reducing their emissions?

Mr. HAWKINS. As you know from previous testimony I have given to this committee, this issue of uncertainty under NSR really misses the basic point which is that if you are an electricity generating company and have a project, if that project increases emissions and you do not do something to keep your emissions at their current levels, then you have to worry about new source review.

If you have a project it doesn't matter what that project is, short of building an entirely new boiler, if you have a project that does not increase emissions over your current levels, you don't have to worry about NSR. So the whole issue is not about uncertainty of NSR, it is about whether the individual plants want the freedom to increase local pollution without having to do something about that. If they agree to keep their pollution at current levels, they have no NSR uncertainty whatsoever.

Mr. TYNDALL. We agree with that completely, so long as Mr. Hawkins understands if a tube is leaking or there are several different tubes leaking, so you replace them and now they can put through more steam, that is not changing the capacity of the power plant.

Of course none of this is agreed to. You can only replace the miles and miles and miles and miles of equipment that handle water and steam through a power plant, you can only replace eight feet at a time or whether you can only replace a mile at a time or the level where you are just doing repairs before you get to some magic line where you are doing something different because the issue of whether these units are increasing emissions isn't driving EPA's current interpretation. It is issues like were you down two more days, were you off line 2 days last year and now you are not going to be off line.

Senator VOINOVICH. The real question I have is this. From what I understand in terms of many of the industries, chemical and other industries including utilities, as far as their moving forward with replacement or modernization or whatever it is, they are in limbo right now because of the uncertainty in terms of new source review. Is that the case or not?

Mr. TYNDALL. There is not a clear line. It is easy for David to say here is the clear line, it is a very simple thing. That means day to day, someone having to make decisions about what they can and cannot do at a power plant or at a factory which is something where you get two different sets of lawyers and you all sit around and try and figure it out. It has been that way for 10 years.

Senator VOINOVICH. Mr. Hughes?

Mr. HUGHES. From our particular perspective, the issue deals with the usage of actual to potential emissions. If for a period of time you have had an economic down turn and have sat there a couple of years and run your plant at 60 or 70 percent of capacity, the market and economy are now beginning to take off, you understand you now want to run your plant back to its original capacity, you want to go in and make improvements to that plant and the improvements aren't needed to get you back to capacity but because of the current usage of actual potential, making those improvements may pull you into a lot of additional controls and timing that cause you some difficulty. That is our issue that is on the table that hopefully will be addressed when the new programs come forward.

Senator VOINOVICH. Many industries are in limbo in terms of whether they are going forward or not because they want these issues clarified as to whether or not they are going to be subject to new source review permits.

Senator JEFFORDS. I want to thank you all but I am not going to necessarily end it. If any of you are sitting there with why didn't they ask me this because I have the answer to all your problems, I'll give each of you 30 seconds. Mr. Page?

Mr. PAGE. We didn't get to talk about the incredible importance to many of us in industry of an effective open liquid emissions trading system. That is a key component in financing our technology renewal and capital stock renewal. Also it is a means whereby the United States can begin to reach out to the developing world and through investment show leadership in terms of climate change. We are involved in Latin America and Africa and Asia right now in terms of some of this. I think that is a win-win situation in terms of no hard currency transfer in many cases with these projects from the developing country.

Clear verification of the environmental benefits is essential and at the same time, helping us to give more flexibility in terms of managing CO_2 here in North America and CO_2 being a global phenomenon, I really believe requires a global solution through emissions trading, not just individual national systems.

Senator JEFFORDS. Thank you. Anyone else?

Mr. METHIER. Following up on the new source review issue, there is uncertainty. We spend a lot of time with people coming in wanting to know what are the rules, what can we do. We don't see things not happening but it is taking longer to work through the process. That is why we say new source review shouldn't be discarded. It does need to be fixed in some places but we do see investments being made, progress being made and businesses are moving forward but it is more difficult than it may need to be.

Senator JEFFORDS. Mr. Hawkins?

Mr. HAWKINS. The committee may have been left with the impression that the only way to get some emissions reductions from today is to enact legislation. We favor comprehensive legislation, let me be clear, but let me also be clear that the Administration today has very broad authority to move forward and the State and local agencies have indicated a willingness to move forward on abating these emissions.

Mr. Tyndall talked about the Clean Air Act allowing up to 12 years to meet the fine particle standard. That is correct, but it is only partly correct. The Clean Air Act requires that the standards be met as quickly as possible. It would be possible today to designate areas as violating these standards, it would be possible for State agencies with EPA support to begin developing regulations today to dramatically cut the fine particle precursor pollution.

I would predict if it doesn't start within a few months, you will see States and maybe environmental organizations using the courts to basically say it is time to get moving because the Clean Air Act requires action and you haven't taken that action.

We can get benefits very quickly under the Clean Air Act if we have leadership from the Administration and if we have the cooperation of the States, and if we have the cooperation of the industry. Since all the panelists today have indicated a willingness to get those kind of environmental benefits, I would hope we could get that cooperation.

Senator JEFFORDS. Mr. Hughes?

Mr. HUGHES. I think the one commonality I heard today was a strong support for making sure we do have clean air. The turn seems to be on how far, how fast we can move without causing disruption in other sectors. I look at this as kind of a 3E issue. We have energy, the environment and the economy. If we are not sure we are balancing those three, we can put ourselves on a very unsound base.

I also thought about when Senator Chafee referred to the train that was now heading toward the bridge and something needed to be done. One needs to judge also how far down the track the bridge is and how fast do I now need to apply the brake because maybe there is some time on some of these issues, not a lot of time but some time that we can deal with rather than all of a sudden applying full brakes and have potential for a derailment.

Senator JEFFORDS. Mr. Tyndall?

Mr. TYNDALL. I agree completely with what David said. As he knows and he has lived it, these programs do take a lot longer than we want to run through the process. They all end up with everybody in court because that is what inevitably happens because that is where we are.

We have proven with the acid rain program if we have a simple set of statutory targets, and give the industry workable lead time to hit them, we can do it and stay out of court and get the job done.

There is also an opportunity here for the committee I really think is going to disappear in a very short time because we are sort of at the beginning of a lot of regulatory battles that are going to start. One is going to be what the Administration is going to do on mercury. Once that happens, what we do on fine particles, and all the other regulatory things that you don't see a lot but we see day to day, once those things start it is going to be a lot harder for Congress to act.

Right now there is this window before all this gets started, before everybody is in the trenches where we might be able to resolve some of these. That is our hope if we cannot make reasonable progress.

Senator JEFFORDS. Mr. Barger?

Mr. BARGER. I would like to begin to attempt some of the resolution that Senator Voinovich asked for. I find myself in complete agreement with Mr. Mullen that the poor get increasingly squeezed in this society.

I don't believe that the cost of controlling pollution that has been grandfathered for a quarter of a century necessarily has to be passed on directly to those people.

Before I came I also talked to two people. The first was a fellow by the name of Michael O'Donovan, who lives in Pensacola. He has a daughter who is affected by asthma. I asked him how much absent insurance he had to pay per month to take care of her. He said $400.

The second person I talked to was my father, who is 80 years old. At the age of 70 after being an athlete all his life, he came down with exercise induced asthma. My father spends $500 a month taking care of his asthma and he doesn't have insurance that covers those medications.

I would urge there are a lot of other costs we need to look at in relation to what the effects of our actions are going to be. I would have to extend the transportation analogies in relation to CO_2 by saying the boat we are on may be the Titanic and we see this white thing out in the distance and we are pretty sure it is an iceberg. It kind of makes sense to me to go ahead and start turning the wheel now.

Senator JEFFORDS. Mr. Mullen?

Mr. MULLEN. I think there is agreement with everyone and that was referenced in terms of removing pollutants. There is no question about that. I think what is relevant is two other pieces. One is that as much as it is difficult to—as part of my business, this isn't my business, I run another business—but in the business I run, I think there is a great deal of similarity. That is there has to be a concern not only for the certainty I hear you talking about, there needs to be some certainty rather than this uncertainty because that will generate certainty for a lot of others.

Senator when we met with folks in the Cleveland area, one of the things that was most difficult for them is to see double or triple energy cost increases because there was uncertainty.

So from my business or what I do every day, establishing certainties not only in energy costs but in health care, I think it is the same principle. One can only accomplish that candidly through what I hope I'm hearing is some type of compromise and looking at the whole, not the parts.

Senator JEFFORDS. Thank you all.

Before you go, we reserve the right to ask for answers to questions in writing.

This has been extremely helpful to the committee and I can't thank you enough for all the work and effort that went into preparing for our questions and your answers.

Senator VOINOVICH. Mr. Chairman, I would like to ask permission of the committee to insert in the record, the resolution passed by the Ohio General Assembly in regard to 556.

Senator JEFFORDS. Without objection, so ordered.

The meeting is adjourned.

[Whereupon, at 12:05 p.m., the committee was adjourned, to reconvene at the call of the Chair.]

[Additional statements submitted for the record follow:]

STATEMENT OF HON. DENNIS KUCINICH, U.S. REPRESENTATIVE FROM THE STATE OF OHIO

I thank the committee for the opportunity to testify today regarding the Clean Power Act, S. 556.

This legislation today addresses a fundamental issue of ethics and justice, of how our nation should use natural resources, and how our use of them affects each other and our surroundings. For air, like water or food, is a basic human need. It is a work of mercy to give water to a thirsty person, or give food to a hungry person. It is a work of justice to help a person breathe who cannot get air. Do we not praise the heroism of one who would resuscitate a drowned swimmer, or prevent a child from choking? Why not, then, is ensuring that all of us can breathe easily on a day-to-day basis, and not just in an emergency, subject to debate?

In 1967, Pope Paul VI gave an address, Populorum Progressio, On the Development of Peoples. In that address, he said: "Development cannot be limited to mere economic growth. In order to be authentic, it must be complete: integral, that is, it has to promote the good of every man and of the whole man. As an eminent specialist has very rightly and emphatically declared: 'We do not believe in separating the economic from the human, nor development from the civilizations in which it exists. What we hold important is man, each man and each group of men, and we even include the whole of humanity'."

As our country moves forward with greater and greater economic prowess, how can we call this development when it witholds a basic human right from many of our citizens? How can we call this development when it makes families poor from health costs, when it debilitates children from filling their lungs, and when it leads to early deaths among the sick and elderly?

I strongly support the Clean Power Act, as do many of my constituents in the Cleveland area for the sake of their health and their environment.

My constituents have good reason to support it. Unfortunately, the Cleveland area suffers from severe air pollution, and two summers ago, had 39 violations of the smog standard in a period of about 60 days. That means that two-thirds of the time during the summer, when people and children are most likely to be outside, they are breathing air that is dirtier than what EPA believes is safe. As result, summer smog in the Midwest triggers 34,000 emergency room visits, 14,700 hospitalizations, and 1.4 million asthma attacks each year.

At these levels, air pollution can have a life-or-death effect, especially on vulnerable populations. A study reported in the Journal of American the American Medical Association (JAMA) this past March proved the association between day-to-day air pollution and the increase risk of lung cancer, cardiopulmonary death, and other adverse health effects. Children will have life-long health problems as a result of air pollution. It will cause senior citizens to suffer premature deaths.

Health Costs

The Centers for Disease Control estimate that 4.8 million children have asthma nationally. A conservative estimate is, that for every child, about $500 per year is spent on mediations, physician care, and hospital treatment, not including other costs, such as school absenteeism, psychological effects and others. Power plant pollution is responsible for over 6,000 premature deaths per year; more than that from auto deaths due to nonuse of seatbelts.

Health costs are a very real part of the discussion of costs and benefits, because they are so enormous, they are impossible to ignore. The medical community is increasingly reporting on public health implications of polluted air and global climate change. Just last month, the Medical Student Journal of the American Medical Association devoted its entire issue to the topic.

Impact on Energy Sources

Some opponents to the Clean Power Act have made some rather exaggerated claims, such that compliance will mean a massive shift to other fuel sources, and that the compliance costs will be extremely burdensome, especially for low-income families. These opponents are, for the most part, the utility industry. The industry claims that the Clean Power Act and similar legislation mandates a switch away from coal. This is a myth. It does not forbid the use of coal as an energy source. There are number of options for reducing power sector carbon emissions. These include:

- Replacing inefficient coal plants with advanced, highly efficient coal generation.
- Shifting generation from coal to low carbon (natural gas) or no carbon generation (renewable) sources.
- Capture and geologic sequestration of carbon dioxide from fossil power plants.

The fact that there are many options for reducing power sector carbon emissions mean that there is considerable flexibility for meeting a carbon cap, and deep carbon reductions do not require substantial reductions in the use of coal use.

Impact on Energy Costs

The industry also claims that compliance costs will be extraordinary. On the contrary, an October 2001 report by the Department of Energy's Energy Information Administration (EIA) showed that, under scenarios similar to the Clean Power Act, households would actually save money. As time goes on, they would continue to save even more money. Specifically, the average annual household expenditure would be $40 less in 2010, and $200 less by 2020. Nationwide, consumers would save $27 billion on their electric bills in 2010 if the Clean Power Act were enacted, and save $60 billion by 2020.

I think the answer to today's hearing, a weighing of the costs and benefits of multi-pollutant legislation, is overwhelming in favor of benefits. Practically, it will mean more efficient use of resources, lower energy costs over the long term, and improvements in public health. As Member of Congress, I think we are also obligated to consider the principles of this legislation. Without acting in favor of multi-pollutant legislation, we allow injustice to continue where increased energy usage results in a disproportionate burden of suffering and costs on the young, the sick, the elderly, and low-income people who cannot afford to move away from polluted areas or for the health care they desperately need. From a principled perspective, it is the responsible, ethical and just policy to support.

STATEMENT OF RONALD METHIER, CHIEF, AIR PROTECTION BRANCH, GEORGIA ENVIRONMENTAL PROTECTION DIVISION, ON BEHALF OF THE STATE AND TERRITORIAL AIR POLLUTION PROGRAM ADMINISTRATORS (STAPPA) AND THE ASSOCIATION OF LOCAL AIR POLLUTION CONTROL OFFICIALS (ALAPCO)

Good morning, Mr. Chairman and members of the committee. I am Ronald Methier, Chief of the Air Protection Branch of the Georgia Environmental Protection Division. I am testifying today on behalf of STAPPA—the State and Territorial Air Pollution Program Administrators—and ALAPCO—the Association of Local Air Pollution Control Officials. I am a past President and member of the Board of Directors of STAPPA and currently serve as Co-Chair of the STAPPA/ALAPCO Energy Committee. STAPPA and ALAPCO are the national associations of air quality officials in 54 states and territories and over 165 major metropolitan areas across the country. The members of STAPPA and ALAPCO have primary responsibility under the Clean Air Act for implementing our nation's air pollution control laws and regulations and, moreover, for achieving and sustaining clean, healthful air for our citizens. Accordingly, we are pleased to have this opportunity to provide our perspectives regarding the benefits and costs of multi-pollutant legislation.

Over the past three decades, since authorization of the first Federal Clean Air Act, the United States has made significant progress in reducing air pollution, while, at the same time, experiencing strong economic growth. In fact, since 1970, Gross Domestic Product has increased by 158 percent, energy consumption by 45 percent and vehicle miles traveled by 143 percent. Notwithstanding this progress, our nation continues to face substantial public health and environmental problems as a result of emissions into our air.

According to EPA's Latest Findings on National Air Quality: 2000 Status and Trends (September 2001), more than 160 million tons of pollution are still emitted into the air each year. Approximately 121 million people still reside in areas that exceed at least one of the six health-based National Ambient Air Quality Standards, including over 80 million in areas that monitor violations of the new 8-hour ozone standard and 75 million in areas that, based on the most current monitoring data available, violate the new fine particulate matter ($PM_{2.5}$) standard (when monitoring for $PM_{2.5}$ is complete, even more areas may be found to exceed this standard); millions more live in areas where hazardous air pollutants continue to pose a serious and pervasive health threat; and many regions of the country experience significant visibility impairment that obscures our beautiful vistas.

Electric utilities are one of the most significant sources of the harmful air emissions that contribute to all of these problems. Nationally, these sources are responsible for 64 percent of annual sulfur dioxide (SO_2) emissions, which contribute to acid rain and the formation of $PM_{2.5}$. Their emissions also account for 26 percent of oxides of nitrogen (NOx) emissions, which are not only a precursor to ground-level ozone, but also a contributor to such public health and welfare threats as secondary $PM_{2.5}$, acid rain, eutrophication of water bodies and regional haze. Further, it is important to note that in some areas of the country, power plant contributions to SO_2 and NOx levels are considerably higher. In addition, electric utilities are responsible for 37 percent of U.S. carbon dioxide emissions (EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–1998, April 2000).

Add to this list of emissions no less than 67 hazardous air pollutants (HAPs)—including nickel, arsenic and dioxins—which power plants also emit in substantial quantities (EPA's Study of Hazardous Air Pollutant Emissions from Electric Utility Generating Units—Final Report to Congress, 1998). The persistent and bioaccumulative nature of mercury makes it of particular concern relative to aquatic ecosystems, where it can contaminate aquatic life and pose a serious threat to humans who consume the contaminated species. Based on just such a threat, over 40 U.S. states and territories have issued fish consumption advisories for mercury for some or all water bodies in their jurisdictions.

The magnitude of emissions from power plants, and the serious public health and welfare implications these emissions have, make controlling electric utilities a top priority. Fortunately, there are tremendous opportunities for doing so in a very cost-effective manner. Our nation's electricity generation infrastructure is aged, comprised of many 30-, 40- and 50-year-old plants that continue to operate without modern pollution control technology. Among the most important steps Congress can take to address air pollution is to establish a comprehensive national multi-pollutant approach for cleaning up outdated power plants and ensuring that new plants are dramatically cleaner.

STAPPA and ALAPCO endorse the concept of a comprehensive strategy for reducing emissions from electric utilities and, to that end, recently adopted a set of principles upon which we believe a viable multi-pollutant approach should be based. I have attached a copy of these principles to my testimony.

Our associations believe that a multi-pollutant strategy for controlling power plants should address all significant emissions from electric power generation. If properly structured, such an approach can increase and accelerate protection of public health and the environment, reduce pollution more cost-effectively than incremental approaches and offer greater certainty to both industry and regulators.

STAPPA and ALAPCO call for this integrated approach to be based on an expeditious schedule that will allow us to reduce emissions as rapidly as we can, and certainly prior to the time that states and localities are required to meet health-based air quality standards. In addition, to ensure steady progress toward the final compliance deadline, interim deadlines should be established, with the first interim compliance requirements taking effect quickly.

Further, a multi-pollutant approach should supplement, not supplant, provisions of the existing Clean Air Act. We believe programs such as New Source Review (NSR), regional haze and Maximum Achievable Control Technology standards for utilities must be retained. I will elaborate a bit more on NSR in a moment.

A viable multi-pollutant approach will also establish the most stringent enforceable national emission reduction goals feasible by capping emissions at levels that reflect the installation of technology no less stringent than best available controls on all existing units nationwide, with existing power plants required to meet a minimum level of control by the final compliance deadline.

STAPPA and ALAPCO further believe that in meeting these emission goals, the regulated community should be afforded flexibility, including an emissions trading mechanism with appropriate limitations and protections against any adverse health or environmental impacts. If emissions allowances are required under a multi-pollutant approach, then they should be allocated equitably, and provisions for allocating to new sources should be established. Additionally, sources should be encouraged to reduce emissions as soon as possible and, to the extent early reduction credits are provided for, the use of such credits should be appropriately limited.

On the matter of NSR, as I just mentioned, STAPPA and ALAPCO believe firmly that power plants—both new and existing—must continue to be subject to NSR requirements. Over the past 8 years, our associations have been actively engaged on the issue of NSR and NSR reform and have a lengthy and very detailed record of comments in this regard. In our recently adopted multi-pollutant principles for power plants, we address the topic of NSR for power plants in particular.

Specifically, STAPPA and ALAPCO believe that current NSR requirements for new sources should remain intact, including, among others, those related to the installation of control technology (i.e., the state-of-the-art Lowest Achievable Emission Rate in nonattainment areas and Best Available Control Technology in attainment areas), the acquisition of offsets in nonattainment areas and the protection of air quality increments to guard against adverse local air quality impacts in attainment areas. Further, while certain NSR reforms for existing sources are definitely in order, such sources making major modifications to existing units should be required to install the best available controls on affected units at the time of the modification, acquire any emissions allowances required to address emission increases and ensure against adverse local health or environmental impacts.

In addition, a multi-pollutant approach to reducing emissions from power generation should strongly encourage the most efficient use of any fuel used as input to electric generation or process energy sources, as well as energy efficiency, energy conservation and renewable electric energy. Further, it should support efforts to develop and deploy consistent approaches for distributed resources to mitigate the impacts of small units not otherwise covered by a national multi-pollutant strategy.

Finally, a viable multi-pollutant strategy will ensure that regions, states and localities retain their authority to adopt and/or implement measures—including local offset requirements—that are more stringent than those of the Federal Government.

As our nation approaches the issue of a multi-pollutant strategy for one of our most significant sources of air emissions, we should do so in a way that institutes an appropriately rigorous emissions reduction scheme on a timely schedule and compels the use of state-of-the-art technology, commensurate not only with the substantial contribution of power plants to our nation's continuing air quality and public health challenges, but also with the level of reductions we will garner from new regulatory programs addressing other big-emitting sources, like passenger cars and heavy-duty diesel engines. Our goal should be to reap every potential benefit that we can so that we are able to ensure both an adequate energy supply and clean, healthful air. Mr. Chairman and members of the committee, STAPPA and ALAPCO look forward to working with you and others as we, collectively, consider alternatives for accomplishing this goal. Once again, on behalf of our associations, thank you for this opportunity to present our views on a multi-pollutant strategy for controlling power plant emissions.

ATTACHMENT

PRINCIPLES FOR A MULTI-POLLUTANT STRATEGY FOR POWER PLANTS

ADOPTED BY THE STATE AND TERRITORIAL AIR POLLUTION PROGRAM ADMINISTRATORS AND THE ASSOCIATION OF LOCAL AIR POLLUTION CONTROL OFFICIALS, MAY 7, 2002

Introduction

Over the past three decades, since authorization of the first Federal Clean Air Act, Federal, state and local governments have made significant progress in reducing air pollution in the United States. In the aggregate, emissions of the six "criteria pollutants" for which health-based National Ambient Air Quality Standards (NAAQS) have been established have been reduced by 29 percent while, at the same time, Gross Domestic Product has increased by 158 percent, energy consumption by 45 percent and vehicle miles traveled by 143 percent. Notwithstanding this progress, our nation continues to face substantial public health and environmental problems as a result of emissions into our air.

According to the U.S. Environmental Protection Agency's (EPA's) Latest Findings on National Air Quality: 2000 Status and Trends (September 2001), the agency's most recent evaluation of our nation's air quality status and trends, more than 160 million tons of pollution are still emitted into the air each year and approximately 121 million people still reside in areas that exceed at least one of the six health-based NAAQS. This report also points to electric utilities as one of the most significant sources of harmful air emissions, responsible for 64 percent of annual sulfur dioxide (SO_2) emissions, which contribute to acid rain and the formation of fine particulate matter ($PM_{2.5}$), and 26 percent of oxides of nitrogen (NOx) emissions, which are not only a precursor to ground-level ozone, but also a contributor to such public health and welfare threats as secondary $PM_{2.5}$, acid rain, eutrophication of water bodies and regional haze. EPA also estimates that electric utilities are responsible for 37 percent of the carbon dioxide (CO_2) emissions released in the United States (Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–1998, April 2000).

Power plants also emit substantial quantities of hazardous air pollutants. EPA's Study of Hazardous Air Pollutant Emissions from Electric Utility Generating Units—Final Report to Congress (1998) concludes that electric utility steam generating units emit 67 hazardous air pollutants (HAPs), including mercury, arsenic, nickel, hydrogen chloride and dioxins. In fact, electric generating units are the major emitter of hydrochloric acid, which is the HAP emitted in the greatest quantity in the U.S. Electric generators are also one of the largest sources of mercury in this country, responsible for more than one-third of anthropogenic mercury emissions. The persistent and bioaccumulative nature of mercury makes it of particular concern relative to aquatic ecosystems, where it can contaminate aquatic life and pose a serious threat to humans who consume the contaminated species. Based on just such a threat, as of July 2000, at least 41 U.S. states and territories had issued fish consumption advisories for mercury for some or all water bodies in their jurisdictions (National Air Quality and Emissions Trends Report, 1999).

Given the significant contribution of power plant emissions to public health and environmental problems in the United States, the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) believe that, if properly structured, a comprehensive, integrated control strategy for electric utilities is an appropriate approach that will offer multiple important benefits.

First, such a multi-faceted approach for power plants will provide an excellent opportunity to address multiple pollutants in an integrated and holistic manner, thus increasing and accelerating environmental and public health protection by yielding far greater environmental gains than those achieved by the various existing programs to which power plants are subject. Such an approach will also enhance opportunities for pollution prevention and sustainability, as well as promote more expeditious compliance.

Second, a comprehensive, integrated approach could offer important advantages to the regulated community in the form of increased certainty and cost efficiencies. Today, the power generation industry is subject to almost a dozen separate programs to reduce air pollution. Many of these programs regulate different pollutants and impose varying compliance deadlines and requirements. An integrated approach could not only provide far greater certainty for the regulated community, it could promote enormous cost efficiencies in developing and implementing control measures for multiple pollutants. For example, EPA has estimated that harmonizing control strategies for NOx, SO_2 and CO_2 in an integrated fashion could save approximately $4 billion, compared to controlling these pollutants separately (EPA presentation to STAPPA/ALAPCO, October 2000).

Finally, a comprehensive, integrated approach could also increase efficiency and certainty for state and local air quality regulators. These efficiencies would extend not only to devising strategies for addressing air pollution control problems from power generators, but also to reviewing and revising operating permits. Further, litigation that could delay emission reductions and environmental improvements would likely be reduced.

Currently, proposals for multi-pollutant strategies for power plants are under consideration in Congress, as well as in a number of states. As discussion ensues regarding these proposals, STAPPA and ALAPCO offer the following principles upon which the associations believe a viable multi-pollutant approach should be based.

STAPPA/ALAPCO Principles for a Multi-Pollutant Strategy for Power Plants

1. Establish an integrated approach for regulating air emissions from electric power plants on an expeditious schedule with synchronized deadlines.
2. Address all significant emissions from electric power generation.
3. Supplement, but do not supplant, the existing Clean Air Act.
4. Cap emissions from power plants to establish the most stringent enforceable national emission reduction goals feasible, and to reflect the installation of technology no less stringent than best available controls on all existing units nationwide, with each existing power plant required to meet a minimum level of control by the final compliance deadline.
5. Equitably allocate any required emissions allowances to all existing sources; include provisions for new sources.
6. Encourage sources to reduce emissions as soon as possible; if early reductions credits are provided, use of such credits should be appropriately limited.
7. Establish interim and final deadlines to ensure steady progress, with the first interim compliance requirements taking effect quickly.
8. Require new units to acquire any required emissions allowances and to comply with existing New Source Review control technology requirements (i.e., Lowest Achievable Emissions Rate in nonattainment areas and Best Available Control Technology in attainment areas), as well as other existing NSR requirements, including, but not limited to, those for offsets in nonattainment areas and for protection of air quality increments to guard against adverse local air quality impacts in attainment areas.
9. Allow existing sources to make major modifications to existing units, provided best available controls are installed on affected units at the time of the modification, the source acquires any required emissions allowances to address emission increases and there are no adverse local health or environmental impacts.
10. Afford the regulated community flexibility in meeting their required emissions reductions, including an emissions trading mechanism with appropriate limitations and protections against any adverse health or environmental impacts.
11. Establish measures that strongly encourage the most efficient use of any fuel used as input to electric generation or process energy sources, including combined heat and power applications.
12. Encourage energy efficiency, energy conservation and renewable electric energy, such as output-based standards and/or allowance allocations.
13. Support efforts to develop consistent approaches for distributed resources and encourage the use of such approaches by jurisdictions interested in regulating the impacts of small units not otherwise covered by a national multi-pollutant strategy.
14. Retain the authority of regions, states and localities to adopt and/or implement measures that are more stringent than those of the Federal Government, including retention of local offset requirements.

RESPONSE BY RONALD METHIER TO ADDITIONAL QUESTION FROM SENATOR JEFFORDS

Question. You mentioned, that "some" NSR reforms for existing sources would be acceptable and you specifically mentioned BACT (or best available control technology). Could you describe what that technology would be for the existing sources, and what kinds of reductions and costs go with it?

Response: In addition to complying with sector-wide emission caps, each existing source should be required to meet performance standards. These performance standards should be based on today's Best Available Control Technology (BACT) levels.

Emission levels on the order of those specified for new units in the recently introduced "Clear Skies Act of 2002" would be appropriate for existing facilities, 'provided they are required on a well-defined expedited schedule. We firmly believe, however, that new units should continue to be subject to existing NSR control technology requirements—including LAER in nonattainment areas and BACT in attainment areas—as well as other existing NSR requirements.

For existing sources the performance standards should reflect the following currently available technologies; the efficiencies noted are typical of well-designed control systems:

- Particulates—baghouse or equivalent (over 99.9 percent)
- Sulfur Dioxide—wet or wet/dry scrubber (over 95 percent)
- Nitrogen Oxides—selective catalytic reduction or equivalent (over 90 percent)
- Mercury—multiple' control technologies, often with carbon injection (75 percent to 95 percent),

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RESPONSE BY RONALD METHIER TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. In your testimony, you suggested that NSR must be retained as part of any multi-pollutant legislation. Is there, however, any provisions in the Clean Air Act that STAPPA would view as unnecessary if the Senate passes a multi-pollutant bill?

Response: STAPPA and ALAPCO have recommended that multi-pollutant legislation supplement, but not supplant, the existing Clean Air Act. With respect to NSR reform, our associations have a lengthy record. While we believe the current NSR program remains appropriate for 'new sources' and certain significant modifications; it is our position that several changes are, in fact, in order for existing sources. A compilation of comments 'reflecting our positions on NSR is attached for your reference.

Question 2. How do you foresee the so-called "birthday" provision being enforced? What are the consequences for regulatory agencies, industry, and citizens?

Response: STAPPA and ALAPCO believe that an age-based trigger for NSR can provide certainty for industry and for continuing environmental improvement. Some in the industry sector have also supported age-based triggers for upgrades to existing major equipment, including age-based upgrades in exchange for less NSR on modifications. While our associations disagree with the long unit lifetime that has been proposed by industry, we believe the concept of an age-based trigger has merit.

Implementation of age-based NSR, and its coordination with other aspects of a multi-pollutant strategy, could be accomplished by allowing a phase-in period for older existing plants already Over a specified useful life (such a concept is included in all the major multi-pollutant proposals currently under consideration); newer units would be on a schedule to be upgraded prior to reaching the specified useful life.

Such an approach provides certainty to industry, regulatory agencies and, most importantly, the local public, in that the timing for upgrades to 'best technology would be clearly known to all. Installation, of an upgrade would then restart the clock for the next upgrade, thus ensuring that air pollution control technology improvement and emission reductions continue into the future.

The use of caps would facilitate the phase-in of reductions from the older existing units already past their specified useful life and compel additional reductions below the performance standards, in the later years. of the phase in. Requirements to periodically evaluate and reduce caps are also appropriate, to reflect emission reductions achieved as the age-based NSR continues to drive advances in air, pollution control technology and lower-emission electricity production. More information on STAPPA and ALAPCO's views in this regard is included in the attached compilation of comments on NSR.

STATEMENT OF ROBERT PAGE, TRANSALTA CORPORATION

Thank you, Mr. Chairman. My name is Robert Page. I am Vice President, Sustainable Development, for TransAlta Corporation, which is headquartered in Calgary, Canada. I have with me Paul Vickers, who heads up our offsets and emissions trading efforts.

We very much appreciate your kind invitation to provide testimony to the committee today. As a Canadian, I feel privileged to share our thoughts on environmental protection with members of the U.S. Senate, a body that we in Canada hold in the highest regard. I am pleased to note that several committee members represent states that are our immediate neighbors, including Montana, Idaho, Ohio, New Hampshire, Vermont and New York.

Who is TransAlta?

Before discussing TransAlta's climate change strategy, some background on our company is in order.

TransAlta is Canada's largest non-regulated electric generation and marketing company, with more than $7 billion in assets and 9,000 megawatts (MW) of generating capacity either in operation or under construction. We recently established a presence in the United States by purchasing a coal-fired power plant in Centralia, Washington. We also have generating units in Mexico and Australia.

Our company has an aggressive growth strategy in North America. We plan to increase our generation capacity to 15,000 MW by 2005 by building or acquiring additional power plants. We therefore favor government policies that accommodate growth in our economy and power supply while protecting the environment.

Our generation mix includes coal, hydro, gas, and wind. In our home province of Alberta, we operate three large coal-fired units and have a 50 percent interest in a fourth. We believe that coal is an essential resource for power generation in North America and are committed to operating coal-fired units on a long-term basis even as we further diversify our generation portfolio.

Environmental stewardship is one of TransAlta's core values. We were recently one of four companies worldwide recognized by the World Business Council for Sustainable Development for voluntary approaches to climate change. We were also chosen in 1998 and 2002 as the top electric utility in Canada for leadership on voluntary greenhouse gas (GHG) reductions. In 2002, we received a national award for the best environmental reporting in Canada and Wall Street again chose us for the Dow Jones Sustainability Index.

Principles in Our Climate Change Strategy

As a company, we accept that climate change is a significant public concern that must be addressed. This means stabilizing and ultimately reducing emissions of CO_2 and other greenhouse gases into the atmosphere. Because society is heading for a carbon-constrained future, our company believes we must seek out cost-effective means to manage carbon in the interests of our shareholders and our customers. We take this responsibility very seriously knowing that TransAlta is currently the second largest single emitter of greenhouse gases in Canada.

Based on this philosophy, TransAlta has developed a Blueprint for Sustainable Thermal Power Generation. Our Blueprint identifies steps that would enable TransAlta to achieve zero net emissions of greenhouse gases in our Canadian operations by 2024. We know that this is a very ambitious goal. Our success in reaching it is not a given but will depend on both the existence of the right government policies and programs and development and application of breakthrough, commercially viable technology that is not in use today.

Our Blueprint envisions two integrated strategies—one for the near- and medium-term and the second for the long-term. Under the first strategy, we will maintain emissions at current levels at existing units and any new units we build or acquire through a combination of offset projects, renewable energy, improved plant efficiency, and emissions trading. Under the second strategy, we will work toward developing and testing new technologies for combustion and for sequestering CO_2 emissions and then deploying these technologies through the normal process of capital stock turnover and renewal.

We are committed to implementing these two strategies through voluntary actions, market mechanisms, and negotiated sectoral agreements. Our company does not support mandatory carbon controls. However, we do believe that government should provide clear market signals for new technology developers and policies and procedures that ensure the orderly development and functioning of emissions trading markets.

Components of Our Program

Two aspects of our program merit special comment.

Offsets and Credits. The first is the importance we attach to offsets and credits in achieving emission reductions. Short of premature plant retirements or costly repowerings, we can only lower emissions at plants using existing technology by improving fuel utilization or replacing equipment to increase efficiency. While we are committed to continuous improvement in plant efficiency, we can expect at best modest gains in emissions performance by this route. Therefore, it becomes important to look outside our system for emission reduction or avoidance measures that we can apply against emissions from our plants. Since CO_2 is not a toxic chemical and its environmental impacts are long-term and global in nature, we believe government policies should officially recognize these "offsets" regardless of where they are generated. Carbon reduction activities conducted anywhere in Canada or the world should receive the same credit since they will achieve the same environmental benefit regardless of location.

One of TransAlta's highest priorities is to create workable mechanisms for generating and trading CO_2 offsets. Since 1996 we have assembled a portfolio of emission reduction projects that will deliver approximately 60 million tonnes of reductions over 25 years. We are currently assessing further additions. The reductions come from a variety of projects undertaken in Canada, the United States and around the world. A major focus has been methane emission reduction since methane is considered to be a very potent greenhouse gas and there are cost-effective reduction opportunities. Projects in this area include landfill and coal mine methane recovery and use and ruminant methane reductions. Other offset projects we have pursued include fuel switching, forests and soils sequestration, and renewable energy generation.

