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Darrell Issa (CA-49), Ranking Member

Comprehensive Staff Analysis of the Economic Impact of the Waxman/Markey Cap-and-Trade Legislation

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Table of Contents

Findings:

- **Cap-and-trade is a regressive tax**: Cap-and-trade is the largest tax increase proposal since the income tax. According to the Congressional Budget Office (CBO), cap-and-trade would cost the average American household an extra $1,600 per year. The rise in prices would impose a larger burden, relative to income, on low-income households than on high-income households. (p. 6-8)

- **All publically available studies of cap-and-trade likely underestimate the cost of the Waxman/Markey legislation**. Economic studies offer an imperfect view of the future, as they are all dependent on the author's assumptions. Moreover, none of the publically available studies consider the additional cost associated with the command-and-control Renewable Portfolio Standard (RPS), which dictates that 25% of all electricity is generated from renewable sources. (Addendum)

- **President Obama greatly underestimates the economic impact of cap-and-trade.** The 2010 budget blueprint estimates that an allowance will sell for $20, generating $646 billion in revenue between 2012 and 2019 - in reality an allowance could be as high as $76 and an auction could impose a carbon tax as close to $2 trillion on the economy. Candidate Obama was more truthful in an interview to the San Francisco Chronicle where he said, "Under my plan of a cap-and-trade system, electricity rates would necessarily skyrocket. Businesses will have to retrofit their operations. That will cost money. They will pass that cost on to the consumers." (p.11-12)

- **Cap-and-trade could increase the cost of electricity by 44% to 129% and could increase the price for a gallon of gasoline between $0.61 and $2.53.** The price of natural gas could increase by 108% to 146%. (p. 12)

- **There could be significantly fewer jobs for Americans in the future under a cap-and-trade system, than without one.** According to the Heritage Center for Data Analysis, yearly job losses range between 200,000 to 900,000 in 2016 and between 550,000 and 600,000 in 2030. Other estimates predict yearly job losses in the millions.(p. 13-14)

- **Cap-and-trade will devastate American manufacturers.** Americans whose jobs rely on the manufacturing industry will be increasingly vulnerable to unemployment. The increased cost for manufacturers will either force some to close up shop or move manufacturing jobs overseas. According to the CBO, "the higher prices that would result from a cap on CO_2 emissions would reduce demand for energy and energy-intensive goods and services and thus create losses …for workers in the sectors of the economy that supply such products. [These workers] could face higher risk of unemployment as jobs in those sectors are cut.… The cost of unemployment would probably be concentrated among relatively few households, and by extension, their communities." (p. 16)

- **Some states will shoulder the lion's share of the burden to reduce CO_2 emissions, while other states might only experience a marginal impact, and could even profit under the Waxman/Markey cap-and-trade scheme.** Workers in Indiana, Kentucky, Michigan, Ohio, Tennessee, Wisconsin, West Virginia, Georgia, and Alabama could bear the brunt of the pain inflicted by the Waxman/Markey cap-and-trade scheme. The large presence of manufacturing, combined with a heavy reliance on coal, in these states indicates that their citizens could, on average, pay higher electricity rates and be more vulnerable to job loss than most Americans. President Obama's so-called tax-rebate plan does nothing to address this geographic disparity. (p. 17-18)

- **Cap-and-trade could ship millions of jobs overseas AND increase worldwide levels of carbon emissions.** If the structural cost of manufacturing in the U.S. increases too much, businesses will seek refuge in less regulated environments overseas. China's energy intensity is three times higher and rising faster than the energy intensity of U.S. manufacturing. This means that any manufacturing process in China will emit at least 300 percent more CO_2 than a similar manufacturing process in the U.S. Climate change legislation that increases the cost of domestic energy production, without altering the energy intensity overseas, would not only cost us jobs, but could also encourage the growth of global CO_2 emissions. (p. 17)

- **If the United States acts alone to curb its carbon emissions, the effort will be an exercise in futility.** Many advocates of cap-and-trade argue that if the United States leads, China will follow. However, China competes against other developing countries in East Asia and around the globe for manufacturing supremacy, not against the United States. Strong negative reactions from China and India's leaders to a carbon tariff also appears to rebut the popular notion that if the U.S. leads, they will follow. (p. 18-19)

- **Cap-and-trade relies on unproven and uncertain technologies to reduce carbon emissions**. Today, the United States is heavily reliant on fossil fuels to meet our energy demands, especially for transportation and baseload electricity generation. Energy Secretary Chu stated at the EIA Energy Conference in April 2009 that "Perhaps by the end of this century we could get renewables, and energy storage and transmission, on a plane where we can transition away from these others [fossil fuels]…but I don't see that happening anytime soon." Mandating a program that requires technology that has yet to be fully proven deployed appears to be foolish, and potentially irresponsible. (p. 19)

- **Any effort to reduce carbon emissions must envision a firm commitment to nuclear power.** Nuclear power is one of the safest, most efficient, and sadly underappreciated zero carbon resources available to our nation. From the development of hydrogen technologies, high heat reactors, to the possibilities of advanced fuel cycles, the benefits of nuclear power cannot be ignored any longer.

The United States will need a massive escalation in plant development; similar to the rates achieved in the 1970's and 1980's, constructing 4 to 6 nuclear plants a year. (p. 28-31)

- **NIMBY -- or "Not In My Back Yard!"-- is a serious obstacle to the deployment of zero carbon sources of electricity**. Ironically, the same environmental groups and lawmakers pushing the Obama Administration to adopt strict controls on carbon emissions are also standing in the way of our ability to transition to carbon free sources of energy such as nuclear, solar, and wind. There are at least 62 wind, wave, solar and biofuel projects, and 15 high-voltage transmission proposals, across 25 states that have faced significant local opposition, often enough to shut them down entirely. NIMBY also slowed or halted progress on 18 natural gas projects and17 nuclear power plants. (p 31-35)

- **The President has an obligation to clarify his green jobs agenda, which currently lacks transparency and obfuscates important policy choices.** The promised "green collar" jobs could replace, and not be an addition to, traditional blue collar jobs. There is evidence that "green jobs" will not pay as well as the jobs that will be lost. It does not appear that many of these jobs are economically viable without a government subsidy. (p. 35-38)

- **Congress should act quickly to preempt the Environmental Protection Agency and other government entities from regulating CO_2 under the Clean Air Act.** The federal government should address climate change in the most efficient and effective way possible. command-and-control regulations," which permeate traditional environmental statutes, such as the CAA are the least efficient, the most burdensome, and will cause the most harm to the economy. (p. 40)

Comprehensive Staff Analysis of Economic Impact of the Waxman/Markey Cap-and-Trade Legislation

I. Introduction

Despite economic turmoil caused by the bust in the housing sector and the effective government take-over of two American manufacturing giants, General Motors and Chrysler, President Barack Obama and leading Congressional Democrats are hurriedly moving to enact legislation – known as "cap-and-trade" – that would create a defacto-tax on the use of energy that creates carbon or other greenhouse gas (GHG) emissions as a byproduct.

There are numerous real world challenges associated with moving from an economy heavily reliant on fossil fuels, to one that maximizes the use of carbon-free energy sources. Despite numerous, and conflicting estimations of the "average" cost under cap-and-trade for American families, the costs in actuality would be shared unevenly. Families in states that rely on coal for baseload energy, have a manufacturing based economy, or have an intemperate climate would carry the largest burdens. Since cap-and-trade is a de facto-tax, these families would see their money collected through higher energy bills redistributed by Washington to families in other states, thus creating an unintended transfer of wealth among poor and middle class American families.

The transition to carbon free energy also faces a number of other unpredictable hurdles. Not In My Back Yard (NIMBY) efforts by the same environmental groups who are pushing for the most drastic limitations on our energy usage pose one of the greatest obstacles to an ordered transition. Also, concern about greenhouse gas emissions is not something the United States can effectively address alone. A U.S. effort to limit emissions which fails to account for the global nature of the problem and provide a global solution could actually increase world wide emissions of CO_2 and GHGs.

In light of these serious concerns, it is important to examine the consequences of cap-and-trade in greater detail. Policymakers and the public must understand the dynamics of the challenge, what costs cap-and-trade would impose on the public, and what goals can be achieved in a reasonable timeframe. Sensibility, prudence, and caution should outweigh politics and partisanship in developing and implementing an ecologically sustainable approach to the production of energy.

II. Cap-And-Trade: The Basics

A key component of previous and proposed climate change legislation is a cap-and-trade program, which seeks to stem global warming by limiting GHG emissions overall, while allowing emitting entities to buy and sell the right to produce the gasses. However, until sufficient alternative energy sources come on-line, any scheme capping emissions will drastically increase the cost of fossil fuels, such as coal, oil and natural gas.

A cap-and-trade program functions as a tax on energy: as emissions are capped, CO_2 becomes an artificially scarce resource, driving up the cost to emit a ton of CO_2. Any activity that results in CO_2 emissions will become more expensive. These emissions may be the byproduct of manufacturing goods, generating electricity, driving, or countless other activities. The cap could cause the price associated with each of these activities to rise. The price increase is part of the system's design – to act as a signal to energy consumers to use less or pay for the right to use it. While describing his plans for an energy policy, President Obama made a startling statement regarding energy costs under a cap-and-trade system: "Under my plan of a cap and trade system electricity rates would necessarily skyrocket … that will cost money. They [businesses] will pass that cost on to consumers …."[1]

Cap-and-trade will not only hit consumers in their pocket book, but American businesses would be saddled with higher costs and reduced competitiveness. American manufacturers rely heavily on fossil fuels for energy, meaning their structural costs will increase, reducing their competitiveness in the global marketplace.[2] This could lead to more layoffs and plant closures at a time when Americans are struggling to hold onto their jobs and pay their mortgages. This known consequence of cap-and-trade leads one to question the prudence of establishing a program that drives up structural costs and reduces competitiveness while the United States is in the midst of one of the worst recessions in decades.

In addition to the economic consequences of cap-and-trade, it is unclear to what extent U.S. mitigation efforts will actually contribute to reducing the impact of global warming. CO_2 is a gas and thus not stationary, so emissions migrate rapidly throughout the atmosphere. Even if the United States capped emissions and returned to pre-2005 CO_2 levels (or a fraction thereof), there is nothing to stop other countries, such as China and India, from continuing to emit large quantities of CO_2. In fact, those emissions levels are expected to continue to rise. The lessons of the Kyoto treaty demonstrate that meaningful reductions in CO_2 emissions will not happen unless every nation commits to emission reductions. Unilateral action by the United States could result in negative economic impacts domestically, while doing little to reduce global emissions.

Democrats Urge Adoption of Compliance System that is Failing in Europe

The European Union's (EU) experience with cap-and-trade offers evidence that cap-and-trade could be more costly and less effective than originally hoped. In 2005, the EU member states implemented the Emissions Trading Scheme (ETS) – which to date is the world's largest program to limit CO_2 emissions. Similar to domestic proposals, the total level of emissions is capped, and covered entities are issued and allowed to trade allowances. According to GAO, observers have said that the first ETS phase, which

[1] Senator Barack Obama, Meeting with the Editorial Board of the San Francisco Chronicle (Jan. 2008).
[2] MINORITY STAFF OF H. COMM. ON OVERSIGHT AND GOV'T REFORM, 110TH CONG., REPORT ON ENERGY POLICY, NATIONAL, ECONOMIC AND ENVIRONMENTAL SECURITY 23 (2008).

ended in 2007, did not decrease emissions, imposed high costs on both consumers and industry, and may have decreased the international competitiveness of European industries.[3]

Climate Proposals in the 110th Congress

Several cap-and-trade proposals have been put forth over the last few years, including the Lieberman-Warner and Dingell-Boucher bills in the 110th Congress, although no proposal has garnered enough support to be passed by either the full House or Senate. The proposals range in scope and scale, based on which GHGs are covered and whether credits are auctioned off or distributed as allowances. Both of the major proposals in the 110th Congress aspired to reduce GHGs 60 to 80 percent by 2050, using 2005 as the baseline year.[4] Most of the models examining the economic impacts of a cap-and-trade plan are based on the requirements of the Lieberman-Warner legislation.

The Lieberman-Warner plan sought to gradually reduce covered emissions (CO_2) plus other pollutants, including CH4, perfluorinated compounds (PFCs), SF4, and HFCs to 71% of 2005 levels by 2050, with intermediate goals of a 4% reduction by 2012 and a 19% reduction by 2030. The cap-and-trade system in S.2191 was set-up to distribute a declining number of carbon credits, or allowances, to covered entities for free, while auctioning off some allowances. Through emissions reduction and carbon capture and storage (CCS), and use of foreign allowances, covered entities could be awarded offsets totaling up to 30% of emissions obligations. The proposal created a Carbon Market Efficiency Board to monitor banking of allowances.[5]

The Dingell-Boucher proposal also used a declining-allowance system to bring the 2050 emissions cap to 25% of the 2012 cap. Allowances would be made available to covered entities both by distribution for free and through auction; enabling entities to buy and sell allowances amongst each other. The Environmental Protection Agency (EPA) would limit total emissions from all entities, but would not have authority to limit the emissions of any individual entity.

The Waxman/Markey Climate Change Legislation

President Obama supports the cap-and-trade concept and outlined a plan for implementation of a new program in his 2010 Budget. As part of a "comprehensive approach to transform our energy supply and slow global warming,"[6] the President

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[3] U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-09-151, INTERNATIONAL CLIMATE CHANGE PROGRAMS: LESSONS LEARNED FROM THE EUROPEAN UNION'S EMISSIONS TRADING SCHEME AND THE KYOTO PROTOCOL'S CLEAN DEVELOPMENT MECHANISM (2008).

[4] STAFF OF H. COMM. ON ENERGY AND COMMERCE, 110TH CONG., WHITE PAPER ON *CLIMATE CHANGE LEGISLATION DESIGN WHITE PAPER: SCOPE OF A CAP-AND-TRADE PROGRAM*1 (2007).

[5] BRYAN BUCKLEY & SERGEY MITYAKOV, GEORGE C. MARSHALL INSTITUTE, THE COST OF CLIMATE REGULATION FOR AMERICAN HOUSEHOLDS17 (2009).

[6] OFFICE OF MGMT. & BUDGET, FISCAL YEAR 2010 BUDGET FACT SHEET, JUMPSTARTING THE ECONOMY AND INVESTING FOR THE FUTURE (2009) *available at* http://www.whitehouse.gov/omb/assets/fy2010_new_era/Jumpstarting_The_Economy.pdf.

pledged to work with Congress to develop a cap-and-trade system to achieve a 14 percent emissions reduction by 2020 and an 83 percent cut by 2050.[7] The President's budget assumes more than $646 billion in new revenues from cap-and-trade, to pay for the Making Work Pay tax credit (a rebate for low-income Americans, many who pay no income taxes at all) and a $120 billion investment in clean energy technology.[8] White House insiders predict that realistically, revenue from cap-and-trade would be at least twice, and possibly three times, this initial estimate. At a meeting with Senate Finance Committee staff, Jason Furman, Deputy Director of the National Economic Council, estimated that the Administration's cap-and-trade system could generate between $1.3 trillion and $1.9 trillion between fiscal years 2012 and 2019.[9] This indicates that the price of a carbon credit would be significantly more than the Administration's initial estimate of $20 per ton of CO_2.

In the 111th Congress, responsibility for drafting climate change legislation falls in the hands of House Energy and Commerce Committee Chairman Henry Waxman, no stranger to cap-and-trade. In 2007, Chairman Waxman introduced the Safe Climate Act, which used a cap-and-trade system to drastically cut carbon emissions, bringing them to just 20 percent of 1990 levels. Had it been enacted, the effects of the bill would have been far-reaching. To reach this goal, Rep. Waxman called for using "cleaner technologies . . . such as hybrid vehicles and wind power."[10] Given that only 7% of our current baseload energy portfolio (which does not include fuel for transportation) comes from renewable sources (and only 11 percent of that from solar, geothermal and wind energy, combined), the dramatic ratcheting down of emissions called for in Waxman's bill would be difficult to achieve.

A Preview of Waxman/Markey

Chairman Waxman and Energy and Environment Subcommittee Chairman Ed Markey recently drafted comprehensive global warming and energy legislation that they hope to mark up in the full committee by mid-May. The initial 600-page draft bill surpasses even President Obama's optimistic short-term CO_2 reduction targets in an attempt to aggressively curb emissions. The House Democrats call for a 20 percent cut from 2005 levels in just 11 years, as compared with the Administration's proposal of a decrease of 14 percent from 2005 levels by 2020. The 2050 emissions goal in the Waxman/Markey plan does line up with the President's plan of an 83 percent decrease from 2005 levels. [11]

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[7] Walter Alarkon, *Not All Senators Warming to Obama Cap-and-Trade Emissions Proposal*, THE HILL, March 4, 2009, *available at* http://thehill.com/leading-the-news/not-all-senators-warming-to-obama-cap-and-trade-emissions-proposal-2009-03-04.html.

[8] CONG. BUDGET OFFICE, A PRELIMINARY ANALYSIS OF THE PRESIDENT'S BUDGET AND AN UPDATE OF CBO'S BUDGET AND ECONOMIC OUTLOOK(2009) *available at* http://www.cbo.gov/ftpdocs/100xx/doc10014/03-20-PresidentBudget.pdf.

[9] Corey Boles & Martin Vaughan, *White House Official Boosts Cap and Trade Revenue Estimate*, WALL ST. J., March 17, 2009, *available at* http://online.wsj.com/article/SB123733423766063691.html.

[10] 153 CONG. REC. E594 (daily ed. March 21, 2007) (Statement of Rep. Waxman).

[11] Darren Samuelson & Ben Geman, *Details Trickle out on Waxman-Markey Proposal*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 31, 2009, *available at* http://www.eenews.net/EEDaily/2009/03/31/1/.

Even as the bill has yet to be finalized and introduced in the House, some members of the Democratic caucus already expressed their concerns with the stringent emissions caps. Rep. Rick Boucher, a member of the Energy and Environment Subcommittee and author of previous climate change legislation, indicated that he will propose changes to the Waxman/Markey bill, noting that the 2020 limits appear overly ambitious and may be "too aggressive for industry given technological constraints."[12]

The draft legislation does not include a mechanism for distribution of allowances, a critical component of any cap-and-trade plan and key factor to consider when evaluating the cost associated with the program.[13] President Obama called for a 100% auction process – covered entities would have to pay to emit carbon, starting with the first ton of CO_2. This type of distribution eliminates any lag time and would immediately send costs to consumers and industry soaring. However, according to Democratic stakeholders, the question of how many allowances would be auctioned versus how many (if any) would be distributed for free remains up for discussion. It is probable that the authors will use free allowances as a bargaining chip to garner support from Democrats wary of the harm to industry from a cap-and-trade plan with a 100% auction. Reports indicate that only about 15% of the program's allowances would be allocated for industries deemed most at risk in terms of international competition, including the cement, chemical, iron and steel industries.[14]

Even more troubling is the inclusion of a highly objectionable citizen suit provision tucked into Part F, Miscellaneous, of the Waxman/Markey cap-and-trade legislation. Section 336 – Enforcement - would open the U.S. government, and thus American taxpayers, to unlimited financial liabilities.[15] This provision would also permit litigation against private industry for increasing the risk of harm due to climate change. This is a dramatic change in environmental law and would be a boon to trial attorneys. However, the value to American taxpayers and workers is not apparent.

