Prepared Statement of
Anne E. Smith, Ph.D.
for
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before the
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and the
Subcommittee on Energy and Environment
United States House of Representatives
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Mr. Chairman and Members of the Committee:

Thank you for your invitation to participate in today's hearing. I am Anne E. Smith, a Vice President of CRA International and leader of its Climate and Sustainability Group. Starting with my Ph.D. thesis in economics at Stanford University, I have spent the past thirty years assessing the most cost-effective ways to design policies for managing environmental risks, including cap-and-trade systems. For the past twenty years I have focused my attention on the design of policies to address climate change risks, with a particular interest in the implications of different ways of implementing greenhouse gas (GHG) emissions trading programs. I have analyzed and commented on the merits and issues with all the major climate legislation proposals that the U.S. Congress has proposed and deliberated over that period. I thank you for the opportunity to share my findings and climate policy design insights with you. My written and oral testimonies reflect my own research and opinions, and do not represent any positions of my company, CRA International.

The topic of today's hearing is the American Clean Energy and Security Act (ACESA), which is also referred to as the "Waxman-Markey Bill". The provisions in this Bill are extensive, and would remold US energy choices, energy infrastructure, individual lifestyles, distribution of wealth, size of government, international relations, and more. I will focus my testimony on the cost and functioning of the carbon market that is a core element of ACESA.

The Need to Focus on Cost Minimization in a GHG Policy

Achieving the degree of global greenhouse gas (GHG) emissions control that is necessary to significantly reduce the risks of climate change will be costly, no matter how it is done. To make such changes viable as a political and social matter demands a laser-like focus in climate policy on minimizing the costs of making a transition to a low-carbon economy. Policy practice and theory have demonstrated that market-based approaches offer the best prospects for minimizing cost of achieving regulatory goals.[1] Assurance of a transparent and efficient carbon market therefore should be a central concern in a climate policy. Focus on this concern should not be undermined or lost in the vast array of other climate policy needs such as international engagement, promotion of more effective energy research and development (R&D) design, and adaptation enhancement.

Mandates Provisions Undermine Cost Minimization

ACESA lacks this essential focus on assurance of a well-functioning and transparent market-based approach for the central task of promoting cost-effective private sector and consumer actions to transition to a much lower-carbon way of doing business and living. It contains the *de rigueur* provisions for a cap-and-trade system (in Titles III and VII). However, ACESA also layers on so many additional regulatory schemes that reflect the command-and-control mentality of yesteryear that no one can possibly expect the Bill as a whole to provide the kind of transparent and cost-effective regulatory environment that is ascribed to market-based policies.

Provisions in ACESA that are intended to force private sector GHG emissions reductions *separately* from the efficient, market-based incentives under the cap include:

- A renewable electricity standard for utilities (Title I, subtitle A)
- A low carbon fuel standard for transportation fuels (Title I, subtitle C)
- An energy efficiency resource standard for natural gas and electricity utilities (Title II, subtitle D)
- Building energy efficiency programs (Title II, subtitle A)
- Lighting and appliance energy efficiency programs (Title II, subtitle B)
- Transportation efficiency programs (Title II, subtitle C)
- Industrial energy efficiency programs (Title II, subtitle E)

By imposing the above set of mandates programs, ACESA would undermine the functioning of its own cap. Mandates *assume* that certain control actions are cost-effective; however, if these actions *are* cost-effective as a carbon reduction measure, they would occur under the cap-and-trade program anyway, unless there are extensive additional market failures. Inclusion of such mandates (and so many of them) in the Bill can thus be interpreted in one of two ways:

1. For those who believe that business and consumers are better able to identify what is good for themselves than is the government, the above provisions would only serve to increase costs of meeting a GHG target. At best, they would only force the private sector to do what it would choose to do anyway under the new carbon-pricing scheme, but with redundant oversight by the government that would entail substantial additional private sector and government administrative burdens to

[1]The theoretical basis dates back at least to Coase, Ronald (1960). "The Problem of Social Cost." *Journal of Law and Economics* 3(1): 1-44, while evidence from policy practice began to emerge from flexible, incentive-driven regulatory programs first initiated under the Clean Air Act during the 1970s such as the "Bubble Policy."

prove compliance. From the perspective of carbon market assurance, however, these mandates programs will increase the difficulty for businesses of predicting carbon prices for planning their GHG reduction strategies. Carbon price outcomes will become very difficult to interpret also. It will be difficult to know whether they reflect the economy's marginal cost of meeting the cap, or are being held low due to an excess of inefficient carbon reductions being forced into the economy through the mandates. In short, the carbon market will become less predictable and far less transparent.