We were also an early pioneer in domestic and international emissions trading and have executed groundbreaking trades with partners in North America, Europe and Japan. Amongst our many trades are transactions in the US with Murphy Oil (El Dorado, Ark.) and Entergy Corp. (Louisiana and Texas).

Technology. I also want to comment on the importance we attach to the design, demonstration, and application of new clean coal combustion systems and the permanent sequestration underground of CO_2 and other emissions.

Our objective is to have a commercial scale retrofit unit in operation by 2007 and a Greenfield facility operational by 2010. Several technologies are being evaluated in development programs: coal gasification and power generation from hydrogen, advanced emission capture technologies and oxy-fuels technologies. Our objective is to reduce the production cost of electricity to levels comparable to today's technologies while dramatically reducing atmospheric emissions of not just CO_2 but conventional pollutants as well. To reach this goal, CO_2, or exhaust gases, would be sequestered underground in oil reservoirs (EOR), deep coal seams (CBM) or in aquifers.

We are exploring these approaches in a number of ways. TransAlta is participating in a Canadian-based program managed by the Clean Power Coalition (see Appendix 1), whose members include coal and power companies, the Canadian Federal and several Provincial Governments as well as EPRI. Since 1997, TransAlta has participated in a number of research and development efforts targeted at developing commercial opportunities for sequestering power plant exhaust and/or CO_2 in underground oil and gas reservoirs. These programs have focused on developing understanding of reservoir characteristics that affect economic application of CO_2 stimulation; developing a ranking of potential reservoir stimulation opportunities; and field testing of injection techniques and reservoir responses. Starting with a one-well trial in 2000, we expanded to a five well program in 2001. In 2002, the program is being further expanded to include a detailed, Province-wide study of CO_2 supply sources, pipelining economics and routing and reservoir stimulation.

While we are hopeful that these technologies will be ready for deployment in the next two decades, we have no assurance that this will occur. The initial results of our work are promising and appear to confirm our commitment but many uncertainties need to be addressed before we can be confident that carbon capture and sequestration techniques can be incorporated in new (or retrofitted) coal plants at a reasonable cost. A concerted effort by government and industry will be essential for the substantial progress that we know will be required.

Lessons from Our Canadian Experience

Generalizing from TransAlta's experience in Canada is risky because our two countries—while sharing a common language and border—have different cultures, laws and political institutions. One obvious difference is that Canada intends to ratify the Kyoto Protocol while the US will not. In all candor, the prospect of Kyoto implementation in Canada has been a major factor in designing TransAlta's carbon management strategies. Clearly, a different set of considerations applies to US-based power producers.

We do believe, however, that we can offer some observations that are useful to this committee as it considers proposals for multi-pollutant legislation:

- Since we need time and capital to develop new technologies, near-term requirements, which cap CO_2 emissions at levels substantially below current emissions, are counterproductive. Our province—Alberta—currently advocates flexible approaches that the Kyoto timeframe (2008–2012) does not allow. We agree with our Provincial Government that pursuing aggressive reductions in this timeframe will punish industry economically by forcing investments in available technology which will quickly become obsolete—and result in stranded costs—when new clean coal technology is available.

- The concept of an integrated multi-pollutant framework—under which targets, incentives, and emissions trading for greenhouse gases are coordinated with government policies for pollutants such as NOx and sulfur dioxide—is one we support. We have seen some piecemeal approaches in Canada which have hindered long term technology development. To avoid this problem, we have begun discussions in Canada about an electricity sector agreement. We are trying to shape this agreement to provide more flexibility on near-term emission reductions in return for the opportunity to develop technologies that achieve more substantial reductions over the long term. Depending on their outcome, these discussions could have useful policy implications for the US.
- As we design programs to reduce emissions of greenhouse gases and conventional pollutants, we need to align our timetables and targets with normal cycles of capital stock turnover and renewal. Premature retirement of assets will reduce return on investment and weaken the financial position of asset owners. This in turn will make it tougher to invest in new plants that use the latest technology. Since the buildup of GHG emissions is a long-term problem and not an immediate threat, allowing existing plants to complete their useful lives without large economic penalties should not be unacceptable environmentally. We would urge this committee to avoid fixed "anniversary" dates (e.g., 30 years) for applying new technology to old plants. The optimal date for plant renewal needs flexibility to adapt to individual plant conditions and to local electricity economics.
- While one response to a CO_2 cap could be repowering of coal units with natural gas, this approach has major problems. Existing supplies of low-cost natural gas are constrained; price volatility is common; and there are better uses for natural gas than as fuel for electricity generation. Moreover, reserves of coal greatly exceed those of natural gas. Alberta has a 900-year supply of coal versus a 10-year supply of light conventional crude or a 20-year supply of natural gas. This comparison highlights the importance of investing in clean coal technology and not relying on natural gas repowering.
- In financing this technology change, government support and incentives for design and demonstration of new technologies are essential. We are strongly advocating government assistance in Canada and would welcome cooperative programs between our two nations. Government funding for new technologies will need to be substantial and sustained. We believe the long term environmental and social benefits of technology renewal will be large. The approach we are recommending would limit economic distortions and job losses for many communities in the coal sector both in Canada and the US and would offer the added benefit of a more secure, North American, supply of energy.
- Equally important for sending the correct market signals is a well-functioning emissions trading market. We feel that access to least cost verifiable offset credits and emission trading is essential during and even after the transition to new technologies. The availability of offsets from outside our system and outside our sector is critical to our ability to stabilize or reduce emissions in the early years without constraining us from increasing generating capacity. As part of any system of offsets and trading, there must be credit for all current and future reduction measures so that early actors receive real recognition and benefits. To preserve our competitive position in light of Kyoto requirements, we in Canada must also have access to cost-effective international credits; we could start with a NAFTA emissions trading scheme that would make credits available from the US and Mexico. A robust, liquid trading market that accommodates cross-border transactions within and ultimately beyond North America will be essential so TransAlta can meet increasingly stringent State and Provincial targets for emission reductions. Knowing that cost-effective trading opportunities exist will set the stage for making commitments to meet these targets under Federal voluntary or covenant-based programs.
- Credible and reliable programs for reporting GHG emissions, recording and verifying measures to reduce, avoid or sequester these emissions, and tracking credit transactions are all critical for effective carbon management strategies. Industry participation in these programs must be broad-based for them to function successfully. We are pleased that the US Senate has responded to this need by creating a comprehensive GHG reporting and registry system in recently enacted energy legislation.
- We recognize the value of integrated sector-based strategies for addressing emissions challenges facing power generators and understand the committee's interest in legislation for the electricity sector (similar to sectoral initiatives underway in Canada). However, we wish to see the timely application of similar policies and

regimes to other industrial sectors, reflecting principles of equitable burden sharing and the need for large, liquid emissions markets.

Because of our Centralia, Washington operations, we are participating in a group of US power producers—Energy for a Clean Air Future—that developed a multi-pollutant proposal last fall for review by Congress and the Administration. Many of the concepts I've discussed in my testimony are reflected in the portion of the ECAF proposal addressing GHG emissions. I'm attaching relevant sections of the ECAF proposal (Appendix III) so they're available to the committee.

In conclusion, I appreciate the committee's consideration of my testimony and welcome any questions.

APPENDIX I

OVERVIEW OF CLEAN POWER COALITION'S (CPC) CLEAN COAL RESEARCH AND DEVELOPMENT PROGRAM

Purpose and Objectives

To develop a proposal for a retrofit of an existing coal fired electricity-generating plant to low or zero emission technology such that a commercial installation could be commissioned no later than 2007. To develop a proposal for a new zero or low emission coal fired electricity-generating plant such that a commercial installation could be commissioned no later than 2010

Funding and Partners

Funding of up to $5,000,000 (Canadian) is in place now. This is sufficient to allow the development of the feasibility study of the alternative technologies under consideration. This phase of the work will be completed 1 year from now (mid summer 2003).

Participants in the CPC to date are:

Nova Scotia Power

- Ontario Power Generation
- Saskatchewan Power
- ATCO Electric
- EPCOR
- TransAlta
- Luscar Coal
- EPRI
- Federal Government (Natural Resources Canada)
- Government of Alberta through the Alberta Energy Research Institute
- Saskatchewan Government (Industry and Resources)
- Nova Scotia Government (Department of Natural Resources)

Technologies and Development Targets

- Coal Gasification
- Syngas production
- CO_2 capture and separation (amine extraction)
- Hydrogen fueled combined cycle power plant integrated with gasification and syngas
- Air separation
- Combined air/oxygen firing steam boilers

Target is to develop a design for a retrofit and a design for a new power plant such that the costs (capital and operating) are within the costs of a conventional pulverized coal steam plant with equivalent air emissions control technologies and CO_2 capture.

The research efforts will be directed at developing dramatic improvements in the following areas:

- Reduction of auxiliary power requirements
- Dramatic improvement in the capacity, reliability and flexibility of amine systems for CO_2 capture
- Elimination of the air separation plant or dramatic reductions in energy consumption
- Improvement of the reliability of the integrated systems to the levels achievable today

APPENDIX II

Brief Biographies

Robert J.D. Page, Vice President, Sustainable Development, TransAlta Corporation Calgary, Alberta, Canada (1997-present); Former Dean, Faculty of Environmental Design, University of Calgary (1990–1997); Currently Adjunct Professor, Environmental Science Chair, Board of Directors, International Emissions Trading Association (Geneva); Chair, Board of Directors, BIOCAP Canada Foundation (National Climate Change Sinks Research Program); Member, Board of Directors, International Institute for Sustainable Development; Member, Business Environmental Leadership Council, Pew Center for Climate Change (Washington DC).

Paul A. Vickers, Director, Offsets and Strategy, Sustainable Development, TransAlta Corporation Calgary, Alberta, Canada (1996-present); Prior to 1996; Shell Canada Ltd; varied assignments in refinery and chemical plant management, business development, research, chemicals marketing and environment and safety; Board of Directors, Emissions Marketing Association (Washington and Milwaukee); Member, Public Advisory Panel of the Vinyl Manufacturers Association of Canada.

APPENDIX III

ECAF FRAMEWORK FOR ADDRESSING THE CLIMATE CHANGE CHALLENGE

ECAF members have given considerable thought to the complex and important issue of global climate change and its relationship to other environmental challenges confronting the power generation sector. ECAF has developed a general framework for addressing the climate issue for power plants. Using this framework as a basis for dialogue, ECAF is committed to working cooperatively with the Administration and Congress to develop responsible approaches to climate change that are compatible with national energy policy and continued economic growth.

Rationale for Addressing Power Plant Emissions of CO_2

Carbon dioxide (CO_2) is a byproduct of the combustion of fossil fuels and is produced and emitted by power plants fired with coal and other hydrocarbon fuels. It is also produced and emitted by many other industrial sources as well as by the transportation sector. These emissions are believed to contribute to the buildup of greenhouse gases (“GHGs”) in the atmosphere and may play a significant role in causing temperature rises and other changes in the global climate. Although many scientific uncertainties remain about the causes and impacts of global warming, there is a growing consensus that precautionary measures should be taken to moderate the rate of greenhouse gas buildup by stabilizing and ultimately reducing CO_2 emissions. On a long-term basis, GHG concentrations in the atmosphere need to be stabilized at a level which prevents unacceptable impacts on global climate.

The prospect of future CO_2 emission controls is a major source of uncertainty for the power generation sector and greatly complicates long-term planning and capital allocation decisions. If stringent CO_2 reduction requirements are imposed at some future date, they could dramatically add to the large expenditures that will be required to control traditional pollutants and Undermine the financial basis for investments that otherwise seem prudent in the current regulatory climate. Accordingly, ECAF members believe that, to comprehensively address the emission challenges facing the industry, a thoughtful, well-defined program for addressing CO_2 emissions by the power sector should be developed in parallel with a sound three-pollutant legislative framework.

Importantly, the power generation sector is only one of several sectors responsible for emissions of CO_2 and other GHGs. Power plants should not bear the entire brunt of GHG mitigation measures. Thus, while initial steps can and should be taken by power producers, these actions need to be integrated into an economy-wide climate change strategy which fairly allocates responsibility for addressing this issue across all sectors.

Goals of a Climate Strategy

As President Bush has emphasized, a multi-generation commitment will be needed to attain the ultimate goal of stabilizing GHG concentrations in the atmosphere. The ECAF’s Climate Change Framework

September, 2001 foundation for this effort will be the development of new technologies that do not exist today. Additional research to better understand the causes and impacts of climate change will also be needed. The President has launched major initiatives to develop carbon-friendly technologies and accelerate climate change research. These initiatives deserve strong support.

In the near-term, a "transitional program" is needed to begin moderating the rate of greenhouse gas buildup in the atmosphere. ECAF agrees with President Bush that the targets and timetables in the Kyoto Protocol are not viable for the U.S. economy and should not form the basis for climate change policy. We do believe that a reasonable goal of U.S. CO_2 programs should be to flatten the rate of emissions growth from the power sector with the goal of stabilizing emissions at a level above the current emissions baseline but below projected emissions under a "business as usual" scenario. This approach would enable the U.S. power sector to take concrete steps down the path toward overall CO_2 emission reductions without erecting barriers to new generation or imposing hardships on producers and consumers.

Principles for Designing a Stabilization Program

Four principles should shape design of a program to stabilize power plant CO_2 emissions:

- Maintaining a level playing field among fuels so that individual fuel types are not disadvantaged and the diversity of the nation's fuel supply is preserved.

Responsibility for CO_2 mitigation measures should be distributed in a manner that does not disadvantage specific types of fuels. A primary energy policy goal is to promote our nation's energy security by obtaining electricity from diverse sources, including gas, coal, nuclear, hydropower and renewables. Because coal-fired power plants emit more CO_2 per unit of energy produced, an approach that establishes uniform CO_2 emission targets across fuel types would significantly penalize coal plants. Fuel-and technology-specific CO_2 emission benchmarks can appropriately ensure further progress in stabilizing greenhouse gas emissions without jeopardizing the nation's energy security or creating an uneven playing field for selecting fuel types for new generation.

- Protecting historic investment in power plant assets while encouraging investment in new generating facilities.

Since emissions growth would be slowed and ultimately halted under a stabilization program, the burden of making needed reductions should be distributed between new and existing power plants on a basis that does not penalize either. This will serve the nation's interest in both maintaining the efficiency of the existing power plant fleet and encouraging new generation to meet future energy needs.

- Taking advantage of the most cost-effective GHG reduction opportunities both within and outside the power plant sector (including on-system and off-system reductions).

Companies can implement a number of carbon mitigation measures within their own systems, including improvements in efficiency, plant retirements or repowerings, and investment in low-emitting power sources (fuel cells, renewables). A wide variety of off-system mitigation measures in the United States and overseas are also recognized as offering verifiable carbon benefits. These include reforestation and other carbon sequestration projects, energy efficiency programs, methane recovery programs and clean development projects. Power producers should have broad opportunities to access these GHG mitigation opportunities whether they involve on-system or off-system mitigation measures.

- Building on the expected path for technological innovation and capital turnover in the energy sector.

Over time, technological innovation and capital turnover in the energy sector will yield important and steadily increasing CO_2 benefits. As plant efficiencies improve, marginal units are shut down or repowered and new technologies are phased-in, the energy sector will transition to power-generation facilities that emit less carbon per unit of electricity output. This ongoing process of capital turnover and technological advancement in the industry should be encouraged, not disrupted. Programs to stabilize CO_2 emissions by power plants should create incentives for companies to invest in on-system or off-system projects with CO_2 mitigation benefits. At the same time, the government should not interfere with market forces or dictate the direction of capital investment in the energy sector.

Key Elements of A Stabilization Program

ECAF believes that a program based on these principles should have the following elements:

- Existing units. The goal should be to stabilize overall CO_2 emissions for existing units at 2000 levels by 2010. ECAF has identified and is reviewing two different ways to assign CO_2 mitigation responsibility to existing plants for purposes of achieving this goal:
- Fuel utilization benchmark. DOE would set fuel-differential benchmarks for each fuel and technology category. These benchmarks could be expressed as differential heat rate targets (in Btu/kwhr), since CO_2 emissions are a direct function

of fuel utilization. Thus, a different heat rate target might be set for combined cycle gas plants and for each of the different types of coal plants (e.g., pulverized coal, fluidized bed coal, IGCC, etc.) The heat rate target would be lower than the current average for that category. The exact level would depend on further analysis of the improvement in heat utilization necessary to maintain emissions from existing plants at 2000 levels by 2010. Our initial view is that the benchmarks would be no greater than 5 percent lower than current average rates. Commencing in 2010, plants that do not meet their applicable benchmarks would be required to mitigate their CO_2 emissions by obtaining GHG credits. These credits would be expressed as CO_2 tons using a formula for converting units of heat utilization to CO_2 emissions. Companies could pool their assets for the purpose of determining compliance with the fuel utilization benchmark. Companies that shut down or repower their plants would receive appropriate credit for these actions.

- Emissions baseline benchmark. Plants would be assigned an annual CO_2 budget based on the average of the highest 3 years from the period 1998–2001 and would thereafter need to maintain emissions at this level or obtain credits. To achieve 2000 levels by 2010, some adjustment in the initial baseline determination may be needed across the board to conform the aggregate plant baselines to national 2000 emission levels. Companies would be able to meet their budgets on a system-wide basis. If they are above budgeted levels, they would need to obtain credits or pay into a greenhouse gas mitigation fund. Again, credit would be provided for plant shutdowns or repowering.

ECAF members are not in a position to endorse either approach at this time. We are also evaluating a "hybrid" approach under which plants/companies would have the option of addressing their CO_2 mitigation responsibilities by electing in advance either the fuel utilization benchmark or the emissions baseline benchmark applicable to their units.

- New units. New units would not be subject to an overall emission target but would need to meet fuel-and technology-specific efficiency benchmarks. Again, separate benchmarks would be set for different classes of generation (coal, gas, etc.) so that no fuel type is penalized. Benchmarks could be tightened over time as technology improves. As with new units, companies not meeting targets would need to obtain credits.
- Credits. Where companies need credits to meet their responsibilities for new or existing units, these credits could be obtained from a variety of on-system and off-system measures (including sinks, methane recovery, efficiency programs, etc.). Emission reductions achieved from these activities in the United States or overseas should give rise to tradable credits. Power companies should have the option to generate these credits through direct investments in mitigation projects or through financial contributions to third-parties (qualified greenhouse gas mitigation funds) that invest in GHG reduction measures.
- Credits for other GHGs. Cost-effective GHG mitigation strategies include efforts to reduce non-CO_2 GHGs, including methane, HFC5, nitrous oxide and others. In part, this increased cost-effectiveness results from the fact that some of the non-CO_2 GHGs have much larger "global warming potentials" than CO_2. This means that pound for pound, these other GHG5 contribute more to global warming than does

For example, a ton of methane has the same global warming potential as 21 tons of GO_2, while a ton of nitrous oxide has the global warming potential of 320 tons of CO_2. As a result, more expensive reductions of these other GHGs can translate into very cost-effective reductions of "tons of carbon equivalent" ("TCE") (the metric into which GHG emissions reductions generally are translated).

- Trading. A program that utilizes credits will only function effectively if creditable emission mitigation measures are marketable assets that have a recognized value among buyers and sellers. Thus, a market for credits will need to be created in which creditable GHG mitigation measures can be bought and sold among energy producers and across industry sectors.
- Dollar-per-ton limit on cost of credits. Since there are major technological and economic uncertainties surrounding any carbon mitigation program, some mechanism is needed for limiting the financial exposure of power generators if the overall costs of stabilization prove unacceptably high. This goal would be accomplished by establishing a dollar/ton limit on the obligations of generators who must obtain credits to meet their responsibilities under the program. Thus, a generator whose average heat rate exceeds the benchmark heat rate or whose emissions exceed the baseline emissions benchmark could offset the resulting excess tons of CO_2 by directly undertaking credit-generating activities, purchasing credits on the open market or making payments to a greenhouse gas investment fund at the specified dollar/ton amount. The greenhouse gas investment fund, which could be publicly or privately

administered, would use these payments to fund cost-effective greenhouse gas reductions.

- New tracking and data-gathering systems. Improved data-gathering and tracking systems will be essential for effective implementation of a stabilization program. These systems will need to obtain reliable and current information on fuel utilization and electricity production so that the responsibilities of new and existing plants can be determined and performance can be verified. In addition, a common emissions tracking system—with safeguards and procedures for quantifying, verifying and reporting emission reductions in the United States and globally—will be required so that emissions progress can be measured and assessed.

Critical Elements for Industry Participation

ECAF would hope that a program with the above elements can be implemented voluntarily. Whatever legal mechanism is chosen, however, effective industry participation will require the following critical protections:

- Safe harbor protection—assurance that no new requirements will be imposed until after the program completion date: necessary for planning certainty and return on capital
- Baseline protection—assurance that reductions made after the baseline year will be fully credited in any future program.
- Credit for early action—assurance that reductions made in the early years of the program can be used in future years.

Programs to Foster Long-term R&D Investments

CO_2 is a necessary by-product of all fossil-fuel combustion—and fossil-fuel combustion remains the safest, most widespread and most cost-effective method of energy production currently available. While increases in generating efficiency can reduce the amount of CO_2 created per unit of energy produced, they cannot eliminate CO_2 emissions using current technology. As a result, significant reductions in CO_2 emissions require either: (1) development of technologies that produce energy without emitting GO_2 or (2) development of methods to "sequester" the CO_2 produced during energy production so that it is not emitted into the atmosphere. While some very promising energy production and carbon sequestration technologies currently are under development, these technologies are not yet cost-effective; indeed, most are not yet ready for commercial deployment. Thus, while efficiency improvements, conservation programs, carbon sequestration projects and plant repowerings, and reductions in other GHGs can all contribute to an emission stabilization program, new technologies are essential for long-term success in reducing CO_2 emissions.

As proposed by President Bush, a comprehensive program doubling the current resources allocated to carbon-related R&D activities should be undertaken to develop clean coal production facilities and other advanced energy production technologies necessary to achieve a long-term reduction in CO_2 emissions and stabilization of CO_2 atmospheric concentrations. This effort would have several components, including: (1) expanding DOE R&D programs such as Vision 21; (2) providing credit for R&D investments by the private sector as part of the CO_2 stabilization program; (3) offering tax benefits for qualifying R&D; and (4) encouraging technology demonstration and technology transfer projects. Federal research funding would be allocated to focus on high risk, breakthrough technologies with the potential to reduce significantly the overall cost of stabilization of GHG concentrations. Public and private sector partnerships would focus on facilitating the rapid commercialization and deployment of promising breakthrough technologies.

RESPONSES OF BOB PAGE TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. When do you think that IGCC for coal will become economic? What would the price of carbon have to be to make it useful?

Response. TransAlta estimates that IGCC technology will be economic by 2007—2010, especially in situations where power plants can be built close to demand for hydrogen and high purity CO_2. This may necessitate a change of traditional thinking about plant siting, where power plants are built close to these byproduct markets and fuel supply is transported to the plants. We estimate that IGCC plants are competitive against natural gas supply at a price of $4.90 US per MMBTU. In our conservative forecast of economic viability by 2007—10, we have not included a value for carbon reductions because of uncertainty about future regulatory regimes. Obviously the ability to claim and monetize carbon reductions would improve the economics—we estimate by about 10 –15 percent.

Question 2. You mentioned that you are actively engaged in trading carbon reductions. From previous testimony before the Committee, it seems that a really robust trading scheme requires some kind of cap or limitation on emissions. Could you comment on that?

Response. TransAlta believes that emission caps are an important component of viable emission trading mechanisms. They provide direction and clarity to industry. We believe the key is to have the caps applied over a broad enough, multi-sectoral industrial base to ensure liquid trading markets. This is particularly relevant in Canada where the industrial base is relatively dispersed. Emission caps do not have to be regulatory in nature in order to function. Voluntary caps can be just as effective given appropriate controls. In Canada we are discussing with governments the concept of a negotiated cap under a covenant mechanism.

Question 3. Would you expect to make any reductions in carbon dioxide emissions from your plants in the U.S. unless there is some kind of price or regulatory pressure?

Response. TransAlta does expect to offer voluntary greenhouse gas reductions from our U.S. plants. We believe that such actions carry intrinsic business value, are consistent with regulatory intent, and being voluntary can be implemented with maximum cost-effectiveness. We are currently working on our U.S. strategy in this regard and will announce it when complete.

Question 4. What are TransAlta's projections for the costs per ton in greenhouse gas offsets the company would need to purchase for TransAlta net emissions to meet your objective of reducing net emissions from your Canadian operations to zero by 2024?

Response. TransAlta projections for greenhouse gas offset prices are similar to those used by Shell, equivalent to $10 U.S. per tonne in 2010. This range was used in the assessment of our 2024 target, with some firming of price after 2010. Russia will play a key role in the determination of the international price.

RESPONSES OF BOB PAGE TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. During your testimony, you briefly discussed the future of carbon control technology. Where do you think carbon control technologies are headed over the next 10 to 20 years?

Response. We believe that clean coal technologies will be viable within the next 10 years, but the form of technology is still not clear. We are participating in a number of technology development project partnerships. We expect that early carbon control technologies may well focus on carbon capture and sequestration for both retrofit and new plants. In the mid-term, coal gasification technologies look most promising, especially when byproduct synergies are realized. Longer-term there appear to be several low-or zero emission technologies that hold promise but are beyond a decade from commercialization. This includes technologies that shift toward hydrogen-based systems.

Question 2. According to our analysis of the three pollutants, mercury is the most expensive, how do you intend to address mercury?

Are you making specific mercury reductions, and if so, what is the level and timeframe?

Response. Mercury is certainly the most expensive pollutant of the three to control on a cost/kg basis, but not in total capital cost. TransAlta believes that mercury should not be controlled separately but as an integral part of NOx, SO_2, CO_2 and particulate emission reductions. Mercury control technology is still in its infancy and more work is required to ensure cost-effective solutions. In Canada we are undertaking a 2-year, industry-wide mercury testing program which will provide data on various plants and coal sources, and will guide the development of Canada Wide Standards for mercury slated for 2005.

Question 3. What is the basic framework of the laws governing air pollution in Canada?

Response. More specifically, can you comment on the strengths and/or weaknesses related to industry certainty and statutory complexity?

There is growing complexity and jurisdictional uncertainty regarding Canadian air quality regulations. Both Federal and provincial regimes are currently under review and the future regulatory requirements are unclear. The Federal/Provincial split in terms of environmental jurisdiction in Canada, coupled with the Provincial regulation of the electricity industry does create significant uncertainty, especially with the regulation of greenhouse gases. There is a greater possibility for conflicting regulatory initiatives and a resultant need for industry to argue for a multi-pollutant approaches. Balancing that uncertainty, we find by contrast to our U.S. operations that in Canada there are significantly fewer regulatory bodies that must be dealt with—generally a single provincial authority and occasionally a Federal agency. We have found that this diversity of U.S. regulatory authorities creates less coordination and more industry uncertainty. Another observed difference between the two countries lies in the Canadian tendency to seek negotiated compliance which leads to greater flexibility and regulatory efficiency, as opposed to a strict legal adversarial approach.

Question 4. During your testimony, you warned the committee to use a "slow integrated approach," regarding any multi-pollutant bill. Can you expand on this premise?

Response. For TransAlta the slow integrated approach will allow us to develop clean coal technology as a real solution. Given the nascent nature of new combustion technology, if we were to apply today's technology it would be a costly and short-term measure, and the technology would soon be obsolete. We also believe that with time it can address the need for an integrated multi-pollutant approach. Our CO_2 extraction technology when combined with underground sequestration would deal with all the emissions. By adopting the longer-term framework we can deliver much more in emission reductions.

RESPONSES OF BOB PAGE TO ADDITIONAL QUESTIONS FROM SENATOR GRAHAM

Question 1. The most surprising part of your testimony is TransAlta's goal of zero net emissions of greenhouse gases by 2024. You also mentioned that one of the reasons that this goal seems feasible in Canada is because of the political institutions and laws. Obviously, the government of the United States is dramatically different. Do you have any recommendations on actions that can be taken by this committee, such as simplifying laws or consolidating programs, that could help U.S. companies comply with a carbon standard?

Response. TransAlta's 2024 proposal is based on a Kyoto regime for Canada, and a regulatory environment that allows the lowest-cost, most flexible international emission offset and trading solutions, grandfathering of existing plants to accommodate capital stock turnover, and significant government and industry investment in renewables and new combustion technologies. To us this implies a much more cooperative working environment between government and industry. We believe that the dichotomy of government as an adversarial regulator and government as a participant with industry in structural change is inefficient. One positive example of cooperation is the Canadian Clean Power Coalition, a coalition sponsored by governments and industry in a concerted effort to implement new clean coal technology in Canada.

Additionally the consolidation of not just regulations, but regulatory authorities as well, would help support the much-needed coordination on the multiple pollutants to be managed.

STATEMENT OF WILLIAM F. TYNDALL, VICE PRESIDENT, ENVIRONMENTAL SERVICES AND FEDERAL AFFAIRS, CINERGY SERVICES INC.

Introduction

Good morning. My name is William Tyndall and I am employed by Cinergy Services, Inc., as the Vice President of Environmental Services and Federal Affairs. In this position I manage a department that provides Cinergy Corp. and its operating subsidiaries with, among other things, information and analysis regarding environmental issues and the risks they pose. I am also in charge of the company's Congressional and other Federal relations and advocacy.

Cinergy Corp. has a balanced, integrated portfolio centered on its energy merchant and regulated operations. The company is a Midwest leader in electricity generation owning 13,000 megawatts of capacity with a profitable balance of stable existing customer portfolios, new customer origination, marketing and trading, and industrial-site cogeneration. Cinergy's regulated delivery operations in Ohio, Indiana, and Kentucky serve 1.5 million electric customers and about 500,000 gas customers.

Cinergy's core energy system comprises approximately 13,000 megawatts at 14 base load stations and seven peaking stations. This portfolio includes 37 coal-fired units that we operate and at least partially own. Of importance to our discussion today, 30 of these units will be more than 30 years old in 2007.

Today I am also testifying on behalf of the Edison Electric Institute (EEI). EEI is the association of U.S. shareholder-owned electric companies, international affiliates and industry associates worldwide. EEI's U.S. members serve more than 90 percent of all customers served by the shareholder-owned segment of the industry, generate approximately three-quarters of all of the electricity generated by electric companies in the country, and serve about 70 percent of all ultimate customers in the nation.

The Need for Multi-Pollutant Legislation

As most of you know, Cinergy has been a long time supporter of multi-pollutant legislation for coal-fired power plants. In fact, I like to think that we had a hand in bringing this idea to this committee. Jim Rogers, Cinergy's CEO, has long thought that both the environmental community and industry can do better than the crazy patchwork of rulemakings that currently loom on the horizon for coal-fired power plants.

We count nearly a score of new requirements that may impact fossil power plants, all with separate and often conflicting timetables, implementation rules, and purposes. The net result is a planning nightmare that makes it virtually impossible for Cinergy to have any stable notion of what requirements will be in place for our plants at any point in the future. In this chaos, we simply cannot accurately assess which plants should be retrofit with controls, which plants should be switched to natural gas, which plants should be retired, and when any of this should take place.

Nor does the present system advantage those seeking further emissions reductions from these power plants. This piecemeal approach necessarily involves many sequential scientific and technical decisions by EPA and the States that may not necessarily be resolved in favor of the environmental community, and regardless are typically late in being made and then litigated by all sides, causing further delay.

Because of this dysfunction from all directions, more than 3 years ago Mr. Rogers and I met with the then-Chairman Chafee to seek his assistance in crafting legislation to combine the morass of air pollution initiatives aimed at power plants into a single set of statutory emissions reduction targets. At that meeting, he directed his staff to move forward to develop a proposal. Later, Senator Smith stepped into the breach and made the issue one of his top priorities. We are gratified that when the present chairman took over, he too viewed passage of multi-pollutant legislation as a top priority for the committee.

At this time, the idea has garnered tremendous support from a diverse group of stakeholders including the Edison Electric Institute, the United Mineworkers of America, International Brotherhood of Electrical Workers, the National Governors Association, the Environmental Council of States, Candidate Al Gore and President Bush.

The idea also attracted the support of many environmental groups including NRDC, the Clean Air Task Force, and the National Environmental Trust. Let me quote their reasons in their testimony 2 years ago before this committee:

"The Act is designed to address air pollution from the power sector—on a pollutant-by-pollutant basis. The result is that there are numerous EPA regulatory initiatives all underway at present affecting different pieces of the power plant pollution problem, on different time scales, and with different geographic targets and often different criteria. Each of these regulatory proceedings are subject to delay and court review—The time has come to improve on the Act's current regulatory scheme for power plants—Surely the devil will be in the details but the stage has been set for a policy discussion that could drive us to a better, cleaner outcome."[1]

I think we all can agree that the "devil will be in the details."

S. 556

While it may cause a great deal of pain on both sides to admit, I think the end points of the emissions programs of the President's Clear Skies Initiative and S. 556 are not that far apart for sulfur dioxide (SO_2), nitrogen oxide (NOx) and mercury. See Exhibit A, attached. However, S. 556 does go further, at a much, much faster clip, and, significantly, does not provide for any averaging or trading for mercury.

The proposal also includes an "outdated power plants" provision requiring the retrofitting of best available controls on all units over 30 years old regardless of the

[1]Testimony of Armond Cohen before the Subcommittee on Clean Air, Wetlands, Private Property and Nuclear Safety, committee on Environment and Public Works, May 17, 2000. Testimony submitted on behalf of Clean Air Task Force, Clear the Air, National Environmental Trust, United States Public Interest Research Group Education Fund, Natural Resources Defense Council, Izaak Walton League of America, Ohio Environmental Council, Illinois Environmental Council, Southern Environmental Law Center, Legal Environmental Assistance Foundation (Florida), Southern Alliance for Clean Energy, Campaign for a Prosperous Georgia, Physicians for Social Responsibility—Southeast Region, Citizens for Pennsylvania's Future, and New York Public Interest Research Group.

environmental need. This provision if it is left in will make the caps irrelevant since, according to EEI, 80 percent of coal-fired units will be 30 years old in 2007. By 2012, the percentage grows to 92 percent. At that point, the cap program will be a pointless paper shuffle since the overwhelming majority of units will be under individual, non-tradable, emissions limits. The bill also creates a mandatory "on system" carbon cap designed to return the industry to CO_2 emissions levels of 17 years earlier.

Absent from the bill is any attempt to parse these new requirements with the existing Clean Air Act. Rather, all of the new requirements would be placed on top of the existing Clean Air Act exacerbating the complexity of an Act that already can give the Tax Code a run for the title of "Most Byzantine and Confusing and Therefore Most Likely to Be Implemented Through Litigation."

So while the Clear Skies Initiative and S. 556 may be in hailing distance in terms of the caps, the lack of trading, the forced retrofits, the truncated timelines, all make S. 556 a much more draconian measure. Because of this, S. 556 threatens the nation's supply of reliable power and the financial integrity of an essential industry, a potential outcome that is not needed to achieve the nation's clean air goals.

S. 556's Macro Economic Impacts

This committee has already developed an extensive record on the impact of S. 556 on electricity prices, natural gas prices, coal consumption and other key variables.

As you know, last November, Assistant Administrator Jeff Holmstead stated in his testimony before this committee that the reduction levels similar to S. 556 would result in a 30 to 50 percent increase in electricity prices and a 20 to 30 percent decline in coal generation.[2] As the committee knows, the low ends of these EPA-assumed ranges are based on ambitious technology penetration and demand reduction scenarios.

At the same hearing, Mary J. Hutzler, the Acting Administrator of the Energy Information Administration, stated that as a result of S. 556, "the average delivered price of electricity in 2020 is projected to be 33 percent higher" and "natural gas prices are also higher by 20 percent."[3] An earlier EIA report pegged the loss of coal generation at 38 to 42 percent while natural gas generation increased by 60 percent.