Other preliminary details of the Waxman/Markey cap-and-trade proposal include: in the aggregate, covered entities would be able to use up to two billion offsets (the offsets are not one to one trades, rather, an entity must reduce five tons of CO_2 for four tons of credit); regulated entities would be allowed unlimited banking of allowances; and compliance would be multiyear rather than year-to-year, ostensibly a measure to reign in costs of compliance. The EPA would be given the authority to determine when allowance prices are too high and if necessary, to release a strategic reserve of allowances into the market via auction.

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[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] Although the legislation contains a provision capping financial awards to prevailing plaintiffs at $1.5 million annually, there is no limit on the number of lawsuits for injunctive relief. Therefore, this so-called cap does not apply to the reimbursement of attorney's fees or expert witness fees for "substantially prevailing plaintiffs."

The draft Waxman/Markey legislation is more stringent than the Lieberman-Warner cap-and-trade system with respect to intermediate reduction targets, plan administration, and final CO_2 reduction goals. For example, Waxman/Markey calls for a reduction of 84% percent by 2050, while Lieberman/Warner set the reduction goal in 2050 at 71%. However, studies of the economic impact of the Lieberman/Warner bill are still useful in analyzing the anticipated impact of Waxman/Markey. Until more current studies are available, a generalized dialogue of the consequences of a cap-and-trade system based on studies of the Lieberman/Warner proposal serves an important function.

III. Cap-and-Trade is Just Another Name for Carbon Tax

The Obama Administration purports to be working with the Democrats in Congress to "put together a market based solution that will drive us to energy independence and create a market for an even more robust market for alternative fuels… and [take] the steps that we need to become energy independent."[16] In response, Chairman Waxman introduced draft cap-and-trade legislation on April 2, 2009. This report frequently refers to this effort as the Waxman/Markey cap-and-trade plan.

The fancy title should not fool anyone - cap-and-trade is simply a tax by another name. The Wall Street Journal describes cap-and-trade as the largest tax increase proposal since the income tax.[17] According to the Administration's own estimates, in over eight years the government will raise up to $2 trillion dollars auctioning off emissions permits.[18] That is more than the United States spent on the Korean War, the Vietnam War, and all post September 11 conflicts combined[19].

Warren Buffet, a highly influential and successful investor, and prominent Obama supporter, notes that cap-and-trade is a "regressive tax" that will be "borne by customers."[20] Peter Orszag, the Administration's point person on all matters relating to the budget, acknowledged that everyday Americans will pay the price of a cap-and-trade scheme, saying "price increases are essential to the success of a cap-and-trade program."[21] Even the liberal advocacy group, Center on Budget and Policy Priorities, noted "policies that restrict GHG emissions will significantly raise the price of fossil-fuel energy products – from home energy and gasoline to food and other goods and services with significant energy inputs."[22] These observations of prominent liberals and supporters

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[16] ClimateWire, *Markets: Buffett calls cap and trade a 'regressive tax,'* ENVIRONMENT AND ENERGY PUBLISHING, Mar. 10, 2009, *available at* http://www.eenews.net/climatewire/2009/03/10/7/.
[17] Editorial, *Who Pays for Cap and Trade?*, WALL ST. J., Mar. 3, 2009, *available at* http://online.wsj.com/article/SB123655590609066021.html.
[18] Tom LoBianco, Obama Climate Plan could cost $2 Trillion, WASH. TIMES, Mar.18, 2009.
[19] Respectively, the government has spent a total of $454 billion in Korea, $698 billion in Vietnam, and $859 billion in Iraq and Afghanistan.
[20] ClimateWire, *Markets: Buffett calls cap and trade a 'regressive tax,'* ENVIRONMENT AND ENERGY PUBLISHING, Mar.10, 2009, *available at* http://www.eenews.net/climatewire/2009/03/10/7/.
[21] Editorial, *Who Pays for Cap and Trade?*, Wall St. J., Mar.3, 2009, available at http://online.wsj.com/article/SB123655590609066021.html.
[22] CHAD STONE & HANNAH SHAW, CTR. ON BUDGET AND POLICY PRIORITIES, EXTENDING "CLIMATE REBATES" TO INCLUDE MIDDLE-INCOME CONSUMERS1(2009).

of cap-and-trade highlight that the Waxman/Markey proposal to reduce GHG emissions is nothing other than a huge tax increase for American families.

According to the Congressional Budget Office (CBO), cap-and-trade would cost the average American household an extra $1,600 per year. Unlike the Members of the U.S. Congress, who spend trillions of dollars without pause and in some cases without actually reading the underlying legislation, hard working Americans know that $1,600 a year is real money. For some, this money could be the determining factor on whether the family can afford a new car. According to the loan calculator on Edmonds.com, $1,600 covers 6 months of payments on a new Chevy Aveo or Chevy Cobalt.[23] For other families, this money could be used to help put food on the table or buy clothes for the school year.

The Administration subtly acknowledges that a cap-and-trade program is, in reality, a tax, dedicating a portion of the climate revenues to fund the so-called "Make Work Pay" tax credit.[24] The promised tax cut for the middle class is a refund/redistribution of climate revenues to certain Americans. Even with this tax rebate, up to $800 per household, most families will still pay between $800 and $3,700 in higher energy costs.

Candidate Obama left out a very important caveat when he pledged that 95% of Americans would get a tax cut under his Administration. What he should have said is that 95% of all Americans will receive a tax cut under his Administration, unless you are part of the 100% of Americans who consume energy.

Cap-and-Trade is a Regressive Tax and Burdens Middle America

Peeling back the fancy rhetoric, the Waxman/Markey plan to fight climate change amounts to a massive tax on energy use. The burden of this tax would not fall equally across the population. Rather, it will hit the middle and lower income Americans the hardest, particularly if they reside in the Mid-West, South or the Plains states. The Americans likely to pay the least, incidentally, live in the North East and West Coast and generally have some of the highest per capita incomes.[25]

Regressive Nature of the Carbon Tax

As noted earlier, Warren Buffet described the cap-and-trade scheme as a "regressive tax" that will be "borne by customers." The regressive nature of the tax is elaborated by the nonpartisan CBO in recent testimony before Congress. CBO explained

[23] Based on a 60 month term at today's APR rates for a new vehicle, *available at* http://www.edmunds.com/apps/calc/CalculatorController?mktcat=new-fiw-auto-finance-calculator&kw=car+finance+calculator&mktid=ga44333274&gclid=CKj2oeXVw5kCFQIMswodSQ25uw

[24] *Protecting Lower-Income Families While Fighting Global Warming: Hearing Before the Subcomm. on Income Security and Family Support, H. Comm. on Ways and Means*, 111th Cong. (2009) (statement of Terry Dinan, Ph.D., Senior Advisor for Climate Issues, Congressional Budget Office).

[25] U.S. CENSUS BUREAU, STATE RANKINGS, STATISTICAL ABSTRACT OF THE UNITED STATES, 2007 (2009) *available at* http://www.census.gov/statab/ranks/rank29.html.

how the rise in prices would impose a larger burden, relative to income, on low-income households than on high-income households for two reasons: first – low income households spend a much larger fraction of their income on energy; secondly, energy-intensive goods, those that require a lot of energy to produce, compose a greater share of low-income households' total expenditures.[26] Data collected by the Bureau of Labor Statistics (BLS) indicates that, measured as a share of income, spending on energy-intensive items by households in the lowest income quintile averages more than five times that of households in the highest quintile.[27] Overall, CBO estimates that the price increases resulting from a 15% cut in CO_2 emissions could cost the average American household between $700 to $2,200, or $1,600 on average.[28]

Table 1[29]

Average Annual Household Expenditures on Energy-Intensive Items, by Income Quintile, 2007

(Dollars)

	Quintile					All
	Lowest	Second	Middle	Fourth	Highest	Households
Utility Expenditures	1,203	1,596	1,840	2,181	2,847	1,934
Gasoline Expenditures	1,046	1,768	2,418	2,988	3,696	2,384
Total Spending on Energy-Intensive Items	2,249	3,364	4,258	5,169	6,543	4,318
Total as a Percentage of Income	21.4	12.2	9.2	7.1	4.1	6.8

Source: Congressional Budget Office based on data from Bureau of Labor Statistics, Consumer Expenditure Survey, 2007 (www.bls.gov/cex/2007/Standard/quintile.pdf).

Note: Energy-intensive items include natural gas, electricity, fuel oil, other heating fuels, gasoline, and motor oil.

Cap-and-Trade Burdens Middle America

Cap-and-trade will likely hit the middle and lowest income earners the hardest – although all Americans will feel the burden of reduced purchasing power and higher electric bills. Regional differences could also play a role in determining winners and losers under a Waxman/Markey cap-and-trade scheme. Variations in regional climates, population densities, and transportation needs could exacerbate the disparate impact of cap-and-trade throughout the United States.[30] Some states could shoulder the lion's share of the burden to reduce CO_2 emissions, while other states experience marginal impacts, and could even profit.

INDIANA AND WASHINGTON

A comparison of a pacific coastal state, Washington State, and one in the nations' heartland, Indiana, accentuates some of the variable impacts of a carbon cap program. Partially due to substantial natural resources, Washington State is able to rely heavily on

[26] *Protecting Lower-Income Families While Fighting Global Warming: Hearing Before the Subcomm. on Income Security and Family Support, H. Comm. on Ways and Means*, 111th Cong. (2009) (statement of Terry Dinan, Ph.D., Senior Advisor for Climate Issues, Congressional Budget Office).
[27] *Id.*
[28] *Id.* at 6.
[29] *Id.*
[30] Steven Hayward refers to the phenomena as the asymmetries of energy use.

hydro and nuclear power, receiving only 11% of its energy from coal. The state also boasts a per capita personal income that ranks 14th in the nation.[31] Indiana, due to geographic and industrial constraints, relies on coal, obtaining approximately 95% of its baseload energy from this single source. The state's economy depends heavily on manufacturing, contributing to high total and per capita energy consumption combined with a per capita personal income that ranks 38th in the nation.[32]

Under a cap-and-trade system, Americans in Indiana could be hit with sharply higher electricity costs as their utilities struggle to transition from coal to less carbon intensive forms of energy. According to recent analysis, the increase in electricity cost per capita for residents of Indiana will be $1,627.[33] Meanwhile, Americans in Washington will likely see little change to their electricity bills, approximately $193.[34] In fact, Washington State utilities may even be in a position to reap windfall profits.[35] Two other states that stand to disproportionately suffer are West Virginia and Wyoming. West Virginians, who have the second lowest level of per capital income in the nation, could see their annual electricity rates rise by $3,972, and Wyoming could see an increase of more than $7,000.[36] The other states with potential to experience a *de minimis* increase in their rates are Delaware ($22), Vermont ($2), and California. ($126)[37].

MICHIGAN and OHIO

Disparities in a cap-and-trade program are not limited to single states. Regional climate variations impact the amount of energy consumed due to what the Department of Energy calls "degree heating" and "degree cooling" days- variations in temperature from the national average. Table 2 demonstrates how different regions are impacted- for example states in the East North Central, like Michigan and Ohio, have almost double the number of heating days than states in the Pacific, like California.[38] Americans living in states like Michigan and Ohio are more likely to feel the pain of higher electricity costs than Americans in more temperate climates. Unfortunately, residents of these states are already feeling the pain of high unemployment. According to the Bureau of Labor

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[31] ENERGY INFO. ADMIN., STATE ENERGY PROFILES, WASHINGTON (2009) *available at* http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WA.
[32] ENERGY INFO. ADMIN., STATE ENERGY PROFILES, INDIANA (2009) *available at* http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=IN.
[33] Press Release, H. Comm. on Ways and Means Republicans, New Analysis Shows Massive Spike in Electricity Prices Under Cap-and-Tax (a.k.a. Cap-and-Trade) (Mar.26, 2009) (on file with author).
[34] *Id.*
[35] *Consumer Protection Policies in Climate Legislation: Hearing Before Subcomm. on Energy and the Environment, H. Comm. on Energy and Commerce*, 111th Cong. (2009) (statement of Steven Hayward, American Enterprise Institute).
[36] Press Release, H. Comm. on Ways and Means Republicans, New Analysis Shows Massive Spike in Electricity Prices Under Cap-and-Tax (a.k.a. Cap-and-Trade) (Mar.26, 2009) (on file with author).
[37] *Id.*
[38] *Consumer Protection Policies in Climate Legislation: Hearing Before Subcomm. on Energy and the Environment, H. Comm. on Energy and Commerce*, 111th Cong. (2009) (statement of Steven Hayward, American Enterprise Institute).

Statistics, unemployment in Michigan reached 12% in February and Ohio reported a rate of 9.4% unemployment.[39]

Table 2: Degree Heating and Cooling Days by Census Region, 2007
(Source: Energy Information Administration)[40]

State/Region	Degree Heating Days	Degree Cooling Days
U.S. Average	4,524	1,242
Pacific Coast	3,226	755
New England	6,612	441
West North Central	6,750	949
East North Central	6,498	731
Mid-Atlantic	5,910	665
South Atlantic	2,853	1,982
East South Central	3,603	1,564
West South Central	2,286	2,447
Mountain	5,209	1,308

GEORGIA

Another way to examine the disparate impact of cap-and-trade is to look at a state's ability to transition to less carbon intensive energy sources. Georgia is a coastal state with a fairly low number of "heating days," offset by a fairly high number of "cooling days." Driven by an energy intensive industrial sector, and high individual transportation demand, Georgia relies heavily on fossil fuels. Georgia does receive some energy from nuclear and hydroelectric sources; however the state has limited potential for expansion of their renewable energy portfolio. Barring a massive expansion in nuclear power, the state could expect to face tremendous increases in energy prices under a cap-and-trade scheme.[41]

These are but a few of the many examples of how the "asymmetries of energy use"[42] will ripple throughout the country. Certain states will inevitably be hit harder than others. Unfortunately, states most vulnerable to economic pain from cap-and-trade are states already under great stress due to the housing crisis and credit crunch. While the Administration promises to implement a "tax cut" paid for by the revenues from auctioning off the right to emit CO_2 and other GHGs, this rebate will not account for

[39] Press Release, Bureau of Labor Statistics, U.S. Dept. of Labor, Regional and State Unemployment: March 2009 (Apr. 17, 2009) (on file with author).
[40] *Consumer Protection Policies in Climate Legislation: Hearing Before Subcomm. on Energy and the Environment, H. Comm. on Energy and Commerce*, 111th Cong. (2009) (statement of Steven Hayward, American Enterprise Institute).
[41] In February, GA reported historically high unemployment rates of 9.3%.
[42] *Consumer Protection Policies in Climate Legislation: Hearing Before Subcomm. on Energy and the Environment, H. Comm. on Energy and Commerce*, 111th Cong. (2009) (statement of Steven Hayward, American Enterprise Institute).

regional differences. The result could be a transfer of wealth, from states that rely on coal for baseload energy, have a manufacturing based economy, and have an intemperate climate, to states that have a more favorable energy portfolio and lower unemployment rates.

IV. Economic Impact of Cap-and-Trade

The economic impact of a cap-and-trade scheme will be enormous and can be felt by Americans in several ways. To fully appreciate the impact of a cap-and-trade scheme on the economy, it is important to look at several potential indicators- direct cost to consumers and producers of energy, the impact that this cost has on potential GDP, as well as the indirect cost imbedded in the increased price of consumer goods.

When economists and policymakers talk about the economy, they often discuss GDP – Gross Domestic Product- the dollar value of all goods and services produced within a country's borders in a given year. If GDP is growing, business, jobs and personal income will also be expanding. If GDP is slowing down, then businesses will hold off investing in new purchases and hiring new employees. This, in turn, can easily further depress GDP, resulting in consumers having less money to spend on purchases.

There is a general understanding, from both sides of that issue, that any cap-and-trade scheme will likely have a negative impact on our nation's economic potential, as measured by our projected GDP, as well as potential job growth. The disagreement is merely over the intensity of the negative impact. However, indirect energy costs receive far less attention and are therefore less understood. Indirect costs are the additional cost to consumers of energy intensive goods and services that are the result of a carbon tax/carbon cap. In this section, we attempt to explain the nature and impact of each of these costs.

Economic Impact, Measured in Direct Cost to Economy

The Waxman/Markey cap-and-trade plan imposes a substantial direct cost on the American economy, much like a tax (minus the benefit of certainty). The premise behind cap-and trade is that the price of a carbon credit will reflect the market value of emitting a ton of CO_2, which is in turn set by the stringency of the cap. The resulting direct cost of a cap-and-trade bill is reflected in the price of a CO_2 allowance or carbon credit. This is the additional cost that a business has to pay for the right to emit a ton of CO_2. The stringency of a carbon cap has a positive correlation with the price of the carbon allowance. Therefore, the direct cost imposed on the American economy increases with the stringency of the carbon cap.

In his budget blueprint, President Obama projects a static price of $20 per carbon credit or allowance over the next eight years.[43] As the charts in Appendix A demonstrate, $20 appears to underestimate the expected price of carbon. Studies of the

[43] Corey Boles & Martin Vaughan, *White House Official Boosts Cap and Trade Revenue Estimate*, WALL ST. J., Mar.17, 2009, *available at* http://online.wsj.com/article/SB123733423766063691.html.

Lieberman/Warner legislation project that the cost of an allowance will range between a minimum of $28.30, under the best of circumstances, and up to $76.

The price of carbon is negatively associated with economic growth - so the higher the price of the allowance, the greater the pain to the economy.[44] Under either plan, the expected costs to consumers and industry of a cap-and-trade system are staggering. In one study of the Lieberman-Warner proposal, Science Applications International Corporation (SAIC) estimated that the price of a single carbon allowance would skyrocket from $36.69 in 2014 to $271.27 in 2030, reducing GDP by between 2.6% and 2.7% from its potential. According to their estimates, the higher costs of production could lead to the loss of 4.05 million jobs in 2030. In this scenario, average consumers could expect a loss of 4.9% per household in 2030, and an increase in total energy expenditures of 114.5%.[45] A different analysis by EPA predicts that cap and trade would increase the average electricity bill in 2030 by 44% to 79% and the price of gasoline could rise between $0.53 and $1.40.[46] Studies with less optimistic assumptions project that electricity rates could increase by as much as 129% and the price for a gallon of gasoline could be as high as $3.35 a gallon[47]

There is very little debate over the extent to which this cost will be borne by energy producers verses energy consumers. A recent report by Moody's projected end-use consumers of electricity (a.k.a. households and businesses) will be responsible for paying the vast majority of any incremental costs. Moody's predicts that the near term price increase attributable to a cap-and-trade scheme will be reflected in 14 and 17% higher electricity rates.[48] As explained above, the actual rate increases could vary dramatically by state and region.