2. The presence of so many mandates provisions in ACESA can alternatively be interpreted as an outright rejection of the belief that consumers and businesses respond rationally to price incentives. If this view is the justification for the many mandates provisions of ACESA, then one must ask what purpose there is for also having the cap-and-trade program in ACESA. A part of the answer may lie in the cap program's ability to generate large quantities of government revenues that can be used to divert private sector wealth towards the slew of additional projects, activities, and side payments that are ancillary to the task of reducing GHG emissions to ACESA's targets. In other words, the cap-and-trade provisions in ACESA exist primarily as a new form of tax, while the command-and-control provisions are intended as the primary means for driving emissions down.

Personally, and as an economist, I interpret the past thirty-some years of US experience with emissions trading for a variety of types of emissions as strong evidence that market-based approaches are the best way to achieve challenging environmental targets in the most affordable manner. Thus, I would recommend that each of the mandates provisions listed above be eliminated from the Bill, except if a strong case can be made that it serves some additional objective other than reducing carbon emissions. This will allow the power of market-based incentives to take the lead in guiding our nation down a cost-effective path towards a low-carbon economy.

Allowance Price Uncertainty and Price Volatility Undermine Cost Minimization

Even if the ACESA mandates provisions are removed, there remain some important concerns for how well the cap-and-trade provisions of Title III might function in this role. A primary concern for cap-and-trade for GHGs is the carbon price uncertainty and volatility. An important aspect of carbon market design would be assuring as much price stability and long-term credibility as possible.

While the price signals in cap-and-trade policies do help elicit a cost-effective and often innovative set of actions to meeting an emissions target, they do not offer any price certainty. Prices in all previous and existing allowance trading programs have exhibited substantial volatility, and this can be expected of GHGs as well.[2] Price volatility, however,

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[2] Some have argued that banking reduces price volatility. While it may reduce it, it certainly does not eliminate it. For example, the Title IV SO_2 market has experienced high volatility over the past two years, even though it has a large bank already in place. During 2005, SO_2 permit prices rose from about $600/ton to above $1600/ton, then plummeted to below $400/ton by the beginning of 2007. They dropped below $100/ton in mid-2008 when the court remanded CAIR . Additionally, banking offers little price stability at

is likely to have much greater generalized economic impacts with a CO_2 cap than for caps on SO_2 and NO_x. CO_2 is a chemical that is an essential product during the extraction of energy from any fossil fuel. As long as fossil fuels are a key element of our energy system (which they are now, and will remain for many years even under very stringent caps), any change in the price placed on GHG emissions will alter the cost of doing business throughout the economy. This is because all parts of the economy require use of energy to one degree or another.

In contrast, under the Title IV SO_2 cap, a fluctuating SO_2 permit price would only affect emissions from coal-fired electricity generation. In deregulated electricity markets, coal-fired electricity does not always affect the wholesale price of electricity, and even significant fluctuations in SO_2 permit prices might have almost no effect on electricity prices. Even in regulated electricity markets, the impact of the SO_2 price on the cost of all electricity generation would be diluted by the unaffected costs of all other sources of generation before it reached customers. Also in contrast to an economy-wide GHG cap, no other sources of energy in the economy are affected at all by SO_2 price changes. Finally, under the Title IV SO_2 cap, price variations experienced during the past four years from \$100/ton to \$1500/ton have a modest effect on the majority of coal-fired units that are already either scrubbed or burning low-sulfur coal. Such units might see the cost adder due to its SO_2 emissions vary between 1% and 26% of its base operating cost,[3] and (as noted) the impact on consumer's cost of electricity would be much smaller, if anything.