S. 556 would also create huge short-term imbalances in the supply and demand for natural gas. According to EIA's July 2001 report, the increase in natural gas use by electricity generators under S. 556 will in turn require near record levels, of production after 2005 and consumption will reach nearly four times the volume used in 2000. To meet this demand, suppliers will need to tap into new reserves. For instance, EIA suggests that North Slope drilling may provide at least some of the supply needed. Inevitably natural gas producers will clamor for additional access to Artic and coastal drilling sites to meet the voracious new appetite for natural gas that S. 556 will unleash.

And by the way, none of these economic analyses actually capture the full costs of S. 556. Neither EPA nor EIA modeled the "Outdated Power Plants" provision, yet this section will immediately cancel out the cap-and-trade program supposedly contained in the bill, and dictate compliance strategy. As I mentioned, in 2007 80 percent of the generation will be under this command and control provision; 92 percent will fall under the mandate by 2012. For Cinergy and for the industry, this is the provision that will drive costs and it has not even been modeled by EPA or by EIA.

But those are the macro effects of this legislation. Let me describe its impact on Cinergy.

Impacts on Cinergy

To start, let me say a little about who Cinergy is and what we have done to address environmental issues so far.

Between 1990 and the present, Cinergy invested approximately $800 million on air pollution control equipment for its coal-fired power plants. In addition, we are currently in the middle of a huge capital investment program to add nine selective catalytic reduction units ("SCR's") to our system as well as taking other steps to meet the stringent NOx SIP Call requirements. This summertime NOx program goes into effect in 2004. When all is said and done, Cinergy will invest $800 million to comply with this program. By the way, to put our expenditures in context,

[2] See Testimony of Jeff Holmstead, Assistant Administrator, U.S. EPA, before the committee on Environment and Public Works, U.S. Senate (November 1, 2001) p. 10.

[3] Statement of Mary J. Hutzler, Acting Administrator, Energy Information Administration, Department of Energy, before the committee on Environment and Public Works (Nov. 1, 2001) p.3

Cinergy alone is installing as many megawatts of SCR's as the entire Ozone Transport Region.

Cinergy has reduced its NOx emissions rate since 1990 by 45 percent and its SO_2 emissions rate by almost 50 percent. Under the NOx SIP call, we will operate under emissions caps that are based on a target emissions rate of 0.15 lbs/MMBtu. This is much lower than the EPA New Source Performance Standard of 0.6 lbs/MMBtu and is reflective of BACT determinations for new coal units made as recently as 5 years ago. For SO_2, our allowance allocation under the current acid rain program works out to about 0.8 lbs/MMBtu emissions rate, as compared to the EPA New Source Performance Standard maximum of 1.2 lbs/MMBtu.

But these reduction levels do not begin to meet the requirements we will face if S. 556 passes in its present form. According to our modeling, reduction levels equivalent to S. 556 will require the installation of 14 new scrubbers and 12 new SCR's by 2007. Mercury controls (probably carbon injection with fabric filters but who knows) will need to be installed on every unit except perhaps for those units with a SCR and a scrubber. Indeed, depending on the coal type burned, the mercury requirement would probably turn into a mandate to switch to natural gas since there is no existing technology that delivers 90 percent reductions for all coal types.

And this does not even count the outdated plant provision. Under this provision, all of Cinergy's plants over 30 years old must be retrofit at 5 years from passage. Of Cinergy's 37 coal fired units, 30 are more than 30 years old so we would face the added expense in the next 4 years of retrofitting these units with SCR's, SO_2 scrubbers, and particulate controls.

To give the committee an idea of the magnitude of this undertaking, typical capital costs to install "best available" controls for a medium size (500 megawatts) coal-fired unit are as follows: Scrubbers to remove SO_2 will cost approximately $125 million; SCR's to control NOx will cost approximately $60 million; and particulate controls (ESP's and/or fabric filters) will cost approximately $30 million.

As a result, we estimate that S. 556 would require Cinergy to invest $4.3 billion on new pollution control equipment.

However, over the next 5 years, Cinergy must invest approximately $300 million per year just to maintain its existing electricity and gas distribution system, and to meet new service demands. At the same time, we also must invest approximately $100 to 200 million per year to create the capacity to serve the steady load growth we are experiencing and to meet the reserve margin requirements of our three retail jurisdictions. For instance, we are currently in the middle of a 3-year $211 million project to transform one coal-fired power plant in Indiana into a state-of-the-art, natural-gas combined-cycle power plant.

In addition, to meet the requirements of the NOx SIP Call that will go into effect in 2004, Cinergy is investing approximately $800 million dollars in control equipment over 5 years. We are meeting this challenge without sacrificing the reliability of our existing gas and electricity distribution assets and without sacrificing the ongoing need to maintain sufficient generation resources to meet demand.

The $4.3 billion investment dictated by S. 556 are more than 5 times the sums being spent on NOx controls and represent approximately 80 percent of our existing market capitalization of approximately 6 billion. And this sum must be raised and spent largely by 2007, giving us really only 2 years after our NOx expenditures are completed to meet this fiscal challenge.

It is financially impossible for a company of Cinergy's size to make investments of this size in the timeframe provided. And lest you think we are an aberration, there are some 65 other power generators around the country that are Cinergy's size or smaller and who generate more than 50 percent of their power from coal. I have no doubt that each and every one of these entities will view S. 556 as economically infeasible as well.

This is not to say that Congress cannot impose stringent new emissions targets that maintain the financial integrity of one coal-centric company or the entire industry. Time is the key. The industry needs at least a 5-year window once it is finished with the NOx SIP Call construction to begin to meet new requirements. This means a 2010 start for those portions of the program that necessitate new capital expenditures. The industry also needs phased reductions so that capital expenditures can be staggered over longer periods. For instance, the phased caps included as part of the Clear Skies Initiative provides both a strong emissions reduction roadmap and a reasonable amount of time to construct the scrubbers, SCR's and other projects that will be required—without jeopardizing the industry's ability to maintain the grid, add generation and deliver reliable service to our customers.

Other Issues

Aside from the affordability issue, which needless to say, captures my company's primary attention, there are many other reasons why S. 556 is unworkable.

Reliability Issues Due to Retrofits: Adding scrubbers, SCR's and other pollution control equipment requires long design and planning lead times, expanding or creating new landfills (for additional scrubber sludge) and securing all of the permits thereto, careful coordination of the labor, cranes, sheet metal and other aspects of the construction, and long down times at plants to tie equipment in. To meet the NOx SIP Call, Cinergy had to pay huge premiums to secure the material and laborers needed to meet the tight deadlines. S. 556 involves more requirements on more plants in a shorter timeframe. Both the construction and the chaos that will result when companies cannot finish the work in time will negatively impact reliability.

Re-Permitting: The modernization provisions ofS. 556 essentially require every power plant that has reached its 30th birthday to be re-permitted under the provisions of the Clean Air Act's new source review program. Under the applicable requirements, this would mean not only that plants would need to secure a case-by-case determination of the level of reductions they would need to hit, they would also need to have their air quality impacts measured, modeled, assessed and approved by States, Federal land managers and EPA, and in non-attainment areas, secure emissions reductions offsets—despite their participation in a stringent cap-and-trade program. Plants could not start construction of the controls until the process has been completed and the requirements for the "modernized" unit formally assigned. This tortuous public process normally takes years for any one source.

It is impossible to predict how long it will take the crush of units that will initially be covered by the program to secure their permits but I have no doubt that the vast bulk of these permits and the work that must follow will not be completed by the deadline in the bill.

Technological Innovation: There will not be any under S. 556. A new emissions reduction target set far enough in the future can drive technological innovation. But the stringent targets in S. 556 will not drive new technologies because of the minute lead time. Since these massive pollution control projects take years to plan and execute yet the bill imposes the reductions within 5 years, companies will need to start making compliance decisions immediately upon passage. And companies will have no choice but to go with the technologies that are commercially available at the time of passage or switch to natural gas. This is especially true for mercury controls and monitoring technology.

Allocation of Allowances: Essentially, S. 556 leaves this issue up to EPA. However, an issue of this magnitude needs to be resolved in the legislation itself. Cinergy strongly encourages the continued reliance on the allocation approaches that Congress used for the Acid Rain program. This system has not resulted in any windfalls but has resulted in low compliance costs. I have provided additional comments on this topic on behalf of Cinergy at Exhibit B.

Conclusion

I do believe that this committee can craft multi-pollutant legislation that both meets environmental goals and provides the industry with a workable roadmap. I urge the committee to carefully consider the views of industry, of the Administration, and of the breathing public, and create that bill. In my view, well-crafted multi-pollutant legislation can pass through this committee, the Senate, the Congress, and start creating emissions reductions and cleaner air. S. 556, while allowing for wonderful debate, does not offer that hope.

Exhibit A

Comparison of Current Levels, Clear Skies and S. 556

Annual Emissions

	High Level	Current Levels	Title IV Plus NOx SIP Call	Clear Skies		S. 556
				2010	2018	2007
NO_x (Million tons)	~7	5	~ 4 (cap)	2.1	1.7	1.5
SO_2 (Million tons)	~18	11	9 (cap)	4.5	3	2.25
Hg (Tons)	>70 [a]	48	~45 (level)	26	15	5

(a) Without current controls, mercury emissions would exceed 70 tons.

KEY POINTS ABOUT ALLOWANCE ALLOCATIONS

Using the Current system of Allowance Allocations

- Allocating emission allowances on the basis of heat input, as provided under the current system for SO_2 allowances, would provide allowances to those generators that are also making significant reductions under a multi-emission approach (or even under current regulation).
- When comparing impacts on two states, one in the Midwest and one in the Northeast with less coal-fired generation, allocation of allowances under the current system naturally would mean more allowances to the Midwest state.
- The current system will make for an easier transition to a new cap and will provide greater incentives for credit for early action proposals. Re-allocating allowances will increase uncertainty and will delay any early action by facilities that might otherwise be inclined to participate.

Switching to an Output Based Approach

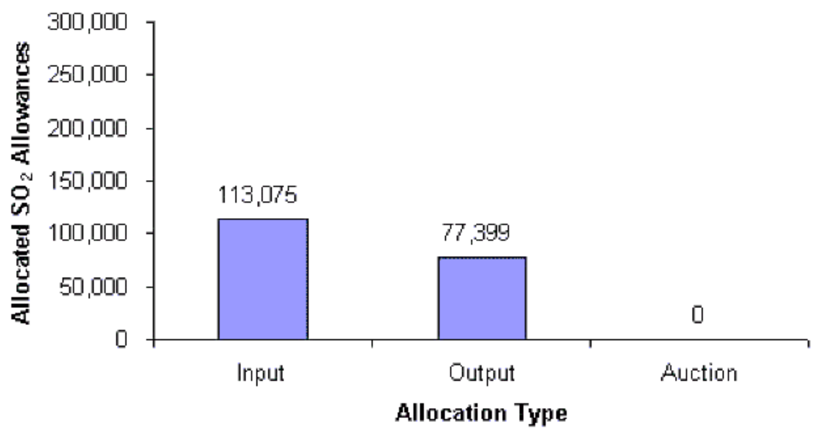
- Allocating on the basis of output would provide allowances to facilities such as nuclear plants that don't participate in a cap-and-trade program and are not investing in expensive emission control equipment. In addition, this system arguably gives allowances to those that are already more competitively advantaged under a strict emission reduction program than those having to make the reductions. Such an allocation approach thus would further penalize plants making reductions, and in fact would require them to make even further emission reductions than under an input based system.
- The relative gains to a northeast state relative to a Midwest state are illustrated in the following graphs. The graphs show potential allocations to the two states under the input-based and output-based approaches. The graphs illustrate the costs to meet a cap and the allocations under the two formulas. Results are presented in per capita values to standardize for the large differences in the size of the two states. Results are based on numbers for sulfur dioxide reductions as indicated by S. 556, but are readjusted to eliminate a carbon cap which would result in plant shutdowns and a skew of the entire allowance system.

• Under the output-based approach, the Northeast state would gain relative to the Midwest state. This gain occurs despite the fact that the Northeast state would have substantially lower emission reduction requirements than the Midwest state.

(S. 556 without CO_2, USING ILLUSTRATIVE PERMIT PRICES):

Annual Emissions Allocations Under Input and Output based formulas (tons)

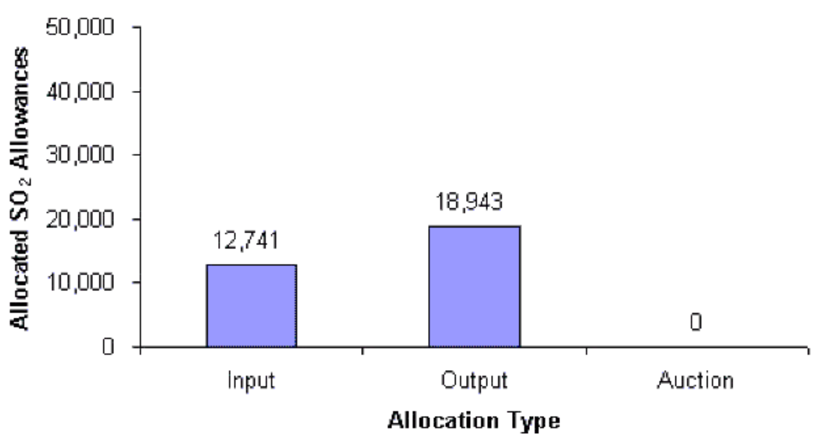
Midwest State



Source: Calculations based on EIA data.

Annual Emissions Allocations Under Input and Output based formulas (tons)

Northeast State



Source: Calculations based on EIA data.

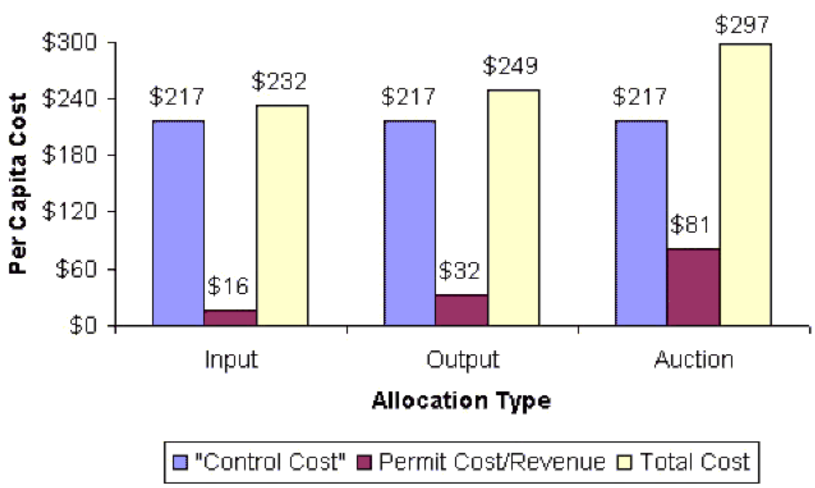
• These illustrative results indicate that while residents of the Northeast state would bear a relatively small burden in terms of the costs of emission reductions called for under the cap, they would reap a windfall in terms of a favorable allowance allocation. In contrast, residents of the Midwest state both would bear substantially greater per capita costs for controls and also receive fewer allowances. Thus, a switch to an output-based approach would further exacerbate an already significant burden borne by Midwest states that will be required to shoulder the bulk of increased costs due to the more stringent emission reduction programs.

Why Auctions Would Make Any Multi-emission Bill Unworkable

- Auctioning allowances would substantially increase costs to generators and ultimately consumers, on top of the substantial costs required to meet the emission targets. In contrast to the situation in all other cap-and-trade programs in which all participants can gain either as buyers or sellers relative to a less flexible command-and-control approach—under an auction approach all participants would lose.
- Auctioning would mean that participants would pay for all of their emissions, an approach that is inconsistent with the spirit of the national ambient air quality standards. This basically assumes that all power plants start with zero emissions, and must purchase allowances in order to operate at any level. On top of the purchasing of allowances, generators would also be required to spend millions to add emission control equipment to their plants
- Auctioning of all (or even a substantial share) of allowances would be unprecedented.
- Although some suggest that an auction is a means of reducing the cost of meeting a cap on emissions, the main impact of an auction would be to transfer revenue to the government. An auction would be equivalent to a tax on electricity—imposed on the industrial heartland and on states that are already suffering job losses and a lagging economy.
- In our example of a Northeast vs. Midwest state, auctioning of allowances would substantially increase overall compliance costs for residents of both states.
- The net effect of the auction on residents of the two states of course would depend upon how the revenues were used, which is difficult to project.

Illustrative Calculations of Annual Per Capita Control Costs and Permit Costs for SO_2-, NO-X, and Mercury Under Alternative Allocations

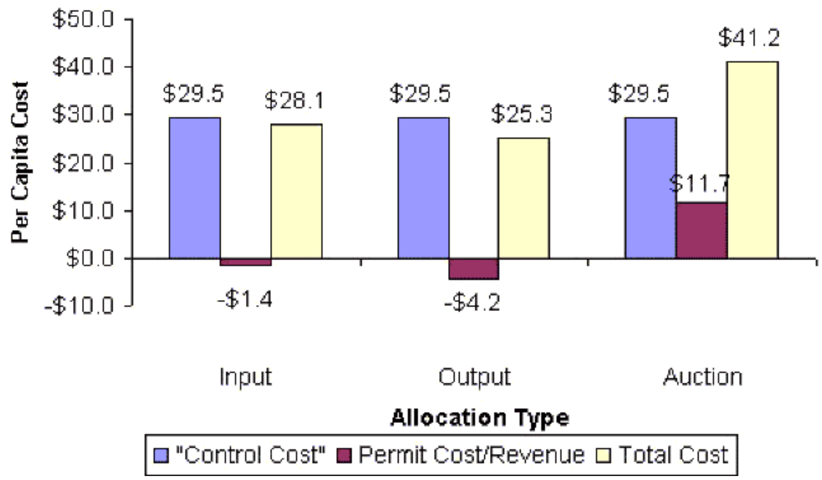
Midwest State



Source: Calculations based on EIA data.

Illustrative Calculations of Annual Per Capita Control Costs and Permit Costs for SO_2-, NO-X, AND MERCURY UNDER ALTERNATIVE ALLOCATIONS

Northeast State



Source: Calculations based on EIA data.

Assumptions

The results provided in the preceding graphs are based upon the following assumptions. The graph depicts a three-pollutant bill similar to S. 556 but without CO_2 reductions:—NOx emissions capped at 75 percent below Title IV levels (i.e., to 1.51 million tons) by 2007.—SO_2 emissions capped at 75 percent below the Phase II Title IV cap (i.e., to 2.24 million tons) by 2007.—Mercury emissions capped at 90 percent below 1997 levels by 2007.

- Permit prices for NOx, SO_2 and mercury are illustrative. The conclusions regarding the relative implications of allocation approaches for the two States depicted should not be sensitive to these allowance prices. The permit prices used are the following:—$2,000 per ton for NOx;—$1,500 per ton for SO_2; and—$150,000 per pound for mercury.

RESPONSES OF WILLIAM F. TYNDALL TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. Does EEI support the President's Clear Skies proposal, S. 2815, or any multi-pollutant legislation or proposal?

Response. EEI does support the concept of a multi-emission approach although it has not endorsed a specific legislative proposal at this time. EEI sent a letter to the Committee reaffirming its support of multi-emission legislation on April 11, 2002 and I have attached a copy of that letter to these answers.

Question 2. The timeline for mercury reductions in S. 556 is about the same as the one that is likely to be in the final mercury MACT rule, which is due in 2004. How much will it cost Cinergy to comply with a rule that required reduction of 90 percent before 2008?

Response. The mercury MACT implementation timeframe that you outline assumes no delays due to insufficient data regarding the actual mercury removal performance of existing units in the MACT pool or the performance of mercury control technologies in general. It also presumes that EPA will ignore the data variability and inconsistency issues in the data sets it does have and set an unattainable standard. It also presumes that all sides will not litigate at least some aspects of the rule and delay its implementation.

Nonetheless, to respond to the question you pose, stand alone, stringent mercury MACT rule requiring compliance in 2008 is expected to be very costly. Due to the lack of commercially proven technologies and the lack of reliable data on control costs, it is very difficult to provide a cost estimate of the standard you posit. To provide a rough estimate, initial modeling suggests that Cinergy will face a capital expenditure of approximately $500 million to comply with a stringent mercury MACT standard. Annual operating costs cannot be guessed at due to the large uncertainty surrounding the exact reduction that can be achieved with any specific technology and the lack of data regarding the actual costs of operating and maintaining specific mercury control technologies at large power plants.

RESPONSES OF WILLIAM F. TYNDALL TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. If you were to comply with the Jeffords/Lieberman bill, what would it cost your company and how does that cost relate to your bottom line?

Response. We estimate that S. 556 would require Cinergy to make capital expenditures totaling $4.3 billion on new pollution control equipment within approximately 5 years. This represents approximately 80 percent of our existing market capitalization. We do not believe that we would be able to either raise this sum in the equity or debt markets or spend it on the necessary projects within the timeframe provided. For these reasons, were S. 556 to pass in its present form, it would have a devastating impact on our bottom line and the bottom line of every other investor or publicly owned utility in the Country with any reliance on coal as a fuel.

Question 1a. Can a company your size comply?

Response. We would do everything we could to comply with the law. However given S. 556 unrealistic timetables and targets and its reliance on command and control implementation, full compliance within the short window allowed would be questionable as well as enormously expensive, if it could be achieved at all. Whether one company can comply is dependent on factors driven by both internal and external forces that companies may have limited ability to control. As I stated in my testimony, we anticipate industry-wide compliance within a 5-year window with the stringent caps and command and control features of S. 556 would create energy, emissions, engineering, manufacturing and labor imbalances that would pale in comparison with what we experienced the NOx SIP call requirements. This would be further acerbated by the scheduling of virtually every one of our units (along with nearly every other coal or oil unit in the country) to shut down for weeks or months to install controls. Yet we will still be required to meet our customers' energy demands 24 hours a day, 365 days a year.

Question 2. I understand that the Health Effects Institute has discovered a problem with the $PM_{2.5}$ health studies. Could you give us your view (or what EPA has determined) on how many studies used the same flawed statistical software in 1997 when promulgating the $PM_{2.5}$ standards?

Response. Based on information provided by EEI and EPRI, I understand that on May 30, 2002, the Health Effects Institute (HEI) announced that researchers at Johns Hopkins University had discovered a flaw in the statistical techniques used by those researchers in conducting the HEI-sponsored National Morbidity, Mortality and Air Pollution Study (NMMAPS). The Johns Hopkins University researchers found that a flaw in the S-Plus program (a common statistical software package) "can bias the estimate of relative risk of air pollution upwards or downwards," and that, after correcting the statistical problem, the relative risk estimates were "sometimes larger, and more often smaller, than previously reported." In fact, the preliminary re-analyses by Johns Hopkins shows that only 2 of the 88 cities that were reexamined had a statistically significant association between PM_{10} and mortality.

Two key studies on which EPA relied in setting the 1997 $PM_{2.5}$ standards likely used the flawed statistical software: Schwartz et al. (1994), Acute Effects of Summer Air Pollution on Respiratory Symptoms Reported in Children, and Schwartz et al. (1996), Is Daily Mortality Associated Specifically With Fine Particles? Moreover, a majority of the studies published since 1996 appear to have used the flawed statistical software. At least 21 studies listed in Tables 9–14 and 9–17 (which list the critical particulate matter epidemiological studies as identified by EPA) of the Third External Review Draft of the Particulate Matter Criteria Document released by EPA in May 2002 appear to suffer from this problem; this represents more than half the studies listed in those tables.

On August 8, EPA wrote to its Clean Air Scientific Advisory Committee regarding its plan for addressing the statistical problems with $PM_{2.5}$ studies and the schedule for completing its Criteria Document for particulate matter. EPA identified criteria for prioritizing which studies should be reanalyzed, provided a list of key studies for reanalysis, identified steps to facilitate analyses, and discussed a late September/early October workshop regarding the analyses. The next (fourth) draft of the Criteria Document is now scheduled for March 2003 public comment and completion by October 2003.

Question 3. In your testimony, you stated that the so-called "birthday" provision would make the Clean Air Act's Acid Rain Program's cap-and-trade system pointless. Can you please explain?

Response. S. 556 as it stood when I testified included an "outdated power plants" provision requiring the retrofitting of best available controls on all units over 30 years old regardless of the environmental need. This provision makes the caps irrelevant since, according to EEI, 80 percent of coal-fired units will be 30 years old in 2007. By 2012, the percentage grows to 92 percent. With the vast majority of the units forced to put on controls regardless of the environmental need, there will be no savings to consumers in a cap-and-trade program. Generators cannot over control at the most cost-efficient units and sell allowances to units with higher costs when the birthday provision overrides these investment decisions and instead forces controls to be installed on the basis of age. We do not view the changes to these provisions made in the Chairman's mark and subsequently adopted in the bill as it passed Committee as significantly fixing this problem.

Question 4. According to testimony by other witnesses, Clean Air Act provisions, such as NSR and the regional haze standards, need to be retained in any multipollutant legislation to protect air quality in attainment areas. What is Cinergy's and / or EEI's opinion?

Response. The intention of a multi-emission bill is to provide both economic and environmental certainty—to in effect create a roadmap for reductions that will meet the progress and protections inherent in the Clean Air Act while creating certainty and coordination savings for industry. Cinergy does not believe that the new source review program creates any emissions reductions since its unworkable and uneconomic structure simply leads to companies avoiding any changes that will trigger its permitting requirements. And even if you believe the myth that the program has been ignored by the industry and that the current enforcement initiative will lead to large reductions, these benefits are dwarfed by the reductions inherent in a strong multi-pollutant program. For instance, the President's Clear Skies Initiative generally requires Cinergy to install far more emissions control equipment on a faster time line than the agreement in principle Cinergy reached to resolve its NSR litigation.

Other Title I programs including regional haze can and should also be combined into the overall legislative package. As you know, the environmental community developed a position on regional haze with western States that allows utilities through 2018 to meet regional haze requirements. In the Eastern States, the two phases of reductions in the Presidents Clear Skies Initiative, for example, should similarly provide sufficient visibility improvement to satisfy the Regional Haze program.

RESPONSES OF WILLIAM F. TYNDALL TO ADDITIONAL QUESTIONS FROM SENATOR GRAHAM

Question 1. Do you have any recommendations on how multi-pollutant legislation should deal with cases such as TECO's? [TECO is the only company that has signed a consent decree with the EPA under NSR].

Response. Companies that have negotiated in good faith and signed NSR settlement agreements prior to passage of multi-pollutant legislation should be allowed to use all of their pollution control projects and other reductions to meet the requirements of the legislation. To the extent these reductions occurred prior to deadlines imposed by the legislation and were not mandated by any State SIP requirement, they should be allowed to be counted as early reductions and valued in an emissions allowance market as such. To the extent NSR is changed by the legislation, companies should be able to use those NSR changes going forward even if their consent decree contains more onerous NSR provisions that were based on the statute as it stood at the time of the settlement. Finally, to the extent NSR is significantly modified or eliminated by the new system of stringent caps imposed by the legislation, and the government determines that further prosecution of NSR litigation against other companies is now irrelevant, it may be appropriate to allow TECO to have all or portions of its Consent Decree dissolved due to the subsequently imposed and more stringent statutory provisions.

RESPONSES OF WILLIAM F. TYNDALL TO ADDITIONAL QUESTIONS FROM SENATOR WYDEN

Question 1. In Cinergy's 2000 Environmental Progress Report, you wrote that Cinergy CEO Jim Roger's "sound view is that coal-fired power can meet tough new targets for reductions of key emissions including carbon dioxide if given sufficient flexibility and lead times." What, if any, changes does Cinergy believe are needed to the 4-Pollutant bill to give sufficient flexibility and lead times for your company to meet tough carbon dioxide reduction targets?

Response. The existing carbon reduction program in S. 556 is not workable since it results in significant retirement of coal units, massive natural gas fuel switching and large increases in the price of electricity.

For Cinergy, a more realistic reduction target based, for instance, on a freeze of industry green house gas emissions at 2000 levels is achievable by the end of the decade when coupled with similarly timed reductions in mercury, NOx and SO_2. Further reductions from this initial round can and will occur with the commercialization of coal gasification and other advanced "zero-emissions" technologies. To start on this path immediately—and to end a deadlock that will otherwise block progress for the foreseeable future—the Committee should consider creating a voluntary green house gas program initially coupled with a "trigger" provision that creates a mandatory program if there is insufficient participation or progress.

Finally, the Committee needs to couple targets with incentives to ensure the development and deployment of the next generation of environmentally friendly power plant technologies.

STATEMENT OF DAVID G. HAWKINS, DIRECTOR, NRDC CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Five years ago Chairman Jeffords introduced S. 687, the first comprehensive bill to control the four major pollutants released by fossil-fuel power plants. Today we are gathered to discuss the bill he and others introduced in this Congress, S. 556, the Clean Power Act. There is broad agreement now that power plants should be cleaned up. But there are enormous differences in the benefits conferred by the Clean Power Act and the competing approach sketched by the Administration. I welcome the opportunity to testify on behalf of Natural Resources Defense Council's (NRDC) 500,000 members in support of the Clean Power Act and to describe why we believe it is the right approach for cleaning up power plant pollution.

The Clean Power Act will produce major benefits for Americans' health and the quality of our environment. Indeed, the bill's provisions to limit global warming pollution can help America regain leadership in acting to protect the planet from devastating changes to the climate.

Both the Administration and the Clean Power Act's sponsors agree that air pollution from power plants imposes large costs on health, environment and the economy in the United States. Sulfur dioxide (SO_2) pollution is a major cause of fine particles that cause tens of thousands of premature deaths every year, with 30,000 premature deaths attributed to pollution from the power sector. SO_2 also acidifies lakes, streams, and soils and pollutes our national parks with haze that spoils vistas that once were clear. Nitrogen oxide (NOx) is another power plant acid rain pollutant. NOx also forms smog, fine particles and haze and overloads estuaries with nitrogen fertilizer contributing to dead zones in places like the Chesapeake Bay, Long Island Sound, the Gulf of Mexico and other coastal waters. Power plants also emit more mercury than any other remaining category of pollution sources. Mercury is a nerve poison that builds up to hazardous levels once released in the environment. Mercury contamination is so pervasive that 41 states have issued fish consumption warnings for their water bodies. Finally, and largest in terms of tonnage and extent of potential damage, heat-trapping carbon dioxide (CO_2) from power plants is the largest U.S. contributor to global warming. While the Administration now acknowledges CO_2's role in climate change, it continues to oppose any policy action to establish binding limits on CO_2 emissions.

Comparing the Clean Power Act and the Administration Proposal

In February, the Administration released a description of the power plant legislation it would support. NRDC's summary of the Administration's approach is that, compared to competing proposals, it condemns the public to much higher pollution exposures, threatens local air quality, and prevents timely action to address the risks of global warming. Not only did the Administration approach reject the bipartisan (more accurately, tri-partisan) Clean Power Act, it also rejected an August 2001 proposal from EPA, the expert agency Congress has charged with implementing clean air programs. While no legislation has been submitted and many details remain murky, enough is known about the Administration's proposal to demonstrate how poorly it performs, when compared to the Clean Power Act, or for that matter, to EPA's August 2001 recommendation:

- For the three traditional pollutants, the Clean Power Act gets far greater pollution reductions much faster than the Administration proposal.
- The differences in total loadings under S. 556 compared to the Administration proposal between now and 2020 will result in significantly greater health and environmental damage with the Administration approach.
- By failing to address CO_2 emissions from power plants, the Administration proposal delays action to limit emissions from America's largest single source of global warming pollution.
- The Administration proposal may save industry some compliance expenses in the short term compared to the Clean Power Act but the government's own analyses show that the added benefits provided to Americans by the Clean Power Act are much larger than the temporary industrial cost savings. Further, by incorporating effective measures to increase energy efficiency and the use of renewable energy sources to help meet the emissions caps called for in the bill, S. 556 can achieve a net reduction in consumer bills while delivering a dramatic improvement in environmental quality.
- While the Clean Power Act guarantees that all communities will enjoy major cuts in pollution from nearby and distant power plants, the Administration would allow increases in local pollution that would make some local communities worse off. The Clean Power Act, not the flawed Administration proposal deserves your support. We urge the committee to mark up S. 556 soon and report it to the Senate for consideration. The toll that the four-horsemen of fossil-fuel power plant pollution inflicts daily on Americans is far too great to delay action to clean up this industry.

Clear Skies: Clearly Dirtier

While the Administration has decided on an attractive sounding name for its proposal, the Clear Skies Initiative (CSI), the only thing that is clear about the proposal is that it is clearly dirtier than the Clean Power Act (and than the EPA August 2001 proposal). The caps and timetables proposed under CSI for the traditional pollutants would allow millions more tons of these hazards to be released over the next two decades than under the Clean Power Act, with clearly greater damage done to Americans' health and our environment. (See Figure 1).

While the Clean Power Act requires an annual cap of 2.25 million tons of SO_2 to be met by 2007, the Administration CSI proposal allows twice as much pollution, 4.5 million tons, and does not require that reduction until 2010. The CSI briefing materials also imply that the SO_2 cap will be lowered in a second phase to a level of 3 million tons per year by 2018. But the fine print in the proposal states an administrative review process is required before the second phase cap is set. This means that the reductions claimed for the second phase are no more certain than the outcome of a future ambient air quality standard setting process. If CSI became law, the only thing Congress, the public and states could count on would be the first phase cap of 4.5 million tons. On the other hand, industry lawyers could count on thousands of billable hours (fees that electricity consumers will pay) as they assist their clients in the "review" of the second phase cap. (See Figure 2 for state-by-state comparisons of emissions under the CSI in 2010 and 2020 and the EPA August 2001 proposal).

As a result of the much higher caps for SO_2 under the CSI approach, the health and environmental damages would continue at much higher levels than under the Clean Power Act. Over the period 2007–2020, the CSI approach would result in at least 40 million tons more SO_2 emissions than under the Clean Power Act. The higher emissions allowed by CSI would inflict great damage to public health, including as many as 10,000 additional premature deaths every year for at least a decade. In its analysis of its August 2001 proposal (a document that the Administration still has not released officially), EPA calculated the health benefits from SO_2 and NOx caps set at the level of the Clean Power Act as including the prevention of "over 19,000 premature deaths" annually.[1] In contrast, EPA estimates the CSI approach will avoid "up to 9,000 premature deaths" in 2010.[2] (See Figure 3 for current mortality rates).

As indicated by the higher number of preventable deaths under the CSI approach, the larger SO_2 caps in the Administration proposal would leave more areas violating the fine particle standard, placing a greater burden on state and local officials to

[1] USEPA, "A Comprehensive Approach to Clean Power," August 3, 2001, at 21.
[2] USEPA, "Human Health Benefits of Clear Skies," May 2002.

pursue difficult and more expensive reductions in prolonged state-by-state rulemaking proceedings. According to EPA computer runs prepared last September but made available to the committee only last week, an SO_2 cap of 3.58 million tons would leave nearly twice as many counties in the eastern United States in violation of the fine particle standard than would a cap of 2 million tons per year.[3] Since, as discussed above, the CSI proposal only guarantees a statutory cap of 4.5 million tons, this will complicate and most likely delay attainment planning efforts in areas where millions of people live.

In addition to causing greater mortality and morbidity, the additional SO_2 emissions under CSI would leave more lakes and streams susceptible to chronic acidity from acid deposition. According to computer runs made available to the committee last week, an SO_2 cap greater than 2 million tons per year will leave 15 percent of today's chronically acid lakes in the Adirondacks still chronically acidic as long away as the year 2030. In the Southeastern U.S. stream acidification will worsen under the caps above 2 million tons, with 44 percent of streams in the Southeast predicted to be either chronically or episodically acidic under a 3.58 million ton cap.[4]

As with SO_2, the CSI approach also allows much higher NOx emissions than the Clean Power Act: 2.1 million tons beginning in 2008 compared to 1.51 million tons beginning in 2007. This results in 9 million more tons of cumulative NOx loadings between 2007–2020, even if one assumes that EPA succeeds in lowering the cap to 1.7 million tons in 2018 as represented by the Administration's descriptions of the CSI proposal. These added emissions will also mean more acid deposition, more eutrophication of coastal waters, and more fine particle pollution than under the Clean Power Act.