Economic Impact – Measured in Lost GDP Potential

In order for employment opportunities to keep pace with population growth, it is important that the U.S. economy grow at a robust pace. Today we are experiencing a period of negative economic growth, a decline in our economic health. The federal

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[44] *The Distributional Consequences of a Cap-and-Trade Program for CO2 Emissions: Hearing on Protecting Lower-Income Families While Fighting Global Warming Before the Subcomm. on Income Security and Family Support, H. Comm. on Ways and Means*, 111th Cong. 9 (2009) (statement of Terry Dinan, Ph.D., Senior Advisor for Climate Issues, Congressional Budget Office).

[45] AM. COUNCIL FOR CAPITAL FORMATION & NAT'L ASS'N OF MANUFACTURERS, ANALYSIS OF THE LIEBERMAN-WARNER CLIMATE SECURITY ACT (S. 2191) USING THE NATIONAL ENERGY MODELING SYSTEM (ANALYSIS CONDUCTED BY SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC)) 8 (2008).

[46] ENVIRONMENTAL PROTECTION AGENCY, ANALYSIS OF THE LIEBERMAN-WARNER CLIMATE SECURITY ACT OF 2008 3 (2008) *available at* http://www.epa.gov/climatechange/economics/economicanalyses.html.

[47] AM. COUNCIL FOR CAPITAL FORMATION & NAT'L ASS'N OF MANUFACTURERS, ANALYSIS OF THE LIEBERMAN-WARNER CLIMATE SECURITY ACT (S. 2191) USING THE NATIONAL ENERGY MODELING SYSTEM (ANALYSIS CONDUCTED BY SCIENCE APPLICATIONS INTERNATIONAL CORPORATION (SAIC)) 12 (2008).

[48] Christa Marshall, *Electricity Rates to Soar Under Cap and Trade*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 24, 2009, *available at* http://www.eenews.net/climatewire/2009/03/24.

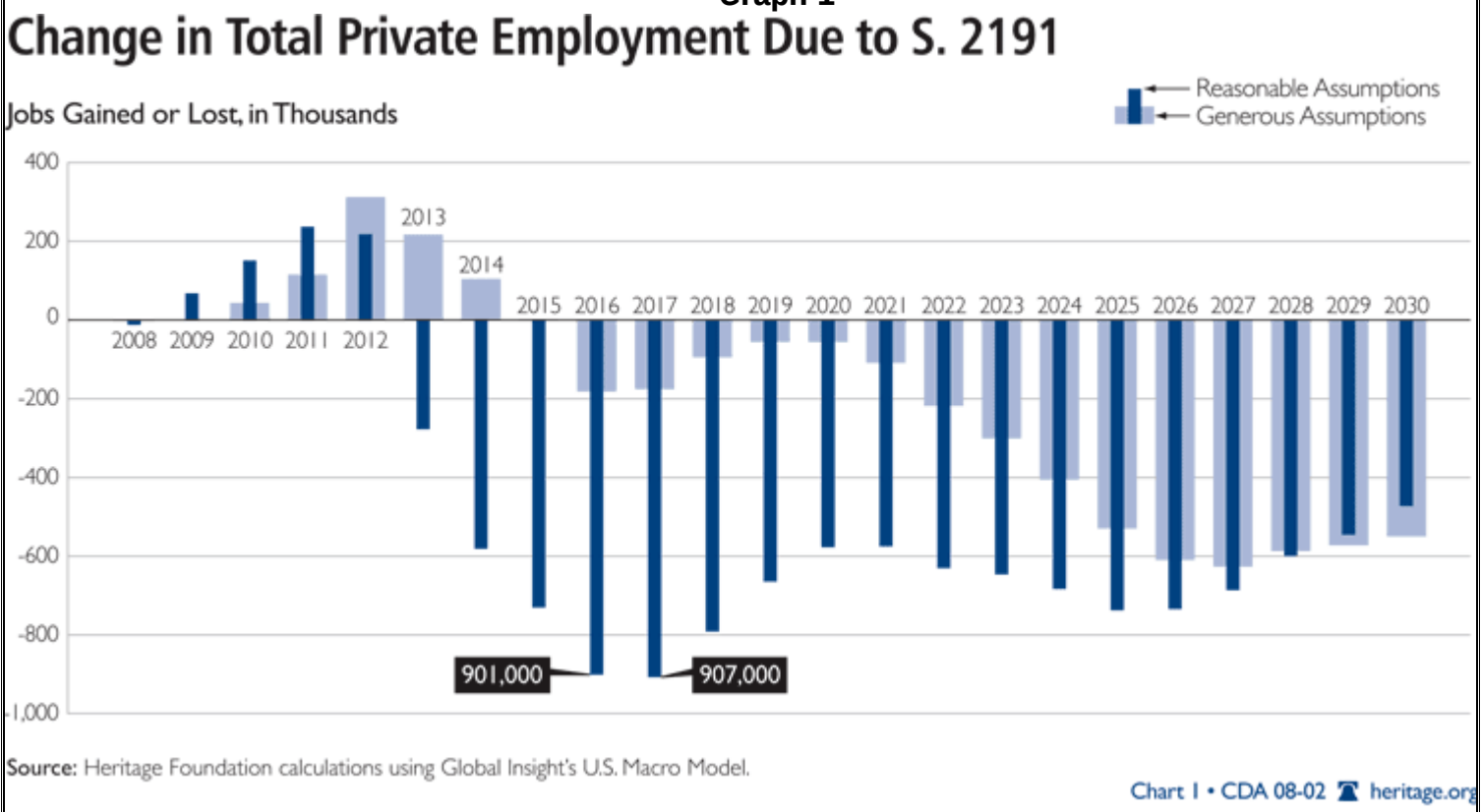
government has injected trillions of dollars in an effort to stimulate our economy, so that we may return to positive growth and put men and women back to work.

The Waxman/Markey cap-and-trade scheme will have a significant and negative economic impact on the U.S. economy. The charts in Appendix A summarize the findings of several studies that have tried to estimate the expected impact of a cap-and-trade plan. Appendix B goes into greater detail about the assumptions used by the various authors, and why they matter.

The studies completed on Lieberman/Warner all predict a drop in GDP compared to baseline projections (projections of economic growth without cap-and-trade plan).[49] Only a few studies also examine the corresponding job loss, but the lessons of the present economy suggest that the decline in GDP could result in significantly fewer jobs available for Americans in the future under a cap-and-trade system than there would be without one. The Heritage Center for Data Analysis estimates that under Lieberman/Warner, yearly job losses range between 200,000 to 900,000 in 2016 and between 550,000 and 600,000 in 2030.[50] These numbers represent jobs that would otherwise be created, but for the imposition of cap-and-trade. In this study, Heritage accounted for "green jobs" created in the early years due to government subsidy. Graph 1 provides a visual demonstration of the jobs that would be lost due to adoption of a cap-and-trade plan.

[49] BRYAN BUCKLEY & SERGEY MITYAKOV, GEORGE C. MARSHALL INSTITUTE, THE COST OF CLIMATE REGULATION FOR AMERICAN HOUSEHOLDS 9 (2009).
[49] WILLIAM BEACH, ET AL., THE HERITAGE FOUNDATION, THE ECONOMIC COST OF THE LIEBERMAN-WARNER CLIMATE CHANGE LEGISLATION 2 *(*2009) *available at* http://www.heritage.org/Research/EnergyandEnvironment/cda08-02.cfm.

Graph 1[51]



Another way to understand this loss in GDP potential is to realize that cap-and-trade is equivalent to a permanent tax increase for the average American household. An analysis by the George C. Marshall Institute predicts that the cap-and-trade "tax" increases over time in real terms from about $1400 to $2000 during 2015-2030 and approximately $2000 to $3000 in 2030-2050. The de-facto tax increase becomes quite significant considering that the average American household spends about $2500 on food annually, or approximately $208 a month (Table 3).[52]

[51] *Id.*
[52] *Id.*

Table 3[53]

Impact on Consumption of Average American Household

	2008*	2015	2030	2050
Population (Million)	301	321	359	397
Consumption (billion 2005$)	$8,217	$11,533	$17,761	$29,567
Consumption/Per capita (2005 $)	27,760	$35,928	$49,474	$74,476
Decrease in consumption per capita (2005 $)	$277	$359	$495	$745
Decrease for a family of 4 (2005 $)	$1,110	$1,437	$1,979	$2,979

*2005 data are used, 2008 are likely to be even higher.

Economic Impact – Indirect Energy Cost

When considering the cost of cap-and-trade, commentators generally focus on how it will impact direct energy costs, i.e. electricity bills or gasoline prices. Sadly the financial burden would not end there. Americans will also be paying more for ordinary consumer goods, because of indirect energy costs- the price of energy imbedded in the goods and services purchased every day. For example, the indirect energy incorporated into the cost of a prescription drug is the energy it costs to create the drug, sterilize, package, and transport it safely to pharmacies. Under the Waxman/Markey cap-and-trade bill, Americans would be both paying more in direct energy use, but also through indirect energy consumption.[54] According to a recent study, indirect energy costs amount to almost 90 percent of what the average household spends on direct energy consumption.[55] Increases in the cost of indirect energy will once again hit low income Americans hardest, as demonstrated in Table 4, because they dedicate the highest portion of their income to goods that have a high indirect energy component.

[53] *Id.*
[54] KENNETH P. GREEN AND APARNA MATHUR, AMERICAN ENTERPRISE INSTITUTE, INDIRECT ENERGY AND YOUR WALLET 6 (2009).
[55] *Id.*

Table 4[56]

DISTRIBUTION ACROSS INCOME CLASSES, 2003

Decile	Ratio of indirect energy expenditures to income (percent)
Bottom (poorest)	5.05
Second	3.72
Third	2.86
Fourth	2.46
Fifth	2.12
Sixth	1.99
Seventh	1.79
Eighth	1.65
Ninth	1.49
Top (richest)	1.33

SOURCE: Authors' calculations.

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Cap-and-trade increases the cost of producing goods and services, which is paid for by both producers and consumers through what is essentially an energy tax, driving up the cost of everyday goods, via indirect energy costs, further squeezing pocketbooks across America.

Cap-and-Trade Plan Will Devastate American Manufacturers

All Americans will be paying more for energy, reflected in higher utility bills and more expensive consumer goods. Compounding these increases, Americans whose jobs rely on the manufacturing industry could find themselves increasingly vulnerable to unemployment. The increased cost for manufacturers will either force some to close up shop or move manufacturing jobs overseas.[57] According to CBO, "the higher prices that would result from a cap on CO_2 emissions would reduce demand for energy and energy-intensive goods and services and thus create losses …for workers in the sectors of the economy that supply such products. [These workers] could face higher risk of unemployment as jobs in those sectors were cut….The cost of unemployment would probably be concentrated among relatively few households, and by extension, their communities."[58] Two key characteristics point towards the communities that would likely be hit hardest: the percentage of workers employed in manufacturing and the percentage

[56] *Id.*
[57] *Protecting Lower-Income Families While Fighting Global Warming: Hearing Before the Subcomm. on Income Security and Family Support, H. Comm. on Ways and Means*, 111th Cong. (2009) (statement of Terry Dinan, Ph.D., Senior Advisor for Climate Issues, Congressional Budget Office). (stating that "the higher prices that will result from a cap on CO2 emissions would reduce demand for energy and energy-intensive goods and services and thus create losses for…workers in the sectors of the economy that supply the products….Workers could face a higher risk of unemployment as jobs in those sectors are cut.")
[58] *Id*. at 7.

of energy generation from coal. Several states that are already struggling with high unemployment rates could be crushed by the implementation of cap-and-trade. In particular, the workers in Indiana, Kentucky, Michigan, Ohio, Tennessee, Wisconsin, West Virginia, Georgia, and Alabama could experience a tremendous blow from the Waxman/Markey cap-and-trade scheme.

Misguided Domestic Policies Will Cost us Jobs and Increase Emissions

Irrespective of the decisions made by Washington to address climate change, consumers world wide will still demand concrete for their homes, steel for their cars, and other energy intensive products needed to maintain and enhance their standard of living.[59] The only real questions are where will these goods be manufactured and how much will consumers have to pay for them? Will they be manufactured here at home, or in countries like China and India, who do not have the same pollution control standards?[60] If the structural costs of manufacturing in the U.S. increase too much, businesses will seek refuge in less regulated environments. It is important to recognize that where manufacturing takes place is not only a critical question for American workers, it is also a key environmental concern.

In the context of climate change, the off-shoring of manufacturing has even greater implications because China's energy intensity is three times higher and rising faster than it is in the U.S. or Europe.[61] This means that any manufacturing process in China will emit at least 300 percent more CO_2 than a similar manufacturing process in the United States. Policies that encourage U.S. companies to leave our shores do more than cost American workers good jobs- these policies could eventually result in a net increase in global GHG emissions, because the developing world simply does not have the same environmental standards.[62] Because of this dynamic, it stands to reason that if the United States acts alone to curb its carbon emission without a structured unified global commitment, the effort will be an exercise in futility.[63] The challenges posed by climate change demand a global solution.

Many in Congress, and even Energy Secretary Chu, have recently realized the disadvantageous position that cap-and-trade would put American manufacturers in, with respect to the global market place. The solution for some is the imposition of a carbon tariff on Chinese and Indian goods if these countries do not implement their own form of

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[59] MINORITY STAFF OF H. COMM. ON OVERSIGHT AND GOV'T REFORM, 110TH CONG., REPORT ON ENERGY POLICY, NATIONAL, ECONOMIC AND ENVIRONMENTAL SECURITY 8 (2008).
[60] Lisa Friedman, *Report says China has soaring emissions and lax regulations*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 23, 2009, *available at* http://www.eenews.net/climatewire/2009/03/23/3/.
[61] Greg Peel, *Reality Check: China's Increasing Energy Intensity*, STOCK INTERVIEW.COM, Dec. 1, 2006 *available at* http://www.stockinterview.com/News/12032006/Peel-China-Energy-Intensity.html;
[62] ALLIANCE FOR AMERICAN MANUFACTURING, AN ASSESSMENT OF ENVIRONMENTAL REGULATION OF THE STEEL INDUSTRY IN CHINA, (2009), *available at* http://www.americanmanufacturing.org/wordpress/wp-content/uploads/2009/03/chinaenvironmental-report-march-2009.pdf.
[63] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CONTRIBUTION OF WORKING GROUP III TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (2007).

a cap-and-trade scheme.[64] Representatives of both China and India went on record in strong opposition to the imposition of carbon tariffs. Xie Zhenhua, Vice Chairman of China's National Development and Reform Commission, said such a policy would, "constitute protectionism under the guise of 'climate protection.'"[65] Shyam Saran, India's lead climate negotiator, said that the inclusion of border tariffs in a U.S. global warming bill would be "most unfortunate" and a "very negative development."[66] The Wall Street Journal notes that "carbon trade barriers would almost certainly violate U.S. obligations in the World Trade Organization….Any restriction the U.S. imposes on imports can also just as easily be turned around and imposed on U.S. exports, whatever their carbon content."[67] A carbon tariff could be a "solution" that unwittingly creates more problems. It would be unfortunate if an effort to bring about a revolution in green technology caused a retreat from the open global markets that do so much to boost economic growth and innovation.

Will China Follow?

China is the primary emitter of CO_2 and its contribution is expected to climb. A report sponsored by the Center for Strategic and International Studies found that Chinese CO_2 emissions could be as much as twice the U.S. emissions by 2025, while the EIA predicts that China's energy related emissions will exceed those of the U.S. by 41% in 2030.[68] Some advocates of cap-and-trade argue that if the United States leads, China will follow.[69] China does not want to harm the competitiveness of its firms with carbon restrictions however; China competes against other developing countries in East Asia and around the globe for manufacturing supremacy, not against the United States.[70] If China were to impose carbon driven restrictions, this would drive jobs out of China and into India, Vietnam, Bangladesh, or Indonesia – once again hindering efforts to lower world emissions of CO_2. India has been clear that they will not take on binding emissions reduction commitments. Indian officials stated that, "It is morally wrong for us to agree to reduce when 40 percent of Indians do not have access to electricity…of course, everybody wants to go solar, but costs are very, very high."[71] The strong negative

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[64] *New Directions for Energy Research and Development at the U.S. Department of Energy: Hearing Before the H. Comm. on Science and Technology*, 111th Cong. (2009) (statement of Steven Chu, Secretary of Energy, stating that if China refused, the U.S. would have to use tariffs and duties on imported Chinese goods.)

[65] Michael Forsythe, *China's Xie Calls Tariff Threat on Climate 'Protectionsim'*, BLOOMBERG, Mar.18, 2009, *available at* http://www.bloomberg.com/apps/news?pid=20601087&sid=akHjL4EyqXuo&refer=home.

[66] Lisa Friedman, *India Rejects U.S. Carbon Tariff Proposal*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 25, 2009, *available at* http://www.eenews.net/climatewire/2009/03/25/5/.

[67] Editorial, *Cap and Trade War*, WALL ST. J., March 30, 2009, *available at* http://online.wsj.com/article/SB123837276242467853.html.

[68] MINORITY STAFF OF H. COMM. ON OVERSIGHT AND GOV'T REFORM, 110TH CONG., REPORT ON ENERGY POLICY, NATIONAL, ECONOMIC AND ENVIRONMENTAL SECURITY 18 (2008).

[69] K.T. Arasu, *U.S. Urged to Lead China into Carbon Emission Cuts*, REUTERS, Feb. 27, 2009, *available at* http://www.reuters.com/article/environmentNews/idUSTRE51Q4C020090227.

[70] DEREK SCISSORS, HERITAGE FOUND., WEBMEMO: CHINA WILL FOLLOW THE U.S.: A CLIMATE CHANGE FABLE, (2009).

[71] Rama Lakshmi, *India Rejects Calls for Emission Cuts*, WASH. POST, April 13, 2009 at A8.

reaction from China and India's leaders to a carbon tariff and other suggestions that they impose their own cap on carbon emissions stands in contrast to the popular notion that if the U.S. leads, they will follow.[72] The assertion that if the United States is willing to harm its firms first, they will follow suit is an optimistic and potentially harmful precedent.

Any meaningful international agreement to reduce carbon emissions must include the developing world since they are both an integral part of the problem and essential to the solution. Sensible energy/climate change policy should strive to minimize the negative impact that higher energy prices could have on the United States manufacturing base, preventing leakage and keeping jobs on American soil. A carbon tariff could address some of the legitimate concerns of domestic manufactures – but at what price? Should we risk an international trade war by erecting high barriers to our markets?[73] While this would address the fact that a cap-and-trade program voluntarily puts our manufacturers in a disadvantageous position, it would do nothing to address the fact that the higher prices for energy intensive goods would suppress demand, inevitably putting those firms operating on the margin out of business.

V. Transitioning to a Low Carbon Economy

Energy is essential to the economic activity that sustains and improves the quality of life. Today, the United States is heavily reliant on fossil fuels to meet our energy demands, for both transportation and baseload electricity generation. By design, a cap-and-trade system will increase the prices Americans pay for energy, in order to make renewable sources cost-competitive with traditional energy sources.[74] Alternative sources of energy and clean coal technology, though promising, remain far from commercially viable and cannot replace our reliance on fossil fuels in the near term. These concerns were echoed in remarks from Energy Secretary Stephen Chu at a recent energy conference; "Perhaps by the end of this century we could get renewables, and energy storage and transmission, on a plane where we can transition away from these others…but I don't see that happening anytime soon."[75] If these technologies fail to come on-line at a fairly rapid pace, Americans could be forced to pay more for less – compromising quality of life and economic stability.