Variation of CO_2 prices have also been observed in the EU's Emissions Trading Scheme (ETS) market since its inception, as shown in Figure 1. Prices were notoriously wide-ranging during the initial learning period called "Phase I," between €0/ton and about €30/ton (about \$35/ton at the time). The ultimate decline of Phase I prices to \$0/ton was caused by the fact that Phase I allowances could not be banked into later phases, which had tighter caps under which those allowances could have retained positive value. Nevertheless, the range from €7/ton to €30/ton would probably have been experienced even if the Phase I allowances had been bankable. Indeed, the price range for Phase II allowances has also experienced that degree of variation, with recent lows of €8/ton compared to highs nearing €35/ton, occurring in two distinct cycles over the past four years. This continued volatility has occurred despite Phase II allowances being fully bankable. This range has caused coal-fired units to experience carbon cost adders that alternate from 50% to 230% of their base operating cost. This variability in EU ETS allowance prices has also caused gas-fired units to experience operating cost increases in the range of 5% to 30%.[4] Since gas-fired units frequently set the wholesale market price of

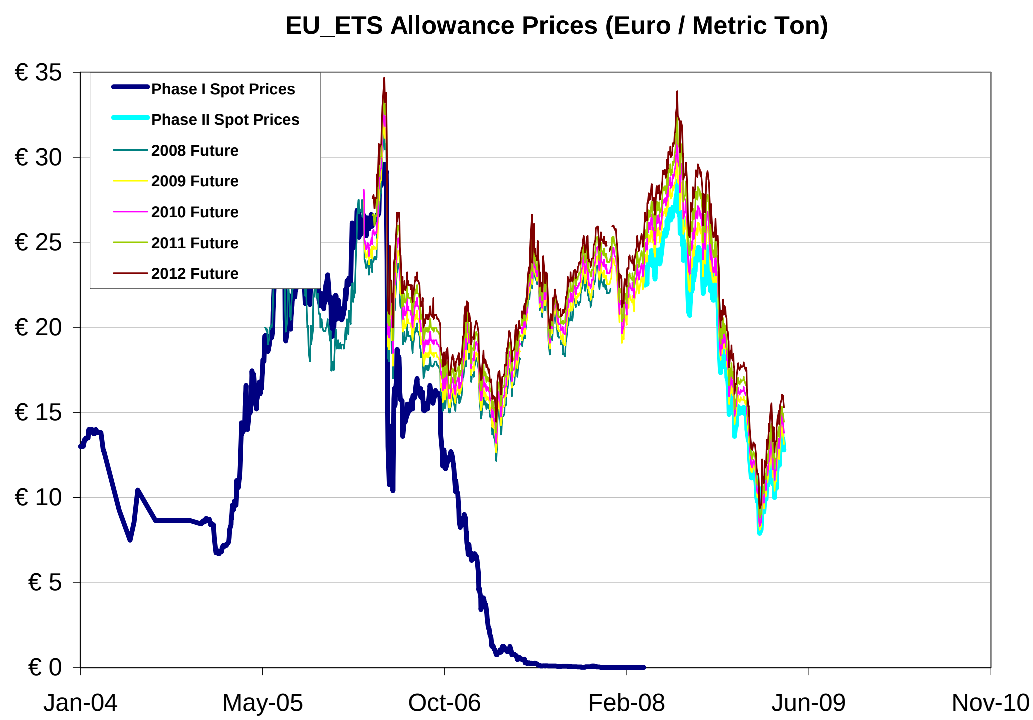
all during the start up of a new cap, simply because no bank yet exists, and this initial-period volatility can be very large if the first-period cap requires a substantial amount of reduction and/or has a relatively brief regulatory lead time. The experience of the first year in the NO_x cap of the Ozone Transport Region of the northeastern U.S. is a classic example.

[3] By "base" operating cost, I mean the cost of generating a unit of electricity before accounting for the emissions price. The majority of this cost is the cost of the fuel.

[4] The absolute cost adder of a gas plant is about half of the absolute cost increase for a coal plant, but the percentage increase in the base operating cost of gas plants is much smaller because natural gas is so much more expensive than coal to start with. These calculations assume that coal generation costs about €15/MWh, and gas generation about €60/MWh.

electricity, the pressure on retail electricity prices would also fluctuate with carbon price variations such as this.

Figure 1. Prices Experienced in the EU ETS's Phase I and II.