For mercury, the CSI proposal sets an initial cap five times higher than the Clean Power Act: 26 tons per year starting 2010 compared to 5 tons per year starting in 2007 under the Clean Power Act. Even the optional second phase of CSI would leave 15 tons per year of mercury emissions and not be triggered until 2018. Compared to the Clean Power Act, the CSI approach would result in a cumulative added mercury burden of 330 tons between the years 2007–2020 even if EPA succeeds in lowering the cap in 2018. Because mercury is an accumulative toxin, these added tons will do their damage for scores of years after they are released.

The committee should note that the current Clean Air Act requires EPA to adopt a performance standard based on Maximum Achievable Control Technology (MACT) in the next few years, with compliance required by the end of 2007. In the regulatory development process now underway, EPA is evaluating performance requirements that would achieve the 5 ton-per-year cap in the Clean Power Act and the weakest option being analyzed by the agency (at the request of the utility industry) is a level only slightly higher than the nominal CSI phase 2 target. In sum, the CSI approach for mercury delays the cleanup of this toxin by 10 years compared to the current law and calls for a cap that is three to five times larger than the more protective options currently under consideration at EPA.

Finally, as the committee knows, the CSI proposal rejects any limit on CO_2 emissions, despite the fact that power plants are responsible for 40 percent of U.S. emissions of this heat-trapping pollutant. Instead, the Administration has called for a continuation of voluntary measures even though electric sector CO_2 emissions grew by more than 25 percent during the previous decade of voluntary "commitments," a growth rate triple that of the rest of U.S. emission sources. In the next section of my testimony I will discuss why the committee should reject this terribly flawed approach to controlling power plant pollution and adopt the comprehensive program in the Clean Power Act.

Global Warming and the Clean Power Act

The Clean Power Act's provisions to cap CO_2 pollution from power plants are responsive to several fundamental facts about global warming:

- The magnitude and the scope of the threat posed by global warming are already large and will grow the longer we delay action to address it.
- Power plants are responsible for 40 percent of US CO_2 pollution and their emissions will continue to increase without action.
- It is in the strategic interest of the United States to commercialize modern technologies that reduce the growth in global warming pollution in all countries.
- An integrated strategy of emission caps and measures to increase energy efficiency and use of renewable energy sources can succeed in reducing all four air pollutants from power plants at lowest overall costs.

[3] USEPA, "Projected $PM_{2.5}$ and Ozone Nonattainment Maps."
[4] USEPA, "Water quality.ppt," May 2002.

The Challenge of Climate Change

At the end of May the U.S. Government submitted its latest "Climate Action Report" (National Communication) to the United Nations under the Rio Treaty that the United States ratified 10 years ago. That report summarized the harm that could be done to America and Americans from a wide range of changes to our climate caused by human emissions of global warming pollutants. If left unchecked global warming will have profound effects on the United States from Florida to Alaska and from California to Maine. Based on research by top U.S. scientists over the last 4 years, and extensively peer reviewed, the report identifies many threats to our way of life, including:

- In Florida, rising sea levels, higher temperatures and higher CO_2 concentrations threaten to literally reshape Florida. Much of the Everglades as well as other important coastal wetlands would be inundated. Florida's famed coral reefs, already suffering from the effects of coastal development and extreme heat during the 1998 El Nino, may be destroyed. Florida's growing elderly population, many of whom came to Florida to enjoy its mild climate, is particularly vulnerable to heat stress when mild weather is replaced by stifling heat.
- In Vermont and New York, sugar maples could disappear and ski areas will become increasingly snowless.
- In the West, alpine meadows could disappear and water resources could be stretched to the breaking point. Conflicting demands for water are already a source of tension between farmers and urban dwellers as well as between the United States and Mexico. These problems will be exacerbated by severe reductions in a critical natural reservoir: mountain snowpacks. Rising temperatures will result in more precipitation as rain, rather than snow, and an earlier spring snowmelt, resulting in an increased risk of spring flooding as well as summer drought.

Two recent NRDC reports highlight some of the risks documented in the government's assessment of climate threats. Our report Feeling the Heat in Florida emphasizes that in addition to the threats described above, Florida's tourism industry would be severely damaged by disappearing beaches and the loss of other natural resources that bring divers and sport fishers to the state. More recently NRDC released a report on the effects of global warming on trout and salmon, which found that the habitat for individual species of these prized fish could shrink by 5 to 17 percent by 2030 and by 14 to 34 percent by 2060, as the cold clear streams on which these fish depend become increasingly tepid.

The opponents of action to combat global warming were quick to argue that the extent and location of harm is "uncertain." Inaction is not excused by claims the threats are uncertain and the warnings not specific enough. We are not locked into a fate of exposing our children to future threats simply because we do understand today the size of the risk. We know now the prudent steps we can take to reduce the risks of harm from global warming. The key is to start now with effective programs to limit the emissions that cause global warming. The Clean Power Act is just such a step.

To appreciate why it is necessary and productive to begin now to carry out an effective action program to cut emissions, a quick overview of climate change fundamentals is helpful. A variety of gases and compounds associated with human activity change the heat-trapping characteristics of the atmosphere. In particular, CO_2 released by fossil fuel burning and deforestation is the largest single source of heat-trapping emissions to the atmosphere. This increase in heat trapping is changing the climate, even while we argue how soon the changes will harm us.

To avoid confusion caused by statements that CO_2 is "natural," it is important to understand how human activity has changed the earth's natural carbon cycle. CO_2 in the atmosphere is part of a continuous cycle of exchanges of carbon between vegetation, animals, soils, the oceans and the air.[5] While huge amounts of carbon flow between these pools every year, the amount of CO_2 in the atmosphere since the last glacial period over 12,000 years ago was fairly constant (around 600 billion metric tons of carbon) until we began widespread burning of fossil fuels around two hundred years ago. Our use of fossil fuels has fundamentally changed the natural carbon cycle by adding to the atmosphere immense quantities of carbon that have been stored underground, isolated from the natural cycle for hundreds of millions of years.

Humans do indeed exhale CO_2 but that does not add to the total CO_2 in the atmosphere. The CO_2 we exhale comes from plants we eat (either directly, as vegetables, or indirectly, as meat). The plants we consume removed and stored carbon

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from the atmosphere while growing. Human breathing simply returns the same amount to the air.

In the last couple of hundred years, burning fossil fuels has added about 300 billion tons of carbon to the atmosphere, half of that amount in the last 25 years.[6] Under mid-range growth forecasts for the entire globe, humans will add nearly another 300 billion tons of fossil fuel carbon to the atmosphere in the next 25–30 years, driving CO_2 concentrations ever higher. Without corrective action, this emissions growth will escalate every decade for the foreseeable future, resulting in middle-of-the road forecasts of 1500 billion tons of added carbon during the course of this century. This is an amount double the total amount of carbon that is now in the atmosphere.

This added carbon changes a natural, hospitable carbon cycle into one that poses threats of unprecedented harmful change to patterns of temperature, storms, rainfall, drought, fires, flooding, sea levels, and all other aspects of our life that are affected by climate. Beyond the scope of the threats, the other feature that makes carbon pollution different from traditional air pollution concerns is the long lifetime of carbon in the air. For every 1000 tons of carbon we emit today, 400 tons will still be in the air when our great-great grandchildren are born 100 years from now; and 1000 years from now 150 tons will still be in the air. So the carbon train is not one we can shift into reverse. If we are to avoid climate changes that persist for centuries we have to do it by limiting the amount of carbon we put in the air in the first place, not by waiting for what we have emitted to "disappear."

So how much fossil carbon is it "safe" to add to the natural carbon cycle? The short answer is, the more carbon we add to the atmosphere, the greater are the risks of serious irreversible harm. Today's atmospheric concentrations are already 30 percent higher than pre-industrial levels and we are on our way to doubling concentrations over the next several decades if we do not take action. The Intergovernmental Panel on Climate Change (IPCC) reports support a conclusion that to avoid serious, widespread risks of damage we should keep concentrations from rising above 50–60 percent higher than pre-industrial levels (450 parts per million (ppm) or less).

Others will argue we may be able to go higher without great harm. But the point remains, without action to limit emissions, we will commit ourselves to much higher levels before we know if we, our children, and our children's children's children can live with the changes we have caused. Thus, responsible policy is to do as much as we can to preserve our options to stabilize concentrations at levels not too much higher than today while we learn more about how sweeping future climate changes may be.

To preserve our options to keep long-term concentrations from exceeding prudent levels we must organize ourselves to live within a carbon budget. Given the long atmospheric life of carbon, once emitted, we know how many tons of carbon we can add to the atmosphere over a long period of time and still keep long-term concentrations below some target level. Scientists agree that to preserve the option of stabilizing CO_2 concentrations at 450 ppm we must limit cumulative carbon emissions to about 900 billion tons in the two centuries from 1900–2100.[7] These may seem, at first, like immense periods of time that someone else, someone later, can worry about; but they are not. As I mentioned above, we have already emitted 300 billion tons of our budget and the next 300 billion tons will be released in the next 25–30 years; without effective programs, humans are likely to put 1800 billion tons of carbon in the air between the start of the 20th century and the end of this century.

We must understand that further delay in adopting policies to limit emissions means the remaining budget will be consumed at ever increasing rates. We all remember the idea of "stopping distance" from high school drivers' education classes: the faster your speed, the more ground you cover before you can stop. The same lesson applies here: the expanding global economy means we are emitting carbon and consuming the global carbon budget more rapidly every year. In 1970 when the Clean Air Act was passed, global carbon emissions from energy use were 4.1 billion metric tons; in 1999 they were 6.1 billion tons; and in 2020 they are forecast to be 10 billion tons. To avoid burning through our budget before we can deploy climate friendly technologies, we have to send the policy signal now to the private and public sectors that designing and using low-carbon systems makes good sense.

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[6] Not all the added CO_2 stays in the air. A significant amount is taken up by vegetation and by the ocean. If this did not happen, today's atmospheric CO_2 concentration would already be 50 percent higher than pre-industrial levels rather than the measured 30 percent increases.

[7] For a target of 550 ppm (double pre-industrial levels) the two-century budget is about 1200 billion tons of carbon.

These are no longer theoretical calculations. Figure 4 shows how much of a 450 ppm and a 550 ppm budget we have left today and how rapidly it will be consumed under a plausible business as usual scenario. By the years 2020 or 2030, we will have consumed more than half the budget consistent with stabilizing at either of these levels.

New fossil power plants that are now in the planning and financing stage represent a major commitment of the remaining carbon budget. Once built, these long-lived capital investments will operate and emit carbon for a large fraction of this century. The International Energy Agency forecasts over 600 gigawatts[8] of new coal plants will be built between 1997 and the year 2020, an increase of 60 percent above today's world coal capacity in a little over 20 years. Much of this capacity is in the fast growing economies of the developing world. Without a policy change, these plants almost certainly will use conventional combustion technology and will emit some 60–80 billion tons of carbon over their lifetimes.[9] Business and government officials are designing and financing these plants today and they are doing so without an appreciation of how much of the global carbon budget their individual decisions will consume.

The fact is that rapid consumption of the carbon budget will hurt all countries by limiting our range of choices and making future negotiations of any climate agreement much more difficult. It is in the strategic interest of the United States (and other countries) to develop a cooperative program to convince decisionmakers around the world that all countries will benefit if each deploys low-carbon energy systems in order to slow the consumption of the global carbon budget. But without policy action in the United States, such efforts, if made, are likely to be met with a polite nod and dismissal.

Breaking the Climate Impasse with the Clean Power Act

The Clean Power Act can break the policy impasse on global warming and set in motion the changes in public and private sector investments that are essential for developed and developing countries alike to limit CO_2 emissions to prudent levels over the course of the next century. While any path we pursue to combat global warming can take decades to finish, if we are to keep open the options of stabilizing CO_2 concentrations below levels double pre-industrial concentrations it is essential that we begin now, not ten or twenty years from now.

By putting in place a cap-and-trade system for the electric sector, the Clean Power Act will send a signal now to energy planners and private investors to find innovative ways to reduce carbon emissions associated with our production and use of electricity. There is no question that major reductions in CO_2 from today's levels are technically and economically feasible today; the market actors simply need a reason to use the available menu of options. Greater use of lower carbon fuel, improved production and demand-side efficiency, expansion of cogeneration and combined heat and power systems, replacement of old and inefficient plants with modern technology all will reduce CO_2 from our electric generating system. But these approaches will not be deployed in today's increasingly competitive electric power markets if they involve expenditures even slightly less profitable than what corporate investment hurdle rates demand. And as long as carbon can be emitted for free, there will be no value assigned to investment options that reduce carbon emissions, no matter how affordable they may be.

Let me give an example of a promising, climate friendly system of investments that is not being pursued today even though its components are technically proven, profitable and would contribute to reducing our dependence on oil imports. For years, we have injected CO_2 into oil wells with declining production to boost the amount of oil that can be recovered. Today in the U.S. oil producers pump around 30 million tons of CO_2 into oil fields in a process known as enhanced oil recovery (EOR), supplying about 200,000 barrels a day of our oil needs. These EOR operations are largely concentrated in the southwestern United States where a network of pipelines ships CO_2 to oilfields in the Permian Basin. Unfortunately for climate needs, nearly all of this CO_2 comes from natural CO_2 reservoirs rather than from the hundreds of combustion and natural gas processing sources that are also located in the region.

Oil geologists believe that we could greatly increase EOR recovery, perhaps by an order of magnitude. But believe it or not, the constraint is a shortage of CO_2 supply! While it is technically feasible to build industrial sources that would separate CO_2

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[8] One gigawatt equals 1000 megawatts.

[9] As I will describe below, it is now possible to build coal plants that are designed to be capable of storing carbon in geologic formations. But this technology will not be used without a policy signal that carbon emissions should be constrained.

and provide it for EOR use, that is not the path that the market is pursuing. Instead, operators of existing natural CO_2 reservoirs are proposing to drill new wells to meet demand. Later this week the comment period will close on a proposal to drill new CO_2 extraction wells in the Canyons of the Ancients National Monument in southwestern Colorado.[10] As long as CO_2 can be dumped for free from power plants, the logic of the market favors pulling CO_2 out of the ground to meet EOR demand rather than capturing it from sources that release it to the atmosphere.

Meanwhile, in the San Joaquin Basin oil fields in California, potential EOR operations are on hold because of the lack of a developed CO_2 supply. The Department of Energy has done an economic study of a proposal to build coal-based Integrated Gasification Combined Cycle (IGCC) plants near the California fields, separating the CO_2 for EOR injection and selling the electricity in the western grid. The good news is that DOE concludes these projects could use commercially proven technology and make a profit without any government subsidies. The bad news, according to the same study, is that as long as CO_2 can still be emitted for free, a project developer can make more profit building a conventional natural gas plant and venting the CO_2 to the atmosphere.[11] Absent a policy incentive, like that provided by the Clean Power Act, to make avoiding CO_2 emissions economically attractive, these systems are not likely to be built.

The irony is that the coal industry is one of the most hostile opponents to adoption of binding limits on carbon emissions even though such limits are needed to stimulate a commercial market for IGCC power plants. At present nearly all new fossil generation planned for construction in the United States are natural gas plants, given the uncertainty that faces coal with climate policy in a state of confusion. If coal is to continue as a major player in the United States and elsewhere for more than a few decades it will only be if technologies like IGCC, that make it feasible to store carbon permanently in geologic formations, are commercially deployed at sufficient scale to buy down their costs to fully competitive levels. The United States is one of the few countries in the world with the resources to carry out such a program in a short period of time.

Time is of the essence. While we argue domestically about whether to enact caps on carbon like those in the Clean Power Act, the rest of the world is making energy investment decisions. As I mentioned earlier, some 600 gigawatts of new coal capacity are on the drawing boards for construction in the next twenty years, most of that in the developing world. The logic of the market dictates that these plants will be conventional coal plants, which are still slightly cheaper than more efficient, sequestration-ready IGCC plants. The United States has the power to change that calculus. If we do so, the benefits to us and other countries will be enormous. We can provide a needed technology to a worldwide market and the use of that technology together with a balanced portfolio of efficiency programs and renewable energy systems, can avoid committing the planet to unmanageable growth in CO_2 emissions. The opportunity cost posed by those 600 gigawatts of new coal plants now being planned and built is enormous. We and others will rue our choice if we do nothing to steer that massive investment to a lower-carbon alternative. Enacting the Clean Power Act is a way to shape our future rather than just letting it happen to us.

Comparing Benefits and Costs of Power Plant Proposals

In developing its multi-pollutant proposal for the Administration last August, EPA calculated the benefits of a set of caps essentially the same as those in the Clean Power Act. EPA has concluded that these pollution reductions would provide enormous benefits for public health and the environment, including over 19,000 premature deaths avoided annually and larger reductions in pollution-related disease.[12] Using standard methods, EPA estimated the economic benefits of these health improvements as worth $154 billion annually. The compliance costs to achieve these enormous benefits were calculated at about $10 billion per year.

This analysis should have made clear to anyone concerned about the welfare of the public that the Clean Power Act's caps for traditional pollutants are a massive bargain for the American public. But the Administration ignored EPA's analysis and developed its much weaker CSI proposal.

EPA estimates the CSI approach will cost industry about $3.5 billion in 2010 and $6.5 billion in 2020 but cuts health benefits in half.[13] These numbers reflect a re-

[10] See Environmental Assessment notice at http://www.co.blm.gov/canm/kdmorganea.htm.

[11] Reuther, J, et al., "Prospects for Early Deployment of Power Plants Employing Carbon Capture," U.S. DOE National Energy Technology Laboratory, 2002. Available at http://www.netl.doe.gov/publications/others/techrepts/2430–1a.pdf.

[12] "Comprehensive Approach", note 1, supra.

[13] USEPA, "Clear Skies Initiative Summary," at 17. See notes 1–2, supra.

markable and disappointing choice by the Administration: its proposal saves industry an average of $5 billion annually over the decade from 2010–2020 but costs the public in excess of $50 billion in benefits annually over the same period in lost health benefits, most notably incurring an additional 10,000 avoidable premature deaths annually for most of this period. It is difficult to conceive of a justification for this decision and the Administration has offered none.

While EPA's analysis was ignored by the Administration, it stands as an uncontested estimate of the benefits of the caps for the traditional pollutants contained in the Clean Power Act. EPA's August analysis did not address the benefits or costs of controlling CO_2 because the President in his letter of March 2001 had ruled out that option. However, in November 2001, EPA and the Energy Information Administration (EIA) provided the committee with reports estimating the total costs of the Clean Power Act, including its CO_2 provisions.[14] Below I will summarize why NRDC and others believe the costs estimated by EPA and EIA in their reference case scenarios dramatically overstate the actual costs of the bill.

The True Costs of Limiting CO_2

Adopting the CO_2 caps in the Clean Power Act would change incentives and promote investments in efficiency, renewable energy and CO_2 capture and avoidance measures. But the Administration says it would cost too much. Last November, EPA Assistant Administrator Holmstead testified against S. 556, claiming that the bill would cause a significant increase in electricity prices. This committee heard similar claims in the 1980's when industry and the Reagan Administration claimed that enacting acid rain controls would raise electric rates by 30 percent or more. Of course, nothing like that happened, nor will it under the Clean Power Act.

Five main assumptions affect forecasted costs of carbon limits: 1) the predicted growth in electricity and natural gas demand; 2) the expected deployment of new technology, 3) the method used to distribute emission allowances and recycle revenues to prevent windfall profits to electric generating companies; 4) the schedule of emission reductions required under existing law, and 5) the investments in new natural gas generating capacity expected to result from business-as-usual. One can calculate high costs for controlling carbon emissions only if one assumes little is done to improve energy efficiency and use of renewable energy; if one assumes that Congress will let electric generators retain $50–100 billion in windfall profits; if the reference case is chosen such that technologies and regulations are frozen at today's levels; and if the recent expansion of electricity generation from natural gas is ignored. Unfortunately, the published analyses by EPA and the Energy Information Administration (EIA) have emphasized cases that rely on all these flawed assumptions.

It is worth noting though, that despite the use of multiple assumptions that drive costs upward, EIA concluded that the Clean Power Act would only raise the costs of generating electricity by about 9 percent.[15] Since generation costs are less than half of the rates on a typical customer's bill, if only the added generation costs were passed on to the consumer, the impact on rates would be even smaller. As discussed below, this can be achieved by intelligent design of the allowance allocation system.

"Business as usual" or "reference" scenarios used by both EIA and EPA to project the future without new multi-pollutant power plant emissions controls do not include several Clean Air Act activities that will on their own require substantial additional power plant emissions clean-up. Future power plant emissions requirements not included in EIA/EPA baselines include: Section 112 MACT rulemaking (mercury and other hazardous air pollutants) and subsequent "residual risk" rulemaking; $PM_{2.5}$ NAAQS implementation; 8-hour ozone NAAQS implementation; and visibility requirements (regional haze). While future power plant emissions reduction requirements (reduction targets and dates) cannot be precisely predicted, plausible scenarios for such requirement can certainly be developed and modeled as opposed to being ignored as was done in the analyses presented to the committee last fall.

Also worth noting is that none of the EIA or EPA analyses include scenarios with significant market penetration of coal gasification (IGCC) power plants. Congress is moving toward enacting financial incentives intended to move IGCC technology rapidly into the market. The Bush Administration strongly supports such incentives. As discussed above, penetration of IGCC technology into the market could fun-

[14] The Administration has not provided a formal assessment of the benefits of controlling CO_2 under S. 556 but as the Administration's May 2002 National Communication demonstrates, the benefits of effective action to limit global warming will be enormous.

[15] Energy Information Administration "Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenario," Office of integrated Analysis and Forecasting, U.S. Department of Energy, October 2001.

damentally alter how the power system would respond (physically, economically and politically) to multi-pollutant clean up requirements. However, no EIA or EPA analyses to date appear to include scenarios with substantial deployment of this technology. Such scenarios should be included and would likely show significantly different results than the current EIA/EPA "4-P" scenarios.

Another serious concern about the EIA/EPA reference case assumptions is that much of the costs projected for meeting "4-P" caps similar to those in the Clean Power Act are for building and operating new natural gas power plants to displace coal generation. However, the market is already building many of these plants—so they should not be "counted" as a cost of the Clean Power Act.

For example, 160,000 MW of combined cycle natural gas electricity generation capacity is scheduled to be operational by 2005 with about 110,000 MW of that either already operating or under construction.[16] And, yet, EIA only has about 85,000 MW of online capacity in their 2010 reference case projection, with EPA showing a similar result. There is obviously something wrong with these forecasts. Adjusting EIA and EPA analyses to reflect this market activity would substantially lower costs forecasted for the bill's carbon reductions.

The committee also should be aware that the models used to produce EPA's original cost estimates for S. 556 have been revised and the revisions result in significantly lower cost estimates. EPA's October 2001 cost study[17] contained a number of methodological flaws, which have been addressed in further analysis carried out by the original study's principal authors.[18] The revised version of the original EPA modeling effort corrects a number of important errors. The gas supply function is now more responsive, so that a given increase in price results in a larger increase in supply. This change has lowered both the gas prices (thus reducing the cost of carbon reductions) as well as the control costs for mercury.

The improved analysis also maps the technology scenarios from both the EIA's advanced technology case and the integrated program of efficiency and renewable energy policies from the November 2000 report by the Department of Energy's (DOE) principle research labs, "Scenarios for a Clean Energy Future (CEF)," more accurately than was previously done. This creates a better demand response and greater penetration of energy efficiency and other low-carbon technologies into the marketplace. These effects were underestimated in the original modeling done for EPA.

According to the both the original EPA report and the updated analysis, U.S. gross domestic product would be consistently higher under the Clean Power Act than under business-as-usual as a result of the stimulus-producing measures for energy efficiency and renewable energy promoted by the bill. As for natural gas dependence, the bill's program of efficiency and renewable energy would actually reduce natural gas use for electricity generation compared to the Administration's energy plan. Thus, the large spike in natural gas use that the Administration has forecasted would simply not occur.

Furthermore, price spikes for both electricity and natural gas were grossly exaggerated in previous analyses. For example, in its original analysis EPA projected an increase in average electricity price, compared to today's value, of more than 2 cents per kilowatt-hour in the year 2015, when the CEF "moderate" efficiency and renewable policies were assumed to be implemented. In contrast, the revised analysis projects an increase of less than one half of a cent per kilowatt-hour under the CEF moderate policy scenario.

As for natural gas prices, the original EPA assessment projected that by 2015 wellhead natural gas prices under the Clean Power Act with CEF moderate policy initiatives would be about 5 percent higher than the reference case projection for that year. The new analysis finds that in fact the gas price will be lower than the business-as-usual projection by 3.5 percent. With the Clean Power Act carbon caps and the implementation of the EIA advanced technology case, the costs of generating electricity to meet forecasted demand would actually be as much as $26 billion less in 2015 than under the Administration's energy plan.[19]

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[16] Clean Air Task Force, "Concerns with EIA and EPA Multi-Pollutant Power Plant Clean Up Studies," December 2001.

[17] Report prepared for Senators Jeffords and Lieberman, "Economic Analysis of a Multi-Emissions Strategy," USEPA, Office of Air and Radiation, Office of Atmospheric Programs, October 2001.

[18] John A. Laitner and Donald A. Hanson, "The Macroeconomic Impacts of a Multi-Emission Reduction Strategy," presented at Electric Utilities Environment Conference, Tucson, Arizona, January 22–25, 2002.

[19] It is also noteworthy that last November's EIA analysis predicts cumulative savings of as much as $220 billion in electric generation costs by 2020 if the Clean Power Act's caps and the

Continued

The Role of Energy Efficiency and Renewable Energy

Both the EPA and EIA reports on the Clean Power Act demonstrate the power of the integrated strategy of emission caps, improved efficiency, and greater renewable energy sources that is called for in the bill. By improving efficiency and increasing the share of renewable energy sources, we can reduce the rate of growth in demand for electricity and for natural gas, thereby allowing the emission reductions required by the bill to be achieved without diminishing economic growth. The tools to accomplish this smarter energy future have been documented in DOE's "CEF" report, which shows that an integrated program of efficiency and renewable energy policies can save consumers money and help achieve reduced emissions, including CO_2 emissions at much lower costs.

The EIA has criticized the CEF policies as not being achievable. But EIA has not supported its criticism with any real analysis—rather EIA merely asserts that this rapid deployment of energy efficiency and renewable power technology is unlikely. It is important to understand the relative competencies of these two different institutions within DOE. EIA's expertise is in retrospective analysis of energy market statistics, so it is not surprising that its projections forward are heavily colored by its familiarity with the past trends. In contrast, the national energy labs that prepared the CEF report are expert in the engineering and economics of conventional and advanced energy efficiency and renewable energy technologies. The CEF experts have prepared a rebuttal to EIA's criticism that adds further support to the CEF report's findings.[20] I attached this rebuttal to my testimony before this committee last November and would like to include it in the record of this hearing as well since their response has not been answered by EIA to my knowledge.

An examination of the CEF report demonstrates the reasonableness of the national energy labs' view that we have a large untapped potential to improve efficiency and save money. The measures called for in the CEF report are not dream technologies, waiting to be invented; they are common-sense initiatives designed to increase the use of technologies that already exist. The CEF measures include improved appliance efficiency, through labeling, standards, and financial incentive programs. They include similar measures for buildings, calling for less wasteful heating, cooling and lighting systems and weatherization and rebate programs to reduce gas and electric use in existing buildings.

EIA claims the CEF's projected rate of deployment for these technologies is unreasonable. But in only 6 months, Californians were able to reduce their electricity consumption by 6 percent during the summer of 2001, with no deprivation. This experience should encourage us not to sell short our ability to be smarter about energy use, given the appropriate policy support.

The Administration asserts the goal of its energy plan and carbon intensity initiative is to reduce demand and greenhouse gas emissions to levels below EIA's business as usual (BAU) forecasts.[21] These are laudable goals but the Administration's use of BAU forecasts to critique the Clean Power Act is inconsistent with those goals. The Administration needs to adopt specific policies designed to achieve appropriately ambitious goals for energy efficiency and renewable energy. When it does so, it will conclude, as DOE's experts have, that S. 556 will help, not hurt consumers.

When policies to promote efficiency and renewables are combined with emission caps the cost of meeting S. 556's pollution targets is dramatically reduced compared to BAU assumptions. In the revised EPA analysis they find that by implementing even the very modest efficiency efforts, as suggested in the EIA's "advanced technology" scenario, electricity generation costs fall below BAU costs. For example, in 2010 for the EIA advanced technology case there would be a $12 billion savings in electric generation costs as compared to BAU costs, while by 2015 with the slightly more aggressive CEF moderate efficiency and renewable policies, the saving would rise to as much as $26 billion.[22] We can clean up power plants and save consumers money through smart policies to reduce waste and increase renewable energy supplies.

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advanced technology policies in the CEF study are implemented, even though EIA has emphasized other findings in presenting the results of the study.

[20] Koomey, et al., October 18, 2001, "Assessment of EIA's statements in their multi-pollutant analysis about the Clean Energy Futures Report's scenario assumptions."

[21] See President Bush' Climate Initiative announcement of February 14, 2002 at www.whitehouse.gov.

[22] Calculated as the difference from the base case in total retail expenditures on electricity minus the value of CO_2 allowances plus the costs of energy R&D and efficiency incentive programs.

Who Profits—Polluters or Consumers?

EPA's analysis from last fall makes another unstated assumption that drives up costs for consumers. Mr. Holmstead blamed S. 556 for these consumer cost increases but the real blame lies with the approach chosen by EPA. Even though EPA's earlier study shows changes in generating costs under the Clean Power Act range from a maximum increase of $17 billion per year to a savings of $3 billion per year, the study calculates consumers' bills would go up by $50 to $100 billion per year.[23] EPA reaches this conclusion by assuming that the law Congress will enact will let generators retain windfall profits from the value of carbon permits under a cap-and-trade program. EPA's approach assumes a large transfer of wealth from consumers to shareholders of generating companies, by grandfathering the value of carbon permits to the polluters themselves.

S. 556 does not call for any such result. With more sensible approaches to carbon allowance allocation than the Administration assumes, households will have lower net costs under the Clean Power Act. There are a number of approaches to deny windfall profits to generators and recycle revenue to consumers and the bill encourages EPA to adopt such approaches in designing the cap-and-trade program for carbon. The committee may wish to act affirmatively to be sure that the most effective allocation program is used.

The Role of Natural Gas

The Administration also has claimed that S. 556 will endanger energy security by requiring too much natural gas for electric generation. But large increases in natural gas use do not occur if the integrated CEF efficiency and renewable policies called for in S. 556 are implemented. Under either the moderate or advanced CEF policy programs, EPA's study confirms that natural gas use in electric generators will by 2015 be slightly less then what is expected under BAU growth with no emission controls.[24] There is no reason to oppose limits on carbon pollution in order to avoid excessive dependence on natural gas or any other single fuel for electricity generation. Smart policies that harness the largely untapped potential of efficiency and renewable energy do a better job of promoting fuel diversity and attack the problem of global warming at the same time.

A Piecemeal Approach to Power Plant Pollution is Flawed

Decoupling CO_2 control from the control of traditional pollutants as the Administration proposes would lose valuable time that we need to prevent global warming from becoming an unmanageable problem. In addition this approach would increase costs and uncertainty for the electric generating sector. No one disputes that the strategies companies will use to clean up power plants will be different if they pursue a strategy to limit CO_2 instead of a strategy that ignores the pollutant. The Administration's CSI approach will encourage investment in end-of-pipe controls that target one or possibly two of the traditional pollutants while doing nothing to reduce CO_2 emissions. These added investments will actually tend to prolong the lives of some of the CO_2 emitting sources in the country. In contrast, a comprehensive program like the Clean Power Act will allow a full range of techniques to be used, including use of cleaner fuels, supply and demand-side efficiency programs and repowering existing plants with new technologies whose CO_2 can be geologically sequestered.

As the committee knows, even President Bush has indicated that climate policy is in flux and is subject to review in, what by utility planning terms, is the near future. In his February 14, 2002 statement the President said that the government would review its progress in 2012 and decide on next steps. While this 10-year delay is long and harmful from a climate policy standpoint it provides no certainty to utility planners. Of course, 2012 is two Presidential terms away and the policy may well be reviewed long before then. But even if a company assumed the review would not occur until 2012, the potential for a policy change at that time implicates investment decisions being made today for large capital projects like power plants.

CSI Threatens Local Air Quality

Beyond the differences in the proposals to control traditional pollutants and CO_2, there is another sharp difference between the Clean Power Act and the Administration's CSI approach. While the Clean Power Act would protect and improve local air quality, the CSI approach would threaten it. The Clean Power Act guarantees that each power plant community's pollution will improve by requiring old plants to meet

[23] Note: no citation was supplied in the testimony.

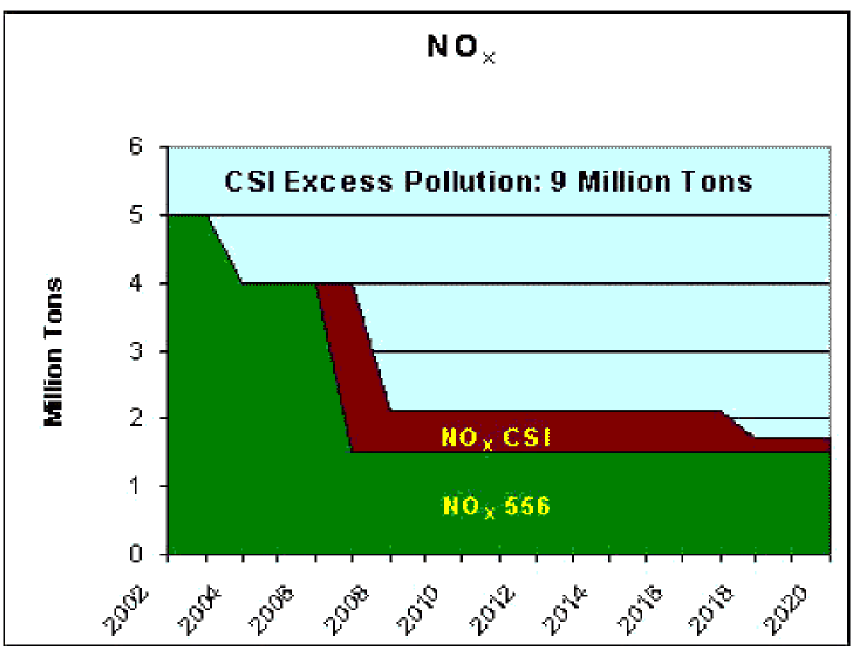
[24] In the updated EPA assessment BAU gas use in 2015 is 1333 billion kWh and with the Clean Power Act and CEF moderate measures it is 1331 billion kWh.

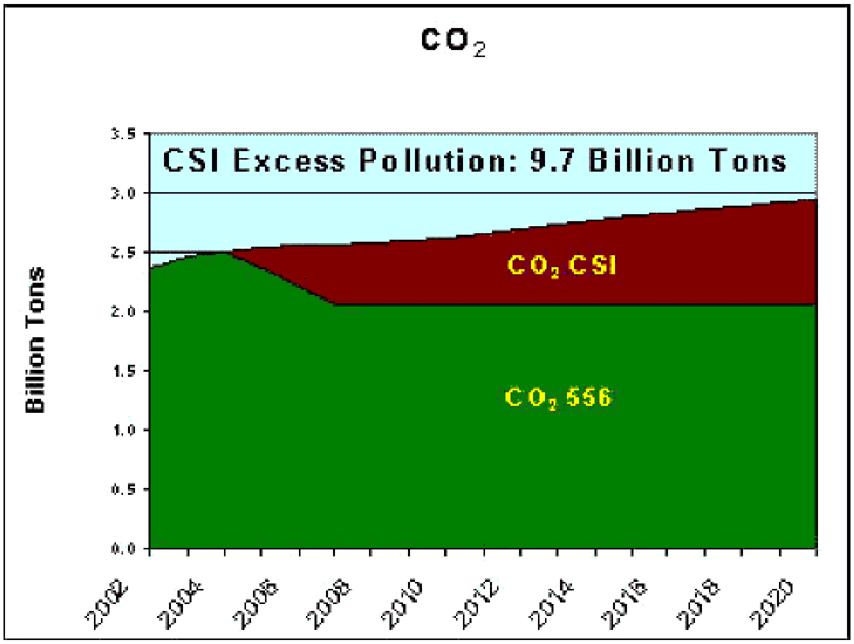
modern performance standards after they have been fully paid off. The CSI approach contains no such safeguard. Indeed, high Administration officials have stated that they will advocate repeal of provisions in the current law that protect local air quality.