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[72] K.T. Arasu, *U.S. Urged to Lead China into Carbon Emission Cuts*, REUTERS, Feb. 27, 2009, *available at* http://www.reuters.com/article/environmentNews/idUSTRE51Q4C020090227.

[73] Robin Bravender, *House Dems aim to curb job 'leakage' under cap and trade*, ENERGY & ENVIRONMENT PUBLISHING, Mar. 25, 2009, *available at* http://www.eenews.net/EEDaily/2009/03/25/7/; (stating, "A U.S. cap-and-trade bill that includes tariffs on imported products is expected to face challenges before the WTO court in Geneva.").

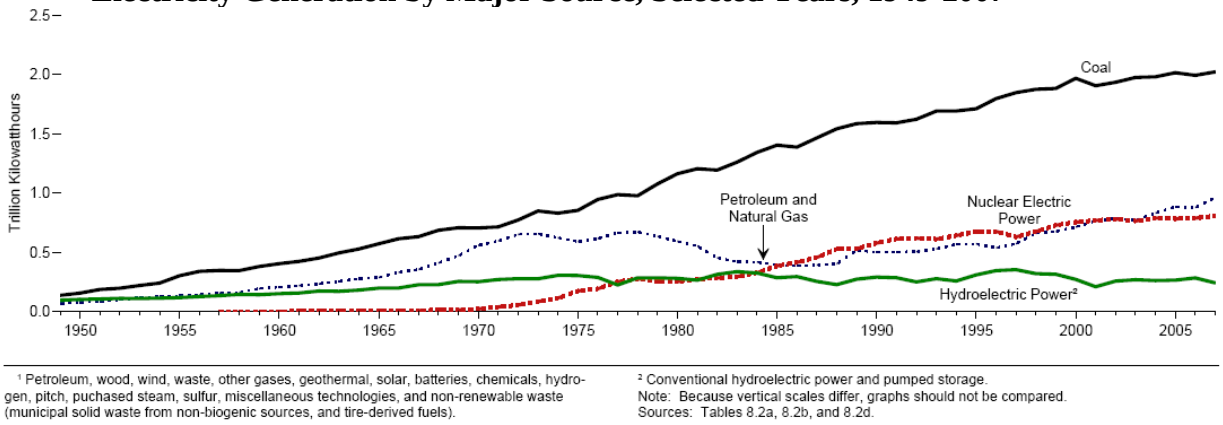
[74] President Barack Obama, Address to Joint Session of Congress (Feb. 24, 2009) (President Obama asked Congress "to send me legislation that places a market-based cap on carbon pollution and drives the production of more renewable energy in America.").

[75] Ben Geman, DOE to play deep role in cap and trade – Chu, GREENWIRE, April 7, 2009, *available at* http://www.eenews.net/Greenwire/2009/04/07/2/.

The Significance of Coal

It is unrealistic to assume that the U.S. can meet its energy needs, and sustain a healthy economy, without the use of coal. Coal supplies 20% of all energy demand, but 50% of all electricity generation.[76] The American industrial sector depends on the use of coal, consuming 78% of energy produced by coal.[77] On the global scale, coal supplies the second largest share of world energy, and consumption is projected to increase over the next 20 years, driven by growing electricity demand in developing countries.[78] Coal is also very carbon intensive, so any policy limiting CO_2 emissions will hit coal consumers very hard.

Graph 2
Electricity Generation by Major Source, Selected Years, 1949-2007



¹ Petroleum, wood, wind, waste, other gases, geothermal, solar, batteries, chemicals, hydrogen, pitch, puchased steam, sulfur, miscellaneous technologies, and non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

² Conventional hydroelectric power and pumped storage.

Note: Because vertical scales differ, graphs should not be compared.

Sources: Tables 8.2a, 8.2b, and 8.2d.

Source: EIA, Annual Energy Review 2007, Table 8.2a.

According to a recent study by MIT, coal use will increase under any foreseeable scenario where constraints on carbon emissions are adopted to mitigate global warming.[79] This is why supporters of cap-and-trade programs often point to the promise of Carbon Capture and Sequestration (CCS) technology as one of the primary technological solutions that will permit the U.S. to continue to use coal for baseload generation, while significantly reducing carbon emissions. President Obama referenced the importance of developing "clean coal" in his Joint Address to Congress.[80]

Carbon Capture and Sequestration (CCS) is technology for capturing CO_2 from large emissions point sources, such as coal fired power plants, and subsequently storing the captured CO_2 in geologic formations. However, widespread commercial deployment of this technology is a long way off and faces an uncertain future.[81] Many of the models

[76] MINORITY STAFF OF H. COMM. ON OVERSIGHT AND GOV'T REFORM, 110TH CONG., REPORT ON ENERGY POLICY, NATIONAL, ECONOMIC AND ENVIRONMENTAL SECURITY 23 (2008).
[77] *Id.* t 23.
[78] *Id.* at 37.
[79] MASS. INST. OF TECH., THE FUTURE OF COAL: OPTIONS FOR A CARBON-CONSTRAINED WORLD (2007).
[80] President Barack Obama, Address to Joint Session of Congress (Feb. 24, 2009).
[81] MINORITY STAFF OF H. COMM. ON OVERSIGHT AND GOV'T REFORM, 110TH CONG., REPORT ON ENERGY POLICY, NATIONAL, ECONOMIC AND ENVIRONMENTAL SECURITY 37 (2008).

predicting the economic impact of cap-and-trade assume the technology will be commercially available by 2015, with some variation depending on assumptions.[82]

CCS technology has to be deployed on an enormous scale in order to significantly reduce the concentration of GHGs in the atmosphere. Experts believe that the U.S. would have to sequester nearly four gigatonnes of CO_2 per year. This would require the injection of about 50 million barrels per day (18.3 billion barrels per year) of supercritical CO_2.[83] To put 50 million barrels of supercritical CO_2 per day into perspective – it is 2.5 times as much oil as the U.S. currently consumes per day (20 million barrels). To date, the largest sequestration project only injects one million tons of CO_2 per year. Moreover, this liquid needs a home, which will require transporting and injecting this huge volume of compressed CO_2 into certain geological sites. Even if CCS were to become physically possible, whether or not it can be economically viable remains to be seen. The CCS process consumes a significant amount of energy itself and can add between 10% to 40% more energy to electricity generation.[84]

While CCS technology holds great promise, the United States remains a long way from deploying this technology on a commercial scale. According to Energy Secretary Chu, CCS technologies will take many years to develop and even longer to be put into practice. "We don't know today what the best technology will be….It will take roughly ten years to prove the technology." Chu said.[85] A recent study prepared by Battelle Memorial Institute indicates that while some CCS projects may come on line in the next decade, widespread deployment and use of CCS will take even longer. The potential for CCS is great but the U.S. cannot realistically rely on the technology to reduce our carbon intensity in the near future.

The Importance of Natural Gas

Absent the commercial deployment of CCS technology, and barring a significant increase in our nation's nuclear capacity, a cap–and-trade bill will force utilities to become increasingly reliant on natural gas for baseload generation. Natural gas currently makes up 19 percent of the U.S. electric industry's generation capacity.[86] While relatively more fuel efficient and with lower carbon emissions than coal, natural gas is significantly more expensive. Due to its high cost, natural gas fired generating units are generally only used as intermediate or peak load units, and not as base load units. Under a cap-and-trade regime, demand for natural gas would dramatically increase as utilities reduce their reliance on coal fired generation. This increase in demand for natural gas

[82] For further analysis, see Appendix B on assumptions.
[83] MASS. INST. OF TECH., THE FUTURE OF COAL: OPTIONS FOR A CARBON-CONSTRAINED WORLD (2007). Supercritical CO_2 refers to CO_2 that is in a fluid state.
[84] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, SPECIAL REPORT ON CARBON DIOXIDE CAPTURE AND STORAGE (2005).
[85] *New Directions for Energy Research and Development at the U.S. Department of Energy: Hearing Before the H. Comm. on Science and Technology*, 111th Cong. (2009) (statement of Steven Chu, Secretary of Energy).
[86] NORTH AMERICAN ELECTRICITY RELIABILITY CORP., 2007 LONG-TERM RELIABILITY ASSESSMENT (2007).

would likely lead to higher prices. In the past, Chairman Waxman has expressed hostility to efforts to increase domestic recovery of natural gas, a troubling contradiction in the face of pending cap-and-trade legislation.

Historically, the U.S. has been both the largest producer and consumer of natural gas in North America. Improved technology, such as hydraulic fracturing, has given the U.S. access to an estimated 1,525 trillion cubic feet of gas, enough to last 82 years at current production rates.[87] Hydraulic fracturing is a technique used to allow natural gas and oil to move more freely from the rock pores where it is trapped to a producing well that can bring it to the surface. The National Petroleum Council estimates that 60 to 80 percent of all the wells drilled in the next decade to meet natural gas demand will require fracturing. Fracturing estimates indicate hydraulic fracturing increased the recovery of domestic oil and gas reserves by 30 percent and it is responsible for the addition of more than seven billion barrels of oil and 600 trillion cubic feet of natural gas to meet the nation's energy needs.

Chairman Henry Waxman, the primary author of the Waxman/Markey cap-and trade scheme, has been publicly hostile to the oil and gas industry's efforts to tap into new sources of natural gas.[88] On October 31, 2007, Waxman held a hearing criticizing the Bush Administration for permitting energy firms to employ hydraulic fracturing in the recovery of natural gas. In his opening statement he asserted, "The Bush Administration argues that we need oil and gas too desperately to let anything stand in the way. But there is no way we can ever drill our way to energy independence. We need efficiency and we need alternatives to oil. And we have a moral obligation to respect our environment."[89] Ironically, Chairman Waxman's position of limiting domestic recovery of natural gas would lead to increased reliance on imports, recreating the scenario where the U.S. is once again dependent on foreign sources to supply our energy needs.

If the United States does not invest in additional nuclear capacity, with CCS decades away from commercial deployment, and development of natural gas production stymied by other environmental considerations, where will the low carbon energy come from that the United States needs in order to sustain any form of economic growth? Chairman Waxman, and others in the environmental lobby, argues that renewable fuels are the answer. The next section will evaluate the potential for renewable fuels to displace carbon based energy sources over the next 20 years.

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[87] Katherine Ling, *Natural Gas: US Reserves to Last 82 Years*, ENVIRONMENT AND ENERGY PUBLISHING, Sept. 13, 2007, *available at* http://www.eenews.net/eenewspm/2007/09/13/1/.

[88] *Oil and Gas Exemptions in Federal Environmental Protections: Hearing Before the H. Comm. on Oversight and Gov't Reform*, 110th Cong. (2007) (statement of Chairman Henry Waxman).

[89] *Id.*

The Transition to Renewable Energy – A Rocky Road

The long term cost imposed by a cap-and-trade scheme will be determined in large part by our ability to transition from an economy reliant on fossil fuels for baseload electricity generation towards renewable and carbon free sources. Many in Congress and the Administration tout the promise of wind, solar and geothermal energy, so-called "green technologies." Whether these technologies can adequately substitute for fossil fuels will be determined based on how quickly they can come on-line and their long term growth potential. This in turn depends on the technology's affordability, reliability, and our ability to incorporate the electricity into the grid.

Affordability

The Obama Administration has demonstrated a clear commitment to increasing our use of renewable energy, including nearly $39 billion in the recent stimulus bill and an additional $2 billion in the FY2009 omnibus spending bill to subsidize green technologies. In addition, the 2010 budget outlines $150 billion over the next 10 years, presumably through cap-and-trade revenues, to fund the improvement and advancement of renewable energy. One of President Obama's campaign promises was to "[e]nsure that 10% of our electricity comes from renewable sources by 2012, and 25% percent by 2025." [90] Along these lines, the Waxman/Markey legislation calls for a Renewable Portfolio Standards of 6% in 2012 and 25% in 2025.

It remains unclear just how much it will cost to develop, generate, store, and transmit this energy to consumers. In a 2008 study, the Congressional Research Service (CRS) compared the costs for constructing and generating electricity under a variety of assumptions and sensitivities, including carbon controls. According to CRS's research, the most economically viable sources of renewable energy are wind and geothermal.[91] Table 5 represents the base case, where geothermal remains comparable to coal and natural gas (around $60/Mwh), while wind is most in line with nuclear and coal: IGCC (around $80/Mwh).[92]

Table 5[93]

Estimated Base Case Results[94]

(2008 $)

Technology (1)	Developer Type (2)	Non-Fuel O&M Cost	Fuel Cost (4)	SO_2 and NOx Allowance Cost	CO_2 Allow. Cost (6)	Prod. Tax Credit (7)	Total Operating Costs (8)	Capital Return (9)	Total Annualized $/Mwh (10)

[90] Press Release, Obama for America campaign, New Energy for America (2008) (on file with author).
[91] CONG. RESEARCH SERV., RL34746, POWER PLANTS: COSTS AND CHARACTERISTICS (2008) [hereinafter CRS, *Power Plants*]; Hydro is excluded due to understanding that limited future capacity will be developed due to environmental concerns.
[92] *Id*. at 39
[93] Table 5 is based on CRS's base case scenario and reflects their assumptions. In the base case, CRS does not include a number of "discretionary" incentives, including the loan guarantee program and renewable energy production tax credit. For more information, see ; Cong. Research Serv., RL34746, *Power Plants: Costs and Characteristics* (2008) available at http://apps.crs.gov/products/rl/html/RL34746.html.
[94] *Id*. at 55

		(3)		(5)					
Coal: Pulverized	IOU	$5.57	$11.13	$0.61	$0.00	$0.00	$17.31	$45.79	**$63.10**
Coal: IGCC	IOU	$5.46	$10.41	$0.10	$0.00	$0.00	$15.97	$67.02	**$82.99**
Natural Gas: Combined Cycle	IPP	$2.57	$30.57	$0.14	$0.00	$0.00	$33.27	$28.50	**$61.77**
Nuclear	IOU	$6.13	$5.29	$0.00	$0.00	($3.18)	$8.23	$74.99	**$83.22**
Wind	IPP	$6.67	$0.00	$0.00	$0.00	$0.00	$6.67	$74.07	**$80.74**
Geothermal	IPP	$13.69	$0.00	$0.00	$0.00	$0.00	$13.69	$45.54	**$59.23**
Solar: Thermal	IPP	$13.71	$0.00	$0.00	$0.00	$0.00	$13.71	$86.61	**$100.32**
Solar: Photovoltaic	IPP	$4.17	$0.00	$0.00	$0.00	$0.00	$4.17	$251.24	**$255.41**

Source: CRS estimates.
Notes: Projections are subject to a high degree of uncertainty. These results should be interpreted as indicative given the projection assumptions rather than as definitive estimates of future outcomes. Mwh = megawatt hour; IGCC = integrated gasification combined cycle; NG = natural gas; CCS = carbon capture and sequestration; SO_2 = sulfur dioxide; NOx = nitrogen oxides; O&M = operations and maintenance; IPP = independent power producer; IOU = investor owned utility.

Basing allowance costs off EIA's "core" analysis of S.2191, Table 6 demonstrates the change in prices under carbon control, all other assumptions remaining constant.[95]

Table 6
Estimated Annualized Cost of Power with Carbon Controls[96]
(2008 $)

Technology (1)	Developer Type (2)	Non-Fuel O&M Cost (3)	Fuel Cost (4)	SO_2 and NOx Allowance Cost (5)	CO_2 Allow. Cost (6)	Prod. Tax Credit (7)	Total Operating Costs (8)	Capital Return (9)	Total Annualized $/Mwh (10)
Coal Technologies									
Coal: Pulverized	IOU	$5.57	$11.13	$0.61	$33.80	$0.00	$51.11	$49.58	**$100.69**
Coal: Pulverized/CCS	IOU	$13.48	$14.13	$0.77	$4.29	$0.00	$32.67	$78.87	**$111.54**
Coal: IGCC	IOU	$5.46	$10.41	$0.10	$31.61	$0.00	$47.58	$67.02	**$114.60**
Coal: IGCC/CCS	IOU	$7.10	$12.61	$0.13	$3.83	$0.00	$23.67	$95.25	**$118.92**
Natural Gas Technologies									
NG: Combined Cycle	IPP	$2.57	$30.57	$0.14	$13.06	$0.00	$46.34	$30.88	**$77.21**
NG: Combined Cycle/CCS	IOU	$3.68	$38.32	$0.17	$1.64	$0.00	$43.81	$51.09	**$94.90**
Zero Carbon Technologies									
Geothermal	IPP	$13.69	$0.00	$0.00	$0.00	$0.00	$13.69	$45.54	**$59.23**
Nuclear	IOU	$6.13	$5.29	$0.00	$0.00	($3.18	$8.23	$74.99	**$83.22**

[95]For more on CRS assumptions see Appendix C or, CRS *Power Plants, supra* note 91.
[96] CRS, *Power Plants, supra* note 91. Hydro is excluded due to understanding that limited future capacity will be developed due to environmental concerns.

						)			
Wind	IPP	$6.67	$0.00	$0.00	$0.00	$0.00	$6.67	$74.07	**$80.74**
Solar: Thermal	IPP	$13.71	$0.00	$0.00	$0.00	$0.00	$13.71	$86.61	**$100.32**
Solar: Photovoltaic	IPP	$4.17	$0.00	$0.00	$0.00	$0.00	$4.17	$251.24	**$255.41**

Source: CRS estimates.

Notes: Projections are subject to a high degree of uncertainty. These results should be interpreted as indicative given the projection assumptions rather than as definitive estimates of future outcomes. Mwh = megawatt-hour; IGCC = integrated gasification combined cycle; NG = natural gas; CCS = carbon capture and sequestration; SO_2 = sulfur dioxide; NOx = nitrogen oxides; O&M = operations and maintenance; IOU = investor owned utility; IPP = independent power producer.

In this comparison, even with carbon controls, geothermal remains the most affordable, while wind remains in line with natural gas and nuclear. The study notes that though geothermal is affordable in both cases, geographic limitations, with resources localized mostly in western states, reduce the overall viability and contribution of geothermal power. Wind becomes cost competitive after a carbon tax is imposed however; it can only be considered a "variable renewable resource,"[97] due to limited operational capacity and storage and transmission concerns. Given the constraints on geothermal and wind, nuclear energy remains the most affordable zero carbon baseload option. Under no circumstances, in the CRS model, does solar become economically viable, even with consideration of carbon controls.

CRS is careful to note, as we have in this report, that prices are indicative only under assumed conditions. For example, the inclusion of loan guarantees of nuclear dramatically reduces its overall cost. [98]

Reliability

In the case of both solar and wind technologies, a key concern is the variability of electricity generation. In the case of wind, maximum power generation only occurs 23% of the time, in prime locations just over 30% – meaning generation of electric power from on-shore wind is highly intermittent.[99] Off-shore wind has a projected capacity around 42%.[100] Solar electricity generation, also dependent on unpredictable forces of nature, faces similar, if not greater, constraints in reliability. The variable nature of wind and solar energies necessitates established intermittent, multi-hour energy storage capacity-technology that is not, at present, widely available or commercially viable. Until storage capacity is effectively commercialized on a large scale, deployment of these technologies will remain stunted.[101]

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[97] CRS, *Power Plants, supra* note 91. CRS defines variable renewable" plants (wind and solar) as those plants that do not fall neatly under the categories of baseload, intermediate, or peaking plants. "Variable renewable" plants are used as available to meet demand.