These are not just theoretical calculations. The EU's statistics bureau, Eurostat, reports that electricity prices rose significantly throughout the EU after the EU ETS started in 2005. Between 2004 (before the EU ETS prices were in effect) and 2007 (when Phase II was in place), household rates rose by 16% on average over all 25 EU countries, and industrial rates rose by 32% on average.[5] The high prices of GHG permits under the EU ETS during that period is widely viewed as having contributed to this price increase, and indeed, wholesale electricity prices have fluctuated in step with the wide swings in ETS permit prices. It is not clear yet how or whether the wide variations in permit prices may begin to contribute to variation in macroeconomic activity. Resolving that question will probably be rendered difficult by the disruptions of the global downturn in 2008-2009, which no one would suggest has any link to the EU ETS.

The EU ETS experience has also demonstrated that even very high carbon prices do not necessarily translate into a willingness of the private sector to make investments in new, lower-carbon technologies. Despite the fairly high average prices in the EU ETS, there has

[5] Eurostat data for medium households and medium-sized industry, downloaded on April 22, 2009 from: http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=en&product=REF_TB_energy&root=REF_TB_energy/t_nrg/t_nrg_price/tsier040.

been no serious degree of private sector investments in cleaner technologies.[6] The usual explanation for the failure of the EU ETS to motivate investments in clean energy technologies is the uncertainty its carbon price levels, and potential impermanence of the scheme. Even if investments in some clean technologies might be justifiable for the average carbon prices of about €20/ton that have been experienced over the past four years, they have not been forthcoming. Uncertainty on what the carbon price level will be – not just for the next few years but for 10 to 20 years into the future – appears to be inhibiting private sector investments in low-carbon technologies.

The EU's response to this outcome of low investment has been to focus on further government involvement and project subsidization. A simpler approach would be to devise a carbon emissions pricing scheme that would provide much greater certainty for businesses about carbon prices now and in the future. This could be done under a carbon cap through provisions to directly and transparently establish allowance price ceilings and price floors (e.g., a price "collar"). An even simpler and more certain approach within the toolkit of market-based measures would be to establish a carbon fee or price rather than through a carbon cap.[7]

Businesses clearly prefer having reliable allowance price expectations, but even governments would probably prefer some stability in the year to year revenue streams from an auction. For example, would large variability and uncertainty in allowance auction revenues be of any use if those revenues are intended to fund important technology-related projects that have long-term funding needs? Even if the revenues would simply be rebated to citizens, would either the government or the citizens find any value in such uncertainty in the size of the rebate checks?

Another potentially serious concern with volatility in carbon prices should also be mentioned here. When companies need to buy allowances to cover their emissions, as with a full auction, their new cash flow may be large compared to their current net revenue. For example, the cash needed by an electricity generating company that has a diversified mix of coal, gas and zero-carbon generation similar to the US average would face new outlays for allowance purchases of $35/ton allowances that are approximately 20% of its gross revenues, and perhaps 200% of its net revenues. Any delays in the pass-though of such costs to customers could seriously disrupt their financial position. Volatility exacerbates this situation by causing continual variations in the cash flow needs. For example, fluctuation in the allowance price between $15/ton and $50/ton would mean that the cash flow requirements might vary from 85% and 350% of pre-policy cash flows, thus even after price pass-through has occurred, delays in adjustments of the retail rates could

[6] The fairly high rate of investment in renewables such as wind and solar in Germany is traceable to the very high guaranteed returns known as "feed in tariffs" for such generation, and is not attributed to carbon prices.
[7] In fact, a cap-and-trade system with a well-defined, narrow price collar and a full auction will function just like a carbon fee, except that there remains some residual uncertainty about the ability of the market manager to defend the price collar, and there is substantially more complexity to the compliance requirements for covered businesses. While both of these market-based approaches would offer much greater planning certainty and hence potential investment in costly low-carbon technologies, neither would be popular with the financial community, which would face diminished prospects for selling their carbon market management services to the affected businesses.

translate into see-sawing profitability. Similarly, if a company has any substantial bank of allowances, it could face large swings in its balance sheet situation. Conditions such as these could translate into reduced credit ratings and companies facing more difficulties in raising capital for their investment needs. This possibility has not been studied at all yet, but certainly requires some careful study, including gaining an understanding of whether any potential financial impacts could be exacerbated by the greater use of allocations rather than free allocations of allowances. But the better solution is simply to eliminate the carbon price volatility, which is not in any way essential to the functionality of a market-based carbon reduction policy.

