

Testimony at the hearing to examine “America’s Climate Security Act of 2007” before the Subcommittee on Private Sector and Consumer Solutions to Global Warming and Wildlife Protection of the Senate Committee on Environment and Public Works

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I wish to thank the chair of this subcommittee, Senator Lieberman, and the Ranking Minority Member, Senator Warner, for introducing the very comprehensive “America’s Climate Security Act of 2007” and for holding these hearings today. I also wish to thank Senator Boxer, the Chair of the full Committee on Environment and Public Works for her leadership in moving the issue of climate change forward on the legislative agenda.

I am Prof. William Moomaw. I am a chemist and policy scientist who is the Director of The Fletcher School Center For International Environment and Resource Policy at Tufts University. I have studied the implications of climate change and the options for dealing with it for the past 20 years. I have served as a lead author on the current and two previous Intergovernmental Panel on Climate Change Assessments and was a coordinating lead author examining the technological and economic potential to reduce emissions of the 2001 Report. I also served as a lead author of the Carbon Dioxide Capture and Storage Special Report.

As several thousand scientific research papers now demonstrate, and as the Intergovernmental Panel on Climate Change has confirmed, the earth is getting warmer, and it is with high certainty that a major cause is the billions of tons of heat trapping gases poured into the atmosphere each year. The United States releases nearly one-quarter of these gases, and it is clear that we must choose our strategy for reducing those emissions carefully so as to protect both the global climate system and the U.S. economy.

I would like to address briefly the following provisions:

- 1) Scope and timetables
- 2) Effectiveness of regulation points
- 3) Allocation of allowances and other incentives
- 4) Specific policies to effect reductions
- 5) Implementation and Enforcement
- 6) International Implications
- 7) Capturing economic opportunities

1) Scope and Timetables

This legislation recognizes that establishing a long-term target with annual benchmarks along the way is essential for creating a clear set of expectations. Hence setting a target for 2050, and identifying specific levels of allowances for each year is the best way to get the economy on track to a sustained low carbon future. Businesses can innovate and plan as can each citizen.

Several independent analyses find that if we are to have a reasonable probability of keeping global average temperatures from rising more than 3.6°F (2°C), above preindustrial levels, it will be necessary to keep atmospheric concentrations of carbon dioxide equivalents below 450ppm^{1,2}. To achieve this goal will require reducing U.S. emissions by at least 80% below current levels by mid-century along with comparable aggressive reductions in emissions by other nations. This will avoid the most severe impacts of global warming on the US economy^{3,4}. The lower we can draw down our emissions, the less we will have to pay for adaptation or outright damages from a significantly altered climate.

ACSA sets a reduction target of 70% for 2050 for covered sources, which currently represent about three-quarters of total U.S. GHG emissions. If emissions in these uncovered sectors increase, or even if they decrease at a slower rate than is required for covered sources, the level of economy-wide emissions reductions will be less than 70% in 2050. The legislation utilizes a complex set of policies to achieve reductions in these uncovered sectors, and it is difficult to estimate whether these policies will be as effective as a binding cap in achieving the same level of emissions reductions as in the capped sectors.

I welcome the requirement in ACSA for periodic reports by the National Academy of Sciences on the effectiveness of actions taken by the U.S. and other major emitting countries, as well as the availability and cost of climate-friendly technologies. I believe the EPA should be authorized to take appropriate action in response to these reports, such as modifying the emissions reduction requirements, expanding the scope of coverage, or revising the set of policies and incentives aimed at achieving emissions reductions in the uncapped sectors. Any such changes should be made through a formal rulemaking process; Congress would retain its existing authority under the Congressional Review Act to review and if necessary overrule, any such changes.

I would urge this committee to consider increasing the 2050 emissions reduction target to 80%. I would also encourage broadening the range of sources that are capped, in particular natural gas used for purposes other than electricity generation. The legislation regulates all of the known major heat trapping gases, and it would be appropriate to add authority for EPA to designate and control the release of any other gases that may later be found to have significant global warming potential.