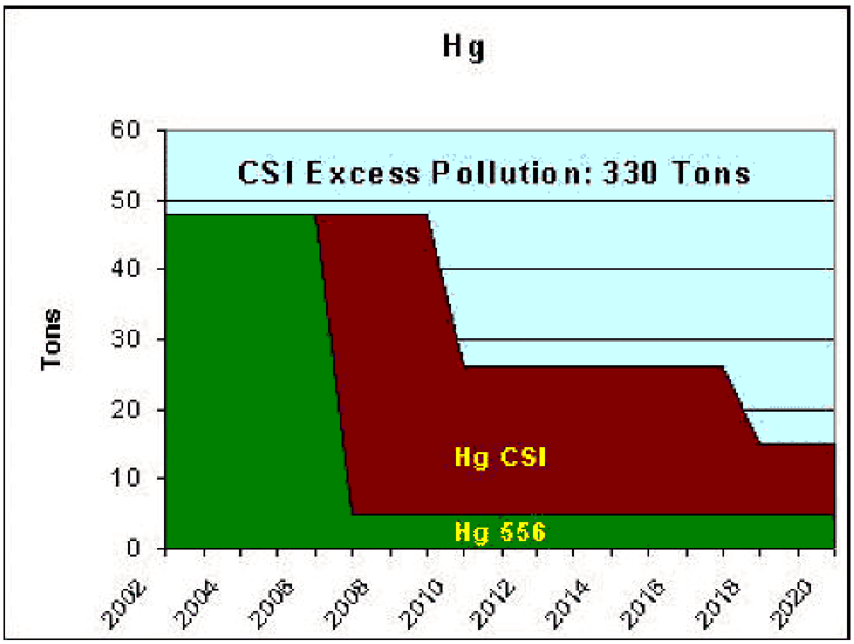
The current law requires large pollution sources that undergo modifications to structure their projects so that they do not increase local pollution. If there is a significant emissions increase from such projects the Act requires the source to meet modern performance standards to minimize the pollution it adds to the community air shed. In a nonattainment area such projects must also offset their emissions to avoid making existing unhealthy air levels even worse. This offset program is the original emission trading program, put in place by the Ford Administration and ratified by Congress in 1977.

The current Administration would scrap these safeguards, claiming that the caps it proposes will provide adequate protection. First, as discussed above, the CSI caps are so large that they will leave many areas with unhealthy air even if no hotspots developed. Second, the Administration argument ignores the fact that a national cap cannot by itself prevent increases in local air pollution. The Administration cites the operation of the 1990 Act's acid rain program to argue that national caps can avoid hot spots. But the 1990 acid rain cap program did not do away with the "new source review" (NSR) programs; it kept them in place. It is the combination of the cap and the NSR programs that has produced regional reductions without local pollution increases. This history is relevant for another reason: as the Administration notes, the acid rain cap program has been implemented with tremendous cost savings to industry. The point the Administration and industry critics of the NSR programs seem unable to acknowledge is that these cost savings were achieved with the NSR provisions remaining as a fully functioning part of the law. When the President's father proposed his acid rain cap legislation in 1990 he did not propose to get rid of the NSR safeguards. That was a wise decision and the current president should follow his lead. Thank for the opportunity to present these views. I'll be happy to answer your questions.

Figure 1. Emission Caps: CSI v. S. 556




CO2
CSI Excess Pollution: 9.7 Billion Tons
CO2 CSI
CO2 556
Billion Tons
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020


Hg
CSI Excess Pollution: 330 Tons
Hg CSI
Hg 556
Tons
60
50
40
30
20
10
0
2002
2004
2006
2008
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2012
2014
2016
2018
2020

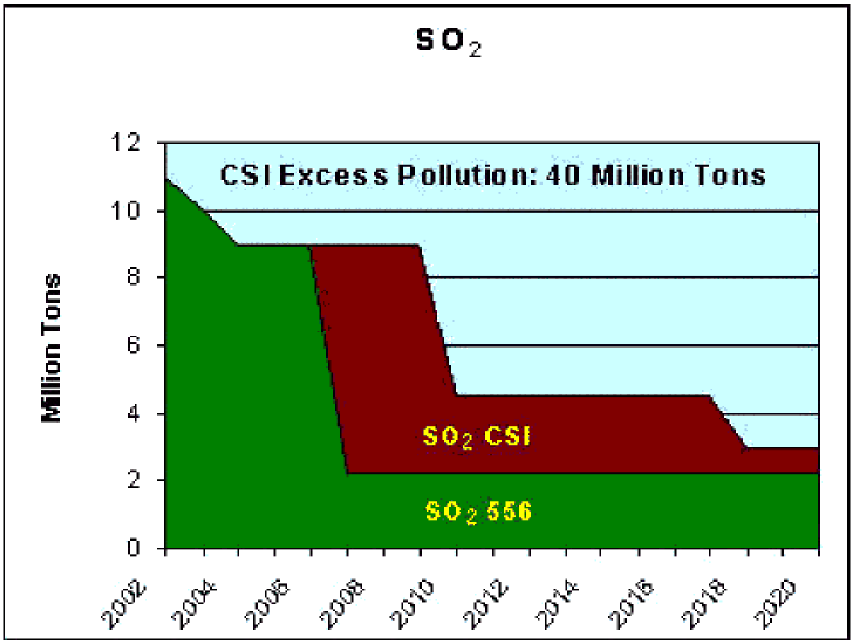


Figure 2a. SO_2—CSI v. EPA 8/01

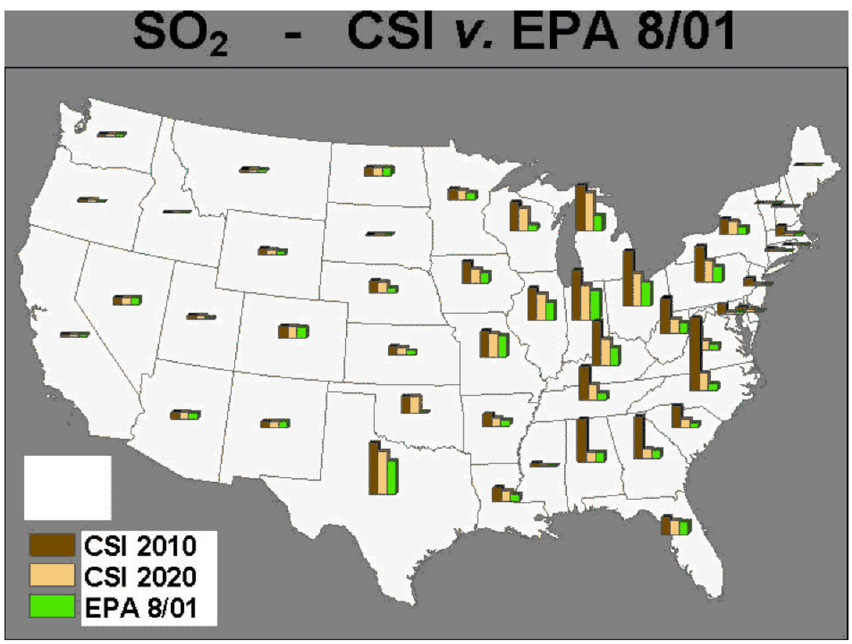


Figure 2b. NOx—CSI v. EPA 8/01

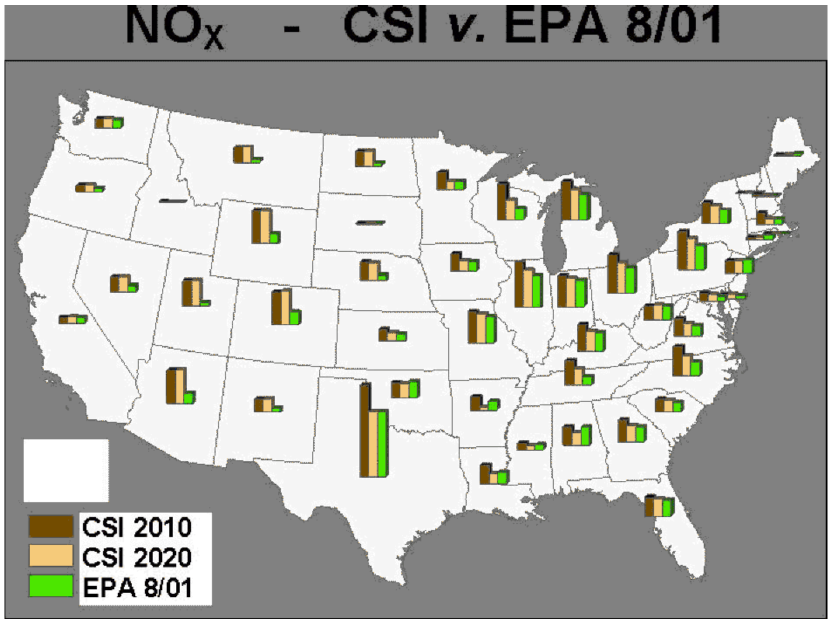


Figure 2c. Mercury—CSI v. EPA 8/01

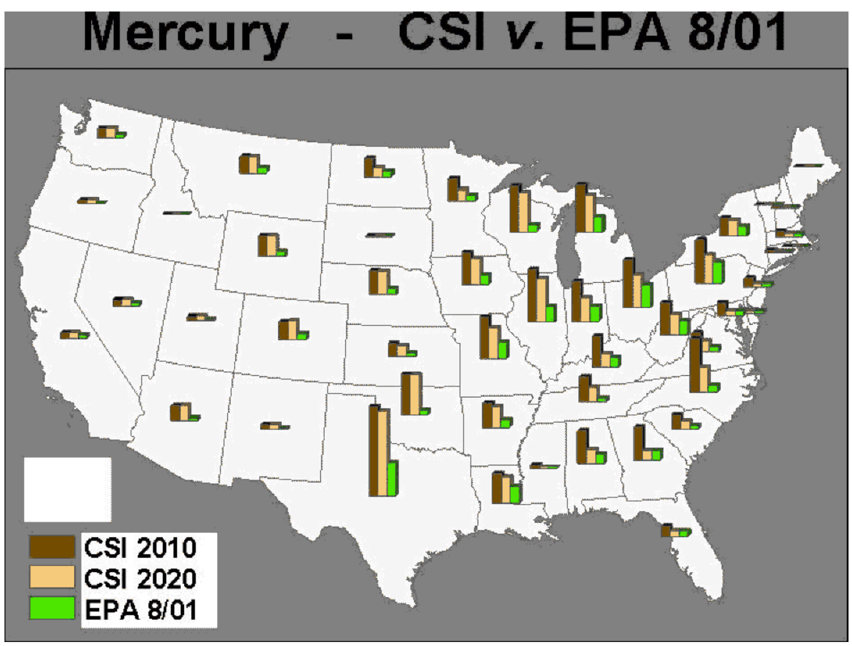
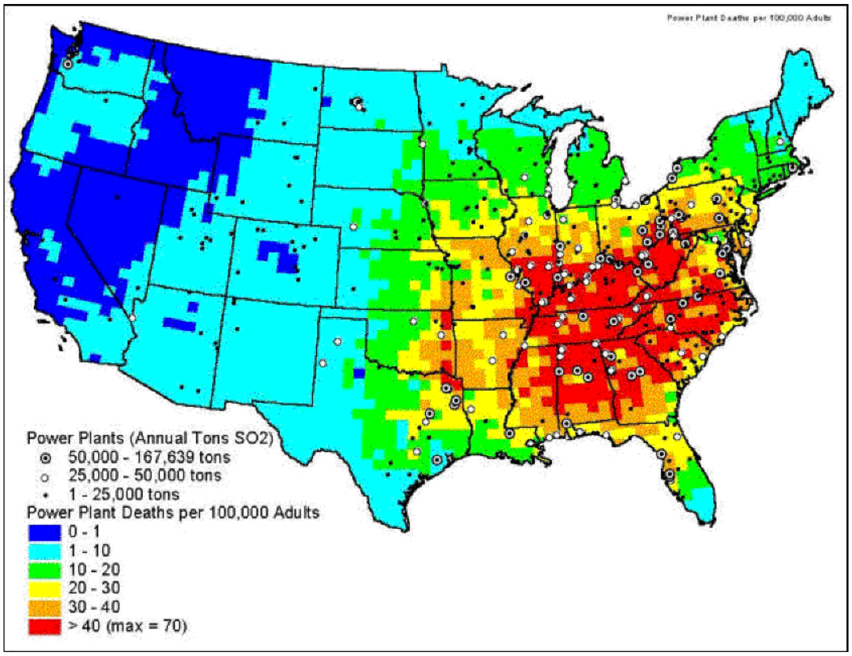
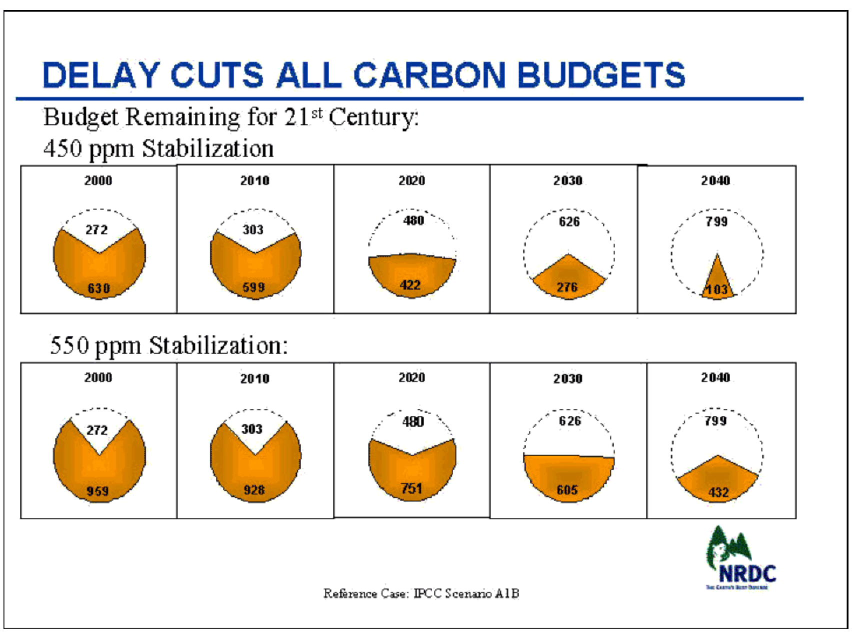


Figure 3. Mortality from Current Air Pollution



Source: Abt Associates, 2000

Figure 4. Delays Cut All Carbon Budgets



RESPONSE OF DAVID HAWKINS TO ADDITIONAL QUESTION FROM SENATOR JEFFORDS

Question. When do you think that IGCC for coal will become economic? What would the price of carbon have to be to make it useful?

Response. Gasification Combined Cycle technology is economic today with substantial and rapidly growing installed capacity worldwide. According to a data base compiled by SFA Pacific, there are more than 130 commercial scale gasification projects in operation today with a combined capacity equivalent to 24,000 MWe. More than 30 additional projects are planned which would add almost 14,000 MWe to global gasification capacity.

See http://www.gasification.org/98GTC/GTC01003.pdf.

Most of the existing capacity is used to produce hydrogen and other chemicals in refineries and other chemical plants. Most of the planned additional capacity is for electric power applications. Somewhat less than half of the existing gasification technology uses coal as the primary fuel, with the remaining capacity using petroleum, petroleum coke, and biomass.

New coal-fired gasification systems (CGCC) plants are highly competitive against new conventional coal steam plants today. Commercial investment in such plants is limited in the United States today for several reasons. First, lack of strong comprehensive emission limits and inadequate enforcement of the Clean Air Act's New Source Review program when existing plants are modified makes continued and expanded operation of obsolete grandfathered power plants artificially cheap. Second, due to lower capital costs, natural gas combined cycle plants are generally the lowest cost option for new plants at current and projected natural gas prices. Third, CGCC technology is primarily based on chemical engineering techniques that are less familiar than conventional boiler technologies to most electricity generation companies. CGCC plants will also become more attractive when standardized designs oriented to the power generation market are introduced. ChevronTexaco and General Electric have published descriptions of such a design. See http://www.gasification.org/98GTC/GTC01048.pdf.

CGCC with carbon capture and disposal will be a very attractive option for complying with the comprehensive emission limits proposed in S. 556. The incremental costs of achieving the S. 556 targets for all four pollutants is far lower with CGCC technology than with conventional coal-steam plants because CGCC plants can be designed so that high pressure CO_2 is separated from other emissions without a major increase in capital costs or loss of plant efficiency. Moreover, CGCC plants could be built today with the option of adding carbon capture and disposal in the future. Several factors will determine how quickly CGCC with carbon capture and disposal would be competitive with natural gas combined cycle units as a low-carbon supply option: the level of carbon emission limits, the price of natural gas, progress in reducing the capital costs of CGCC plants, and the value that can be obtained by selling CO_2 for use in enhanced oil recovery operations.

RESPONSES OF DAVID HAWKINS TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. An EIA analysis found that if the deadline was 2012 instead of 2007, the costs would be substantially less. For example, a 75 percent reduction of NOx by 2007 would cost $1,000 more per ton than if the compliance date was 2012. For mercury, a 90 percent reduction by 2007 would cost about five times more than a 75 percent reduction by 2012. I agree that the Jeffords proposal gets larger reductions in the three pollutants at a faster rate than the Administration's proposal, but at what point do we consider the costs and availability of technology and the work force to install it?

Response. Excessive power plant emissions of NOx, SO_2, CO_2 and Hg are currently causing severe damage to public health and the environment. These emissions should be reduced as quickly as possible to levels consistent with the environmental performance of modern power plants. Representatives of the pollution control industry have testified before the Committee that the emission limits and schedule given in S. 556 are feasible (even prior to moving the deadline back to 2008 during markup). For example, Richard Miller of Hamon Research-Cottrell testified on January 29, 2002 that:

"As testified by the Mr. Jeff Smith, Executive Director of ICAC during his previous testimony on November 15, 2001, I believe the air pollution control industry currently has the existing technologies required to achieve NOx, SO_2, and Mercury reduction levels as proposed under Senator Jeffords' bill (S. 556), and the required resources to further develop and deliver this technology within the timeframe outlined under this bill. This is consistent with the past history of the air pollution control industry to develop the technologies required to achieve emission control technologies regulated since the first Clean Air Act was enacted."

The costs of achieving emission reductions are difficult to predict in advance, and the history of Title IV of the Clean Air Act suggests that a priori projections of pollution control costs are likely to greatly underestimate the cost reductions that can be achieved once the lobbying is over and the engineers get to work. Furthermore, marginal allowance prices for a single pollutant are a poor measure of the cost of any given set of pollution limits. Costs are better measured by the total cost of electricity generation when all emission limits are achieved in an integrated fashion.

While it is true that weaker or more delayed pollution targets would result in lower compliance costs for the industry, the public would pay a much higher price in health and environmental damage if weaker, slower targets were adopted. For example, EPA's analyses in the hearing record relating to different 3-pollutant programs show that targets and timetables like those in the Committee bill produce incremental public benefits about ten times larger than the incremental compliance costs when compared to the Administration's proposal.

Question 2. During your testimony, you cited numerous health-related statistics. What are the scientific methods in those studies for measuring "power plant deaths?"

Response. In my testimony, I made reference to the findings of three studies of premature mortality attributable to power plants and the premature deaths that could be avoided by reductions in power plant pollution. I referred to the estimated 30,000 premature deaths from pollution from the nation's power plant fleet based on analysis by Abt Associates; the consulting firm relied upon by U.S. EPA to assess the health benefits of many of the Agency's air regulatory programs. "The Particulate-Related Benefits of Reducing Power Plant Emissions" (Abt Associates 2000). I cited a study by U.S. EPA finding that the Agency's August 2001 power plant cleanup proposal would result in over 19,000 avoided premature deaths nationwide. (U.S. EPA, "A Comprehensive Approach to Clean Power" (August 3, 2001) available on the web at http://www.clnatf.org/publications/other/epa—straw—proposal.html). I also cited EPA's preliminary analysis of the Bush Administration's "Clear Skies Initiative" finding the proposed emission reductions would avoid up to 9,000 fewer deaths per year for a decade than the Agency's August 2001 proposal. U.S. EPA, "Human Health Benefits of Clear Skies" (May 2002). Since the time of my testimony, EPA has released its final health benefits assessment of the "Clear Skies Initiative" finding that it will avoid only 6,000 premature deaths per year in 2010 and 12,000 in 2020. http://www.epa.gov/clearskies/CSIhealth—env—benefits7–01.ppt. Thus, by EPA's own reckoning, my testimony understated the deficiency of the "Clear Skies" program relative to EPA's August 2001 proposal. Under the latest analysis, "Clear Skies" would mean over 13,000 unnecessary premature deaths per year for a decade and over 7,000 extra deaths per year thereafter.

All these studies share the same basic methodology that has been thoroughly reviewed and approved by EPA's Science Advisory Board in the context of EPA's section 812 report to Congress on the Benefits and Costs of the Clean Air Act from 1990 to 2010 and EPA's risk assessment for the 1997 National Ambient Air Quality Standard for Fine Particulate Matter. See http://www.epa.gov/airprogm/oar/sect812/1990–2010/finaladv.pdf; http://www.epa.gov/science1/pdf/coua0001.pdf; http://www.epa.gov/science1/pdf/councila01004.pdf; http://yosemite1.epa.gov/ee/epa/eed.nsf/pages/guidelinesfiles/$file/Appendices.pdf.

This methodology involves three steps: (1) power system economics; (2) air quality modeling; and (3) health impacts analysis and valuation. The first module of the analysis involves power system economics and asks the question: How will the power system respond to the imposition of the cost of cleanup? Possible compliance responses by power plants include reducing emissions through the installation of control equipment, obtaining emission reduction credits from other plants that "overcontrolled" their emissions relative to the required emission reduction levels, reduced utilization of the plant, or retirement and replacement of the generation from that plant with other sources of electricity. The analysis assumes that the power sector will meet the proposed power plant reduction goals in the most cost-effective manner available and provides critical information on the spatial distribution of power plant emissions before and after cleanup. Both Abt Associates and EPA used the Integrated Planning Model (IPM) to determine the spatial distribution of emissions under the scenarios analyzed.

The outputs from the IPM model provide the inputs to the air quality modeling work that forms the second module of the analysis. All three analyses relied on EPA's approved Regional Emission Modeling System for Acidic Deposition

(REMSAD). The model was run to estimate the fine particulate matter concentrations attributable to power plants and the reduction in pollutant concentrations due to the levels of pollutant reductions analyzed.

The air pollution concentration outputs from the air quality modeling analysis provide the inputs for the third module of the analysis—estimating the health benefits from the pollution reductions. Utilizing health studies from the peer-reviewed, published literature that link changes in ambient fine particulate matter concentrations to risk of mortality, pollution dose-response functions were derived that quantify the relationship between the forecasted changes in exposure and the expected changes in specific health effects. In each analysis, published, peer-reviewed studies of chronic mortality were used to set the risk coefficient for premature death (e.g., Pope et al. 1995, Krewski et al. 2000, and Pope et al. 2002). In each analysis, the modeled changes in pollutant concentrations (from the base case to the emission reduction scenarios) were used to estimate the power plant attributable health impacts or avoided impacts from each. The difference between the based case and the emission reduction scenario yielded estimates of the health benefits (or avoided adverse impacts).

Once the avoidable health impacts were determined, the monetary value of each of the various health endpoints was estimated through economic valuation techniques accepted for previous EPA analyses. Given the attributable and avoided health impacts calculated, the study authors tallied the health damages—from lost workdays and cost of emergency room care, to the statistical value of human lives lost from power plant emissions—and estimated the benefits of the health impacts avoided under the cleanup scenarios.

How do these studies match-up against similar studies?

I am aware of only four other studies that estimate the health impacts from power plant pollution. These studies tend to confirm the direction and order of magnitude of the results of the Abt Associates and U.S. EPA studies of power plant pollution health impacts discussed above.

In 1996, Jonathan I. Levy and John D. Spengler at the Harvard School of Public Health began a series of studies that examined the health impacts of fine particulate matter from specific power plants. Each study looked at a different region. The first considered two coal plants in Massachusetts, the second examined nine plants in Illinois, and the third focused on five plants in Metropolitan Washington, DC. In 1997, Jonathan Samet of Johns Hopkins University Medical School performed a similar analysis on a single power plant in southwest Washington State. The researchers examined impacts such as deaths, hospitalizations, asthma attacks, and other serious health outcomes. They asked several different questions, including: (1) What are the likely impacts of the plants based upon current emissions? (2) Would the impacts decrease if emissions were reduced using readily available pollution controls? (3) Are impacts uniformly distributed or are people closest to the plants at highest risk? And (4) Is there a disparate impact on certain vulnerable groups?

For the two Massachusetts plants, Levy and Spengler found that current emissions are linked to over 110 deaths, 79 of which could be avoided by installing modern pollution controls. Levy, J.I., Spengler, J.D., "Modeling the Benefits of Power Plant Emission Controls in Massachusetts," v. 52, 5–18. J. Air & Waste Manage. Assoc. (2002). For the pollution from the nine Illinois plants, they found approximately 300 attributable deaths of which over 200 could be avoided by pollution controls. Levy, J. I., Spengler, J. D., et al. "Using CALPUFF to Evaluate the Impacts of Power Plant Emissions in Illinois: Model Sensitivity and Implications," 36 Atmospheric Environment 1063–1075 (2002). The pollution from the five D.C. area plants was found to be responsible for over 250 premature deaths annually, over 175 of which could be avoided by upgrading pollution controls on the plants. Levy and Spengler also found that even this standard analysis seriously understates the impact of power plant pollution on low-income and minority groups. Levy, Jonathan I, Susan L. Greco, and John D. Spengler, "The Influence of Population Heterogeneity on Air Pollution Risk Assessment: A Case Study of Power Plants Near Washington, DC," Environmental Health Perspective (in press). Last, Samet found pollution from the Centralia plant in Washington State responsible for 51 deaths, while installation of desulfurization controls could cut that number to 12. Samet, J.M., et al., "An Assessment of the Health Risks Due to Air Emissions from the Centralia Power Plant," (August 17, 1997).

The methodology in these studies of specific plants differs slightly from that used by Abt Associates and U.S. EPA to examine the impacts nationwide of the U.S. power fleet. First, Levy/Spengler and Samet analyses did not utilize an underlying power system economics model. They assumed constant generation at the plants after the imposition of pollution controls. Also, because the analyses examined the impacts of specific individual plant and small groups of plants on a smaller area, Levy/Spengler and Samet made use of a more refined regional air quality model that takes better account of dispersion and local terrain (i.e., CALPUFF Lagrangian puff model using NOAA's Rapid Update Cycle meteorological data. Also, in each study, the authors applied their own synthesis of the peer-reviewed, published health literature to derive risk coefficients for fine particulate matter-related mortality based on the body of literature available at the time of each analysis.

Question 3. According to your testimony, you claimed that S. 556 would create incentives for landlords to improve the efficiency of their existing rental properties. Can you cite the specific provision that provides incentives?

Response. Section 707(c) of S. 556 provides significant incentives to landlords to improve the efficiency of existing rental properties. Subsection (c) allocates up to 20 percent of the emissions allowances for sulfur dioxide, nitrogen oxides, and carbon dioxide to encourage energy efficiency, renewable energy, and cleaner power sources. Under subsection (c)(2), owners and operators of energy efficient buildings, producers of energy efficient products, and entities that carry out energy efficiency projects will receive allowances in proportion to the amount of electricity or natural gas that is saved by those activities. These allowances can then be sold at market value, providing concrete financial incentives for undertaking these activities.

These incentives will benefit owners of rental properties, as well as others. For example, the owner of a rental apartment building could obtain emissions allowances for making energy efficiency improvements in the building (e.g., adding insulation, upgrading heating systems) that verifiably reduce its electricity or natural gas consumption. The incentives will also encourage the building owner to purchase super-efficient products (e.g., refrigerators and other appliances, lighting products, water heaters and air conditioners), which will be available at lower prices due to the award of emissions allowances to producers of those efficient products. Allowances will also be available for constructing highly efficient new rental properties.

Families who rent their homes will also benefit from Section 707(a), which allocates most emissions allowances to households. The number of allowances awarded will reflect the relative amount of residential electricity consumption in various States, as well as the size of households. Revenue from the sale of these allowances will be distributed to rental households, as well as to other households. With these revenues, families who rent housing (as well families that own their own homes) will be able to invest in money-saving measures to further reduce their electricity expenditures. For example, a rental family could replace an inefficient television or window air conditioner with new super-efficient models described above.

RESPONSE OF DAVID HAWKINS TO ADDITIONAL QUESTION FROM SENATOR GRAHAM

Question. I know that NRDC is an advocate of allocating the permits for pollutants in a manner that would allow the public to own them. That is, some entity would hold the permits in trust and sell them to companies as necessary. The revenues of such sales would then be used to offset increased utility rates.

Could you provide me with further details on how the program would work and why you prefer this over a output-based allocation?

Response. The findings in the Clean Power Act (Section 701(6)) recognize that the atmosphere is a public resource and that emissions allowances represent permission for power companies to use this public resource to dispose of air pollution from electricity generation. For these reasons, S. 556 allocates emissions allowances to promote public purposes, including protecting electricity consumers from adverse economic impacts; providing transition assistance to adversely affected workers, communities, and industries; and promoting clean energy resources and energy efficiency. The bill accomplishes these goals with a combination of approaches, including both an allocation to consumers and an output-based allocation to electricity generators.

First, Section 707(a) of the bill allocates the majority of allowances for SO_2, NOx, and CO_2 directly to residential households. Households receive more than 60 percent of all allowances in 2008, rising to nearly 80 percent in 2018. Proceeds from allowance sales will protect consumers from increases in electricity costs.

Second, Section 707(c) sets aside 20 percent of the allowances—on an output basis—to encourage energy efficiency, renewable electricity generation, combined heat and power, and cleaner fossil generation. These incentives will help realize multi-billion dollar costs savings for consumers and for the economy as a whole. As demonstrated in the Department of Energy's Scenarios for a Clean Energy Future (www.ornl.gov/ORNL/Energy—Eff/CEF.htm), energy efficiency and renewable power could meet 60 percent of the need for new power plants projected by the Bush Administration's energy plan.

According to the Clean Energy Future study, an energy path that improves efficiency and uses more renewable resources would save Americans more than $30 billion per year on their electric bills. Power plant emissions that cause smog and dangerous fine particles could be cut by more than half from current levels. Power plant emissions of carbon dioxide could be cut by a third.

Under the Clean Power Act, a new wind generator would earn emissions allowances as it generates electricity. The allowances can then be sold. In this way, the bill encourages more renewable generation by improving the rate of return from such projects. In effect, the bill creates a market value for cleaner energy that is not captured in the current market where electricity suppliers can release unlimited carbon dioxide pollution for free. In addition, by allocating allowances to other clean resources, the bill encourages an array of energy efficiency measures, from the production of more EnergyStar products to the construction of more energy-efficient homes and commercial buildings. Industrial facilities can also earn allowances for projects that accomplish verified electricity or natural gas savings. These provisions also encourage faster penetration of combined heat and power systems, which would earn allowances both for their electricity and thermal energy output. Finally, the bill encourages construction of more low-emitting natural gas generators and coal gasification plants (CGCC). Coupled with permanent storage of carbon dioxide underground, CGCC offers a potential way to use coal without continuing to dump CO_2 into the atmosphere. All of these incentives are provided to electricity generators and consumers on the basis of megawatts of electricity output (or in the case of energy efficiency measures, on the basis of megawatts avoided).

Other provisions provide a portion of the allowances to fossil-fueled electric generators without charge for a 10-year period, based on their electricity output in the year 2000. Another share of allowances is dedicated to transition assistance to adversely affected employees and communities, and to the most electricity-intensive industries. Transition assistance programs can be funded by the proceeds from selling these allowances. Finally, shares of allowances are made available to encourage techniques for geological and biological carbon sequestration.

The basic approach is illustrated below:

You asked for more information on the program would work. A first question would be how households, employees, and communities will obtain the value of their allowances. Household allowances would be transferred initially to trustees appointed by the Administrator, who will obligated to obtain fair market value for them by means of periodic auctions. Proceeds will then be directed to residential households primarily through credits on their electricity bills. The credits stemming from the household allowances will offset increases in electricity rates for residential consumers.

Allowances allocated to adversely affected employees and communities will also be transferred to and auctioned by Administrator-appointed trustees. Proceeds could be used to fund training programs, income maintenance, and other forms of assistance to communities.

The Clean Power Act uses trustees because it would not be practical or efficient to distribute allowances directly to millions of beneficiaries (e.g., each residential household) and then to expect the beneficiaries individually to bear the inconveniences and expenses of arranging to sell their allowances. Trustees could be banks or other institutions that agree to accept strict fiduciary responsibilities on behalf of their household beneficiaries.

The Clean Power Act does allocate a small percentage of the allowances directly to electric generators free of charge. Numerous studies show that this approach is sufficient to protect those firms, and their shareholders, from any losses in the value of electric generating companies as the result of the bill's emission control program. According to Resources for the Future (RFF), "it would be sufficient for the government to allocate at zero cost only 7.5 percent of the emissions allowances to completely offset the losses within the electric sector." Burtraw, D. et al., "The Effect on Asset Values of the Allocation of Carbon Dioxide Emission Allowances," Resources for the Future (Mar. 2002) p.13, http://www.rff.org/disc—papers/PDF—files/0215.pdf (emphasis added). Other studies have reached similar conclusions: Smith, A. et al., "Allowance Allocation: Who Wins and Loses Under a Carbon Dioxide Control Program?" Prepared by Charles River Associates for the Center for Clean Air Policy (Feb. 2002), www.ccap.org (click on 'climate' link); Goulder, L., "Confronting the Adverse Industry Impacts of CO_2 Abatement Policies: What Does it Cost?" Resources for the Future (Sept. 2000), http://www.rff.org/issue—briefs/PDF—files/ccBrf23—goulder.pdf. In fact, RFF found that electric generators would reap huge windfall profits—nearly 13 times the impact on their firms—if they were given all emissions allowances free of charge.

RESPONSES OF DAVID HAWKINS TO ADDITIONAL QUESTIONS FROM SENATOR WYDEN

Question 1. What options do coal-fired utilities have, besides fuel switching, in order to meet the carbon dioxide reduction target in the Clean Power Act?

Response. Coal-fired utilities would have many options for complying with the carbon dioxide reduction target in S. 556 in addition to fuel switching from coal to natural gas. These include improving the efficiency of existing plants; repowering coal-fired units with gasification technology; investing in renewables (e.g., wind turbines to generate electricity with zero emissions, or co-firing biomass in coal boilers to reduce the effective emissions rate); investing in demand-side management investments to reduce overall generation requirements; and purchasing allowances through the trading system.

Improve power plant heat rates. Improving the efficiency of coal-fired plants may reduce carbon dioxide emissions while maintaining, or even increasing, electricity generation capacity. Investments in heat rate improvements save fuel costs and are frequently undertaken as a standard measure at older plants. In contrast to the current situation, a cap on carbon emissions will guarantee that a heat-rate improvement at one plant achieves a reduction in total system emissions, rather than possibly displacing other cleaner resources.