[98] *Id.*

[99] Letter from Bruce Josten, Executive Vice president, U.S. Chamber of Congress to Representative John Dingell, Chairman of H. Comm. on Energy and Commerce, (June 15, 2007) [hereinafter *Josten Letter*](on file with author).

[100] ENERGY INFO. ADMIN., COST AND PERFORMANCE CHARACTERISTICS FOR RENEWABLE ENERGY GENERATING TECHNOLOGIES, ASSUMPTIONS TO THE ANNUAL ENERGY OUTLOOK 2002 (2002) *available at* http://www.eia.doe.gov/oiaf/archive/aeo02/assumption/renewable.html.

[101] *Josten Letter, supra* note 99.

Integration into the National Grid

The role of renewable energy, particularly in the electricity sector, depends unequivocally on the future of the United States transmission system. Born in the early half of the 20th century, the existing transmission system is in dire need of improvements to its regulatory framework, as well as upgrades in technology and infrastructure. The massive blackout in 2003, which left large swaths of the northeast, including New York City, in total darkness, highlighted the limitations of the current grid. The Energy Policy Act of 2005 contained provisions intended to ease congestion on the grid. But these reforms are not sufficient to address the transmission needs that arise when we bring more renewable energies online.

Renewable energy sources pose numerous complications for an already strained transmission system. The intermittent output and remote citing of most promising renewables makes them difficult to integrate into the existing grid. The case of wind power presents an excellent example of the hurdles facing the renewable energy in the United States. Most valuable wind resources are located in remote areas, requiring a massive expansion of the transmission system to reliably transfer the power to population centers. Recent studies by the government and private utilities found that to achieve 20% wind energy in the United States, it would require between 12,000 to 19,000 miles of additional transmission at a cost between $20 and $26 billion.[102] Aside from the costs involved in such an expansion, community opposition to the placement of transmission lines provides an inevitable challenge. The United States needs expanded investment in upgrading our national transmission system; otherwise large scale advances in renewable energy use will remain limited.

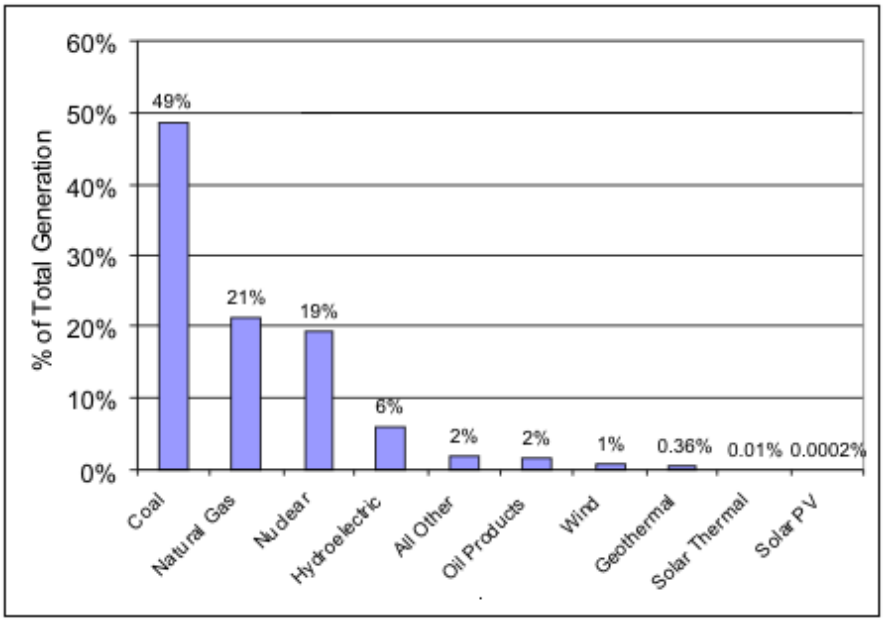
The Reality of Renewables

The United States has been subsidizing wind and solar technology since the oil crisis of the 1970's. Yet, total renewable energy consumption has grown by less than 4 quadrillion BTU since the 1950's.[103] In 2007, renewable energy accounted for 7% of the nation's energy supply and 8.4% of total U.S. electricity generation. [104] In their recent Annual Energy Outlook 2009, EIA predicts that renewable energy sources will account for 14.2% of total domestic power production by 2030, nearly 10% below President Obama's target of 25% by 2025. In 2007, hydroelectricity accounted for 71%, of renewable generated electricity- around 6% of the nation's electricity supply. Due to stagnation of recourses and environmental concerns, hydroelectricity is not likely to expand in the coming decades, requiring a massive expansion of wind, solar, biomass,

[102] CONG. RESEARCH SERV., R40103, CARBON CONTROL IN THE U.S. ELECTRICITY SECTOR: KEY IMPLEMENTATION UNCERTAINTIES 8 (2008).
[103] ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW (AER) 2007 279 (2007) [units converted].
[104] ENERGY INFO. ADMIN., ENERGY IN BRIEF- RENEWABLE ENERGY PLAYS A ROLE IN THE NATION'S ENERGY SUPPLY (2007) (2008), *available at* http://tonto.eia.doe.gov/energy_in_brief/renewable_energy.cfm#fnotes.

and geothermal to meet potential RPS standards.[105] In 2007, wind, geothermal and solar combined accounted for 13% of the total renewable-generated electricity, and overall these technologies supplied less than 0.7% of the nation's total energy consumption.[106] EIA predicts that, excluding hydroelectricity, renewable energy generation in the electric power sector will grow from 2.5% in 2007 to 8.3% in 2030.[107] With increased funding and incentives, especially in a carbon capped market, this estimate could potentially increase, but would need to double, at minimum, in order to reach the 25% target.

Graph 3



Sources: EIA, *Electric Power Monthly* March 2008, Table ES1.B, and the EIA906/923 preliminary data file for 2007.

Other Challenges

Beyond funding and technical constraints, renewable energy sources- especially wind and solar- require tremendous amounts of land and resources. According to BLM, wind farms require between 50-100 acres per Megawatt, but only impose a 10% surface disturbance.[108] Solar plants also require immense parcels of land however; unlike wind, solar requires a highly concentrated footprint. Depending on the technology, BLM believes solar plants require 5-10 acres per MW with a near 100% surface disturbance.[109]

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[105] ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2009 74 (2009) *available at* http://www.eia.doe.gov/oiaf/aeo/pdf/0383 (2009).pdf.
[106] *Id.*
[107] *Id.*
[108] DEPT. OF INTERIOR, BUREAU OF LAND MGMT. BRIEFING: WIND AND SOLAR ENERGY DEVELOPMENT ON PUBLIC LANDS (2008) (materials on file with author).
[109] *Id.*

The acreage and near total land disturbance present tremendous environmental concerns for solar energy. Interference with sunlight and rainfall will, in turn, affect local flora and fauna. Water needed to cool the plants will strain already depleted supplies in the arid climates conducive to solar generation. Environmental groups and local citizens have already resisted the installation of these projects indicating that Not In My Back Yard (NIMBY) will play a major role in the fate of renewable energy.[110]

Broad reductions in the use of fossil fuel cannot, at present, be offset by renewable sources. These technologies show promise and increased focus on developing new clean energy technology must be encouraged-responsibly. The uncertainty of these resources should compel the United States to embrace their potential, but proceed with caution before mandating programs reliant on their massive expansion.

The Better Path Forward: Nuclear Energy

The potential costs, both to the consumer and society, of a cap-and-trade system, coupled with a bias towards renewable energy, could be devastating. Thankfully, the potential to reduce carbon emissions do not live and die with the sun and the wind. Technology exists today – nuclear energy- that is not only clean; it is proven, reliable and safe. Nuclear power is one of the safest, most efficient, cost effective, and sadly underappreciated zero carbon resources available to our nation. It provides a versatile source of clean energy with near limitless potential. From the development of hydrogen technologies and high heat reactors, to the possibilities of advanced fuel cycles, the benefits of nuclear power should not be ignored any longer.

In 2008, nuclear power in the United States produced more than 800 billion kilowatt-hours, equal to 19% of our total electricity output and representing nearly 75% of U.S. carbon-free electricity. Today, there are 104 nuclear facilities licensed to operate in the United States. However, no new reactor has been licensed for construction since the late 1970s. Opponents perpetually cite the health and safety risks of nuclear power, but in over 50 years of commercial operation, not a single member of the public has been injured by radiation from a United States commercial nuclear power plant. Plant safety has improved dramatically and as the NRC recently noted, "The average number of significant reactor events over the past 20 years has dropped to nearly zero."[111]

New reactors, Generation III/III+ technology plants, aim to reduce costs and increase safety through simplification, standardization of design, and improved construction techniques.[112] Nuclear plants, like wind and solar, have high capital costs but once built, are inexpensive to operate. Federal programs, such as Loan Guarantees, can help minimize capital costs and aid in the "nuclear renaissance." Even as the

[110] For additional information on how NIMBY obstructs the deployment of zero carbon energy, see infra Section VI.
[111] *Nuclear Energy Development: Hearing Before the S. Comm. on Energy and Natural Resources*, 111th Cong. (2009) (statement of Marvin S. Fertel, President and Chief Executive Officer, Nuclear Energy Institute).
[112] CRS, *Power Plants*, *supra* note 91.

economy struggles, nuclear energy remains a bright spot, creating almost 15,000 jobs in the last two to three years in anticipation of new plant development.[113]

Nuclear Energy is the Key to a Low Carbon Economy

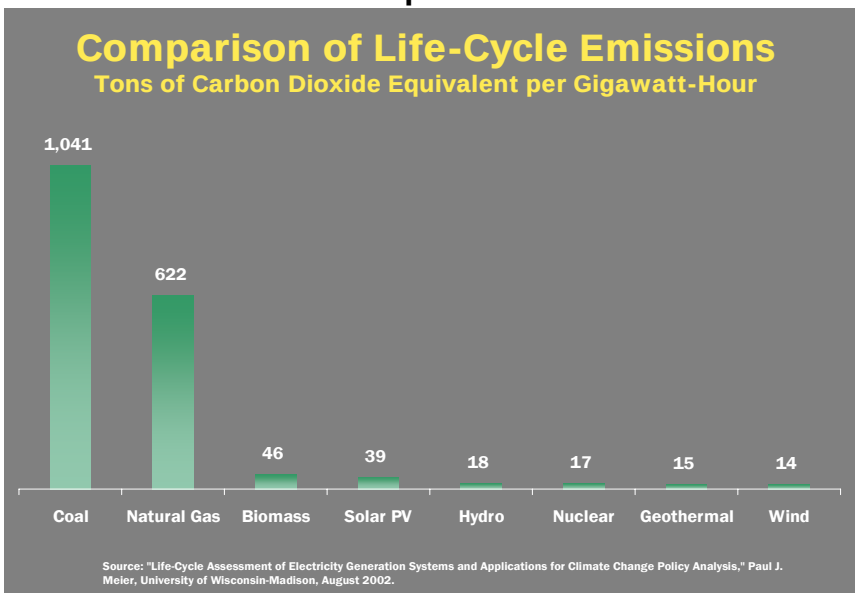
Any effort to reduce carbon emissions should envision a firm commitment to nuclear power. The NRC is currently reviewing applications for 26 new reactors, which would provide an additional 34,000 MW of electricity. The Nuclear Energy Institute (NEI) estimates that should all 26 new reactors be completed by 2030, nuclear power could maintain a 20% contribution to the nation's energy supply. In order for nuclear energy to play an increased role in achieving 2050 climate goals, there must be a massive escalation in construction, similar to the rates achieved in the 1970's and 1980's, around 4 to 6 plants a year.[114] Prior to improvements in licensing and standardization, from 1963 to 1985, 78 GW of nuclear power were ordered, constructed, and brought online.[115]

Healthier for the Environment

Opponents often criticize the negative environmental impacts of nuclear energy, even though it is arguably as good, if not better, than most other presently viable sources of energy. In 2005, the University of Wisconsin found that the lifecycle carbon emissions from nuclear power were comparable to wind, geothermal, and hydro- and significantly better than solar or biomass (Graph 4).

[113] *Nuclear Energy Development: Hearing Before the S. Comm. on Energy and Natural Resources*, 111th Cong. (2009) (statement of Marvin S. Fertel, President and Chief Executive Officer, Nuclear Energy Institute).
[114] *Id.*
[115] CONG. RESEARCH SERV., RL34489, CLIMATE CHANGE: COSTS AND BENEFITS OF S.2191/S.3036 42 (2008) [hereinafter CRS, *Climate Change*].

Graph 4[116]



Nuclear plants also have much smaller footprints than either solar arrays or wind farms. Comparing land use to output, using existing carbon free resources, a nuclear generating facility requires less than one acre of land to produce one MW of electricity, while a wind farm requires more than 45 times that amount of land (Table 7).

Table 7: Land Use for Carbon Free Energy Sources[117]

Plant	Location	Energy Type	Acres	MW	MW/Acre	Acre/MW
Nevada Solar 1	Nevada	Concentrated Solar	400	64	0.16	6.25
Nellis Solar Power Plant	Nevada	Photovalic Solar	140	14	0.1	10
Shiloh Wind Power Plant	California	Wind	6800	150	0.02	45.33
Byron Generating Station	Illinois	Nuclear	1782	2353	1.3	0.75

[116] Life-Cycle Assessment of Electricity Generation Systems and Applications for Climate Change Policy Analysis," Paul J. Meier, University of Wisconsin-Madison, August 2002. (http://www.nei.org/resourcesandstats/documentlibrary/protectingtheenvironment/graphicsandcharts/comparisonoflifecycleemissions/)

[117] Table created by author using data from Acciona, Nevada Solar One, http://www.acciona-na.com/About-Us/Our-Projects/U-S-/Nevada-Solar-One.aspx; Press Release, Nellis Air Force Base, Nellis Activates Nations Largest PV Array (December 18, 2007) (on file with author); Mortenson Construction Project Profile- Shiloh I Wind Farm, http://www.mortenson.com/projects/project_profile.html?projects__id=264; Exelon Nuclear, Byron Generating Station Fact Sheet, http://www.exeloncorp.com/NR/rdonlyres/EDE5EF6B-4FE4-4EC1-8CFB-931980C9A17A/6713/2009ByronFactSheet.pdf.

Nuclear power receives the occasional homage from the Administration, but it remains to be seen whether they are truly committed. In the outline of the 2010 budget, *A New Era of Responsibility: Renewing America's Promise*, the Administration pays little attention to the role of nuclear power. The report contains no language directly attributable to promoting nuclear energy, instead focusing mainly on the issue of nuclear waste. Ultimately, their outline provides more questions than answers when it comes to the future of nuclear energy in America.

Barring swift and committed shifts in policy, the rebirth of nuclear will take longer than our nation and world can endure. New plant construction requires expensive investments of time and resources. Estimates for new construction range in the period of ten to twelve years with current capital costs around $6 to $8 billion per plant. The Energy Policy Act of 2005 was a step in the right direction, but to offset the economic impact of potential carbon caps the government must do more to nourish this promising technology.

VI. The Problem of NIMBY – "NOT IN MY BACKYARD"

Technological and regulatory constraints make the task of transitioning to less carbon intensive economy difficult, particularly in the near term. Compounding these difficulties, the very same environmental groups and lawmakers who are pushing the Obama Administration to adopt strict controls on carbon emissions are also standing in the way of our ability to transition to carbon free sources of energy, such as nuclear, solar, and wind.

This resistance, commonly referred to as NIMBY – or "Not In My Back Yard" – comes in the form of opposition to additional nuclear generation, construction and citing of additional transmission lines, and opposition to solar and wind farms. Ironically, some of the biggest culprits of NIMBYism are also the leading advocates of cap–and-trade, including Senator Harry Reid and Representative Edward Markey, as well as environmental groups, such as the Sierra Club, Friends of the Earth, and Green Peace. The NIMBY-based opposition to carbon free energy will only push back the day when renewables and nuclear can displace fossil fuels as our primary source of energy. If the Waxman/Markey cap-and-trade scheme becomes the law of the land, these groups and individuals could exacerbate the unnecessary and additional cost that Americans will have to pay for energy.

<u>NIMBY: Halting Progress on Nuclear Energy</u>

A prominent case of NIMBY standing in the way of carbon free sources of energy is the opposition of U.S. Senate Majority Leader, Senator Harry Reid of Nevada, to the citing and development of Yucca Mountain as the nation's nuclear waste repository. Senator Reid has waged a long, and now successful, campaign to reverse the decision of a previous Congress and Administration.

The development of Yucca Mountain has spanned 5 presidencies and has consumed billions in taxpayer dollars. The Obama Administration maintains that Yucca Mountain is not a viable option. Following through on his campaign promise, the President's FY2010 budget outline slices all funding for the Yucca project except, "those costs necessary to answer inquiries from the Nuclear Regulatory Commission, while the Administration devises a new strategy toward nuclear waste disposal."[118] Yucca Mountain is not dead as long as the NRC is allowed to continue its review of the licensing application, but even this is in jeopardy. In May of 2008, a spokeswoman for Senator Obama, when asked if he would pull the licensing applications, replied flatly, "Yes."[119] A spokesperson for Senator Harry Reid recently noted that "President Obama and Secretary Chu made a promise to the people of Nevada and to Sen. Reid that they're going to kill the dump. We have no doubt they're going to do that." [120]

It remains to be seen what "new strategy" the Administration will support, though history suggests that President Obama is comfortable "finding another state willing to serve as a permanent national repository or creating regional storage repositories,"[121] as long as that state is not Illinois. In a June, 2006 letter to Senator Pete Domenici, Senator Obama and his fellow Illinois Senator, Dick Durbin, wrote,

> We strongly believe that states should not be unfairly burdened with waste from other states by decisions made at the federal administrative level when those states voluntarily designate an interim storage site to handle waste generated in that state. Currently, the statutory language allows for the creation of a regional site within any state with a commercial reactor…every state should be afforded the opportunity to chart a course that addresses its own interim waste storage….[122]

Yucca Mountain is not dead…yet. The real question is whether the Administration simply plans to "kick the can down the road," using the growing stockpiles of waste as an excuse to limit the expansion of nuclear power; or if they will move forward and rectify the broken waste management policies that have plagued the American nuclear industry for the past 20 years.