To sum up, price uncertainty and price volatility will impose impacts in the case of GHG emissions limits that are completely different in scale and scope from those under previous emissions trading programs. The US experience with other emissions caps and the EU ETS experience with carbon caps provide good reason to expect high volatility under a US carbon cap. Their potential to increase variability in overall economic activity thus should be viewed as a core concern in designing a GHG cap-and-trade program. At the same time, the nature of climate change risks associated with GHG emissions is such that it is possible to design price-stability into a GHG cap-and-trade program without undermining its environmental effectiveness. In the case of a stock pollutant such as greenhouse gases, there is no need to absorb high costs in return for great specificity in achieving each year's emissions cap.[8] Thus, the cost to businesses of managing the price uncertainty of a hard cap is not worth the greater certainty on what greenhouse gas emissions will be from year to year. The emissions certainty that is needed is the long-term reduction to a near carbon-free economy. That objective will have greater certainty under a cost-effective, affordable and non-disruptive policy that establishes a carbon price signal that is predictable and credible for decades to come.

ACESA Does Not Have Effective Provisions to Assure Price Certainty and Stability

ACESA does not contain any mechanism to assure price certainty or price stability. It contains provisions that are called as "cost containment" measures, but these measures do not provide any degree of price certainty and only minimal potential to diminish the degree of price volatility. For example:

- The provision for banking and constrained borrowing cannot eliminate volatility. For example, the SO_2 prices under Title IV of the Clean Air Act (described above) occurred despite the existence of a very substantial bank of allowances. The volatility in the EU ETS Phase II has also occurred despite the ability to bank Phase II allowances into future compliance periods.
- The provision for use of domestic and international offsets may reduce the overall level of allowance prices for the given cap stringency. However, they do not provide any kind of price certainty. Indeed, in the early years of the cap, a strong reliance on offsets to keep costs low could exacerbate price uncertainty and

[8] Richard G. Newell and William A. Pizer 2003, "Regulating Stock Externalities Under Uncertainty," *Journal of Environmental Economics and Management*, Vol. 45, pp. 416-432.

volatility. This is because offsets validation rules will probably remain uncertain for a period of time after enactment, and hamper the formation of a ready supply of verified allowances in time for the initial compliance periods. Thus early-year allowance prices may be relatively high, as if the policy had not allowed offsets at all, then a year or two later, once a flow of verified offsets is established, a glut of allowances may emerge, with allowance prices falling very low. This supply and attending offset pricing pattern was observed in the early years of the Clean Development Mechanism (CDM).

- The "strategic reserve" of allowances under the ACESA cap comes the closest to an attempt at diminishing allowance price volatility, but it will be insufficient to provide any expectation of a price ceiling. First, sales from the strategic reserve will have a floor price that is not established in advance of legislation. An *a priori* path of reserve prices would provide much greater certainty for planning purposes than one that is established on the basis of future, unknown, price outcomes. Second, the provision, by design, allows price increases of at least 100% before the reserve can even be used.[9] Thus, if prices have averaged about $35/ton during a three year period, they would have to suddenly increase to above $70/ton before the strategic reserve would even have a role to play. Further, prices might rise well above the 100% mark even in the presence of the reserve auction. The existence of a minimum price at which those allowances can be had does not offer any guarantee of where the prices will peak. If there is a severe shortage of allowances needed for compliance in a particular year, prices could be bid above the minimum price. Only if the quantity available for auction is very large relative to any potential compliance needs will the potential for prices to be bid higher than the reserve price be eliminated. Even if there were no bidding above the reserve prices, there is no good reason why price variations of up to 100% over a three-year period should have to occur at all, and such variations are quite substantial in their potential effects on prices of energy and other goods and services that embody energy.

Avoidance of Cap-and-Trade Is Not an Antidote for Price Volatility Concerns

The challenges of designing a GHG cap-and-trade system that has the promise of being efficient and fair have been daunting. Unfortunately, many in the policy community who have been facing this daunting task are now rejecting market-based approaches altogether. ACESA reflects this kind of reaction, with its emphasis on a large set of highly prescriptive regulatory programs, which leaves the market-based part of the Bill almost like window-dressing to mask the intrusive spirit of the overall bill. Each non-market provision will usurp some of the flexibility of decisions that are offered by market-based approaches like cap-and-trade. Once the flexibility is removed, it cannot be entirely regained if the mandate is found to have been an inefficient one – too many compliance-related investments will have become sunk costs in the interim. Further, each of these mandates provisions will result in not just higher, but hidden costs, as regulatory approaches are good

[9] That is, the minimum price (the "reserve price") in an auction of strategic reserve allowances is *double* the average price of allowances for that vintage in the preceding 36 months.

at doing. The costs to our economy and the losses in incremental innovations that are associated with market-based approaches will be large.