Repower with Coal Gasification-Combined Cycle (CGCC). Coal gasification is an option that increases thermal efficiency and thus lowers CO_2 emissions. It also has lower emissions of the other three pollutants. This technology is an option both for new plants as well as plants that would consider fuel switching. Coal gasification also has the advantage of being compatible with carbon dioxide capture and geologic storage (because of the relatively concentrated stream of carbon dioxide compared to conventional combustion), which would give plant operators additional long-term options. The CGCC repowering option when equipped with carbon capture and geologic storage can achieve a 90 percent reduction in CO_2 emissions while still using coal as the fuel.

Invest in renewables, end-use efficiency, and lower-carbon intensity generation. Electric power companies may reduce the emissions of their entire generation portfolio while still operating coal-fired generation by investing in non-coal fired generation sources (e.g., renewables, combined-cycle gas) or energy efficiency and conservation. This investment could occur in the firm's service area or, by virtue of the emissions trading system, anywhere nationwide. The Clean Power Act also uses allowance allocations to provide incentives for renewables, conservation, and highly efficient new generation, which will indirectly benefit existing coal-fired generation by reducing compliance costs and the associated allowance prices.

Purchase allowances to cover emissions. One of the principle features of the Clean Power Act is the use of a cap-and-trade approach for carbon dioxide, maximizing flexibility and minimizing regulatory costs for power plants. Individual coal plant operators may purchase allowances to cover all or part of their carbon emissions. Overall, not all coal plants could meet their obligations in this manner, but it will be an option available to all plants. Under the Clean Power Act, some of these allowances could be purchased from entities participating in eligible forest carbon sequestration programs.

Retire oldest, dirtiest generation. The most efficient way to meet the overall caps in the Clean Power Act will likely involve some limited retirement of the oldest, dirtiest, and least productive generating units. All analyses, however, show that the cleaner and more productive coal-fired plants can continue to be operated, at a profit, under the emissions caps of the Clean Power Act.

Question 2. Do you agree that it would be beneficial for both the environment and for generators of electricity to include allowances based on CO_2 reductions from forest sequestration as a component in the 4-P bill?

Response. The Clean Power Act allocates allowances from within the carbon dioxide cap to eligible forest carbon sequestration programs. NRDC believes that forest sector activities have an important role to play in a comprehensive climate policy. The Clean Power Act approach is the best way to include the forest sector within the scope of power plant legislation while maintaining the bill's CO_2 cap and its objective of promoting a lower carbon energy system.

The Clean Power Act provides new financial resources to support and incentivize forest carbon sequestration, above and beyond existing public and private programs, while maintaining the bill's cap on emissions from the power sector. The additional resources are provided by allocating emissions allowances to landowners who take specified actions to increase sequestration. Landowners will be able to sell the allowances to power generators who need them for compliance. The allowances that landowners receive come from the original amount created by the Clean Power Act.

Thus, forest sequestration activities receive new support without generating new allowances or credits that would "bust the cap."

The bill's approach is more responsible than alternative approaches that would inflate the emissions cap by creating new allowances (i.e., offsets). The off-the-books offset approach would weaken the carbon cap for the power sector and would undermine the objective of transforming the power sector over time to a sustainable energy producer, relying on cleaner generation and efficiency to help us meet our long-term climate protection needs.

In the context of more comprehensive carbon mitigation programs, forest carbon sequestration policies will benefit the environment if they include rules that ensure real climate benefits and environmental co-benefits. Climate benefits are provided only if forest activities result in additional removal of carbon dioxide from the atmosphere, compared to the business-as-usual case in the absence of those policies. In addition, sequestration policies must take into account the fact that forest (and agricultural) sequestration is not permanent. That is, stored carbon may be subsequently lost, either through intentional land use decisions or by foreseeable occurrences such as fire or pest outbreaks. Policies must include provisions to assure that the atmosphere will be made whole whenever stored carbon is lost. Without such provisions, carbon sequestration cannot be considered on an even footing with other emission reductions.

Forest carbon sequestration can benefit the broader environment if the types of forest management activities implemented improve water quality, wildlife habitat, and other factors. While some sequestration practices meet these objectives, some others can be harmful to the environment. The Clean Power Act forest sequestration programs include appropriate guidelines to assure accurate assessment of net climate benefits and the promotion of projects with environmental co-benefits.

STATEMENT OF LEE P. HUGHES, VICE PRESIDENT, CORPORATE ENVIRONMENTAL CONTROL, BAYER CORPORATION ON BEHALF OF THE AMERICAN CHEMISTRY COUNCIL

My name is Lee Hughes and I am Vice President of Corporate Environmental Control for Bayer Corporation. I am responsible for the environmental matters of Bayer's U.S. operations. This includes compliance with the Clean Air Act. Thank you for the opportunity to appear before you today.

I am here today representing the American Chemistry Council. Leading companies engaged in the business of chemistry make-up the membership of the Council. Consistent with our goal of continuous improvement in our environmental performance, the chemical industry supported the 1990 Clean Air Act Amendments. For over a decade we have worked with EPA to implement its many programs and in the development of programs that continuously make people's lives better, healthier, and safer.

Council members have a big stake in the continued success of environmental programs, including the Clean Air Act, and have worked hard to ensure that success. Overall environmental, health and safety spending by Council members for the year 2000 alone was roughly 3.4 billion dollars. We have steadily reduced emissions while increasing production, thereby increasing economic productivity while reducing our environmental footprint. One-way Council members have accomplished this is by using "combined-heat-and power" ("CHP" or "co-generation") units to increase our energy efficiency and cut emissions from power generation as well.

While we have improved our energy efficiency for decades, we remain an energy intensive industry. Not only do we use a lot of electricity, we are major consumers of natural gas, both to power our energy efficient operations and as a raw material. In fact, we are the major user of natural gas for non-energy purpose. This makes our businesses very sensitive to energy prices and to the availability of natural gas as one of our core materials. While S. 556's provisions are aimed largely at the utility sector, some of our operations would be directly affected. Moreover, as major users of energy, Council members will be directly impacted by any increase and availability of critical raw materials such as natural gas that are driven by the provisions of S. 556.

General Position and Concerns

We support the goal of continued improvement in air quality, building on significant progress to date. We also support the use of market-based mechanisms to achieve these goals. However, we are very concerned about S. 556's potential impact on our industry and the broader economy. The one million employees of the business of chemistry are just beginning to rebound from two very tough years of economic slowdown, and are poised for an upturn. We are concerned that this bill's impact on energy prices and natural gas availability could send us the other way by driving many utilities to switch to natural gas as a fuel source. We think it is important to set our goals and timetables for additional emissions reductions in a way that takes account of and minimizes these sorts of economic impacts while delivering improved air quality. We also believe it is important to harmonize any new requirements with existing provisions of the Clean Air Act, rather than to simply layer an entire set of new provisions over an already complex matrix of existing requirements.

Because of these reasons, the American Chemistry Council is opposed to S. 556 in its current form. We believe that S. 556 needs to be reconsidered and amended. Our three primary concerns are:

1. Ensuring fuel diversity.
2. Recognizing the benefits of CHP Units.
3. Harmonizing the various sections of Clean Air Act with new requirements.

The Need for Continued Fuel Diversity

It is critical to the business of chemistry that S. 556 and similar proposals not result in an over-reliance on natural gas to generate our nation's electricity needs unless there is simultaneous government action to ensure access to an adequate supply of natural gas. The business of chemistry relies on natural gas as an energy source and as a basic raw material. For many utilities, the most cost-effective, or perhaps only, way to meet the stringent targets in S. 556 would be to switch to natural gas, accelerating the trend toward gas as a preferred fuel. Without any increased initiatives, the Energy Information Agency (EIA) is predicting that the use of natural gas to power our utilities will increase threefold by 2020 in their "business as usual" case. This increasing demand for gas is occurring at the same time we are restricting access to supplies of natural gas. S. 556 would exacerbate this shift.

When the supplies of natural gas are short and demand is high, prices rise with a significant impact on our industry. In fact, each dollar rise in the price of natural gas means about $1 billion in additional annual cost for our members—costs that we cannot recover in the price of our products in the global marketplace in which we compete. When U.S. companies cannot compete in the global market, we lose jobs and investment in the United States (and production increases in parts of the world where local companies may be allowed to have much higher emissions). Last year's spike in gas prices was disastrous for our U.S.-based industry.

When the price of natural gas approaches $4.00 per MBTU, the U.S. chemical industry's costs of production rise to the point where we are no longer competitive with foreign producers. Gas prices increased to over $10.00 per MBTU during our most recent spell of demand-supply imbalance, the winter of 2000–2001, and the industry had one of its worst years in 50 years. Last year we saw several plant closings because of that price spike.

To the extent that multi emission proposals result in significant fuel switching by utilities from coal to natural gas and public policies do not provide for adequate gas supplies, demand for gas can reasonably be projected to outpace supply. Growth in demand for electricity is already affecting the supply/demand balance for natural gas before any additional fuel switching is encouraged. EIA reports that 90 percent of our new electric power facilities will rely on natural gas as their sic fuel. Actions that further alter our basic fuel mix for electricity and drive up demand for natural gas create significant problems for our industry and we urge this committee to evaluate them carefully.

Given the levels of reduction currently required by S. 556, and the time lines for meeting these levels, we conclude that enactment of this legislation will result in significant additional fuel switching by the utilities. In particular, the CO_2 component of the bill would virtually guarantee that the utilities would need to abandon coal use in favor of natural gas. Existing technology cannot accomplish the CO_2 reductions currently sought by S. 556, and the bill's timetable does not provide for adequate technology development. The short deadline for meeting S. 556 deadlines in 2007 does not allow new and developing technology-based solutions to come on line in time to make a difference. Fuel switching to natural gas would be the only viable alternative for the utilities, at the expense of the broader U.S. economy.

Congress Must Not Penalize Co-generation or Combined Heat and Power (CHP) Units

S. 556 covers more than power generating units in the electric utility industry. It also covers combined heat and power units (CHP) that produce thermal energy and electricity for onsite consumption, but who may also sell small amounts to the electric grid. This puts these already efficiently operating units in a competitively disadvantaged position of now needing to buy credits—essentially penalized for being "ahead of the curve."

The U.S. chemical industry continues to make significant investments in the use of combined heat and power (CHP) technology to provide much of its electrical and thermal energy needs. CHP, also referred to as "co-generation," produces both thermal power and electricity, from the same fuel input. Where utilities generally discard the thermal energy produced from combustion, CHP units capture it for use in a manufacturing plant.

The advantages of CHP cannot be overestimated. A typical CHP unit produces power twice as efficiently as a traditional utility and emits at least 50 percent less pollution. In this regard, generation of energy needs by CHP technology is extraordinarily beneficial toward meeting the nation's air quality goals.

We know members of the Environment and Public Works Committee appreciate the role of CHP, since most of them, including the committee's chairman, supported Senators Carper and Collins on their amendment to restore the incentives for CHP in the recently passed energy bill. It is most surprising then that S. 556 appears to ignore the beneficial aspects of CHP units because it includes them within its coverage. CHP units should not be included in S. 556, but should be provided with an opportunity to opt-in to the program.

Harmonize New Requirements With The Clean Air Act

We support using a market driven approach to achieve the goals of the Clean Air Act. We believe the market will do a significantly better job of allocating scarce resources to accomplish the goals of the Clean Air Act than a confusing, overlapping, and constantly changing command and control regulatory regime. However, to achieve the true benefits of a market-based system, it must be properly structured and it must be allowed to work. And, it must not penalize good performers.

Currently, S. 556 meets neither of these tests. Its compliance timelines are too short to allow the market to develop and function. Further, by not providing relief from any of the command and control requirements of the Clean Air Act, the uncertainty of meeting the various regulatory program requirements in the coming years will discourage facilities from participating in market-based trading. Companies will likely decide that they need any "credits" within their company—or worse, they simply may not be able to generate credits because of other overlapping regulatory requirements.

The trading mechanisms of the Clean Air Act acid rain program were successful because that program was the mechanism for reducing acid rain and the program focused only on a single, similar sector, i.e., utilities. By design, S. 556 isn't the only program that will apply to a facility, and S. 556 will also cover non-utilities such as combined heat and power units from the chemical sector and others.

These two factors will contribute to a higher cost program and severe inequities between industrial sectors with different margins and a constrained allocation. This means that a source subject to S. 556 will still face the uncertainty of meeting all other Clean Air Act requirements for the same pollutants in addition to meeting S. 556 requirements. Not only does this remove any incentive for an industry to support S. 556, but also it eliminates any perceived benefit of certainty and cost-effectiveness that a properly crafted market-based system could provide.

Finally, because S. 556 adds another mechanism for meeting Clean Air Act emission goals without ensuring that these programs will work in concert, sources will not be able to benefit from the market-based approach of S. 556. Instead, they will still be required to adopt each additional command and control approach implemented by the CAA over the next two decades.

As additional support for our views, the committee should consider that,

- the Clean Air Act is working and air quality has improved;
- the nationneeds to maintain diversity of fuel sources;
- the business of chemistry is vitally important to the U.S. economy;
- the business of chemistry is competitively disadvantaged by high natural gas prices; and
- including combined heat & power units in S. 556 will add significant burden to these highly efficient and well-controlled units.

The Clean Air Act Is Working and Air Quality Has Improved

The Clean Air Act, now nearing thirty years old and with amendments through the years, is a complex, command and control driven series of requirements and deadlines. While fraught with cumbersome programs, such as new source review, and full of complex and costly requirements, emissions have been dramatically reduced since the early 1970's. Furthermore, the Nation's air quality keeps improving as demonstrated by declines in annual emissions for all measured categories over the past 14 years. The 1990 amendments added significant control requirements and deadlines extending the scope and reach of the Act. Combined with EPA's 1997 decision to tighten standards for ozone and add a standard for fine particulates—we see a continued stream of requirements through 2020.

Because of this improvement, decisions about what to control, and the stringency of the control can have a critical impact on entire business sectors. The chemical industry is a prime example of a highly regulated and controlled industry that may now have to face significant raw material cost increases if a bill like S. 556 attempts to move too far too fast. In addition, S. 556, in its current form, would regulate combined heat and power units from the chemical and other industries. The cost of achieving any incremental environmental gains in emission reductions from these units will be prohibitive.

As you move forward with the development of multi-pollutant legislation, we ask the committee to carefully consider the progress that has already been made in reducing emissions, the increasingly complex and costly requirements still under development, and the need for equity in determining the scope of the program. Many combined heat and power facilities, like those in the chemical industry, are highly regulated and tightly controlled. Sweeping one-size fits all approaches will put us at a further economic disadvantage. In fact, structuring a program that doesn't provide credit for previous emission reductions penalizes sources and industries that have dramatically reduced their emissions in favor of those who currently use energy less efficiently.

The Need for Continued Diversity and Balance in our Nation's Energy Mix

The crippling run-up of energy prices in 2001 is still fresh in our minds and we still face a continuing threat of a repeat of that crisis. Current natural gas production and the recent decline in exploration almost guarantee it. Carefully crafted multi-pollutant legislation could help minimize this threat. In turn, by statutorily influencing the delicate balance of supply and demand for energy resources, multi-pollutant legislation could have a detrimental impact on our efforts to address our Nation's basic energy needs.

Our industry is an example of one that uses energy efficiently to make products that consumers use to make their lives better and in many cases, help our nation improve the efficiencies of energy generation and utilization. The business of chemistry converts certain petroleum products, natural gas, and other naturally occurring raw materials into a wide variety of basic chemicals. These basic chemicals are then converted by other sectors of the chemical industry into chemical intermediates and final chemical products such as plastics, synthetic fibers, and rubber. In turn, these chemical products are fabricated by many different industries into thousands of essential consumer products such as detergents, antifreeze, medical and sanitary products including sterile medical applications, food-packaging, and energy efficient uses such as insulation. All segments of our society use these products to make their lives better, safer and more energy efficient.

The Business of Chemistry is Vitally Important to the U.S. Economy

We are the nation's largest exporting sector, larger than agriculture, computers, or aircraft/aerospace. Exports grew 13.4 percent to a record $79.9 billion in 2000. The $6.3 billion trade surplus in 2000 continued a seventy-year-old tradition. In the United States, more than ten cents of every export dollar are due to chemicals and related products. That said, all of these numbers are down dramatically in the past year due largely to the run up of natural gas prices during the energy crisis of 2000—2001.

More than one million people are employed by the business of chemistry, and companies that purchase the products of the business of chemistry employ more than 36 million workers.

To maintain our position, the business of chemistry depends on reasonable prices and a secure supply of raw materials. Among these raw materials, natural gas is one of the most important. The chemical industry is the nation's biggest industrial user of natural gas, accounting for 11 percent of total U.S. consumption, and 30 percent of industrial consumption.

The Business of Chemistry is Competitively Disadvantaged by High Natural Gas Prices

High natural gas prices have an adverse effect on the business of chemistry in the United States. Although the market for chemicals is global, the price of natural gas is not. When U.S. firms are paying higher disproportionate prices for natural gas, chemical products made in the United States are at a competitive disadvantage in the global marketplace.

Not only does the relative price of natural gas affect chemical producers, so does the degree to which chemical producers rely on natural gas as a feedstock. For example, 70 percent of U.S. ethylene production relies on natural gas liquids as a feedstock, whereas 70 percent of global ethylene production relies on heavy liquids such as naphtha and gas oil. Therefore, as the price of natural gas rises disproportionately to that of heavy liquid feedstocks, the competitive position of U.S. ethylene producers is further weakened.

Last year's price shocks greatly affected U.S. production. The price of natural gas liquids (ethane, propane, butane) rose such that heavier feedstock chemicals (naphtha, gas oil, condensate) became more attractive economically. Unfortunately, few chemical production facilities that use natural gas as a feedstock could use these heavier liquids. In the short run, these high natural gas prices in the United States had a dramatic effect on companies in the business of chemistry. Here are some examples:

- Shut down almost one-half the nation's methanol capacity and one-third of its ammonia capacity. Five years ago, the United States was self-sufficient in methanol. Now we import about the same amount of methanol as we do oil.
- Ethylene capacity dropped between 10 percent and 15 percent, with at least 5 percent of this drop due to plant shutdowns. Net trade in ethylene was at one-fifth the 1997 level in 2001.
- High electrical power requirements and cost adversely affected choralkali, atmospheric gas, and ethylene oxide production facilities.
- The Gulf Coast region's economy, where most of the U.S. petrochemical industry is located, was hit particularly hard with widespread job losses due to plant shutdowns.
- The combined effect of higher natural gas prices led to fewer U.S. exports, greater U.S. imports, and a rising U.S. trade deficit. As a result, net trade for the United States last year fell at least $13.5 billion (4.5 billion attributable to the business of chemistry). In the long-term, the outlook remains uncertain:
- Domestic natural gas prices that remain year-on-year above $4 per mm BTU will severely damage U.S.-based chemical producers ability to participate in world trade. This impact is predicated on oil prices remaining below $25 per barrel. Plant closures, employment loss, reduced international investment in U.S. capacity, and an increase in semi- and finished goods imports will occur.
- Capital investment will be negatively affected. For example, a new ethylene plant costs about $400 million to build, but the rising price of natural gas in this country, coupled with the historically flat global price of ethylene (the 1999 price was the same as the 1980 price) makes new investment in the United States unlikely.
- Rising natural gas prices are inherently inflationary and have ripple effects on other products and services. An acceleration in inflation preceded every post-World War II recession.
- If chemical companies cannot pass on the cost increase to their customers, more plant shutdowns will occur, exports will continue to diminish, and more jobs will be lost.

Manufacturing and the chemical industry create the demand at our colleges and universities for scientists and engineers. As we continue to diminish these sectors in our economy, we hurt the technological base we often look to for solving the issues we face. These facts convey the critical nature of developing a multi-pollutant program that doesn't upset our balanced energy supply. Legislation should not discourage further development of CHP facilities.

Including Combined Heat & Power Units in S. 556 Will Add a Significant Burden To These Highly Efficient and Well-controlled Units

Combined heat and power (CHP) generating systems, also known as cogeneration, are cost effective and environmentally beneficial projects that provide both electricity and steam power. They are over 50 percent more efficient than typical power production units. A form of distributed generation, CHP plants are located at or near manufacturing facilities that require large amounts of electricity and steam. They offer several advantages over purchasing utility-generated power to run manufacturing processes:

CHP systems are more reliable and require fewer down times than utility power plants. In addition, since they are located at or near the site of the consumer there is no reliance on the transmission system to move these large blocks of power. The result is fewer bottlenecks and greater available transmission capacity for utilities to serve other customers.

CHP systems are, on average, twice as fuel efficient as conventional utility power plants because the heat that is wasted in a utility plant is captured for use in the associated manufacturing facility in the form of steam. By getting twice the amount of power from the same fuel input, CHP systems generally produce less than half the emissions of conventional utility power plants.

Combined heat and power systems offer benefits beyond those realized by the manufacturing community. Because it is distributed generation, CHP offers communities an additional option for power in times of emergencies. Furthermore, since the cost of building an industrial CHP plant is borne by the manufacturing plant, consumers are not held responsible for recovery of that capital investment, as with regulated utility plant investments.

Because of their numerous benefits in energy generation and minimal environmental footprint, CHP units cannot be considered in the same vein as electric power generating units. Multi-pollutant legislation that encompasses CHP units would put them at a significant economic disadvantage as they are already highly controlled. Cost per ton of emissions removed range well over $5,000 per ton removed as compared to electric generating units where cost per ton removed would average under $1500 per ton removed.

Some have suggested that these units would be "credit generators" under a multi-pollutant approach. In fact, these highly controlled units would be purchasers because uncontrolled units would generate more credits, and much more cheaply. By not accounting for the relative efficiency of various units, the unintentional result is to reward the less efficient production.

Summary

In summary, the Council's members believe that a carefully crafted multi-pollutant program could work and could provide air quality benefits to the nationwithout serious economic disruption. To succeed, however, the program must:

1) avoid creating supply/demand imbalances for critical fuels such as natural gas,
2) avoid significant increases in electricity costs,
3) not include CHP units,
4) allow CHP and other sources not covered to voluntarily opt-in,
5) address three pollutants, SOx, NOx and mercury, and
6) harmonize these provisions with existing CAA requirements to ensure that market mechanisms function properly.

We oppose S. 556 in its current form, as this bill does not meet these criteria. We would be happy to work with the committee to amend or develop an alternative to S. 556.

RESPONSES OF LEE HUGHES TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. You indicated that my bill puts combined heat and power units in a competitively disadvantaged position of needing to buy credits. Please review the enclosed version of S. 556, which the Committee approved on June 27, 2002, and tell me if you still hold that opinion and, if so, why?

Response. We continue to believe that S. 556 will competitively disadvantage CHP units. Under S. 556, CHP units would invariably be net purchasers of credits generated from inherently less efficient electric generating units, or in some instances, from units that may not have been previously controlled, as such purchases would be less costly than making the reductions at CHP units. This sends the wrong message—that adopting more environmentally and energy efficient technologies ahead of regulatory requirements will put you at a competitive disadvantage.

Combined Heat and Power units (CHP) are typically much smaller and at least 50 percent more efficient than a typical electric generating unit. Many CHP units are powered by natural gas and/or already have in place emissions controls that exceed those on typical coal fired electric utility generating units. CHP units are also generally much smaller than typical electric utility generating units, and due to the economies of scale require larger investment per unit of emissions reductions vs. electric generating units. S. 556 would treat these highly efficient units the same as a typical electric utility generating unit. Achieving a 70 percent reduction in emissions from these highly efficient units would generally be more costly per unit of emissions reduction than for large electric utility generating units for reasons of both economies of scale and the general rule that additional reductions for already controlled sources are more costly than the initial reductions. For these reasons the cost per unit emissions reductions for the electric utility generating units will generally be lower than for CHP units, such that the economically rational way for a CHP operator to meet the requirements of S. 556 would be to purchase credits from a utility generator.

Question 2. The National Coal Council report in May 2001 said that IGCC for coal could increase efficiency of existing coal-fired plants by 20 percent. That comes close to meeting the targets in the Clean Power Act and wouldn't "virtually guarantee that utilities would need to abandon coal use in favor of natural gas." Are any of your member companies working on this technology?

Response. The various "clean coal" technologies that are under development do show promise of greatly increasing efficiency and reducing emissions. To our knowledge, these technologies for use in large electric utility generating applications are still going through considerable pilot testing and would not be verified, available, and cost-competitive until at least sometime in the next decade. The tight timeframes imposed by S. 556 would not allow these technologies to come on-line before industries would need to meet the requirements. Requirements for CO_2 sequestration to also be applied to gasification technology significantly increase the cost, as pointed out by the EIA in their report responding to your request. They assumed that technologies using sequestration of CO_2 were allowed to enter the market starting in 2010. Increased costs were noted to be equivalent to an increase of $550/kw for IGCC plants and $270/kw for advanced combined cycle plants. This differential is another driver toward increased use of natural gas for power generation, thus aggravating the potential upward price pressure on gas. (Ref. SR/OIAF/2001–05, Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenarios, October, 2001, p.75).

One ACC member company does already utilize coal gasification technology to supply feedstock. While there is a high potential for further feedstock or combined feedstock/power application, considerable further development is needed to make the complex technology and equipment more competitive; it is unlikely that will result in a high level of market penetration prior to the tight timeline requirements of S. 556.

Another ACC member company recently evaluated the use of gasification technology for a cogeneration unit as a solution to NOx reductions required by the Houston SIP. This plant with the capacity to provide significant electricity to the grid would emit less NOx than the existing boilers. Steam from the cogeneration unit would replace that currently produced in the member company's boilers. An additional benefit from the gasification technology was the production of synthesis gas for feedstock use which improved the overall project economics. After serious negotiations, this project did not go forward due to 1) risk surrounding gasification technology and 2) high capital cost. The decision was made to expand current natural gas based cogeneration to allow shutdown of existing boilers. This is under existing NOx regulations—before any additional impact from S. 556.

Question 3. Does the American Chemistry Council support the implementation of the fine particulate matter ($PM_{2.5}$) standard? Will that increase natural gas demand?

Response. ACC members are committed to complying with all statutory and regulatory requirements, including EPA's fine particulate standard. We anticipate that, along with many other CAA requirements, the fine particulate standard will drive up the demand for natural gas as sources fuel switch as the most efficient way to grapple with meeting a plethora of control requirements. ACC noted in our written testimony that the reference case scenario (without multi-pollutant legislation or any future regulatory requirements) including compliance with existing CAA requirements would increase natural gas use dramatically. (Reference: EIA, SR/OIAF/2001–04, Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants, September 2001).

This reference case is cause enough for our concerns about increased demand for natural gas and we expect that the reference case will upset the balance and diversity of fuels. We are concerned that supply of natural gas, to which Congress continues to restrict access, cannot keep up with demand. As we've seen in recent months, exploration and development of natural gas fields continue to be restricted—which will only further increase prices as demand outpaces the supply. S. 556 would then impose an even greater demand on the natural gas supply as switching from coal to gas is highly likely to be the preferred way to achieve the tight timelines for compliance, the stringent reduction requirements, including CO_2 reductions that S. 556 would impose in addition to existing CAA requirements. S. 556 will exacerbate pressures on natural gas pricing.

RESPONSES OF LEE HUGHES TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. Ohio is a major producer of polymers. Last year when the natural gas prices spiked, our companies were negatively impacted and they lost their international competitive edge. What would the impact of the Jeffords/Lieberman Bill be on our domestic polymer and chemical industries? Job Loss?

Response. Polymers originate from the building block chemicals like ethylene. The US historically has had a global competitive advantage due to natural gas prices vs. the petroleum-based feedstock in other parts of the world. As the relative prices of US feedstock gas goes up, our cost to produce ethylene and other polymer raw materials goes up and the US industry loses our competitive advantage against Europe, Asia and the Middle East, where gas is increasingly being converted to ethylene. In this global market the other regions become low cost producers, and so they make money and expand capacity while US producers lose money and shrink capacity, with job loss resulting. In essence the high gas prices kill polymer manufacturing in the US and shift it overseas.

Unlike the utility sector, ACC members compete globally and this makes us very sensitive to spikes in the cost of our feedstock and energy supplies. ACC members use natural gas both as a feedstock and as an energy source. Any run-up of natural gas prices will have a direct, negative impact on our industry and last year's spike cost the industry in lost jobs, plant closings and dramatically eroded our global competitiveness. In general, each $1.00 per million Btu increase in natural gas price costs the chemical industry $2.7 billion. And when the historical price of natural gas rises above approximately $4.00 per million BTU, we lose our competitive advantage. S. 556 will lead many coal-burning utilities to switch to natural gas. This will directly lead to increased natural gas prices as demand increases. Further, as noted above, the ongoing energy debate highlights that little is being done to increase the exploration and supply of natural gas.

Question 2. According to testimony by other witnesses, the Clean Air Act provisions, such as NSR and the regional haze standards, need to be retained in any multi-pollutant legislation to protect air quality in attainment areas. What is Bayer's and/or the American Chemistry Council's opinion?

Response. ACC supports provisions that recognize when a source has installed the latest technology and thus would allow them to have satisfied NSR requirements for at least 10 years. After that, additional technology should be required only if a source makes modifications that would result in a real actual increase in emissions determined by the maximum hourly rate of emissions of a regulated NAAQS compound, before and after a change. The only potential exception might be if the cost effectiveness of controls for a local problem were much more cost effective for a participating source than from any other sources. The additive and duplicative nature of the existing statute is one of the problems that will only be exacerbated by S. 556. That said, we do not believe that the existing Clean Air Act requirements should be eliminated for those sources that are not subject to S. 556. These requirements may also be necessary to address localized problem areas, or to address regional haze issues in certain instances where S. 556 would not achieve all of the necessary reductions to meet the programs' goals. Further, States should also be allowed to retain their authority to require additional reductions beyond the scope of multi-pollutant legislation when necessary to address their air quality problems.

Question 3. In your testimony, you described combined heat and power units. Can you expand on this and how these types of units will be affected by S. 556?

Response. Cogeneration, or CHP, units are typically units operating at manufacturing sites that generate both electricity and thermal energy, in the form of steam, from the same fuel for use primarily at the manufacturing facility. S. 556 expands the definition of utility unit beyond that under the current Clean Air Act Acid Deposition title. The current definition specifically excludes a unit that cogenerates steam and electricity unless the unit is constructed for the purpose of supplying, or commences construction after the date of enactment and supplies more than one third of its potential electric output capacity and more than 25 MW output to any utility power distribution system for sale (reference CAA Amendments of 1990, Sec.402 (17)(C)). S. 556, in contrast, is applicable to any combination of units with a nameplate capacity of 15 MW or more that generate any electricity for sale. This change draws into the scope of regulation small boilers and combustion turbines that heretofore were not considered as utility units, and which may in fact only sell power intermittently as needed to balance energy outputs when process upsets occur, or as economically possible under periods of high customer demand—to the benefit of all consumers by providing peak period supply. Obviously such units would have a very high emissions control cost compared to typical large electric utility units. Retaining the Acid Rain definition is a logical approach that would not drive smaller units to install exceedingly high cost controls, purchase allowances from utility units, or to simply shut down those highly energy efficient facilities.

Similarly, many CHP units are gas fired combustion turbine based, thus already emitting at significantly lower levels than typical electric utility units. The combination of low-emitting gas firing along with the high efficiency of CHP units should be used as justification for not including those units in the applicability of multi-emission legislation.

RESPONSE OF LEE HUGHES TO ADDITIONAL QUESTION FROM SENATOR GRAHAM

Question. In your written testimony you devote a section to the need to harmonize requirements in the Clean Power Act with existing Clean Air Act Program. You mention New Source Review specifically, which is interesting to me because one of our Florida companies (Tampa Electric) has signed a consent decree with EPA and has been working to clean up their coal plants.

Do you have suggestions on how proposed legislation should streamline all of these different programs and regulations into one seamless program?

Response. We are not familiar with all of the details of the NSR case that you referenced and therefore cannot comment specifically on that matter. With regard to streamlining multi-pollutant legislation with the Clean Air Act, the significant overlap occurs with the new source review program, the regional haze program, the NOx SIP Call, and the Section 112 MACT rules.

Congress needs to provide certainty in the legislation for sources subject to the multi-pollutant requirements. The single greatest benefit of a cap-and-trade approach is that sources are given a target and then allowed flexibility in meeting the goals in the manner that they deem most cost effective. Layering multi-pollutant requirements on top of other existing requirements removes this incentive and retains the uncertainty of the underlying Clean Air Act. As an example, if a source moves forward with its planning for future electrical generating capacity under the coverage of the multi-pollutant program will it still find its operations subject to the myriad other requirements as well.

Specific underlying control requirements addressing other pollutants from these facilities would continue to apply and would be addressed in the source's permit. The legislation should specifically state that sources subject to the multi-pollutant requirements would not be subject to underlying standards, such as new source review, regional haze, the NOx SIP call, and MACT for those pollutants specifically covered by multi-pollutant legislation. The only exception to this would be the need to retain a State's authority to act if a local air pollution problem is still determined to be attributable to that source after considering the source's compliance with the legislation's requirements.

RESPONSE OF LEE HUGHES TO ADDITIONAL QUESTION FROM SENATOR WYDEN

Question. You argue that Combined Heat and Power (CHP) systems should not be included under S. 556 since they are already operating at very low levels of pollution. Would you agree that there are some CHP facilities that may not have advanced control technology because they may have "netted out" of the New Source Review requirements? Up until now, they've been given a free pass under NSR. Do you believe it would be unreasonable to require them to cut emissions under this bill, really for the first time?

Response. Encouraging new capacity to use combined heat and power (CHP) brings more benefits than adding pollution control equipment to either existing utility or cogeneration units. Combined heat and power systems have not received a "free pass" in that they had to invest a higher amount of capital to build these units to realize this efficiency benefit. New investments of this type will be more likely if the investment risk due to regulatory changes or need to purchase credits is reduced. Allowing for a known economic life without the risk of regulatory or other economic changes would support this goal.

Whether or not a source has netted out of NSR should not be a criterion for inclusion in the multi-emissions applicability. Regardless of net-out, a new source would most likely have already gone through the State delegated air permitting process, with proper applicability of NSPS or even BACT in some cases. Those CHP facilities meeting the applicability requirements of the current act would have been included under the CAAA Title IV Acid Rain program so they have already been controlled. Requiring the additional emissions controls as in S. 556 to smaller CHP units than currently covered by legislation would impose heavy cost penalties to those facilities that have proven to be highly efficient, thus penalizing rather than supporting continued/increased use of CHP by the industrial and commercial sectors.

STATEMENT OF DON BARGER, NATIONAL PARKS CONSERVATION ASSOCIATION

Mr. Chairman and members of the committee, I am Don Barger, the Southeast Regional Director for the National Parks Conservation Association (NPCA). Thank you for the opportunity to testify about the national park-related benefits and costs of reducing multiple pollutants from power plants.

NPCA is America's only private, nonprofit advocacy organization dedicated solely to protecting, preserving, and enhancing the National Park System. NPCA was founded in 1919 and today has more than 350,000 members who care deeply about the well being of our national parks. Protecting and restoring air quality in America's national parks, including the 49 national park units defined as Class I areas by the 1977 Clean Air Act amendments, long has been one of NPCA's top priorities.

Our nation creates and preserves national parks because of their spectacular, inspirational, scientific and historical value as pieces of America's natural and cultural heritage. They are irreplaceable, priceless icons. Our national parks are sanctuaries sought by the American people for countless reasons and at innumerable times. Air pollution is among the most significant of the many threats our parks face. Because America's national parks are priceless, our testimony focuses primarily on the costs air pollution levies on these national treasures that are so central to the American spirit and to our national identity.

We will begin our testimony by discussing the centrality of clean air to the purpose of many national parks. We will briefly discuss the legislative framework that governs the management and preservation of national parks, next discuss the negative impact of air pollution on the parks, and then describe the benefits of protecting the scenic values and other precious resources that comprise our parks. Finally, we will outline the impact of specific regulatory approaches on protecting the air in our national parks.