The long term storage of nuclear waste is a pressing issue. President Obama, whose home state generates roughly 50% of its electricity from nuclear power, should have a vested interest in finding a reasonable, long term solution for our spent nuclear waste. Advanced reprocessing facilities and advancements in generator or recycling

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[118] OFFICE OF MGMT. & BUDGET, EXEC. OFFICE OF THE PRESIDENT, BUDGET OF THE UNITED STATES GOVERNMENT, FISCAL YEAR 2010 (2009).
[119] Lisa Mascaro, *Yucca Mountain: Once Flatlining, now of life support*, LAS VEGAS SUN, Feb. 20, 2009, *available at* http://www.lasvegassun.com/news/2009/feb/20/once-flatlining-now-life-support/.
[120] *Id.*
[121] Letter from Barack Obama, U.S. Senator, to Harry Reid, U.S. Sen. Majority Leader, and Barbara Boxer, U.S. Senator (Oct. 30, 2007), *available at* http://my.barackobama.com/page/community/post_group/NVHQ/CSYB.
[122] Letter from Barack Obama, U.S. Senator, and Dick Durbin, U.S. Senator, to Pete Domenici, U.S. Senator (June 30, 2006), *available at* http://durbin.senate.gov/record.cfm?id=258262.

technology provide promising avenues for reducing our nation's waste, while fueling current and future reactors. Despite this interesting possibility, there will always be at least some nuclear waste, and though it can be stored at reactor sites for decades, the U.S. should not forget that it has taken 22 years, with at least 10 more to go, to develop Yucca Mountain. Yucca remains a sound option, but if the United States decides to change course, the President should remember that ultimately, the waste will end up in someone's backyard.

NIMBY: Stifling Wind Energy

Another prominent example of NIMBYism is a wind project in the backyard of Senators John Kerry and Edward Kennedy and Congressman Edward Markey. Despite their aggressive position supporting cap-and-trade, none of the Congressmen have supported the construction of Cape Wind, an offshore wind turbine complex that would cover 24 square miles of Nantucket Sound off the coast of Cape Cod.[123] It would be the largest privately-owned alternative energy generation project in the nation, producing up to 420 megawatts of clean, renewable electric power when operating at expected capacity. Yet the project has been stalled for years because of the coordinated local opposition.

Criticism has come from the Alliance to Protect Nantucket Sound who state that Nantucket Sound is known worldwide for its wildlife and natural beauty.[124] Opponents note that noise and disturbance from construction, operation, and maintenance may result in damage to or loss of habitat, increased avian mortality, and other impacts on the region's ecology. Robert Kennedy, Jr., whose family's Compound is within sight of the proposed wind farm, wrote an essay stating his support for wind power in general, but opposing this project.[125] In his essay, he notes that "the project will damage the views from 16 historic sites and lighthouses on the cape and nearby islands."[126] The remainder of the article is careful to embrace the benefits of wind energy, just so long as it is not built in his back yard.

NIMBY: Obstruction of Solar Energy Projects

California, a leading proponent of renewable energy, has become a leading example of the inherent conflict between conservation and clean energy. The Bureau of Land Management (BLM) is diligently reviewing 130 applications for solar and wind energy development on more than one million acres of public desert lands in California. Approximately 100,000 to 160,000 acres of California desert are needed to meet the

[123] Posting of Walter Brooks to CapeCodToday.com, *Kerry foe rips his energy bid* Ogonowski: Senator's dragged heels on renewable resources, http://www.capecodtoday.com/blogs/index.php/2008/04/15/kerry-foe-rips-his-anti-wind-farm-stand-?blog=109 (Apr. 15, 2008, 12:52 PM EDT).
[124] Save Our Sound Home Page, http://www.saveoursound.org/site/PageServer?pagename=CapeWind_Threats_TheProject
[125] Robert Kennedy Jr., An Ill Wind off Cape Cod, N.Y. TIMES, Dec. 16, 2005, *available at* http://query.nytimes.com/gst/fullpage.html?res=9407EFD61F31F935A25751C1A9639C8B63.
[126] *Id.*

state's 33 percent renewable energy goal by 2020– land that preserves irreplaceable natural resources. Sen. Dianne Feinstein (D-CA) recently announced her intention to introduce legislation blocking solar energy development on more than 600,000 acres of California desert.[127] The legislation would apply to lands wedged between Joshua Tree National Park and the Mojave National Preserve, including nearly 100,000 acres of National Park Service lands and 210,000 acres spread across 20 wilderness areas controlled by BLM. In a letter to BLM, Feinstein stated, "The private parties contributed this large sum of money in the belief that this land will be protected and conserved…Building huge solar facilities on these lands is untenable and unacceptable."[128] Senator Feinstein understands the importance of conservation. Protecting this valuable state and national treasure, home to "bighorn sheep and desert tortoises, sand dunes, extinct volcanoes, ancient petroglyphs and expansive mountain ranges," preserves a valuable national resource – one that cannot be replaced.[129] The future of solar energy rests in the public's desire to conserve the natural landscape.

Senator Feinstein's concerns are shared by a local Sierra Club organization, as a chapter representative who opposes the solar panel project was quoted saying, "Deserts don't need to be sacrificed so that people in L.A. can keep heating their swimming pools."[130] Other environmental groups, including the Sierra Club, are appealing BLM's approval of a Southern California electric transmission line needed to connect the solar energy generated at Imperial Valley to San Diego.[131] The same environmentalists who are pushing for higher energy prices to encourage the deployment of renewable resources oppose that deployment if it conflicts with the rest of their environmental agenda.

In addition to these high profile examples, there are at least 62 wind, wave, solar and biofuel projects and 15 high-voltage transmission proposals, across 25 states, that have faced significant local opposition, often enough to shut them down entirely.[132] NIMBY has also slowed or halted progress on 18 natural gas projects, 17 nuclear power plants, and around 175 coal plants worth more than $62 billion in investments. [133] Prominent environmental groups, such as Sierra Club, Friends of the Earth, Green Peace and Public Citizen are also all involved in litigation aimed at stopping the development of carbon free energy sources.

This Administration is funneling billions of dollars into renewable energy projects and advanced technologies necessary to transition into a green economy, but the same

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[127] Eric Bontrager, *Public Lands: Feinstein moves to protect Calif. desert lands from renewable projects*, ENVIRONMENT AND ENERGY PUBLISHING, *Mar. 19, 2009, available at* http://www.eenews.net/EEDaily/2009/03/19/9/.

[128] Letter from Dianne Feinstein, U.S. Senator, to Ken Salazar, U.S. Sec'y of Interior (Mar. 3, 2009) (on file with author).

[129] *Id.*

[130] Greenwire, *Environmentalists Clash Over Climate, Conservation*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 24, 2009, *available at* http://www.eenews.net/Greenwire/2009/03/24/6/.

[131] Debra Kahn, *Groups appeal BLM's Approval of California Power Line*, ENVIRONMENT AND ENERGY PUBLISHING, Mar. 25, 2009, *available at* http://www.eenews.net/eenewspm/2009/03/25/archive/4?terms=Approval+of+California+Power+Line.

[132] *Project No Project*, U.S. Chamber of Commerce, Apr. 6, 2009, http://pnp.uschamber.com.

[133] *Id.*

constituency these programs aim to appease stand in the way of their deployment. Any legislation that limits use of, or imposes a cost on, fossil fuels should address and limit the aggressive environmental lobby that opposes and slows down these important projects. Failure to do so could severely cripple our economy and impose even greater hardship on American families.

VII. The Myth of Green Collar Jobs

The "green jobs" mantra has been unquestionably embraced by Democratic lawmakers, labor unions, and environmental groups as the panacea for today's troubled economic times. Touting the Obama Administration's plan for "green jobs" was at the top of Labor Secretary Hilda Solis's agenda when she made her first official appearance before Congress.[134] With the national unemployment rate at 8.5%, the highest since 1983, and jobless rates already above 10% in California, Nevada, North Carolina, South Carolina, Oregon, Michigan, Rhode Island and Washington, D.C., the President should have job creation as his top domestic priority. However, there are legitimate reasons to question the claims being made about "green jobs."[135]

The Center for American Progress asserts that $100 billion in green investment, 2 million jobs will be created.[136] President Obama promises more – he plans to create 5 million jobs with $150 billion in green investment.[137] However, proponents of "green jobs" are careful not to clarify whether these jobs are replacing or are in addition to the 3.5 million jobs tied to the traditional energy industry that will be in jeopardy if cap-and-trade is implemented.[138] A recent study of the green jobs movement in Spain concludes that every job created in the renewables industry comes at cost of 2.2 jobs elsewhere in the economy.[139] The focus of this study is on opportunity cost –jobs that were not created because resources were diverted towards renewables. It seems apparent that if investment in "green jobs" is tied to the passage of cap-and-trade legislation, the gains in "green jobs" could be overwhelmed by the foreseeable loss in the traditional energy sector as well as manufacturing jobs heavily reliant on fossil fuel energy.[140]

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[134] Taryn Luntz, *Solis to Plug Obama Admin Plan for 'Green Jobs'*, ENVIRONMENT AND ENERGY PUBLISHING, Apr. 20, 2009, *available at* http://www.eenews.net/EEDaily/print/2009/04/20/6.

[135] Long term, the discussion is not around whether cap-and trade will kill jobs, rather the debate centers around the volume of jobs that will be lost. Analyses of the Lieberman Warner cap-and-trade scheme predict net job losses to the economy. Keeping in mind that the Waxman/Markey plan sets steeper reduction targets and invests less in alternative technology, estimated job losses could be even greater.

[136] ROBERT POLLIN ET AL., POLITICAL ECONOMIC RESEARCH INSTITUTE, GREEN RECOVERY: A PROGRAM TO CREATE GOOD JOBS AND START BUILDING A LOW-CARBON ECONOMY 2 (2008).

[137] Liz Wolgemuth, *The Truth and Green Jobs*, U.S. NEWS AND WORLD REPORT, Mar. 25, 2009.

[138] Andrew Morriss, *Seven Myths About Green Jobs* 6 (U. Ill. College of Law, Working paper No. LE09-007, 2009).

[139] GABRIEL CALZADA ALVAREZ, UNIVERSIDAD REY JUAN CARLOS, STUDY OF THE EFFECTS ON EMPLOYMENT OF PUBLIC AID TO RENEWABLE ENERGY SOURCES (2009).

[140] Inevitably if you increase the cost of doing business, whether it is through a system of allowances or through a tax, those firms operating on the margin will not survive, and these jobs will be lost as well. See also WILLIAM BEACH ET AL, THE HERITAGE FOUND., THE ECONOMIC COST OF THE LIEBERMAN-WARNER CLIMATE CHANGE LEGISLATION 2 (2009) *available at* http://www.heritage.org/Research/EnergyandEnvironment/cda08-02.cfm.

Lack of Transparency

When examining the Administration's claims, it is impossible to compare studies that tout the promise of a green economy because there is no standard definition as to what constitutes a "green job." This lack of uniformity leads to a lack of transparency and an inability to confirm the authors' claims.[141] The task of defining what jobs are "green" is further complicated because there is no official government study analyzing the number of green jobs that could be created based on projected government support. Therefore, all claims about the number of "green jobs" that will be created should be viewed with some skepticism.

Since there is no standard definition of "green job", then what jobs are counted in a study is left to the author to decide. This ad hoc approach has led to some interesting methodologies. For example, most studies of "green jobs" do not count jobs in the nuclear industry, which has zero carbon emissions, as being green, or do so inconsistently.[142] Other studies count jobs in the U.S. steel industry as green-collar, so long as the steel produced is eventually used to build a wind turbine.[143] While the image of the new green-collar worker is that of an environmental engineer, or Most of the green jobs expected to be created are secretarial positions, management analysts, bookkeepers and janitors.[144]

The lack of transparency about what counts as a green job obscures policy choices that merit debate. The favored status of green jobs creates incentives for special interest groups to work the political system to have their jobs designated as "green" and their rivals excluded.[145] Most of these jobs would be the result of government, rather than private, investment leaving the government, not the market, to determine the location, nature, and potentially who will be employed in the new green economy. It also appears that there is a strong and concerted push by labor unions to ensure that every new "green job" is also a union job.[146]

Troubling Preference for Inefficiency

A second area of concern is that studies boasting green job creation appear to have a troubling preference for inefficiency.[147] Green industries rely heavily on

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[141] Morriss, *supra* note 138.
[142] *Id.* (stating that "the [Conference of] Mayors report counts current nuclear power generation as green jobs, yet doesn't account future jobs in nuclear power as green jobs")
[143] UNITED NATIONS ENVIRONMENTAL PROGRAMME, GREEN JOBS: TOWARDS DECENT WORK IN A SUSTAINABLE, LOW-CARBON WORLD (2008).
[144] Morriss, *supra* note 138.
[145] *Id.*
[146] *Witnesses Provide Various Definitions of Green Jobs Before House Workforce Panel*, DAILY LABOR REPORT, Apr. 4, 2009, at 60.
[147] *Id.*

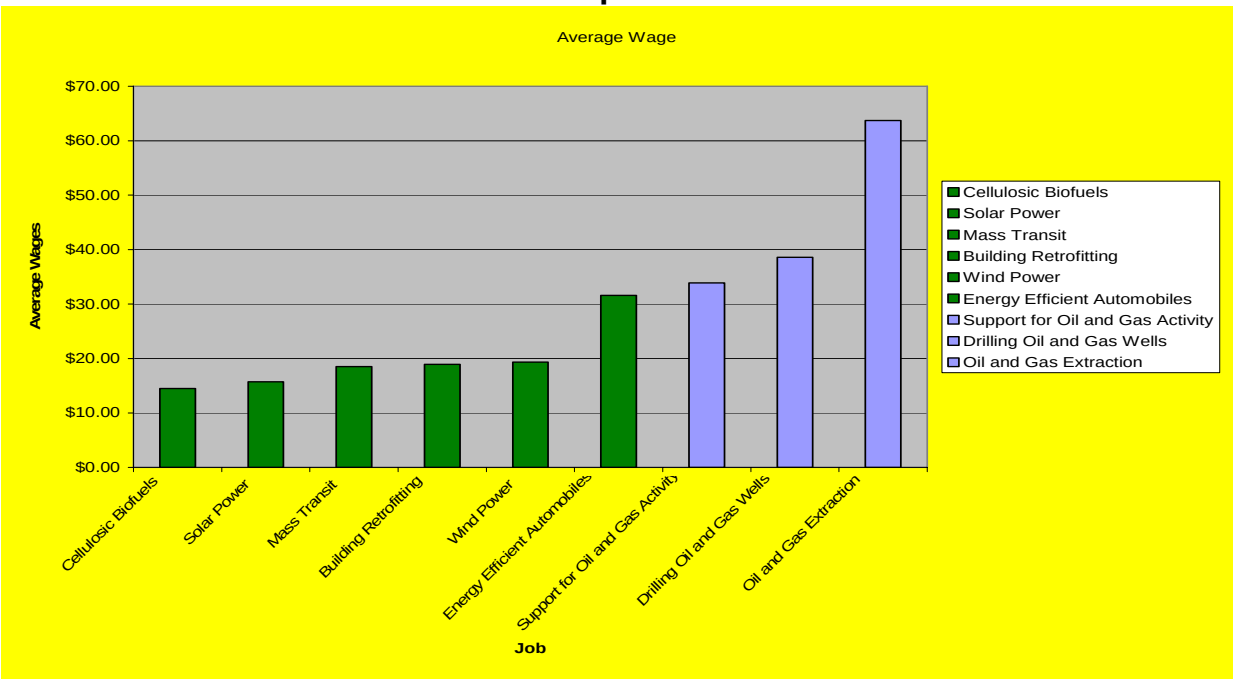
manpower, a trait that makes them alluring when it comes to government-led job creation.[148] Favoring energy sources that are labor intensive could divert funds away from capital investment and delay the development of new technologies. In other words, if capital is being spent to pay workers, it is not being reinvested into research and development. High labor productivity is traditionally a measurement of an efficient and healthy economy. Creating a world of high paying, low-productivity jobs requires an economic structure previously unknown in human history. This preference for inefficiency illustrates that the economic viability of green jobs depends on government subsidy.[149]

Green Jobs Pay Less Than Traditional Jobs in the Energy Sector

Evidence suggests that "green jobs" may not pay as well as the jobs that they displace. According to a University of Massachusetts study and data from the Bureau of Labor Statistics, the national average estimate of a green job is $20 per hour ($41,114 per annum) compared with an average oil and gas industry exploration and production wage of $45 per hour ($93,575 per annum).[150] Yet these high paying jobs in the traditional energy sector will be the first to go under a cap-and-trade scheme, as they are linked to high carbon emissions. Moreover, the average annual wage for a "green job" is less than the average annual pay across all industries in the U.S. in 2007, which was $44,458, or approximately $21 per hour.[151] Graph 5 below details the differences in salary associated with green jobs versus jobs in the fossil fuels sector.

[148] Wolgemuth, *supra* note 137.
[149] Morriss, *supra* note 138.
[150] ROBERT POLLIN & JEANNETTE WICKS-LIM, POLITICAL ECONOMIC RESEARCH INSTITUTE, JOB OPPORTUNITIES FOR THE GREEN ECONOMY: A STATE-BY STATE PICTURE OF OCCUPATIONS THAT GAIN FROM GREEN INVESTMENTS (2008), The Bureau of Labor Statistics: Occupation and Employment Statistics, May 2007
[151] The Bureau of Labor Statistics: Occupation and Employment Statistics, May 2007, available at http://www.bls.gov/data/#employment.

Graph 5[152]



While the creation of "green jobs" is a popular talking point in Washington policy circles, there is a startling lack of knowledge and lack of transparency as to what exactly a green job is, whether they will be in addition to, or in place of today's traditional blue collar jobs, and whether they are economically viable without a government subsidy. As we struggle to emerge from these challenging economic times, enabling the market to create new high-paying jobs should be the President's top domestic priority. He should not permit this priority to be co-opted by the environmentalist agenda.

VIII. Conclusion

As the staff report demonstrates, a cap-and-trade scheme will likely have a far ranging and potentially devastating impact on the United States economy, consumers, and domestic manufacturing base. This burden will not be equally distributed and some Americans will be forced to shoulder a disproportionate burden of the costs of carbon reductions. The economic impact will be felt through higher electricity bills, a general rise in the cost of manufactured goods, and in job losses in manufacturing communities. The economic impact is of such scale that consumer decisions will be impacted – for some families, paying the carbon tax means they will not be able to purchase a new car, for others it could mean holding off buying clothes for the school year or fewer groceries that week.

[152] *Id.*

Green technologies show promise but face immense technological and environmental hurdles, limiting their ability to reduce our reliance on fossil fuels any time soon. Moreover, President Obama and Chairman Waxman seem to be ambivalent towards investments in new nuclear generation.

Accordingly, it is imperative that decisions with such overwhelming implications be debated and decided openly by our citizens' elected officials, after a robust public discussion of what is at stake. Congress and the Administration have an obligation to fully engage the American people and keep them informed about potential choices and the impacts that those choices could have on their daily lives. Congress should put aside the rhetoric and hyperbole on both sides and have a serious debate on how best to address this issue for the benefit of all Americans and the world.

The public dialogue should acknowledge, and begin to come to terms with the reality that energy policy and climate change cannot be addressed separately. The economy, national security, and the world will only be protected and preserved if policy makers step up to the challenge before them, with all options on the table, and craft an energy policy that is worthy of the citizens who elected them to office.