Modeled Cost Estimates of ACESA Will Unreliable If They Do Not Address the Bill's Many Barriers to Cost Minimization

Many model-based cost analyses, such as EPA's analysis of the costs of the policy released this week,[10] are poorly suited to estimating the costs of policies that are not predominantly market-based in nature. The EPA analysis is widely touted as predicting that ACESA will be very low-cost to meet, yet EPA's analysis has considered only the cap-and-trade provision, which by its nature is intended to deliver minimum costs. EPA explains that it has made no attempt to assess the costs of the mandates provisions listed above, even though such provisions can only cause increases from a *minimum* cost. This might not be a bad cost analysis for the GHG limits in the ACESA *if the cap provision were the primary regulatory requirement in the Bill*. But given that so much of ACESA is tied to command-and-control approaches, it is misleading to present EPA's analysis of just the cap provision in ACESA as even a "preliminary" estimate of the impacts of the GHG control requirements in the Bill.

It is also important to note that the EPA analysis makes no attempt at all to estimate the ways in which the volatility and price uncertainty of the cap will deviate from its estimated idealized *minimum* cost. EPA states that its analysis has not modeled the strategic reserve allowances, which some may interpret as meaning that EPA has not captured a provision that would reduce costs further than its estimate. The correct understanding of this omission, however, is that EPA's analysis has failed to address the costs of volatility,[11] and thus it *understates* costs. Even if the strategic reserve allowances provision would provide some degree of mitigation of volatility, the true costs when considering volatility would remain higher than EPA's current cost estimate that does not include any consideration of price volatility.

These may appear to be criticisms of EPA's analysis, but most of the available models for assessing policy costs of ACESA will face similar challenges. The current commonly-used models were designed to understand the relative costs of alternative market-based emissions policies. None are well-equipped to estimate the costs of policies that are predominantly command-and-control in nature, nor to address the costs of volatility. As additional analyses of the costs and impacts of ACESA are released, the realism of their estimates should be assessed by examining how well each analysis addresses the deviations from the least cost solution due to:

(a) mandates that are fixed by government planners who have less information about true costs than do individual business decision makers and consumers, and

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[10] U. S. Environmental Protection Agency, *EPA Preliminary Analysis of the Waxman-Markey Discussion Draft, The American Clean Energy and Security Act of 2009 in the 111th Congress*, April 20, 2009, available at http://www.epa.gov/climatechange/economics/economicanalyses.html.

[11] "The models used in this analysis do not include price volatility…for this reason the strategic reserve allowance has not been included in this analysis." (USEPA, *op. cit.*, Appendix, p. 4.

(b) the ways in which price uncertainty and price volatility degrade the ability businesses decision makers and consumers to always make the optimal investments.

ACESA Lacks Any Provisions for the Kind of Transformational R&D That Is Essential to Making a Low-Carbon Global Economy Affordable

My testimony has been focused on carbon market efficiency. However, even a highly effective and efficient market-based approach for GHGs will still have a serious limitation that ACESA should address, but does not. Stabilization of climate change risks will require that global GHGs be reduced to nearly zero levels. Although this goal may be possible to achieve at some point in the later part of this century, it can only be done through truly revolutionary technological progress and the resulting changes in the structure of how our energy systems.

Hoffert *et al.* report that "the most effective way to reduce CO_2 emissions with economic growth and equity is to develop revolutionary changes in the technology of energy production, distribution, storage and conversion."[12] They identify an entire portfolio of technologies requiring intensive R&D, suggesting that the solution will lie in achieving advances in many categories of research. They conclude that developing a sufficient supply of technologies to enable near-zero carbon intensity on a global scale will require basic science and fundamental breakthroughs in multiple disciplines. Therefore, Herculean technological improvements beyond those that are already projected and accounted for in cost models appear to be the only hope for achieving meaningful reduction of climate change risks. By inference, no cap-and-trade system should be placed into law that does not simultaneously incorporate specific provisions that directly support a substantially enhanced focus on energy technology R&D.