Clean Air: A Central Value of National Parks

Our national parks—places where polls consistently show Americans expect to breathe clean air and be inspired by spectacular vistas—have become unfortunate laboratories for studying the impacts of air pollution on our nation's natural and historic treasures. Americans are shocked to learn that many of our beloved national parks suffer from some of the highest levels of air pollution in the country. While visibility impairment is widespread throughout the park system, scenic views are not the only resource at risk. The same pollutants that reduce visibility also contribute to 30,000 premature human deaths each year[1]. Acid deposition damages natural and cultural resources. Mercury deposition threatens fish and wildlife in a number of parks. Ground level ozone, or smog, threatens the health of park visitors and workers, and damages park vegetation. Finally, as the Bush Administration's 2002 U.S. Climate Action Report concludes, global warming threatens parks in many ways, from rising sea level to melting glaciers to changes in biodiversity.[2]

NPCA fully supports S. 556, the Clean Power Act, because it would best protect our parks. The bill requires effective, timely, and fair reductions of four key pollutants emitted by power plants—sulfur dioxide, nitrogen oxide, carbon dioxide, and mercury. The authors of S. 556 recognize that significant and mandatory reductions by a date certain in these pollutants are essential elements of a responsible approach to this issue. Reductions in carbon dioxide are essential to provide certainty that new electric power plants must include controls from the beginning, rather than retrofitting years later, and to ensure that coal, a domestically abundant fuel, is burned as cleanly as possible.

LEGISLATIVE FRAMEWORK

Preserving Clean Air Is Central to the Purpose of Parks

In 1916, Congress created the National Park System and required the National Park Service to "conserve the scenery and the natural and historic objects and the wild life therein—and leave them unimpaired for the enjoyment of future genera-

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[1]Abt Associates, The Particulate-Related Health Benefits of Reducing Power Plant Emissions, October 2000. For a quick reference to the key findings of the Abt Associates study, see Clear the Air, Death, Disease, & Dirty Power: Mortality and Health Damage Due to Air Pollution from Power Plants, October 2000, p.3; http://cta.policy.net/fact/mortality/mortalitylowres.pdf.

[2]U.S. Department of State, U.S. Climate Action Report 2002, Washington, DC, May 2002, http://www.epa.gov/globalwarming/impacts/parks/index.html.

tions."[3] Many national parks were established in part to offer the public access to inspirational scenic vistas and clean air, as reflected in their legislative histories:

" The air around Lake McDonald is remarkably clear and pure. . . ."[4]

"The Big Bend area is a region of inspiring scenery. . . ."[5]

". . . the Grand Canyon of the Colorado is one of the most stupendous scenic wonders of the world . . . ."[6]

". . . For the purpose of protecting the scenery, the wildlife, and other natural features of the region authorized to be established as the Everglades National Park . . . ."[7]

Scenic vistas cannot inspire if they cannot be seen. The National Park Service must maintain the integrity of these scenic values while also ensuring that cultural, historic, and natural resources are not impaired by air pollution.

Congress amended the Clean Air Act in 1977 to address growing concerns about pollution damaging public lands and Americans' enjoyment of their national treasures. Recognizing that pristine air quality and scenic vistas are highly valued features of national parks, Section 169 (A) established as a national goal "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Federal Class I areas in which impairment results from man-made pollution." Congress designated 156 areas including national parks over 6,000 acres[8] and wilderness areas over 5,000 acres in existence on August 7, 1977 as "Class I areas," to be afforded the greatest protection under the Clean Air Act.[9] (Attachment 1)

The 1977 amendments also created specific programs to deal with chronic threats to park resources. They charged the Secretary of the Interior and other Federal officials with the "affirmative responsibility" to protect "air quality related values" in Class I areas. These officials must participate in the Prevention of Significant Deterioration (PSD) program, part of the permitting process for new and modified air pollution sources, by determining if the emissions will have an adverse impact on park resources.[10] The 1977 Amendments also established the Best Available Retrofit Technology program to require certain existing sources located in close proximity to a class I area to install pollution controls.

POLLUTION IMPACTS ON PARK RESOURCES AND HUMAN HEALTH

Pollution Continues To Shroud Scenic Views in National Parks

Twenty-five years after Congress established the national visibility goal to remedy existing and prevent future man-made visibility impairment in Class I areas, unnatural haze continues to shroud scenic vistas at national parks throughout the country. Emissions from outdated power plants, lacking controls required of modern facilities, contribute a large portion of the pollution hurting our parks. National Park Service photos contrast good and poor visibility in a few of America's national parks established for their spectacular and inspirational scenery.[11] (Attachment 2)

The National Park Service and U.S. Fish and Wildlife Service reported in December 2000 that pervasive "visibility impairment in all national parks and wilderness areas" is adversely affecting these public lands.[12] According to the Department of the Interior, "Visibility impairment is the most ubiquitous air pollution-related problem in our national parks and refuges—parks and refuges such as Grand Canyon, Cape Romain, and Great Smoky Mountains have evidenced declining visibility—all areas monitored for visibility show frequent regional haze impairment."[13] The EPA reports that the mean visual range in Eastern Class I areas was 14.4 miles in 1999, compared to estimated natural visibility of 45–90 miles. In the West, the mean vis-

[3]The National Park System Organic Act of 1916 (16 USC § 1).

[4]House Report No. 1456, 62d Congress, Glacier National Park, February 6, 1913.

[5]House Report No. 878, 74th Congress, Big Bend National Park, May 13, 1935.

[6]Senate Report No. 1082, 64th Congress, Grand Canyon National Park, Arizona, February 20, 1917.

[7]16 USC § 410d.

[8]http://www2.nature.nps.gov/ard/parks/npscl1b.pdf

[9]42 USC § 7491 (a)(2).

[10]42 USC § 7475.

[11]http://www2.nature.nps.gov/ard/pubs/Core—Slides/visimp.htm

[12]National Park Service Air Resources Division and U.S. Fish and Wildlife Service Air Quality Branch, Technical Information in Support of the Department of the Interior's Request for a Rule to Restore and Protect Air Quality Related Values, December 2000, p.1–1.

[13]U.S. Department of the Interior to U.S. Environmental Protection Agency, Docket No. A–2000–28, September 17, 2001.

ual range was 48 miles for Class I areas, compared to estimated natural visibility of 120–180 miles.[14]

Congress realized that unnatural haze was both a national and a regional problem, and revisited the problems of polluted parks in the 1990 Amendments to the Clean Air Act. Section 169B designated funds to research “sources and source regions” contributing to visibility impairment. Studies and reports verified widespread assumptions, and EPA promulgated the Regional Haze Rule in 1999. The Regional Haze Rule seeks to improve visibility by 2064 attempting to fulfill the national goal of “the prevention of any future, and the remedying of any existing” visibility impairment. EPA set decade benchmarks to ensure that the “least impaired” or clearest visibility days would suffer no degradation and the “most-impaired” or haziest days would improve. EPA reported to Congress in November 2001 that from 1994–1998, on the clearest days, 13 percent of the monitored Class I areas have shown improvement while 87 percent have shown no change or degradation. On the haziest days, 11 percent have shown improvement while 89 percent have shown no change. Any improvement on the haziest days is still slight at best.[15]

Air Pollution Hurts Park Resources

Emissions from power plants harm national parks throughout the country, from Acadia in Maine, to Shenandoah in Virginia, to Mammoth Cave in Kentucky, to Big Bend in Texas, to Mesa Verde in Colorado, to Canyonlands in Utah, to Mount Rainier in Washington State, to Sequoia-Kings Canyon and Joshua Tree in California. Air pollution poses one of the top threats to America’s parks.

NPCA included Great Smoky Mountains National Park in Tennessee and North Carolina and Big Bend National Park in Texas on its 2002 list of America’s Ten Most Endangered National Parks, because they represent the many national parks suffering from poor air quality. Others also recognize the threats posed by air pollution to parks and people. In a letter to President George W. Bush dated June 19, 2001, Tennessee Senator Fred Thompson wrote: “Most shocking to me is that, according to Park officials, air quality in the Smokies is so poor during the summer months that hiking our backcountry trails is more hazardous to your health than walking along (city) streets. . .”

Great Smoky Mountains National Park serves as an unfortunate poster child of Class I areas harmed by air pollution. The park has recorded the highest level of nitrogen deposition of any monitored site (urban or rural) in North America. Clouds blanketing the highest peaks often engulf sensitive spruce-fir forests with pH levels as low as 2.0. On average, rainwater registers five to ten times more acidic than normal rainwater. Scenic views that historically stretched for more than 77 miles in the summer and more than 113 miles during the rest of the year are reduced to 15–25 miles.[16] Researchers have documented that at least 30 different species of plants show visible symptoms of leaf damage or reduced growth from ground-level ozone, including up to 90 percent of black cherry trees in locations throughout the park. On 140 days over the last four summers, the National Park Service has had to issue “unhealthful air” notices to employees and park visitors as ground-level ozone levels reached unhealthful levels. The park’s average daily ozone levels are often two times higher than those in urban areas.

Park Biodiversity Offers Irreplaceable Scientific Values

The values we have yet to discover in our national parks may be at least as significant as those about which we already know. To the extent we allow polluted air to jeopardize those values, humanity could lose extraordinary resources that could yield enormous benefits in the future. For example, scientists announced in May 2002 discovery of organisms in a pool in Mammoth Cave that they believe may be an important anti-cancer agent.[17] (Attachment 3) At Great Smoky Mountains National Park, only 2 years of study as part of the All-Taxa Biodiversity Inventory have documented 1500 species previously unknown in the park, and 250 species completely new to science. Both of these parks suffer from air pollution and acid deposition that could threaten many of these remarkable organisms.

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[14] U.S. Environmental Protection Agency, Latest Findings on National Air Quality: 2000 Status and Trends, September 2001, p.19.

[15] USEPA, Visibility in Mandatory Federal Class I Areas (1994–1998): A Report to Congress, November 2001. http://www.epa.gov/oar/visibility/report/ES.pdf.

[16] National Park Service, 2002 Air Quality Issues at Great Smoky Mountains National Park, Tennessee/North Carolina, 2002.

[17] Environmental News Service, “Mammoth Cave Bioprospecting Produces Potential Cancer Drug,” May 21, 2002, http://ens-news.com/ens/may2002/2002–05–21–09.asp.

Glacier-free Glacier National Park and Everglades National Underwater Historic Park: potential costs of global warming

Glacier National Park preserves more than 1 million acres of forests, alpine meadows, and lakes. Its spectacular glaciated landscape hosts one of the largest intact ecosystems in the lower 48 states.[18]

The largest remaining glaciers at Glacier National Park in Montana are now only about one-third the size they were in 1850, and one study estimates that all glaciers in the park may disappear completely in 30 years.[19] Our testimony includes two photos, one taken in 1938 and one in 1981 of the Grinnell Glacier. By 1993, the glacier shrank about 63 per cent in area and had receded more than half a mile since 1850.[20] (Attachment 4) The area of the park covered by glaciers declined by 73 percent from 1850–1993. A regional warming trend that some scientists believe may be related to global climate change causes this phenomenon. Since 1900, Glacier National Park's average summer temperatures have increased by about 1.8 degrees Fahrenheit.[21]

Florida's Everglades are the largest remaining subtropical wilderness in the United States. Water management and development systems have dramatically altered freshwater flow through the Everglades, with consequences ranging from contaminated freshwater aquifers to near-decimation of wood stork populations. While an unprecedented restoration effort is now underway, some scientists are concerned that the Everglades faces an even greater threat in rapidly rising seas and climate changes associated with global warming.

The sea along the Florida coast is rising today at a rate equivalent to 8–16 inches per century, a rate that is 6–10 times faster than the average rate for this area over the past 3,000 years. By 2100, the best available science indicates that south Florida seas will be approximately 20 inches higher than they were in 1990. EPA researchers estimate that the south Florida sea probably will rise 30 inches above 1990 levels by 2150. This would mean that most of Everglades National Park could essentially become an extension of Florida Bay,[22] washing away the $7.8 billion Everglades ecosystem restoration plan that this committee helped design.

The four national parks and preserves of south Florida are home to sixteen endangered and six threatened wildlife species. Scientists are concerned that the remaining populations of endangered species such as the Florida panther and key deer could be pushed even closer to extinction as their habitats are further limited by rising seas and sprawling human settlements.[23]

The Energy Information Administration (EIA) of the Department of Energy released on November 9, 2001 a comprehensive official accounting of emissions changes from 1990–2000. According to the report, total U.S. carbon dioxide emissions increased by 16.8 percent during this period, with carbon dioxide emissions from electricity generation increasing 26.5 percent. Carbon dioxide comprises 82 percent of the greenhouse gases emitted in the United States[24], and power plants emit 40 percent of that carbon dioxide.[25] Mandatory reductions clearly are needed to reduce the impacts we face from global warming.

Mercury Deposition Hurts Parks

Because mercury is a dangerous, persistent poison that accumulates through the food chain and can result in neurodevelopmental damage in young children and the unborn, trading to allow more mercury pollution in some places than in others is dangerous and ill advised. As a potent neurotoxin that persists in the environment and bioaccumulates in the food chain, mercury pollution demands an aggressive policy response.

Power plants are the largest uncontrolled sources of mercury deposition in the United States. National parks including Acadia, Isle Royale, and Big Bend are studying the effects of mercury contamination on fish and wildlife. Scientists at Acadia have concluded that aquatic resources are at risk from mercury contamination.

[18]www.nps.gov/glac/index.htm.

[19]USEPA website, www.epa.gov/globalwarming/impacts/mountains/index.html.

[20]U.S. Geological Survey, http://nrmsc.usgs.gov/research/glacier—retreat.htm

[21]U.S. Department of State, U.S. Climate Action Report 2002, Washington, D.C., May 2002, http://www.epa.gov/globalwarming/impacts/parks. Click on "western mountains and plains."

[22]U.S. Department of State, U.S. Climate Action Report 2002, Washington, DC, May 2002, http://www.epa.gov/globalwarming/impacts/coastal/cs—ever2.html

[23]Ibid.

[24]U.S. Department of State, U.S. Climate Action Report 2002, Washington, DC, May 2002, http://www.epa.gov/globalwarming/publications/car/index.html.

[25]U.S. Department of Energy, Energy Information Administration, Emissions of Greenhouse Gases in the United States 2000, http://www.eia.doe.gov/oiaf/1605/ggrpt/summary/pdf/0573(2000es).pdf

Scientists at Big Bend believe that above-threshold levels of mercury may be causing reproductive failures among Peregrine Falcons—a species listed as "Endangered" following catastrophic impacts from the pesticide DDT, and de-listed in 1999. Florida has issued fish consumption advisories for water bodies found in Everglades National Park due to high levels of mercury found in largemouth bass and other species. Mammoth Cave has also been affected by a statewide fish consumption advisory due to mercury on all rivers and streams in Kentucky. Forty-one states and territories have issued fish consumption advisories due to mercury contamination.

For the first time, Mammoth Cave and Great Smoky Mountains National Parks during 2002 have begun monitoring atmospheric deposition of mercury. On April 25, the Kentucky Division for Air Quality began monitoring ambient levels of mercury at Mammoth Cave. Preliminary modeling data indicates that episodic plumes of mercury many times expected background levels enter the park and can remain up to 24 hours. Mercury monitoring has been in place since 1995 in the Everglades as part of the National Atmospheric Deposition Program Mercury Monitoring Network. Everglades registers some of the highest levels of mercury deposition of any site across the country. (Attachment 5)

PROTECTING SCENIC VALUES

Improving Visibility in National Parks Offers Many Benefits

Visitors to national parks and wilderness areas consistently rate visibility and clear scenic vistas as one of the most important aspects of their experience. Out of Sight: Haze in our National Parks, a report published in 2000 by Clear the Air (Attachment 6) found that, given the degree to which air quality and visibility influence visitor experience in the national parks, continuing declines in visibility of park vistas could reduce visitation to these national treasures. The report also found: "increases in visibility could raise park visitation by as much as 25 percent which could yield approximately $30 million in increased fee collection and $160 million in additional concession sales. This would in turn add nearly $700 million in retail sales to the economies around the park, $53 million in local tax revenue, and create 15,896 jobs."

Based on the public's willingness to pay for cleaner air where they live and in national parks and wilderness areas, the report estimates the value of eliminating haze from power plants at more than $7 billion annually. The report cites studies that found that the average household in the southeast would be willing to pay $68 (in 1999 dollars) a year for a 100 percent increase in visibility in national parks in that part of the country, and $84 (in 1999 dollars) a year for a 200 percent increase in visibility. Eighty percent of respondents in a New Hampshire study said they would not accept a hazier wilderness vista in exchange for a lower electricity bill.

Recently, EPA estimated the benefits and costs of implementing the most stringent emissions-control strategy outlined by the Southern Appalachian Mountains Initiative (SAMI).[26] This strategy, among other things, would require that all power plants be controlled to modern standards. The analysis found that this level of control would result in a $12-per-year increase in the electric bill of the average household. While not a comprehensive analysis, the study found that this SAMI strategy would reduce healthcare costs associated with respiratory illnesses such as asthma and agriculture loss from reduced tree growth. In their analysis of a strategy controlling only one pollutant-fine particulate matter ($PM_{2.5}$) EPA estimated 8,000 fewer premature deaths and 16,000 fewer cases of acute bronchitis in children, with economic benefits ranging from $36–68 billion annually.[27]

At the Arlington, Virginia hearing on EPA's proposed Best Available Retrofit Technology amendment to the Regional Haze Rule in August 2001, realtor Mary Johnson testified about a quick survey she had done on the Multiple Listing Service of listed properties near Great Smoky Mountains National Park. By comparing properties that were in every way "comparables" except for the existence of a "mountain view", she found that the value of that view ranged around $25-$30 per square foot. If one were to assume that even 1/100th of that value would increase with improved views, the economic benefit derived would dwarf every other consideration.

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[26] SAMI was a voluntary 10-year consortium of state and Federal agencies, business, utilities, and public interests which met to study problems faced in Class I areas in the eight Southern Appalachian states, and to seek consensus on solutions to those problems. SAMI's final written report is due in August 2002.

[27] USEPA, National Park Service, and U.S. Forest Service, Impacts of the SAMI Strategies: An Independent Analysis of the Benefits and Economic Impacts, April 2002.

Parks Benefit the Economies of Gateway Communities

The natural and cultural values protected by the National Park Service are beyond price. At what price would we sell the biodiversity of the Great Smoky Mountains, the mystery of Carlsbad Caverns or the meaning of the Statue of Liberty? However, there are many measurable direct monetary benefits produced by our parks, particularly as they relate to gateway communities adjacent to them.

National Park Service units hosted more than 275 million recreational visits in 2001.[28] They serve as economic anchors in many communities, providing jobs within the parks and fostering economic opportunity outside park boundaries. Occasionally, park economies actually replace declining sectors of existing rural economies, and can soften what could otherwise be a significant economic blow to declining economic opportunity in some rural communities. Enactment of S. 556 not only would improve the condition of park resources and help protect them from future impairment, it would also provide a boost to park revenues and to the many gateway communities and cities whose economies benefit from the health and beauty of our national parks. In addition, the residents of gateway communities would in many cases breathe healthier air.

A Department of Interior study cited in the report found that travel-related expenditures by visitors to national parks totaled an average of $14.55 billion (in 1996 dollars) and generated approximately 210,000 jobs. While the approximately 600 concessionaires in operation throughout the park system generated sales estimated at $650 million, the majority of revenues associated with park visitation, nine billion dollars in 1997, was spent on goods and services in communities neighboring national parks.[29]

Great Smoky Mountains National Park, the most visited national park, receives more than 9 million visitors each year. These visitors annually spend more than $618 million in the local area, supporting more than 12,000 local tourism-related jobs and close to 15,000 total jobs due to secondary effects.[30] Similarly, the 12 national capital parks in Washington, DC draw more than 15 million recreational visits per year. These tourists spent $660 million in 2000, generating approximately $202 million in direct income and more than 16,000 direct and indirect jobs in the District of Columbia metropolitan area.[31]

On a strictly per-acre basis, logging the 17.7 million acres of Maine timberlands is not nearly as economically productive as the 45,000 acres of mostly undeveloped land and easements that make up Acadia National Park. While each acre of private forest annually contributes $368 in direct and indirect benefits to Maine's economy, publicly owned Acadia yields $3,400 per acre in sales of goods and services, including $1,200 in wages. In 2000 Acadia visitors spent $130 million for meals, room rentals, campsites, services, and other transactions in nearby towns, supporting 3,300 direct and indirect jobs. Total value of primary and secondary sales was $155 million, with personal income totaling $55 million.[32] (Attachment 7)

METHODOLOGY FOR PROTECTING PARKS

Significant Emission Reductions Are Needed From Power Plants

To improve visibility, reduce smog, and restore acidified ecosystems to natural states, emissions from power plants, regardless of when they were built, must be significantly reduced.

In Great Smoky Mountains National Park, emissions from outdated power plants produce most of the pollution threatening the resources, staff, and visitors. Power plants emit 77 percent of the sulfur dioxide emissions that eventually form sulfate particles. In the summer, these particles contribute 73 percent of the yellow or grayish layers of haze hanging over the Smokies. Power plants also emit 38 percent of the nitrogen oxides that combine with sunlight and other compounds to create

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[28] National Park Service, Public Use Statistics Office, National Park Service Statistical Abstract 2001.

[29] Clean Air Task Force for Clear the Air, Out of Sight: Haze in Our National Parks, August 29, 2000.

[30] Department of Park, Recreation and Tourism Resources, Michigan State University, Economic Impacts of Great Smoky Mt. National Park Visitors on Local Region, 1997–2000, February 2002.

[31] Department of Park, Recreation and Tourism Resources, Michigan State University, Economic Impacts of National Parks on Gateway Communities; Summary of MGM2 Shortform Analyses, January 2002, pp.7–16. MGM2 is the National Park Service's Money Generation Model version two, used to estimate park visitor impacts on local economies in terms of contribution to sales, income, and jobs. Model documentation and economic impact reports for individual parks may be found at the MGM2 website: http://www.prr.msu.edu/mgm2/mgm2toc.htm.

[32] W. Kent Olson, "Acadia's green 45,000 acres," Bangor Daily News, April 24, 2002.

ground-level ozone or smog. There simply is no proposal that will clear the air in our parks if it fails to require the clean up of these older, grandfathered power plants. Accordingly, a provision requiring each old power plant to install modern pollution controls by its 30th birthday, or within 5 years of enactment, is an essential component to multi-pollutant legislation.

The Acid Rain Program established in the 1990 Amendments to the Clean Air Act set the goal of cutting sulfur emissions 10 million tons from 1980 levels.[33] Despite reductions made to date, acid deposition continues to be a significant threat to ecosystems. 41 percent of lakes in the Adirondacks suffer from chronic or episodic acidification along with 15 percent of lakes throughout New England. According to recent studies, sulfur emissions must be reduced by an additional 80 percent beyond Phase II of the Acid Rain Program to bring these ecosystems from an acidic to nonacidic state in 20 to 25 years.[34] In Great Smoky Mountains National Park, in which streams and soils have been adversely impacted by acid deposition, the average combined nitrogen and sulfur deposition continues to be at least 6 times beyond natural conditions.[35] To restore Class I areas to their natural state and to realize the benefits Congress envisioned when it established Class I areas 25 years ago, emissions from power plants must be reduced to levels at or beyond those proposed in S. 556.

Reduction Program Must Prevent Hotspots

Effects-based monitoring and evaluation of Class I areas provide an appropriate measuring stick for the efficacy of pollutant-reduction strategies. Emission-based multi-pollutant strategies must be linked to specific results. A simple cap-and-trade program offers no specific protection to Class I areas as required by the Clean Air Act. Strategies must be multi-faceted, and linked to continuous and timely progress toward effect-based goals. The New Source Review (NSR) and PSD programs currently provide the only effect-based monitoring and permitting of stationary sources of sulfur and nitrogen pollution, and we've seen no proposal that provides effect-based monitoring and permitting in the absence of the NSR and PSD programs.

The utilities seek certainty by requesting a phased reduction schedule with no measurement of the resulting effects and no accountability for the cumulative impact of the hundreds of proposed new sources. The certainty that such a strategy would produce for our national parks is the abandonment of America's national commitment to our descendants that we have the wisdom to create our future without destroying our past.

Experience with the cap-and-trade system established in the 1990 Clean Air Act Amendments indicates the potentially devastating impacts of a national emissions cap without clear and enforceable protections against local hotspots. While emissions nationwide have been reduced, emissions affecting a number of Class I areas have increased. Due to the use of emission reduction credits under the national trading program, the Tennessee Valley Authority emitted approximately 700,000 tons of sulfur dioxide last year, 300,000 tons above their Phase II allocation. As a result of this and other factors, visibility in and around Great Smoky Mountains National Park remains consistently impaired. A similar situation exists in Florida where power plants increased their sulfur emissions from 1995–2000.[36] (Attachment 8)

In order for Federal land managers to meet their affirmative responsibility to protect the air quality related values of these precious resources, effect-based analyses as prescribed in the PSD program are necessary for any proposed sources which might individually or cumulatively adversely impact the area, regardless of distance. The Administration's proposal to draw 50 kilometer or even 100-kilometer circles around Class I areas would provide less protection than proper implementation of the current Clean Air Act. While it would provide limited effect-based analysis within those zones, such a proposal would also create "free-fire zones" outside those circles, allowing large sources to proliferate without regard to their individual or cumulative impacts on Class I areas, impacts now analyzed in the PSD program. A

[33]http://www.epa.gov/airmarkets/arp/overview.html#phases

[34]Driscoll, C.T., G.B. Lawrence, A.J. Bulger, T.J. Butler, C.S. Cronan, C. Eagar, K.F. Lambert, G.E. Likens, J.L. Stoddard, K.C. Weathers. 2001. Acid Rain Revisited: Advances in scientific understanding since the passage of the 1970 and 1990 Clean Air Act Amendments. Hubbard Brook Research Foundation. Science Links Publication. Vol. 1, no.1.

[35]National Park Service to SAMI, Proposed Air Quality Benchmarks at Great Smoky Mountains and Shenandoah National Parks, November 7, 2001.

[36]USPIRG Education Fund, Darkening Skies, Trends Toward Increasing Power Plant Emissions. http://floridapirg.org/reports/darkeningskies/darkeningskiespdf.pdf. Chart at http://floridapirg.org/reports/darkeningskies/floridatopten.pdf

cap-and-trade program instituted in lieu of the current effect-based programs of the Clean Air Act cannot protect Class I areas from existing or future adverse effects.

CONCLUSION

Americans Want To Protect Our Parks

Our national parks have been called the best idea America ever had. That may become particularly true as we seek to control not just the amounts, but also the effects of air pollution. America's parks are the measuring sticks by which the effectiveness of any national pollution control policy can be judged. If we clean up the air in our parks, we will clean up the air in our neighborhoods. If we save our parks, they may very well save us.

Enactment of S. 556 provides a critical step to protect America's national parks. Our national parks and wilderness areas deserve and demand the protection that S. 556 will provide; the American public expects no less. A May 2001 poll showed that nearly eight out of ten Virginians (77 percent) believed older power plants should meet modern pollution control standards.[37] In a 1996 survey, 84 percent of visitors at Great Smoky Mountains National Park responded that scenic views are "extremely important."[38] The National Park Service conducted similar studies in the mid 1980's, surveying visitors at five parks on the importance of various park features to their recreational experience. At all five parks—Grand Canyon, Mount Rainier, Everglades, Mesa Verde and Great Smoky Mountains—"clean, clear air" ranked among the top four valued features. A 1998 survey of Tennessee residents showed that 75 percent of the citizens wanted new rules to control emissions from power plants, while 85 percent thought that all plants should be required to meet the same standards regardless of when they were built. From the same survey, 69 percent of Tennesseans were willing to pay at least $12/year more on their electric bills, including some who were willing to pay up to $240/year more, to reduce air pollution from electricity generation.[39]

We are eager to work with the committee to fulfill the vision of the Clean Air Act to protect and restore air quality in America's national parks. We must work together to meet the goals of the 1977 Clean Air Act Amendments to prevent future impairment and remedy existing visibility impairment in all Class I areas.

While we greatly appreciate the opportunity to appear before you today, we are compelled to note that the last oversight hearing specifically to address impacts of air pollution on national park units was held 17 years ago in May 1985 by the House Subcommittee on National Parks and Recreation. That hearing, chaired by the late Rep. Bruce Vento of Minnesota, focused on the damage acid rain, regional haze, and ozone were causing in national parks.[40] An oversight hearing to provide a comprehensive update from scientists, park officials, and others concerning the range of pollutants and their impacts in national parks would be useful as Congress considers changes in the Clean Air Act. We respectfully request that this committee schedule a hearing in the near future dedicated to impacts of air pollution on America's national parks. Thank you for inviting NPCA to appear before you today and for considering our views.

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[37] The Tarrance Group, statewide poll conducted for the League of Conservation Voters Education Fund, May 6–8, 2001, p. 10.

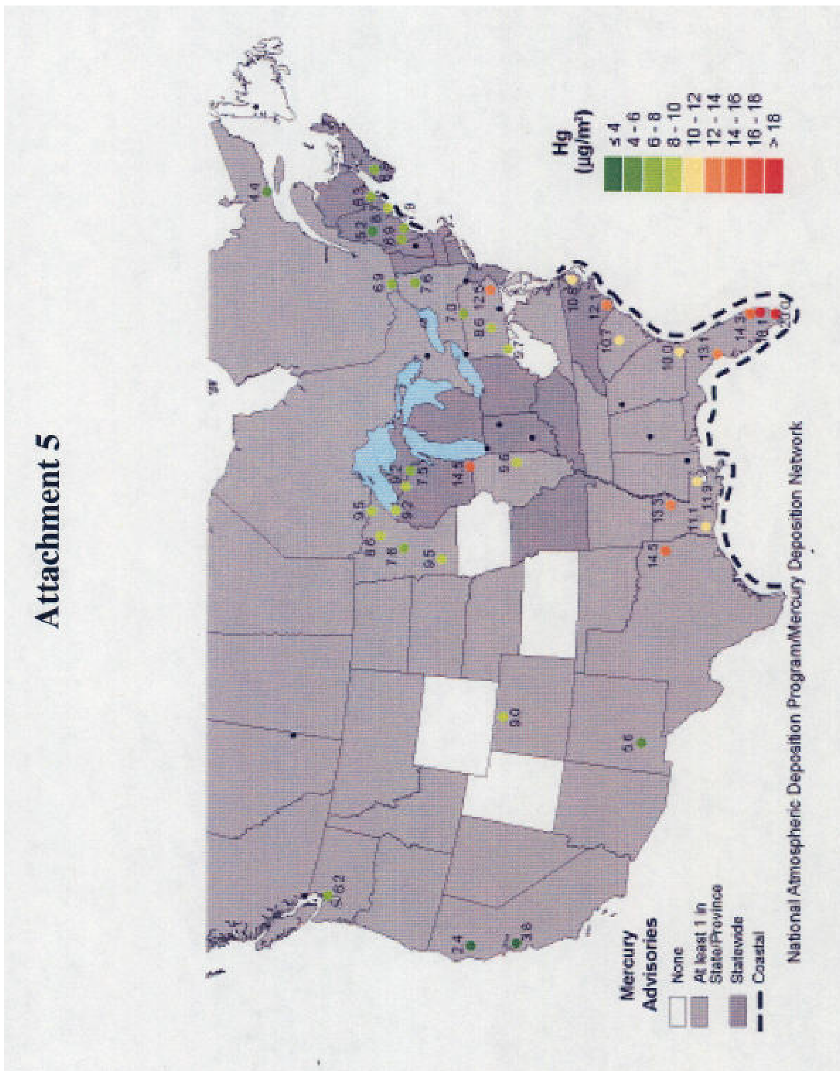
[38] Great Smoky Mountains Natural History Association and the National Park Service, Great Smoky Mountains National Park Management Folio 2: Air Quality, 1997, p. 2.

[39] Beth Schapiro & Associates, Public Opinion and Air Quality Issues, 1998, pp. 10–16.

[40] House Committee on Interior and Insular Affairs, Subcommittee on National Parks and Recreation, Impacts of Air Pollution on National Park Units, Serial No. 99–10, May 20–21, 1985, 586 pp.

ATTACHMENTS

1: National Park Service, Class I areas.



2: National Park Service, Good and poor visibility days in selected national parks.

Acadia National Park

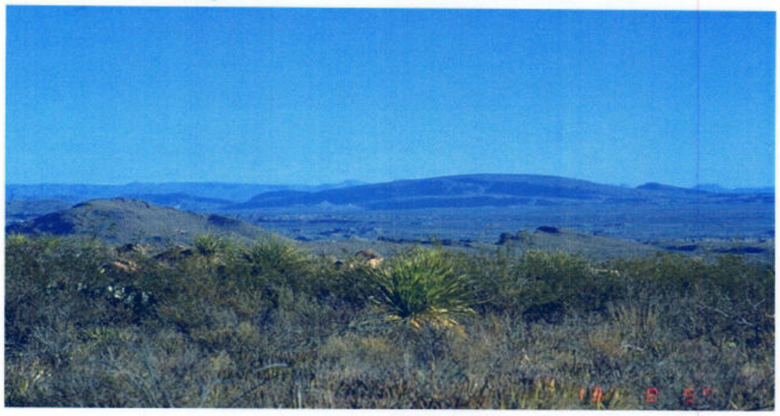
Acadia on a clear day.

Acadia on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Big Bend National Park



Big Bend on a clear day.

Big Bend on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Bryce Canyon National Park

Bryce Canyon on a clear day.

Bryce Canyon on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Grand Canyon National Park

Grand Canyon on a clear day.

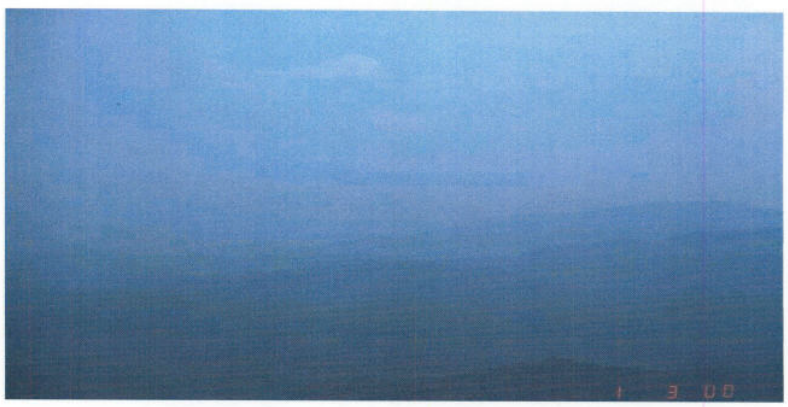
Grand Canyon on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Great Smoky National Park

Great Smoky on a clear day.



Great Smoky on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Redwood National Park

Redwood on a clear day.

Redwood on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

Shenandoah National Park

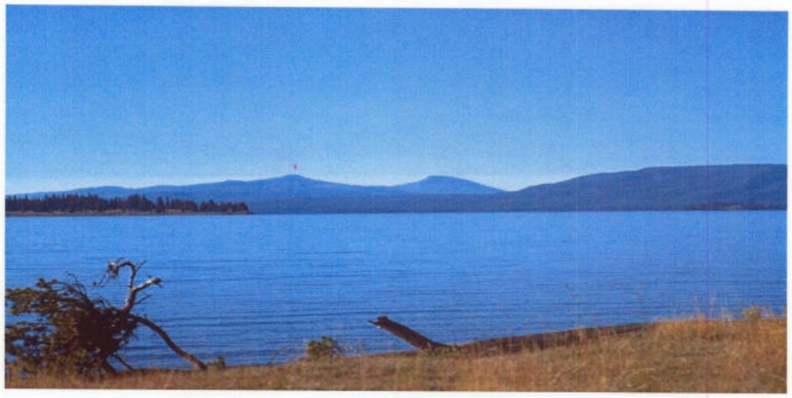
Shenandoah on a clear day.

Shenandoah on a day with high levels of air pollution.

National Parks and their neighbors are under attack from air pollution. This pollution hurts human health, the park's health, and the state's economic health. To clear the air, older coal- and oil-burning power plants must be required to meet modern emissions standards.