Responsible steps should be pursued to reduce our carbon intensity and improve our energy efficiency. Construction of buildings with sustainable design principles and transitioning to energy efficient lighting could help reduce the projected demand for coal. The United States could reduce dependence on foreign sources of oil and fossil fuels by working with the automotive industry to preserve consumer choice while increasing average fuel economy rates. However, domestic conservation is just a step, not an international solution. Global emissions will continue to rise, especially in developing countries. The U.S. should embrace this opportunity to help businesses export clean energy technologies to developing countries.

Renewable energy sources such as solar, wind, and geothermal energy are promising technologies and the government can help the facilitation of research, development, and commercialization. These energy sources should play an important part in a responsible energy portfolio that meets needs of an expanding economy while insulating the U.S. from international events. Renewable energy technology is not a silver bullet and is not able to displace our current reliance on fossil fuel in the foreseeable future. In order to cope with the looming energy crisis under carbon constrained conditions, policy makers should help facilitate development of coal with Carbon Capture and Sequestration (CCS) and nuclear technologies.

The federal government alone does not have the resources to bring about an energy revolution. Shared risk, a sensible regulatory framework, and minimized litigation risk are but a few of the steps the government must consider to help foster a predictable and hospitable investment environment attractive to the private investment necessary to bring these concepts to market. The investment decisions that are made today will affect both the emissions profile and energy independence in the future.

Finally, there should be no doubt that our current dependence on fossil fuel is unsustainable. To the extent that we work towards a sustainable ecology by imposing additional costs on carbon dioxide, the government has a responsibility to do so in the most efficient and effective way possible. "Command and control regulations," which permeate traditional environmental statutes, are the least efficient, the most burdensome, and can cause the most harm to the economy. Congress should act quickly to preempt the Environmental Protection Agency and other government entities from regulating CO_2 under the Clean Air Act.

Public discourse, devoid of political gamesmanship, is the first step toward sound, responsible, and effective energy and climate change. An issue of this magnitude, where the decisions that we make today will impact the quality of life for future generations of Americans, deserves nothing less.

ADDENDUM

The Cost of Cap-and-Trade

Representative Henry Waxman, Chairman of the House Energy and Commerce Committee, has set an aggressive schedule to consider and markup the American Clean Energy and Security (ACES) Act, which seeks to reduce carbon dioxide emissions through the implementation of a far reaching cap-and-trade proposal along with a command-and-control style Renewable Portfolio Standard (RPS). This legislation, referred to as the Waxman/Markey legislation, was made public on April 7, 2009, and is scheduled for a Committee mark-up the week of April 27, 2009.

Unfortunately, there is very little research in the public realm analyzing the cost of ACES. In an effort to go beyond economic theory and quantify the cost, this report has relied on seven different studies of the Lieberman/Warner cap-and-trade legislation considered in the 110th Congress. The report concludes that the economic impact of cap-and-trade will be felt directly by American families, through higher utility bills and gas prices; indirectly, as the cost of most consumer goods rises; through loss of job opportunity as businesses on the margin are forced to close their doors in the face of rising operating costs; and through opportunity costs and decreased economic activity as society's resources are diverted to a less efficient source of energy.

However, all studies of cap-and-trade offer an imperfect view of the future, as they are all dependent on the author's assumptions and none of them consider the additional cost associated with the RPS. Therefore, all studies likely underestimate the cost of the Waxman/Markey legislation.

Why Assumptions Matter

All economic models, just like all scientific models, are vulnerable to significant uncertainties, and none can accurately predict the future. A model's results are dependent on the assumptions made by the author. For example, EPA's analysis of the Lieberman/Warner legislation hinges on their assumption that 70GW of nuclear power would be online by 2030 - nearly twice our current capacity. As discussed in greater detail in Section V of the staff report, without significant changes in U.S. policy as it relates to nuclear energy, this assumption is unrealistic. As such, the prediction made about the cost of Lieberman/Warner likely underestimates the actual cost that will be borne.

Moreover, in the most recent analysis of the Waxman/Markey legislation, EPA assumes that carbon capture and sequestration (CCS) technology will be commercially viable starting in 2015.[153] According to EPA, the availability of CCS technology reduces

[153] ENVIRONMENTAL PROTECTION AGENCY, PRELIMINARY ANALYSIS OF THE WAXMAN-MARKEY DISCUSSION DRAFT, THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009 23 (2009) *available at* http://www.epa.gov/climatechange/economics/pdfs/WM-Analysis.pdf.

the expected price of allowances.[154] However, according to Energy Secretary Steven Chu, CCS technologies will not be commercially viable in 2015, "We don't know today what the best technology will be…It will take roughly ten years to prove the technology."[155] In other words, CCS will not be commercially available in 2015. Accordingly, EPA's predicted cost of ACES likely underestimates the cost of the proposal. Whether CCS and other technologies will be widely available in the near future will greatly impact the price of carbon allowances, and thus the cost to families.[156]

There are No Accurate Estimates of the Cost of Waxman/Markey

There are two key factors that will impact the cost of Waxman/Markey, which have not been quantified. Accordingly, all discussions concerning the cost of ACES to American families and businesses necessarily underestimate its economic impact. First, there is no available analysis of the cost of the renewable portfolio standard (RPS), which mandates that 25% of all electricity generation come from renewable resources by 2025. Second, we are not aware of any study that seeks to quantify the additional cost to the government, and consequently the American taxpayer, resulting from the increased price of goods and services under a cap-and-trade scheme.

Renewable Portfolio Standard

EPA's draft analysis of the legislation does not include a study of the renewable portfolio standard. This is not a minor omission. The 25% RPS mandate will have a tremendous impact on the economy because it uses a command–and-control style approach and does not let the market determine the most efficient way of reducing emissions. Such an approach undermines the main virtue of a cap-and-trade system – letting the market decide the most efficient outcome.

In the hypothetical world EPA constructed to understand the cost of Waxman/Markey, the market incentives for renewables resulting from the cap on carbon are not sufficient to support the 25% RPS mandate. Rather, the EPA model predicts that renewable energy sources will only comprise 8.9% of the electricity portfolio by 2025.[157] Since the cap and trade market incentives are insufficient to encourage additional development of renewables, additional resources must be expended in order to comply with the unrealistic RPS mandate. Consequently, the cost of Waxman/Markey will be significantly higher than EPA's latest predictions. Any study that does not account for the cost imposed by the renewable portfolio standard will tremendously underestimate the cost this legislation will impose on American families and businesses.

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[154] *Id*. at 8.

[155] *New Directions for Energy Research and Development at the U.S. Department of Energy: Hearing Before the H. Comm. on Science and Technology,* 111th Cong. (2009) (statement of Steven Chu, Secretary of Energy).

[156] *Appendix B* explores the importance of assumptions in economic models in greater detail.

[157] ENVIRONMENTAL PROTECTION AGENCY, PRELIMINARY ANALYSIS OF THE WAXMAN-MARKEY DISCUSSION DRAFT, THE AMERICAN CLEAN ENERGY AND SECURITY ACT OF 2009 23 (2009) *available at* http://www.epa.gov/climatechange/economics/pdfs/WM-Analysis.pdf.

Increased Cost to the Government

The second cost that has yet to be quantified is the additional cost to the United States government for purchases of goods that are more expensive as a result of higher energy prices. As detailed in IV of this report, studies have demonstrated that cap-and-trade could increase the cost of electricity by 44% to 129% and the cost of gasoline by between $0.44 and $2.53 a gallon. The federal government will be paying more to satisfy its energy needs right along with American families. In 2006, the U.S. government spent $17.7 billion for 1.1 quads (1,059,521.5 billion Btu) of energy. This represented approximately 0.7 percent of the total federal expenditures of $2.655 trillion for all purposes in FY 2006.[158] These costs will necessarily increase if a cap-and-trade scheme is adopted. Moreover, the indirect cost to the government for energy intensive goods has not been quantified. Under a cap-and-trade scheme, everything the government purchases, from computers to tanks, will cost more as a result of increased energy costs and their effect on energy intensive goods. As these prices rise, the government will have no choice but to raise taxes or retain revenue from the auctioning of permits in order to cover the increased cost. Either way, this is money that will not be returned to the taxpayer in the form of a rebate.

Controversy Over the MIT Study

There has been a considerable amount of controversy surrounding the manner in which the results from a Massachusetts Institute of Technology study have been used to discuss the average cost per household imposed by a cap-and-trade scheme.[159] For readers unfamiliar with the controversy, MIT Professor John Riley first objected to the use of his data in a letter to Minority Leader John Boehner.[160] According to the Weekly Standard, Professor Riley later reported a substantial error in his calculations, significantly increasing the predictions of the cost of cap-and-trade.[161] The core of the controversy surrounded how to treat the revenues the federal government collects from the sale of allowances.

However, disagreement over allowance revenue is of marginal importance once one understands the frailties of all studies currently used to understand the cost of cap-and-trade generally and Waxman/Markey specifically. In his letter to Minority Leader John Boehner, Professor Riley states that "the average cost to a household depends on how allowances or the allowance revenues are distributed."[162] In his original analysis, he assumed that "the revenue is returned to households," which leads him to first conclude that the average annual cost to households will be $340. Professor Riley later conceded

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158 U.S. DEPT. OF ENERGY, ANNUAL REPORT TO CONGRESS ON FEDERAL GOVERNMENT ENERGY MANAGEMENT AND CONSERVATION PROGRAMS (2009). *available at* http://www1.eere.energy.gov/femp/about/printable_versions/annual_report.html.

159 Lisa Lerer, *GOP Still Using Discredited Data*, POLITICO, April, 21, 2009.

160 Letter from John Riley, Professor, Massachusetts Institute of Technology, to John Boehner, Minority Leader, U.S. House of Representatives (Apr. 1, 2009) (on file with author).

161 John McCormack, *Fuzzy Math*, THE WEEKLY STANDARD, April 22, 2009.

162 Letter from John Riley, Professor, Massachusetts Institute of Technology, to John Boehner, Minority Leader, U.S. House of Representatives (Apr. 1, 2009) (on file with author).

that he erred, and that according to his new calculations, the average cost would be closer to $800 per household.[163] However, this whole debate appears to be moot as the MIT study does not accounted for the burden imposed by the renewable portfolio standard, or for the additional money the government would have to spend due to the general increase in prices of energy and energy intensive goods. Given these gaping omissions, it makes little sense to argue over the estimates he did reach.

Conclusion

More important than the precise numbers reached by the studies is the general trends reflected in all studies. It appears that all studies in the public domain agree that imposing a cap-and-trade regime will impose high costs on the economy and the American people. In these trying economic times in which businesses are struggling to stay afloat and many Americans are not certain about their employment future, it is imperative that the analysis of economic costs be as accurate and comprehensive as possible prior to passing this legislation. This analysis must include the economic burden imposed by the renewable portfolio standard, as well as the increased cost to the government for procurement of energy intensive goods. Moving forward towards passage of the Waxman/Markey legislation, without this important knowledge, is a violation of the public trust.

[163] John McCormack, *Fuzzy Math*, THE WEEKLY STANDARD, April 22, 2009.

Appendix A

Assumptions and Predictions of Lieberman Warner Cap-and-Trade Analyses

The attached charts outline some of the basic assumptions and results from different analyses the Lieberman Warner bill. These studies were conducted by government agencies, industry groups, and educational institutions. These summaries are not intended to provide independent analysis. Rather we have organized the available information in a manner to help the reader gain a general understanding of each of the studies.

MIT-EPPA:

Massachusetts Institute of Technology (MIT)-Sergey Paltsev, et al., "Appendix D" of Paltsev et al., *Assessment of U.S. Cap-and-Trade Proposals*, MIT Joint Program on the Science and Policy of Global Change (2007).

EPPA- MIT's EPPA CGE model. The MIT study includes four sensitivities. Our report focuses on two- No offsets and no subsidies, and 15% offsets and CCS subsidy.

ACCF/NAM-NEMS:

American Council for Capital Formation (ACCF) and National Association of Manufacturers (NAM) - SAIC, *Analysis of the Lieberman-Warner Climate Security Act (S. 2191) Using the National Energy Modeling System (NEMS)*, report by the ACCF and NAM (2008).

The ACCF/NAM study employs the National Energy Modeling System (NEMS) model for "high cost" and "low cost" scenarios.

NMA/CRA- MRN-NEEM:

National Mining Association (NMA) and CRA International- CRA International, *Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model* (April 8, 2008).

MRN-NEEM- CRA's macroeconomic model-focus on electric power sector

EPA- EPA/ADAGE and EPA/IGEM:

Environmental Protection Agency (EPA) EPA/ADAGE and EPA/IGEM: "Data Annex" available on the EPA website at http://www.epa.gov/climatechange/economics/economicanalyses.html

EPA's analysis of Lieberman Warner is the most extensive, using a number of different models, base cases, and sensitivities. We employ the same models used by CRS in their analysis of Lieberman Warner- EPA-ADAGE, EPA-ADAGE/TECH, EPA-IGEM, and EPA-IGEM/TECH.[164]

ADAGE- a computable general equilibrium (CGE) model developed by RTI International.

IGEM- a CGE model developed by Dale Jorgenson and Associates

EIA-NEMS:

Energy Information Administration - EIA, *Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007* (April 2008).

NEMS- EIA's macroeconomic modeling tool. EIA conducted a number of sensitivity analyses but we focus on their S.2191 core scenario.

CATF- NEMS:

Clean Air Task Force- Jonathan Banks, Clean Air Task Force, *The Lieberman-Warner Climate Security Act—S. 2191: A Summary of Modeling Results from the National Energy Modeling System* (February 2008).

NEMS- EIA NEMS model

Heritage:

The Heritage Foundation- William Beach, et al. *The Economic Costs of the Lieberman-Warner Climate Change Legislation.* The Heritage Center for Data Analysis (May 12, 2008)

Heritage employs a variety of models based on the U.S. Energy Model from Global Insight, Inc

[164] CRS Report RL34489, *Climate Change: Cost and Benefits of S.2191/S.3036*, by Larry Parker and Brent D. Yacobucci, p 1

MIT-EPPA

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability[165]</th><th>Allowance Cost</th><th>Job Impact</th><th>Effect on GDP (2005 Dollars)</th></tr>
<tr>
<td>No offsets[166], no subsidy[167]</td>
<td>- Limited Alternatives[168]

- No Offsets

- Banking[169]</td>
<td>No CCS subsidy

<table>
<tr><th>Year</th><th>GW Available</th></tr>
<tr><td>2015</td><td>0</td></tr>
<tr><td>2020</td><td>@10</td></tr>
<tr><td>2025</td><td>@10</td></tr>
<tr><td>2030</td><td>@42</td></tr>
</table>
Total[170]- 63GW</td>
<td>2020: $68.30
2030: $101.11</td>
<td>N/A</td>
<td>
<table>
<tr><th>Year</th><th>Base GDP (Billion)*</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)*</th></tr>
<tr><td>2020</td><td>$19,774</td><td>$19,637</td><td>-0.69%</td><td>$137</td></tr>
<tr><td>2030</td><td>$26,460</td><td>$26,377</td><td>-0.31%</td><td>$83</td></tr>
</table>
</td>
</tr>
<tr>
<td>15% Offsets
CCS Subsidy</td>
<td>- Unlimited Alternatives

- Limited Offsets

- Banking</td>
<td>CCS subsidy

<table>
<tr><th>Year</th><th>GW Available</th></tr>
<tr><td>2015</td><td>@10</td></tr>
<tr><td>2020</td><td>@17</td></tr>
<tr><td>2025</td><td>@59</td></tr>
<tr><td>2030</td><td>@148</td></tr>
</table>
Total- @236GW</td>
<td>2020: $58.24
2030: $86.21</td>
<td>N/A</td>
<td>
<table>
<tr><th>Year</th><th>Base GDP (Billion)*</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)*</th></tr>
<tr><td>2020</td><td>$19,774</td><td>$19,619</td><td>-0.78%</td><td>$155</td></tr>
<tr><td>2030</td><td>$26,460</td><td>$26,360</td><td>-0.38%</td><td>$100</td></tr>
</table>
</td>
</tr>
</table>

* Estimated

[165] Reflects the studies inclusion of a CCS subsidy (see footnote 3), and GW potential for CCS equipped technology for each year. CRS Report RL34489, *Climate Change: Cost and Benefits of S.2191/S.3036*, by Larry Parker and Brent D. Yacobucci, p 44. See Appendix A for additional information on technology assumptions

[166] **Offsets-** Emissions credits granted through activities not directly related to emissions from an affected source

[167] See Sec. 3601, S.2191- CCS Bonus Allowances

[168] **Alternatives-** Alternatives relate to generation by other sources. In cases with limited alternatives, this usually assumes that there is a limit on, or les availability, of alternative sources of energy.