2) Effectiveness of Intervention Points

Since energy use is diffused throughout the economy, it is important to find the most effective points for intervention. For fuels, this is as far upstream as possible. Hence addressing electric power generation by encouraging the use of low and zero carbon technologies or else removing carbon dioxide from the exhaust stream makes the most sense. Data have been assembled that demonstrate that an amount of electricity equal to 19% of current US production could be provided from currently available waste energy sources without releasing any additional carbon dioxide at costs in the range of a few cents per kilowatt hour⁵.

One result of my own research that is not reflected in the legislation is the potential to reduce emissions by 40% or more by removing the barriers to distributed energy systems that can provide electricity, heating and cooling. These systems can be installed in refineries, industrial parks, at universities, hospitals and business parks to generate electricity on site. Since typically more than half of the fuel energy from the burned fossil fuel is released as heat rather than as electricity, one can use that heat at the site for industrial purposes, or to provide hot water and space heating and cooling. Producing electric power where it is used also dramatically reduce the need for additional transmission and distribution wires, but any excess production can be sold and exported for use by the power utility and its customers. While we usually focus on the generation of electric power, approximately 54% of our capital investment is in the wires and systems that transmit and distribute that power.

I also have two suggestions for provisions in the legislation. The first is how new fossil fuel power plants are treated. Virtually all of America's old and inefficient fleet of existing power plants will be replaced over the next half century. The question is what will they be replaced with? As designed, the legislation allocates allowances for the entry of new coal burning power plants from the available number of allowances. This is important, but there is an opportunity with new plants to obtain even greater emissions reductions. This can be done by requiring higher levels of efficiency for new coal and other fossil fuel plants, requiring removal of carbon dioxide from the waste stream, or requiring the purchase of additional allowances to make new plants comparable to lower carbon dioxide emission sources. Without such additionality for new fossil power plants, the United States could lock-in higher emissions for an additional half-century.

The second suggestion is to expand the options for carbon dioxide removal from power plants and industrial processes. The technology of carbon dioxide capture and storage that is currently being considered is not the only option. While working on the IPCC Special Report on Carbon dioxide Capture and Storage, I learned of a system of biological capture of carbon dioxide from power plant stacks by algae that also removed large quantities of polluting nitrogen oxides. The algae produce over 50 times the biodiesel and ethanol per acre that traditional crops can produce with just a few percent of the water. These systems can be retrofitted to existing power plants and are being tested right now on large gas and coal plants. This process requires no transportation or long-term storage of carbon dioxide⁶. I do not know if this technology will be successful or if any other clever options will arise, but I would not want to see such options excluded because of a restrictive definition of "carbon dioxide capture and storage."

In trying to lower demand, it is important to set incentives and standards further downstream for end users. Based upon the research that I have done independently and jointly with expert colleagues in evaluations for the Intergovernmental Panel on Climate Change, there are several important opportunities that are in the bill, that can be strengthened.

First, the "low hanging fruit" on the demand side is in improving building efficiency. I know that Senator Lautenberg has taken a strong interest in strengthening building codes,

which is essential for achieving the overall goals of this legislation. My wife and I have just constructed a zero net energy home in Massachusetts. According to our contractor, building Energy Star homes that use just 70% of the energy of a code built house cost not a dollar more! Our house has received Energy Star certification that it will require less than 20% of the energy of a code built house. While our home cost a bit more to construct, the payback period decreases every day oil and other energy prices rise. Unfortunately, building our more comfortable, healthy house that does not contribute to global warming or our excessive dependence on fuels from unstable and hostile regions of the world did cost the US GDP. To meet our standards, we had to purchase doors, windows, energy-recovery ventilator and waste water heat recovery units from Canada, and most of our appliances from Europe. We almost could not purchase domestically made solar panels because they were all being shipped to Europe where the demand and high valued currency made this a more attractive market. In fact the European market is so attractive that this American company has announced it is building its new factory there instead of here.

The opportunity for domestic job creation has recently been well described by Van Jones, a community organizer in Oakland, CA, as quoted in a recent column by Thomas Friedman⁷. He points out that the more we require homes and offices to be more efficient, and require more solar panels and wind turbines, the more jobs will be created that can not be outsourced. “You can’t take a building you want to weatherize, put it on a ship to China and then have them do it and ship it back.” He argues that training of inner city youth to become what he calls “green collar” workers will show them that “You can make more money if you put down that hand gun and pick up a caulk gun. If you can do that, you just wiped out a whole bunch of problems.” He is right. This legislation can not only address climate change, but also enhance economic opportunities through the Energy Technology Deployment provision and create jobs through the Climate Change Worker Training program, which appears to be related to the efforts of Senator Sanders to increase the number of job opportunities in building a more efficient America.