Images provided courtesy of National Park Service

Yellowstone National Park



Yellowstone on a clear day.

Yellowstone on a day with high levels of air pollution.

America needs to clean up the polluted air in its treasured National Parks. Utilities release millions of tons of air pollution annually contributing to visibility reductions in National Parks by up to 80 percent from natural levels.

Images provided courtesy of National Park Service & U.S. Forest Service

3: Environmental News Service, “Mammoth Cave Bioprospecting Produces Potential Cancer Drug,” May 21, 2002.

Available at http://ens-news.comlens/may2002/2002–05–21 –09.asp (click on the below article title)

MAMMOTH CAVE BIOPROSPECTING YIELDS POTENTIAL CANCER DRUG

SALT LAKE CITY, UTAH—A bacterium discovered in Kentucky’s Mammoth Cave National Park produces a substance that may be an effective anti-cancer drug, researchers announced Monday.

“We have isolated numerous bacteria from Mammoth Cave in Kentucky. One of these bacteria produces a substance that appears to inhibit the activity of a protein involved in the formation of new blood vessels [angiogenesis]," said Dr. Ryan Frisch of Grand Valley State University, one of the researchers on the study.

"When cancer cells begin to form tumors, one of the requirements is the formation of new blood vessels to provide the tumor with oxygen and nutrients," explained Frisch. "One of the strategies in the fight against cancer is to discover drugs that are anti-angiogenic because, if blood vessels are not produced, the tumor does not grow and prosper. These experiments indicate that the substance produced by this bacterium may be a new tool in the fight against cancer."

The research was released this week at the 102d General Meeting of the American Society for Microbiology in Salt Lake City.

Human diseases, such as cancer and the increasing number of antibiotic resistant bacteria, require a constant supply of new drugs for effective treatment. Screening substances from native plants and bacteria, which often have far more complexity than compounds synthesized in the laboratory, is considered a major opportunity for drug discovery.

One rich source of new, uncharacterized species is found in inaccessible ecosystems such as those found in caves, or in the geothermal springs of Yellowstone National Park.

But the biological exploration of these areas, dubbed bioprospecting is controversial. Bioprospecting—the exploration for and collection of biological resources for commercial purposes—has been sanctioned in national parks for the last decade as part of larger research projects.

Under a proposed new policy, the Park Service would reap financial rewards from bioprospecting through benefit sharing agreements with business and industrial groups that would be permitted to take samples of species on park lands and patent the products they produce. The potential profits for the agency could create a conflict of interest and encourage the Park Service to issue more bioprospecting permits than natural ecosystems can bear.

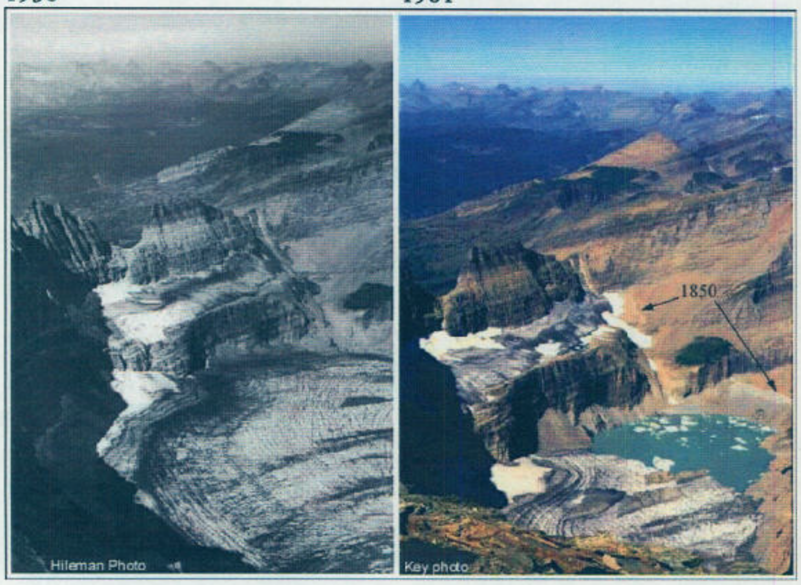
The Park Service is now soliciting public comments on the scope of an upcoming Environmental Impact Statement on bioprospecting. Several conservation groups are urging the agency to require individual environmental studies, including public comment periods, for all bioprospecting contracts on public lands.

4: USGS, photos of the Grinnell glacier in Glacier National Park in 1938 and 1981.

A GLACIER FREE GLACIER NATIONAL PARK?

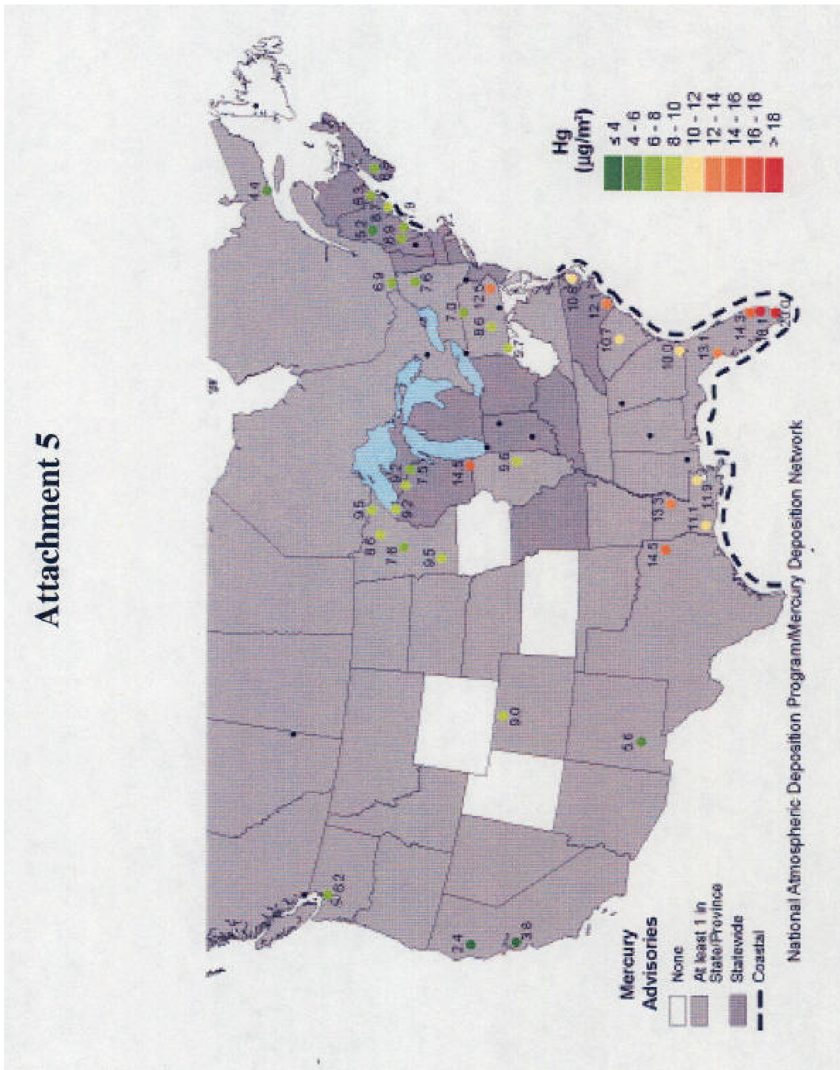
Grinnell Glacier in Glacier National Park viewed from the top of Mount Gould during late summer 1938 (left) and 1981 (right). In just 43 years, a lake from meltdown has formed at the end of the glacier, which has suffered a significant loss of volume from climate change. Between 1938 and 1993, the glacier had shrunk about 63 percent in area and, since 1850, had receded more than half a mile.

1938 **1981**



http://nrmsc.usgs.gov/research/glacier_retreat.htm
U.S. Geological Survey, Northern Rocky Mountain Science Center, Glacier Field Station, c/o Glacier National Park West, Glacier, MT 59936

5: National Atmospheric Deposition Program: Mercury Deposition Network map showing mercury advisories and deposition at sites across the country, with the Everglades registering the highest levels.



6: Clear the Air, Out of Sight: Haze in our National Parks, August 2000. Clean Air Task Force, Boston, MA. (Kept in committee files).

7: W. Kent Olson, "Acadia's green 45,000 acres," Bangor Daily News, April 24, 2002.

[From the Bangor (ME) Daily News, Wednesday, April 24, 2002]

ACADIA'S GREEN 45,000 ACRES

(By W. Kent Olson)

The Maine Woods, famous from Thoreau's book of the same name, is the State's commercial mother lode. In aggregate, this huge this huge complement of mostly private timberlands occupies 17.7 million acres, 89 percent of Maine. The working forest is a crucial capital asset, underpinning the timber and paper industries that have driven the State's economy for centuries. But for all its outputs the forest is not nearly so economically productive on a strictly per-acre basis, as the 45,000 acres of mostly undeveloped land and easements that make up Acadia National Park, where not a tree is harvested commercially.

It Is total land volume that pays off, of course, $6.5 billion from commercial woodlands. But an arithmetic reduction is instructive. While each acre of private forest land annually contributes $368 in direct and indirect benefits to Maine's economy, publicly owned Acadia produces $3,400 per acre in sales of goods and services alone. The figure includes $1,200 in wages, or 4.7 percent of the average of Maine income.

This is not to imply that just any 45,000-acre tract could be so generative. Or that if you stopped cutting it, a working forest would magically sprout cash. Rather, the idea is that exceptional places, thoughtfully and calculatedly set aside from the market system's general reach, can themselves create and help sustain markets. Well-tended public lands can strengthen capitalism, especially in the immediate surroundings. So it is with Acadia.

Michigan State University professors Daniel Stynes and Dennis Propst, using work initiated by Ken Hornback, developed the "Money Generation Model," for determining economic effects of national parks (www.prr.msu.edu/mgm2). Stynes and Propst estimated that in 2000, Acadia visitors spent $130 million in nearby towns for meals, room rentals, campsites, services, etc. This sum underwrote 2,300 jobs directly, and employed another 1,000 people supplying products or services to the primary businesses. Total value of primary and secondary sales was $155 million, and personal income was $55 million, creating significant tax effects.

Even with its intrinsic worth, the park is not the sole actor. The view from, say Cadillac Mountain extends seaward beyond its boundaries. The ocean, a commons, thus subsidizes Acadia's amenity value. Still, the park's core real estate—location, location, location—is the working capital, a public asset producing private wealth.

Unfortunately that asset is underfunded by 53 percent annually, according to Acadias' Business Plan, a rigorous financial analysis certified by PriceWaterhouseCoopers and published by the park, National Parks Conservation Association and Friends of Acadia. Within a larger effort benefiting all 386 national park units, Friends formed the Acadia Full Funding Coalition, in Maine, to increase this park's yearly operating funds to $14 million through appropriations and park entry fees. That's what is needed to keep Acadia unimpaired forever, the Park Service's mission.

Sens. Olympia Snowe an Susan Collins and Reps. John Baldacci and Tom Allen have pledged strong support. Thanks to State Sen. Jill Goldthwaite and others, the Maine Legislature recently passed a resolution urging the president and Congress to back the idea.

Private donations have an important sharply focused role in park funding. Friends of Acadia's goal is to supplement Federal funds, not replace them. Contributors add a margin of excellence to resource protection beyond what government can do. This increases the park's "book" value, benefiting all of Maine.

With full Federal appropriations, entry fees that meet market standard, upped concession revenues and laser-beam philanthropy of the kind Friends of Acadia has pioneered, park staff can manage future visitation and protect Acadia for the ages.

Question: what other 45,000-acre forested area, with 121 employees doing the work of 230, with half the budget needed to meet legal mandates, is a season barely 6 months long, and with all its vegetation left upright, gives Maine 3,300 jobs and $130 million in cash, year after year?

Answer: None. This rare and precious Acadia National Park—a "gem on a shoestring." Said the Portland Press Herald—deserves constant reinvestment.

Tiny Acadia is not exactly the Maine Woods of legend, but it is our national park, a capital asset if ever there was one. Maine owes a tremendous debt to all who bring a vital margin of excellence to this phenomenal place.

8: U.S. PIRG, Florida's Top Ten: Power Plants that increased emissions, 1995–2000.

Florida's Top Ten

Power Plants that Increased Pollution

1995 – 2000

	Plant Name	1995 CO2 (tons)	1996 CO2 (tons)	1997 CO2 (tons)	1998 CO2 (tons)	1999 CO2 (tons)	2000 CO2 (tons)	Total Increase (tons)
1	Stanton Energy	2,645,121	4,461,627	6,420,602	5,928,290	6,083,921	6,718,589	4,073,468
2	Putnam	993	1,457,880	1,438,332	1,432,209	1,299,645	1,359,730	1,358,737
3	Crist	5,174,693	4,276,699	4,606,496	6,685,309	6,611,153	6,457,298	1,282,605
4	Anclote	2,741,017	3,288,992	3,733,221	4,365,726	4,320,648	3,808,903	1,067,886
5	Manatee	3,883,789	3,057,365	3,505,039	5,204,653	4,744,813	4,837,988	954,199
6	Fort Myers	1,479,753	1,492,596	1,889,274	2,928,592	2,648,306	2,433,895	954,142
7	C D Mcintosh Jr	2,767,611	2,363,855	2,626,488	2,328,717	2,743,322	3,569,381	801,770
8	St Johns River Power	10,030,142	10,740,497	10,735,241	10,974,347	10,595,267	10,809,674	779,532
9	Sanford	2,222,598	2,202,768	2,455,555	3,501,942	3,172,172	2,958,916	736,318
10	Polk Station	n/a	n/a	1,058,919	1,475,314	1,640,573	1,678,772	619,853

	Plant Name	1995 SO2 (tons)	1996 SO2 (tons)	1997 SO2 (tons)	1998 SO2 (tons)	1999 SO2 (tons)	2000 SO2 (tons)	Total Increase in SO2 (tons)
1	**Crist**	34,951	33,242	36,724	50,594	45,702	53,082	18,131
2	**Port Everglades**	11,290	10,702	13,506	22,245	21,595	20,947	9,657
3	**P L Bartow**	13,112	22,716	24,912	30,413	28,668	20,291	7,179
4	**Manatee**	22,603	18,484	22,565	33,480	30,215	28,910	6,307
5	**Crystal River**	86,243	98,753	113,498	107,100	101,827	92,211	5,968
6	**Martin**	9,979	12,709	9,846	13,144	10,106	15,894	5,915
7	**Stanton Energy**	4,483	6,255	8,974	7,507	7,643	9,669	5,186
8	**Northside**	11,254	13,004	15,809	28,421	23,393	15,300	4,046
9	**Turkey Point**	8,018	8,498	10,196	15,357	12,742	11,071	3,053
10	**Deerhaven**	5,977	6,977	7,026	7,736	5,429	8,416	2,439

	Plant Name	1995 NOx (tons)	1996 NOx (tons)	1997 NOx (tons)	1998 NOX (tons)	1999 NOx (tons)	2000 NOx (tons)	Total NOx Change (tons)
1	**Fort Myers**	5,162	4,611	8,908	14,456	13,401	10,614	5,452
2	**Sanford**	8,977	7,080	10,534	16,878	15,386	14,335	5,358
3	**Stanton Energy**	5,189	7,190	9,222	0	7,627	9,263	4,074
4	**Martin**	3,916	5,630	5,514	6,714	5,487	6,985	3,069
5	**Manatee**	6,783	4,435	6,277	10,385	8,429	8,381	1,598
6	**Northside**	3,103	2,649	3,645	6,155	6,012	4,623	1,520
7	**C D Mcintosh Jr**	6,606	5,711	5,804	5,309	6,269	8,112	1,506
8	**Anclote**	5,867	7,873	8,113	10,631	8,898	7,328	1,461
9	**Cape Canaveral**	8,914	8,845	9,207	14,142	11,496	10,277	1,363
10	**Port Everglades**	8,969	4,903	6,657	9,953	11,878	10,263	1,294

[From the New York Times, Wednesday, January 2, 2002=

AN UNCERTAIN PARKS POLICY

Just over one year ago, President-elect Bush introduced Gale Norton as his choice for secretary of the interior, handed her the task of fixing the national park system and promised $1 billion in new money every year for 5 years to help her do it. As promises go, revitalizing the parks did not seem very adventurous. Everyone loves the parks. Still, president after president had taken the parks for granted, leaving an overdue repair bill of more than $5 billion as well as an annual operating shortfall in the hundreds of millions. Thus Mr. Bush's promise was no small thing.

So how has he done? In the year now ending, Mr. Bush asked for and Congress provided an increase of only $90 million or so in the operating budget. But Mr. Bush was operating within the constraints of President Clinton's last budget; next year will be a better indication of his resolve. It will also be helpful if, as the National Parks Conservation Association has suggested, he instructs his interior secretary to use this money to protect the parks' historical, cultural and natural resources—its plants and animals and their habitat—in addition to repairing roads and buildings.

Money, in fact, is only one measure of Mr. Bush's commitment. A truer test is whether he and by extension Ms. Norton are genuinely committed to the values that animated the founders of the national park system. Chief among these is keeping ecosystems intact. That means nourishing the natural environment and keeping the animals that depend on it as healthy and stress-free as is humanly possible in a system besieged with nearly 300 million visits a year.

On this score, Mr. Bush has given pause. One distressing example is the Administration's sneaky effort to reverse a Clinton rule phasing out snowmobiles from Yellowstone National Park—a rule buttressed by overwhelming public approval and years of conscientious science. Ms. Norton seems convinced that industry can come up with a kinder, gentler snowmobile than the infernal machines that gather near the park entrance at West Yellowstone and then proceed to foul the air, ruin the natural quiet and scare the animals. So far as we know, there is no such machine.

The larger point about the snowmobile issue is that it reflects a commercial bias that really has no place in Federal policy regarding the parks. Yellowstone will survive snowmobiles, but such a bias could be disastrous elsewhere. The future of the Everglades, for example, depends on whether the Administration is willing to honor the wishes of Congress as expressed in the Everglades restoration plan and give the natural system its fair share of South Florida's copious rainfall, instead of allowing the developers and big farmers to grab it all.

Similarly, the smoggy haze that afflicts so many national parks from Big Ben in Texas to Acadia in Maine will never improve unless the Administration cracks down on emissions from older coal-fired power plants. The Environmental Protection Agency has yet to issue final rules on park haze. Meanwhile, its administrator, Christie Whitman, is under pressure to roll back a provision in the Clean Air Act known as "new source review" that has done much to reduce air pollution.

Mr. Bush's promises of more money are welcome, and his selection of Frances Mainella to run the National Park Service has been widely applauded. Yet at every turn, he faces the choice between short-term commercial and local interests and the long-term health of the parks. So far, on most environmental issues, commercial interests have got the upper hand. Mr. Bush can achieve some redemption by doing right by the parks.

10: American Lung Association and National Parks Conservation Association, letter to Members of Congress seeking support for S. 556 and H.R. 1256, February 14, 2002.

AMERICAN LUNG ASSOCIATION.
February 14, 2002.

Dear Member of Congress:

Visitors to America's national parks should not have to risk their health by breathing park air. Yet, those who hike in some of our national parks can no longer be confident about the purity of the air they breathe.

We are becoming much too familiar with the problem of haze air pollution at majestic treasures like the Grand Canyon, Canyonlands, Great Smoky Mountains, Big Bend, Shenandoah, Mount Rainier and Acadia. However, not only is our ability to enjoy the scenic value of these glorious places at ever increasing risk, but at some of them our health may be as well., Our nation's most visited park, Great Smoky Mountains National Park, has one of the most serious air problems of any national park and consistently records higher concentrations of ozone smog than Atlanta. The National Park Service has had to issue "unhealthful air" notices to employees and park visitors on 139 days over the last 4 years. In 1999, the air in the park was unhealthy to breathe on one out of every 3 days during the summer tourist season.

More recently, the University of Southern California released some of the strongest evidence to date that confirms the danger of ozone to physically active children. It confirms previous evidence that clearly demonstrated that ozone can aggravate existing cases of asthma, while highlighting results that point to ozone as potentially causing the actual onset of the disease.

Parents who live around our country's metropolitan areas must already keep their children indoors during too many summer days when the alternative is breathing unhealthy air. When those families travel to their national parks, they should not have to face the same choice. Our nation can and must do better.

Americans care about the purity of their air, and we all have the right to breathe clean air when we visit our national parks. Yet, the energy industry is using its influence to gut critical clean air protections that Americans expect. Some of the old power plants that may be given a greater license to pollute by undermining the Clean Air Act's new source review provisions have a direct impact on the air quality in our national parks and are threatening not only the long term vitality of precious places like the Great Smoky Mountains, but of the health of families who visit them. It is simply wrong to place the health of the millions of annual visitors to our nation's most visited national park at risk in order to benefit the bottom line of a handful of powerful energy companies.

We ask for your help in rejecting any proposed rollback in the protections already available under the Clean Air Act. Further, we ask that you support S. 556, Clean Power Act, and H.R. 1256, the Clean Smokestacks Act. Both of these bills protect human health while preserving critical provisions of one of the most effective environmental laws ever written, the Clean Air Act.

We ask that you not support the proposals announced by the Bush Administration. By contrast, the Administration proposals would significantly roll back provisions of the Clean Air Act. The Administration proposals would limit the ability of States to act to reduce air pollution. Their provisions would actually allow more pollution than in provisions currently in place under the Clean Air Act.

For the protection of some of our most precious national treasures-our national parks and our children's health-we urge you strongly to support S. 556 or H.R. 1256.

For more information, please feel free to contact the National Parks Conservation Association at 202–223–6722 or the American Lung Association at 202–785–3355.

CRAIG OBEY,
Vice President Government Affairs,
National Parks Conservation Association.

PAUL G. BILLINGS,
Assistant Vice President, Government Affairs,
American Lung Association.

RESPONSES OF DON BARGER TO ADDITIONAL QUESTIONS FROM SENATOR VOINOVICH

Question 1. It is my understanding that the Adirondack Council is mostly concerned about NOx and SO_2 because of the real impacts today. Hence, they support the President's proposal. In your opinion, what is more important to the parks-real reductions today or waiting perhaps years to include CO_2?

Response. My testimony before the Committee was that we cannot afford for those to be the only two choices. I believe that what's important is for us to fulfil our commitments to the parks and to the people of the United States by insuring that these precious resources are inherited unimpaired by future generations. In order to do that, we have to understand that the impacts of mercury and global climate change are, in fact, also "real impacts today." It is the nature of climate change that the impacts will extend over a very long period of time. This fact makes those impacts more, not less, profound and the need to act now even more immediate. I would request that you closely examine the photographs from Glacier National Park that were included in my testimony. How will we explain Glacier National Park to our grandchildren 30 years from now if there are no longer any glaciers? During the hearing, there were numerous analogies to our current situation as a ship. I believe that the most important thing for us to understand about global climate change is that we are all in the same boat. And that our economy is in here with us.

Mercury is a bio-accumulating neuro-toxin that is being found increasingly in our environment. According to the National Atmospheric Deposition Program 2000 Annual Summary (pp. 12–13), every State in the Lower 48 States that monitors mercury has had to issue fish and wildlife consumption advisories to its citizens. The 6 States that do not have advisories do not monitor mercury. Attachment 5 in the packet submitted by NPCA at the hearing is a map of atmospheric deposition of mercury at sites across the country. Some of the highest levels in the country are found in south Florida and the delicate ecosystems of Everglades National Park. Preliminary monitoring data at Great Smoky Mountains and Mammoth Cave National Parks are showing elevated levels of mercury in precipitation there. Due to its persistence in the environment and the food chain, mercury pollution is inappropriate for trading programs (such as the one in the President's proposal) that would allow its concentration and prolonged deposition.

I cannot speak to the Adirondack Council's decision to support a plan that the Bush Administration's own research indicates will not be adequate to reverse the continuing acidification of streams in Great Smoky Mountains National Park. In the 2001 report, Acid Rain Revisited: Advances in scientific understanding since the passage of the 1970 and 1990 Clean Air Act Amendments, the Hubbard Brook Research Foundation determined that:

Recent water quality data show that:

- 41 percent of lakes in the Adirondack Mountain region of New York and 15 percent of lakes in New England exhibit signs of chronic and/or episodic acidification.
- Only modest improvements in ANC, an important measure of water quality, have occurred in New England. No significant improvement in ANC has been measured in the Adirondack or Catskill Mountains of New York.
- Elevated concentrations of aluminum have been measured in acid-impacted surface waters throughout the Northeast.

Given the loss of acid-neutralizing base cations and the accumulation of sulfur and nitrogen in the soil, many ecosystems are now more sensitive to the input of additional acids and recovery from acid deposition will likely be delayed. Research shows that emissions reductions mandated by the 1990 CAAA are not sufficient to achieve full ecosystem recovery in watersheds in the Northeast that are similar to the HBEF within the next 25–50 years. Analyses of policy proposals calling for an additional 40–80 percent reduction in electric utility emissions of sulfur beyond the levels set by the 1990 CAAA show that such proposals would result in measurable improvements in chemical conditions. Specifically, with an additional 80 percent reduction in sulfur emissions from electric utilities, streams such as those at the HBEF would change from acidic to non-acidic in approximately 20–25 years. (Emphasis added)

Question 2. According to your testimony, you said that during this week's ozone alert day in Washington, DC, the air for pedestrians was better in downtown Washington, than the air in our national parks. Can you explain this statement?

Response. Yes. I testified: "While we were having the ozone red alert yesterday here in Washington, I checked the ozone levels both here and at the Great Smoky Mountains National Park. Bottom line, it would have been a lot healthier to run to work yesterday in Washington than it would have been to hike on the Appalachian Trail in the Smokies." The pollutant of concern here is ground-level ozone, a secondary pollutant produced when NOx and hydrocarbons known as volatile organic compounds (VOCs) combine in the presence of sunlight. Ozone is a strong lung irritant that can burn and even scar the delicate tissue of the lung at elevated levels.

The comparison I made was between the 8-hour average ozone concentration at 8 a.m. on the morning of June 11 at monitoring sites in Washington, DC and at Great Smoky Mountains National Park. Data from the park is from the Clingman's Dome monitoring station that sits along side the Appalachian Trail (AT); the Washington, DC data is from the McMillan Reservoir monitoring station near Howard University, the closest site to the center of Washington. The comparison showed that the concentration of ozone in Washington was 39 parts per billion (ppb); the concentration at that same moment along the AT was 102 ppb. This situation was not a fluke. Long-term monitoring data show that in the last 8 years, there have been more days that exceeded the 8-hour standard in the park than there have been in Washington. All of this data can be found at the follow link:

EPA's Ozone Monitoring and Mapping Data: ftp://SHCoperator@ftp.airnowdata.org/outgoing/data/

Further tests of the direct impacts on hikers along the Appalachian Trail in the park are currently ongoing. These tests are described in a series of five articles that appeared in last Sunday's (8/14/02) Knoxville News-Sentinel (links provided below). I would also be glad to connect you to the researchers at the University of Tennessee if you desired more technical descriptions of this testing.

Inhaling the haze: http://www.knoxnews.com/kns/local—news/article/0,1406,KNS—347—1332527,00.html

Scientist climb up for a breath of unfresh air: http://www.knoxnews.com/kns/local—news/article/0,1406,KNS—347—1332669,00.html

Public opposes weakening of the clean air act: http://www.knoxnews.com/kns/letters—to—editor/article/0,1406,KNS—363—1330779,00.html

Emissions limit to have big effect on counties: http://www.knoxnews.com/kns/local—news/article/0,1406,KNS—347—1332668,00.html

Environmentalist activist takes the clean air fight personally: http://www.knoxnews.com/kns/local—news/article/0,1406,KNS—347—1332667,00.html

RESPONSES OF DON BARGER TO ADDITIONAL QUESTIONS FROM SENATOR GRAHAM

Question 1. I visited Great Smoky Mountains National Park last August and I had the opportunity to learn about the problems that air pollution has created for visibility. Most visitors to the Park don't realize that the smoke-covered mountains that they see first thing in the morning are a result more of pollution than the natural phenomenon for which the mountains are named.

In your testimony, you write about that "scenic vistas cannot inspire if they cannot be seen." There are also other harms caused to natural resources by pollutants. Can you provide with some further information on these problems?

Response. The Cherokee Indians called these mountains "Shaconage", the Place of Blue Smoke. It was named for the wisps of moisture that spiral up from the sides of the mountain after a rain. The uniform grayish-yellow haze that greets most of the park's visitors in the summer is a chemical soup generated largely by the combustion of fossil fuels. You are correct that visibility impairment is only one of a number of serious problems created by air pollution in our national parks. These other problems include acidification of soils and streams, foliar damage to plants and the very serious health impacts of pollution on park visitors and park staff.

Research detailing the numerous adverse impacts to Class 1 areas from air pollution is voluminous and overwhelming. Perhaps the best summary of that research can be found in the "Technical Information in Support of the Department of the Interior's Request for a Rule to Restore and Protect Air Quality Related Values" which accompanied a formal Petition for Rulemaking submitted by the Department of the Interior (DOI) to the Environmental Protection Agency (EPA). It should be noted that this Petition for Rulemaking by DOI has not been acted upon by EPA.

DOI's petition for AQRV rulemaking: http://www2.nature.nps.gov/ard/epa/index.htm

STATEMENT OF J. THOMAS MULLEN, PRESIDENT AND CEO, CATHOLIC CHARITIES HEALTH AND HUMAN SERVICES, CLEVELAND, OH

Chairman Jeffords and distinguished Members of the U.S. Senate, Committee on Environment and Public Works: I thank you for the opportunity to testify today regarding Senate bill 556, referred to as the Clean Power Act. My name is Tom Mullen and I am President of Catholic Charities Health and Human Services in Cleveland, Ohio. Catholic Charities in Cleveland serves over 600,000 people annually and has an $87,000,000 annual operating budget, while employing of 1,700 people. We provide services to children and families; older adults; persons with disabilities; and those with emergency and basic transitional needs. (Last year we served over 4.5 million meals to the hungry and provided tens of thousands nights of shelter to homeless women, men and children). This service area is in the eight-county Cleveland Catholic Diocese in Northeast Ohio.

I want to acknowledge the support and involvement that committee Member Senator George V. Voinovich has given to our communities and the people we serve in Ohio. I want to share with you today what impact that Senate bill 556 would have on a number of the people we serve daily in Northeast Ohio.

Senator Voinovich, in the last couple of years, has convened people most directly impacted by the rise in utility costs. The elderly on fixed limited incomes and the working poor with families have made it clear to him during these meetings and to me on a daily basis that they cannot afford increases in costs for their basic needs. Many indicate that, currently, they cannot afford basic needs without either falling behind in payments and/or ignoring one of those needs like rent, utility, or health care bills. Senate bill 556 on the surface strives to cleanse the environment of many of the oxides and, in particular, carbon dioxide and mercury. These gases are given off through the burning of coal. I ask the committee to carefully review the negative impact that would occur on millions of people in our country and in my state of Ohio if the bill is enacted without deeper consideration and further research.

The State of Ohio's energy production is provided by 86 percent use of coal. If Senate bill 556 is enacted, the conversion to natural gas from coal would have a devastating effect on the people of Ohio and our country, particularly the poor and the elderly. The Edison Electric Institute estimates that, if enacted, the loss in America in gross domestic product by the year 2010 would be $75 billion and grow to $150 billion in 2020. In the State of Ohio, the loss would be $3 billion and grow to $6 billion by 2020.

Employment in Ohio would be dramatically impacted with job losses estimated at 25,000 by 2010 and 37,000 by 2020. With all of this, the most vulnerable of our people economically, would see their electric costs in Ohio soar to $494,000,000 in 2010 and to $1.5 billion in 2020.

The overall impact on the economy in Northeast Ohio would be overwhelming, and the needs that we address at Catholic Charities in Ohio with the elderly and poor would be well beyond our capacity and that of our current partners in government and the private sector.

In a recent study on Public Opinion on Poverty, it was reported that one-quarter of Americans report having problems paying for several basic necessities. In this study, currently 23 percent have difficulty in paying their utilities—that is, one out of four Americans. If Senate bill 556 is passed, we could see the difficulty in Cleveland reach beyond one out of two people and families not able to pay utilities. This is based on the current fact that, in Cleveland, 25.8 percent of people are below the Federal poverty level and from the 200 percent increase in emergency assistance needs we are experiencing at Catholic Charities in the last 18 months. This is all without the domestic increase these same individuals and many thousands of others will experience through job loss and utility cost increase as a result of the Clean Power Act.

I want to emphasize, again, the two groups of our most vulnerable population in Ohio that would be impacted by this bill. First, the elderly in Cleveland—approximatelyone-half (49.4 percent) of persons over 65 years old have incomes less that $15,000 per year. In Cuyahoga County, nearly one-third (31.5 percent) fall into the same category. Northeast Ohio reflects realistically what negative impact the increase in utility cost would have for all our seniors in Ohio and through similar states throughout the nation.

The second group that I have real concern for and will be hurt similarly by this is children. In Cleveland, over one-fourth of all children live in poverty and are in a family of a single female head of household. These children will suffer further loss of basic needs as their moms are forced to make choices of whether to pay the rent or live in a shelter; pay the heating bill or see their child freeze; buy food or risk the availability of a hunger center. These are not choices any senior citizen, child, or, for that matter, person in America should make.

I ask the committee to look carefully at the ramifications of Senate bill 556 and its impact on employment and energy costs. We have many vulnerable people in Cleveland, in Ohio, and across America who cannot carry the burden of this legislation. Chairman Jeffords and Senators of the committee, thank you for your time.

RESPONSES OF TOM MULLEN TO ADDITIONAL QUESTIONS FROM SENATOR JEFFORDS

Question 1. As you may know, I've always been a strong proponent of the LIHEAP program. So, I'm not interested in harming low-income people by imposing pollution controls. But, I think we can work together to keep the 40–50,000 low-income people in Cleveland who use electricity for heat from being harmed by control costs and by pollution. Would you agree, though, that we need to reduce our carbon dioxide emissions soon.

Response. Yes, we need to find ways to accommodate both.

Question 2. In the "Straw" Proposal analysis, EPA concluded that power plan emission reductions similar to the levels in the Clean Power Act would not only bring cleaner air but would also save the average family of four in places like Cleveland $2500 each year in avoided health care costs. How does that compare to the average expenditure on electricity in a low-income home in Cleveland.

Response. If the $2,500 is accurate, it would come very close to being equal; yet we must remember that 100 percent expenditure covering health care for the poor does not come directly from their pockets as energy costs do. Health care coverage for the poor and elderly comes from Medicaid and Medicare.

Responses of Tom Mullen to Additional Questions from Senator Voinovich:

Question 1. Specifically, how much have high energy costs in the past increased requests for help from the people you serve?

Response. The increased energy costs impact all basic needs. The attached analysis covering a 2-year period (1999–2001) speaks directly to this concern and also provides information on the growth.

Question 2. Can you please illustrate your organization's current abilities to meet the needs of those you serve, and how, as you stated in your testimony, the impact of S. 556 to the elderly and poor would be "well beyond" your capacity?

Response. We do not have a capacity to meet the needs currently and further impact on the poor and elderly would additionally increase the percentage of need, further decreasing our capacity from a fiscal and human resources perspective to serve them.

Responses of Tom Mullen to Additional Questions from Senator Graham:

Question 1. I come from a State where a large segment of the population lives on a fixed income. This fact makes issues of cost very important to Floridians.

What kinds of Federal programs exist that could be used to help Americans living on fixed incomes if their utility bills rise as much as your cost estimates predict?

Response. The HTF, TANF, AEA and HEAP programs increase and discussions with utilities to work with the poor and elderly in budget payments and extended payment plans. This would allow for budgeting and increase the predictability of these costs.

Question 2. Do you have any recommendations for ways that these programs or new programs could be used to help alleviate these effects?

Response. Refer to the answer in Question 1. I am providing a summary (attached) of the Cleveland, Ohio situation in the area of basic needs for the first half of 2002, as prepared by Catholic Charities Information and Referral Services. These figures focus primarily on Cuyahoga County (Greater Cleveland) and not the other eight counties of the diocese.