[169] **Banking -** the limited ability to save allowances for the future, enabling a source to shift the balance of reductions over time

[170] Total refers to total cumulative potential output by 2030

ACCF/NAM-NEMS[171]

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost</th><th>Job Impact (Million)</th><th>Effect on GDP (2007 Dollars)</th></tr>
<tr><td>Low</td><td>- Somewhat limited alternatives

- Somewhat limited Offsets(Greater than 20% offsets)

- No Banking
*AEO 2008 oil prices</td><td>CCS build limits

2030: 25 GW (not annualized)</td><td>2014: $36.69
2020: $54.59
2030: $227.52</td><td>2014: -0.85
2020: -1.22
2030: -3.04</td><td>
<table>
<tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr>
<tr><td>2020</td><td>$19448</td><td>$19297</td><td>-0.80%</td><td>$151</td></tr>
<tr><td>2030</td><td>$24674</td><td>$24043</td><td>-2.60%</td><td>$631</td></tr>
</table>
</td></tr>
<tr><td>High</td><td>- Limited Alternatives

- Limited Offsets (15% to 20% offsets)

- No Banking
*AEO 2007 “High Profile Side Case” Oil Prices</td><td>CCS build limits

2030: 50 GW (not annualized)</td><td>2014: $38.36
2020: $64.28
2030: $271.27</td><td>2014: -1.86
2020: -1.80
2030: -4.05</td><td>
<table>
<tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr>
<tr><td>2020</td><td>$19448</td><td>$19238</td><td>-1.10%</td><td>$210</td></tr>
<tr><td>2030</td><td>$24674</td><td>$24005</td><td>-2.70%</td><td>$669</td></tr>
</table>
</td></tr>
</table>

CRA- MRN-NEEM

*AEO 2008 natural gas prices, electricity demand growth, non electric CO2 emissions
*Includes HR6

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost[172]</th><th>Job Impact (Million)</th><th>Effect on GDP (2007 Dollars)</th></tr>
<tr><td>Banking</td><td>- Unlimited Alternatives

- Limited Offsets (15% Domestic)

- Banking</td><td>Build limits
<table>
<tr><th>Year</th><th>GW Available</th></tr>
<tr><td>2015</td><td>2</td></tr>
<tr><td>2020</td><td>15</td></tr>
<tr><td>2025</td><td>30</td></tr>
<tr><td>2030</td><td>60</td></tr>
</table>
Total- 107GW</td><td>2015: $50.00
2020: $60.00
2030: $90.00</td><td>2015: -3.75
2030: -2.5</td><td>
<table>
<tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr>
<tr><td>2020</td><td>$</td><td>$</td><td>-1.20%</td><td>$</td></tr>
<tr><td>2030</td><td>$</td><td>$</td><td>-1.00%</td><td>$</td></tr>
</table>
</td></tr>
</table>

[171] ACCF/NAM in 2007 dollars
[172] CRA in 2007 dollars

EPA- ADAGE[173] and IGEM[174]

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost[175]</th><th>Job Impact</th><th>Effect on GDP (2005 Dollars)</th></tr>
<tr><td>ADAGE-REF</td><td>-Unlimited Alternatives Capped[176]

-Limited Offsets (Incl Intl)

- Banking</td><td>Subsidy
<table><tr><td>Year</td><td>GW Available</td></tr><tr><td>2015</td><td>0</td></tr><tr><td>2020</td><td>@23</td></tr><tr><td>2025</td><td>@47</td></tr><tr><td>2030</td><td>@94</td></tr></table>
Total- @165GW</td><td>2020: $37.40
2030: $60.60</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$19820</td><td>$19683</td><td>-0.69%</td><td>$137</td></tr><tr><td>2030</td><td>$26438</td><td>$26200</td><td>-0.90%</td><td>$238</td></tr></table></td></tr>
<tr><td>ADAGE-TECH[177]</td><td>- Unlimited Alternatives Capped

- Limited Offsets (Incl Intl)

- Banking</td><td>Subsidy
<table><tr><td>Year</td><td>GW Available</td></tr><tr><td>2015</td><td>0</td></tr><tr><td>2020</td><td>@23</td></tr><tr><td>2025</td><td>@9</td></tr><tr><td>2030</td><td>@56</td></tr></table>
Total- 89GW</td><td>2020- $28.30
2030- $46.00</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$19873</td><td>$19775</td><td>-0.50%</td><td>$99</td></tr><tr><td>2030</td><td>$26509</td><td>$26351</td><td>-0.60%</td><td>$158</td></tr></table></td></tr>
<tr><td>IGEM-REF</td><td>- Unlimited Alternatives Capped

- Limited Offsets (Incl Intl)

- Banking</td><td>N/A</td><td>2020-$51.00
2030-$83.00</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$19851</td><td>$19345</td><td>-2.55 %</td><td>$506</td></tr><tr><td>2030</td><td>$26713</td><td>$25910</td><td>-3.76 %</td><td>$983</td></tr></table></td></tr>
<tr><td>IGEM-TECH[178]</td><td>- Unlimited Alternatives Capped

- Limited Offsets (Incl Intl)

- Banking</td><td>N/A</td><td>2020- $45.00
2030- $73.00</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$19802</td><td>$19385</td><td>-2.10%</td><td>$417</td></tr><tr><td>2030</td><td>$26220</td><td>$25247</td><td>-3.60%</td><td>$947</td></tr></table></td></tr>
</table>

[173] ADAGE- a computable general equilibrium (CGE) model developed by RTI International
[174] IGEM- a CGE model developed by Dale Jorgenson and Associates
[175] EPA in 2005 dollars
[176] Nuclear power increase 150% by 2050
[177] TECH- refers to use of the "high technology basecase- benchmarked to AEO2006 High Technology Case

EIA-NEMS

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost[179]</th><th>Job Impact</th><th>Effect on GDP (2000 dollars)[180]</th></tr>
<tr><td>S.2191 Core</td><td>- Unlimited Alternatives

- Offsets Available (incl intl)

- Banking</td><td>Subsidy

<table><tr><td>Year</td><td>GW Available</td></tr><tr><td>2015</td><td>@8</td></tr><tr><td>2020</td><td>@16</td></tr><tr><td>2025</td><td>@24</td></tr><tr><td>2030</td><td>@16</td></tr></table>
Total- 64GW</td><td>2020- $30.00
2030- $61.00</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$</td><td>$</td><td>-0.30%</td><td>$43</td></tr><tr><td>2030</td><td>$</td><td>$</td><td>-0.30%</td><td>$59</td></tr></table></td></tr>
<tr><td>Limited Alternatives/No Intl Offsets</td><td>- Limited Alternatives- CCS not available until 2030, Nuclear and biomass limited to AEO2008 levels, LNG imports limited to AEO2008 levels

- No international offsets

- Banking</td><td>CCS not available by 2030</td><td>2020- $76.00
2030- $156.00</td><td>N/A</td><td><table><tr><td>Year</td><td>Base GDP (Billion)</td><td>Model GDP (Billion)</td><td>% Change</td><td>Value of loss (Billion)</td></tr><tr><td>2020</td><td>$</td><td>$</td><td>-0.90%</td><td>$141</td></tr><tr><td>2030</td><td>$</td><td>$</td><td>-0.80%</td><td>$163</td></tr></table></td></tr>
</table>

[178] Ibid
[179] EIA allowance costs reflect 2006 dollars
[180] EIA GDP in 2000 dollars

CATF- NEMS

*****EIA BTA

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost</th><th>Job Impact</th><th>Effect on GDP (2000 Dollars)</th></tr>
<tr><td>S.2191</td><td>- Unlimited Alternatives (constrained biomass)
- Offsets Available
- Banking</td><td>Subsidy
<table><tr><th>Year</th><th>GW Available</th></tr><tr><td>2015</td><td>@1</td></tr><tr><td>2020</td><td>@8</td></tr><tr><td>2025</td><td>@51</td></tr><tr><td>2030</td><td>@73</td></tr></table>Total- 133GW</td><td>2020- @$20.00
2030- @$45.00</td><td>N/A</td><td><table><tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr><tr><td>2020</td><td>$</td><td>$</td><td>-0. %</td><td>$</td></tr><tr><td>2030</td><td>$</td><td>@$17000</td><td>-0.7%</td><td>$</td></tr></table></td></tr>
</table>

The Heritage Foundation

<table>
<tr><th>Case</th><th>Assumptions</th><th>CCS Assumptions and Availability</th><th>Allowance Cost[181]</th><th>Job Impact (Thousands)</th><th>Effect on GDP (Indexed to 2000 price level)</th></tr>
<tr><td>Generous Assumptions</td><td>- Somewhat Limited Alternatives*
- Offsets available
- No Banking
*CCS and low carbon fuels on schedule</td><td>CCS available in all plants built after 2018</td><td>2020- $50.00
2030- $68.00</td><td>2015: 115
2020: -23
2030: -461</td><td><table><tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr><tr><td>2020</td><td>$15784.8</td><td>$15714.2</td><td>-0.45%</td><td>$70.6</td></tr><tr><td>2030</td><td>$20005.9</td><td>$19894.8</td><td>-0.55%</td><td>$111.1</td></tr></table></td></tr>
<tr><td>Reasonable Assumptions</td><td>- Limited Alternatives*
- Offsets available
- No Banking
*CCS constrained</td><td>No CCS before 2030</td><td>2020- $65.00
2030- $80.00</td><td>2014: -570
2020: -543
2030: -431</td><td><table><tr><th>Year</th><th>Base GDP (Billion)</th><th>Model GDP (Billion)</th><th>% Change</th><th>Value of loss (Billion)</th></tr><tr><td>2020</td><td>$15784.8</td><td>$15568.4</td><td>-1.30%</td><td>$216.4</td></tr><tr><td>2030</td><td>$20005.9</td><td>$19569.9</td><td>-2.18%</td><td>$436.0</td></tr></table></td></tr>
</table>

[181] Heritage in 2006 dollars

Appendix B – Assumptions

In the report, we look at a number of studies that project the future costs of a cap-and-trade program. It is not meant to be an affirmation or criticism of any of these studies- rather, it is meant to highlight the difficulties in understanding the impacts such a program could have on our economy and society. Long term projections of the future economic impacts of cap and trade should not be viewed as fact. Conversely, they should be viewed with a thoughtful skepticism. Cost projections, especially long-term, are speculative estimates that often reflect the author's assumptions or view of the world. The confluence of unforeseen factors - from availability of technology, to regulatory or policy changes, to construction costs- will have tremendous impact on future real-time pricing. But this does not mean we should ignore the findings these studies present because they can help us understand the sensitivity that a program will have to a variety of technical, economic, or behavioral assumptions.[182] An excellent way to look at this is to examine the impact of specific assumptions in the various models.

Impact of Technology and Availability of Alternatives

The varying assumptions used in these models demonstrate that the availability of advanced or new technology would have tremendous implications for the structure and impact of a cap-and-trade program. Table 1 illustrates the varying assumptions on the availability of CCS. The most striking example is the contrast between the two MIT studies. Clearly, the availability of a subsidy increases the potential for earlier deployment of a specific technology, in this case CCS. The earlier a technology is available, the greater impact it might have on reducing allowance costs. While it is difficult to predict what technology will be available and when, the comparative differences in these models illustrate the benefits.

Table 1. Assumptions about the Availability of CCS[183]
(in Gigawatts [GW])

	2015	2020	2025	2030	Total
ACCF/NAM/ NEMS-HIGH (build limits)	*not presented*	*not presented*	*not presented*	*not presented*	25
ACCF/NAM/ NEMS-LOW (build limits)	*not presented*	*not presented*	*not presented*	*not presented*	50
MIT/EPPA (no subsidy)	0	about 10	about 10	about 42	about 63
MIT/EPPA (subsidy)	about 10	about 17	about 59	about 148	about 236
NMA/CRA (build limits)	2	15	30	60	107
EPA/IPM (subsidy)	5	5	70	n/a	80
CATF/NEMS	about 1	about 8	about 51	about 73	133

[182] CONG. RESEARCH SERV., RL34489, CLIMATE CHANGE: COSTS AND BENEFITS OF S.2191/S.3036 44.
[183] *Id.*

(subsidy)					
EPA/ADAGE-REF (subsidy)	0	about 23	about 47	about 94	about 165
EPA/ADAGE-TECH (subsidy)	0	about 23	about 9	about 56	about 89
IA/NEMS (subsidy)	about 8	about 16	about 24	about 16	64

Source: [EPA/ADAGE and EPA/IPM: "Data Annex" available on the EPA website at http://www.epa.gov/climatechange/economics/economicanalyses.html MIT/EPPA: Sergey Paltsev, et al., "Appendix D" of Paltsev et al., *Assessment of U.S. Cap-and-Trade Proposals*, MIT Joint Program on the Science and Policy of Global Change (2007). EIA/NEMS: EIA, *Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007* (April 2008). CATF/NEMS: Jonathan Banks, Clean Air Task Force, *The Lieberman-Warner Climate Security Act—S. 2191: A Summary of Modeling Results from the National Energy Modeling System* (February 2008). ACCF/NAMS/NEMS: SAIC, *Analysis of the Lieberman-Warner Climate Security Act (S. 2191) Using the National Energy Modeling System (NEMS)*, report by the ACCF and NAM (2008). NMA/CRA: CRA International, *Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model* (April 8, 2008).
Note: GW estimates for MIT/EPPA and ADAGE calculated assuming a 90% capacity factor.]

Looking at this chart, one can see that models including a subsidy assume that CCS is available starting in 2015, and in increasingly greater amounts. As demonstrated below, rosy assumptions can lead to misleading allowance prices. In Table 2, we include the allowance price for the MIT studies referenced in Table 1 above.

Table 2- MIT Sensitivity Comparison

	2015	Allowance Price 2015	2020	Allowance Price 2020
MIT/EPPA (no subsidy)	0	56.14	about 10	68.30
MIT/EPPA (subsidy)	about 10	47.87	about 17	58.24

.
All other assumptions remaining constant, the MIT model assumes that the inclusion of a subsidy provides 10 GW of CCS capable technology in six years- reducing the allowance price by about $10. As pointed out on page 24 of our report, Secretary Chu has noted that it will take at least ten years to prove the viability of this technology, making the MIT assumption dubious, at best.

Similarly, model's assumptions about the availability of alternatives are informative of the impacts on cap-and-trade. Any cap-and-trade plan requires massive investment and roll-out of alternate sources of energy to off-set losses due to reduction in carbon intensive sources. The figures in Table 3, while not reflective of actual availability of alternatives, reflect the respective model's assumptions regarding factors such as need and consumer response. These are meant to be illustrative- as noted by CRS, "the interplay between nuclear power, renewables, and coal-tired capacity is a proxy for the need for a low-carbon source of electric generating capacity in the mid-to-long term."[184] For example, the CATF model, which has one of the lowest allowance costs in 2030, assumes that 104 GW of new nuclear power will be built by that date. If only half

[184] *Id.* at 42.

that nuclear capacity was built by 2030, all other things being constant, the CATF price projection would likely be much higher. This is just one example, from one study.

Table 3

Assumptions about the Construction of Generating Capacity and Allowance Cost Under S. 191 to 2030[185]

	Nuclear Power	Renewable Power	Natural Gas-fired	Coal with CCS	Allowance Cost-2030[186]
ACCF/NAM/ NEMS-HIGH	10 GW (limit)	6 GW/year (limit)	About 284 GW (built)	25 GW (limit)	$271.27
ACCF/NAM/ NEMS-LOW	25 GW (limit)	6 GW/year (limit)	About 269 GW (built)	50 GW (limit)	$227.52
MIT/EPPA	about 3-4 GW (built)	about 26 GW (built)	About 71 GW (built)	about 236 GW (built with subsidy)	$86.21
NMA/CRA	40 GW (limit)	130.5 GW (limit)	About 33 GW (built)	107 GW (limit)	$90.00
CATF/NEMS	104 GW (built)	54 GW wind power (built with subsidy) Biomass (constrained)	0	133 GW (built with subsidy)	$45.00
EPA/ADAGE-REF	about 71 GW (built)	about 58 GW (built)	Little	about 165 GW (built with subsidy)	$60.00
EPA/ADAGE-TECH	about 70 GW (built)	about 61GW (built)	Little	about 89 GW (built with subsidy)	$46.00
EIA/NEMS	264 GW (built)	112 GW (built)	77 GW (built)	64 GW (built)	$61.00
AEO 2007 baseline	12.5GW	12.4 GW	88.2 GW	145 GW (no CCS)	

Source: [EPA/ADAGE and EPA/IPM: "Data Annex" available on the EPA website at http://www.epa.gov/climatechange/economics/economicanalyses.html MIT/EPPA: Sergey Paltsev, et al., "Appendix D" of Paltsev et al., *Assessment of U.S. Cap-and-Trade Proposals*, MIT Joint Program on the Science and Policy of Global Change (2007). EIA/NEMS: EIA, *Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007* (April 2008). CATF/NEMS: Jonathan Banks, Clean Air Task Force, *The Lieberman-Warner Climate Security Act—S. 2191: A Summary of Modeling Results from the National Energy Modeling System* (February 2008). ACCF/NAMS/NEMS: SAIC, *Analysis of the Lieberman-Warner Climate Security Act (S. 2191) Using The National Energy Modeling System (NEMS)*, report by the ACCF and NAM (2008). NMA/CRA: CRA International, *Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model* (April 8, 2008).

Note: "Limit" is the maximum that the model assumes can be built—it is not necessarily the amount the model determined would be built. **"Built"** is the amount the model determined needed to be built. **"About"** is an estimate by CRS of the additional capacity necessary for the increased electricity production projected by the model between 2010 and 2030 under S. 2191 in the absence of capacity data being provided. The exception is where the natural gas-fired capacity was estimated from a chart. The estimates were calculated assuming an 80% capacity factor for biomass, 90% for nuclear

[185] *Id.* at 44.

[186] Cannot be viewed as a direct correlation due to alternate assumptions but can be helpful as a point of reference.

Conclusion

Any assumption, whether regarding availability, limits, and subsidies, or something as simple as population or annual GDP, can have a dramatic effect on the overall cost of a cap and trade system. We demonstrate this in the hopes of heightening the caution of those who seek to impose a very costly and potentially devastating program. We must pursue these measures with prudent expedience- relying on what is proven while inspiring the development of potential improvements.

Appendix C

Assumptions from CRS Report on Power Plant Costs and Characteristics

Power Plant Technology Assumptions[187]

(2008 $)

Energy Source	Technology	Overnight Construction Cost for Units Entering Service in 2015, 2008$ per kW[a]	Capacity (MW)	Heat Rate for Units Entering Service in 2015 (Btus per kWh)	Variable O&M Cost, 2008$ per Mwh	Fixed O&M, 2008$ per Megawatt	Capacity Factor
Pulverized Coal	Supercritical	$2,485	600	9,118	$4.68	$28,100	85%
Pulverized Coal: CC Retrofit	Subcritical	$2,192 (cost for CC retrofit only; original plant cost assumed to be paid off)	351	15,817	$16.15	$56,609	85%
Pulverized Coal: CC, New Build	Supercritical	$3,953	600	11,579	$14.32	$45,564	85%
IGCC Coal	Gasification	$3,359	550	8,528	$2.98	$39,459	85%
IGCC Coal: CC	Gasification	$4,774	380	10,334	$4.53	$46,434	85%
Nuclear	Generation III/III+	$3,682	1,350	10,400	$0.50	$69,279	90%
Natural Gas	Combined Cycle	$1,186	400	6,647	$2.05	$11,936	70%
Natural Gas: CC	Combined Cycle	$2,342	400	8,332	$3.00	$20,307	85%
Wind	Onshore	$1,896	50	Not Applicable	$0.00	$30,921	34%
Geothermal	Binary	$3,590	50	Not Applicable	$0.00	$168,011	90%
Solar Thermal	Parabolic Trough	$2,836	100	Not Applicable	$0.00	$57,941	31%
Solar Photovoltaic	Solar Cell	$5,782	5	Not Applicable	$0.00	$11,926	21%

Sources: Heat rates, O&M costs, and nominal plant capacities are generally from the assumptions to EIA's 2008 Annual Energy Outlook; also see the other tables in this Appendix. Capital cost estimates are based on a CRS review of public information on current projects except for plants with carbon capture; see Appendix B. Capital costs and heat rates are adjusted based on the technology trend rates used by EIA in the Annual Energy Outlook, except for wind (cost is held constant between 2007 and 2010, instead of the increase EIA shows due to site specific factors). EIA costs are adjusted to 2008 dollars using Global Insight's forecast of the implicit price deflator. Capacity factor for coal plants is from MIT, *The Future of Coal*, 2007, p. 128. Natural gas plants without carbon capture are assumed to operate as baseload units with a capacity factor of 70%; natural gas with carbon capture operates at an 85% capacity factor, based on the assumption that such a plant would not be built other than to operate at a high utilization rate. Capacity factor for wind from California Energy Commission, *Comparative Costs of California Central Station Electricity Generation Technologies*, December 2007, Appendix B, p. 67. Nuclear plant capacity factor reflects the recent industry average performance as reported in EIA, *Monthly Energy Review*, Table 8.1. Capacity factors for solar and geothermal from EIA, *Assumptions to the Annual Energy Outlook 2008*, Table 73.

Notes: CC = carbon capture; kWh = kilowatt-hour; Mwh = megawatt-hour.

a. Construction costs include the affect of cost reductions due to technology improvements from the 2008 base levels reported in **Appendix B** [CRS Report]

[187] CONG. RESEARCH SERV., RL34746, POWER PLANTS: COSTS AND CHARACTERISTICS (2008).