Placing a price on carbon emissions, as a cap-and-trade program would do, would affect the pattern of private sector R&D. However, this so-called "induced-innovation effect" would be small. Economic analysis shows that market forces produce a less than socially optimal quantity of R&D. Once a private sector innovator demonstrates the feasibility and profitability of a new technology, competitors are likely to imitate it. Copycats can escape the high fixed costs required to make the original discovery. Therefore, they may gain market share by undercutting the innovator's prices. In that case, the initial developer may fail to realize much financial gain. Foreseeing this competitive outcome, firms avoid investment in many R&D projects that, at the level of society as a whole, would yield net benefits.[13]

The task of developing new carbon-free energy sources is likely to be especially incompatible with the private sector's incentives. With no large emissions-free energy sources lying just over the technological horizon, successful innovation in this area will

[12]M. I. Hoffert *et al.*, "Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet" *Science*, Vol. 298, Nov.1, 2002, p. 981.
[13] These points are developed in a more rigorous fashion in W. D. Montgomery and Anne E. Smith "Price, Quantity and Technology Strategies for Climate Change Policy," in M. Schlesinger *et al* (eds.) *Human-Induced Climate Change: An Interdisciplinary Assessment*, Cambridge University Press, forthcoming 2007.

require unusually high risks and long lead times. As Hoffert *et al.* pointed out, developing the needed technologies will entail breakthroughs in basic science, placing much of the most essential R&D results beyond the boundaries of patent protection. These are precisely the conditions under which for-profit firms are least likely to rely on R&D as an approach to problem-solving. Thus, greenhouse gas caps on their own would insufficiently increase private sector R&D directed toward technological solutions to abatement.

Market-based policies can very effectively stimulate incremental innovation and deployment into the market place of emerging new technologies. They cannot, however, stimulate the kinds of technological progress necessary to enable meaningful emissions reductions later on. Realistically, then, government must play an important role in creating the correct private sector incentives for climate-related R&D, as well as in providing direct funding to support such activity. This role must be built into any cap-and-trade policy, in order to avoid establishing an emissions policy that cannot fulfill expectations, and to avoid wasteful diversion of key resources for the requisite forms of R&D.

Merely establishing cap and trade cannot meet the crucially important need for enhanced emphasis on basic research rather than additional subsidies for specific technologies that are already far along in the development process. It also does not clearly define government's role or an appropriate division of labor or risk between the public and private sectors in the development of new technologies, whether as commercialization and incremental improvement of existing low-carbon technologies, or R&D for new, breakthrough technologies. Creating an effective R&D program will not be easy, but it ultimately has to happen if climate risks are to be reduced. The difficult decisions are how much to spend now, and how to design programs to stimulate R&D that avoid mistakes of the past.[14]

In conclusion, the current policy debate about how to impose near-term controls through cap-and-trade programs is encouraging policy makers to neglect much more important, more urgently needed actions for reducing climate change risks. The top priority for climate change policy should be a greatly expanded government-funded research and development (R&D) program, along with concerted efforts to reduce barriers to technology transfer to key developing countries. Neither of these will be easy to accomplish effectively, yet they are receiving minimal attention by policy makers, and are not addressed at all in ACESA.

Summary

My testimony has been focused on the carbon reduction provisions of ACESA, and particularly on ways to ensure an effective carbon market that has the necessary emphasis on achieving GHG goals at lowest cost. In brief, I have identified ways that ACESA's regulatory provisions could be made more reasonable:

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[14] Arrow, Kenneth J., Linda R. Cohen, Paul A. David, Robert W. Hahn, Charles D. Kolstad, Lee Lane, W. David Montgomery, Richard R. Nelson, Roger G. Noll, Anne E. Smith (2008). "A Statement on the Appropriate Role for Research and Development in Climate Policy." AEI Center for Regulatory and Market Studies, Working Paper 08-12.

(1) Eliminate the costly provisions for mandates that will only interfere with the efficiency and transparency of the market-based approach, while unnecessarily increasing administrative burdens and government intrusion on private sector choices.

(2) Add provisions that will provide a more effective reduction or outright elimination of price uncertainty and price volatility.

(3) Incorporate explicit consideration for promotion of transformational energy R&D.

I have also noted that cost estimates for ACESA that come from modeling exercises that only consider the market-based provision's costs, and do so without addressing the impact of volatility, will significantly understate the true impact of this highly prescriptive Bill.