So my recommendation is to make certain that the provisions for improving the performance of buildings through enhanced building codes and performance standards be strengthened. Since building to Energy Star standards seems to add no cost to construction and reduces energy use by 30% below building code standards, this could be implemented immediately. To be effective requires a program to train and certify contractors and building inspectors, and building supply industry should be encouraged to make new building technology available as soon as possible. I also support a program that would create a kind of Energy Extension Service to help homeowners and commercial building owners to initiate actions to retrofit their existing building. It is also essential that the provision in the bill that assures that states retain the right to enact stronger measures for buildings, power plants and transportation and that they be rewarded, remain in the final legislation.

3) Allocation of Allowances and Other Incentives

The legislation distributes many of the allowances based on past emissions, and only auctions some of them. While there may be situations where this would encourage more

rapid reduction of emissions, it is important to recognize that this is the same as handing out cash subsidies. Allowance may seem free because the Treasury does not print currency to issue them. But they are property that is just like a currency. I have seen some estimates that awarding allowances rather than auctioning them could give away value of the order of \$100 billion dollars per year for the first ten years of this program. This includes the allocations awarded to new fossil fuel power plant entries to the market. It is important to assess the implications of this and to decide whether it might not be better to capture more of this value as has been done in allocating the communications spectrum by increasing the fraction of allowances that are auctioned.

Specifically, I would encourage the committee to consider reducing the free allocation of allowances to the electric generation and industry sectors from the current 20% each to no more than 10% each, and to phase out such free allocations no later than 2025. This still would represent extremely generous transition assistance to these sectors. The allowances saved should be added to the pool allocated to the Climate Change Credit Corporation, to be auctioned with the revenues used for the various public purposes outlined in the bill

Offsets can play a useful role in lowering the cost of making the transition to a low carbon economy. The bill tries to assure that offsets actually achieve real reductions through a high level of certification and verification. I have advised one firm in the voluntary offset business and another that is planning to start up, and have emphasized the importance of transparency, additionality and verifiability of real reductions through offsets. A colleague of mine at Tufts University has done a careful analysis of air travel offset firms and ranked them. Another analysis was conducted by an organization on whose Board I serve. I realize that voluntary offsets are not considered in this legislation but refer the Committee to those studies to see the potential for using offsets and how to avoid problems with them^{8,9}. My recommendation is that offsets be specifically designated for activities where it is difficult to reduce emissions. To assure that real reductions are achieved through offsets, the legislation establishes procedures for identifying qualifying offsets that would count towards reduction commitments.

4) Specific Policies to Effect Reductions

An important component of the proposed legislation is that after setting targets and goals, it establishes specific policies to move the economy in the direction of lower heat trapping emissions. I have already alluded to the enhanced new building code standards that should be complimented by a system of enhancing the efficiency of existing buildings and certifying the performance of all buildings so that buyers and renters will have “truth in energy use.” The provisions in the legislation for improving the efficiency of heating and cooling equipment can be made more explicit to include appliances and end use efficiency through continuous improvement, and performance based standards. It is useful to remember that the standard, large American refrigerator of 1973 used 4 times as much electricity as today’s Energy Star model (which is 10% larger) because of ever-tightening appliance standards. The efficiency of this appliance could be doubled again.

Policies that encourage new technological innovations will assure that American products are the best and most desired in the world. Including incentives for improved private and public transportation systems and the reduction of sprawl will take time to implement, but they are essential for reducing our emissions in the long term. Rewarding early action is especially important in creating incentives for others to act quickly as well. Since the half-life of carbon dioxide is approximately a century, it may be useful to give larger incentives to actions initiated in the earlier years (before 2020) so as to avoid releasing these gases in the near term.

5) Implementation and Enforcement

The legislation has a complex set of mechanisms including a Carbon Efficiency Board, domestic and international offset credits and the potential for borrowing from future emission allowances and paying back with interest. As the legislation moves forward, some assessment of the implementation costs and ability to enforce all of these provisions might be made. It is difficult to assess at this time the ease or difficulty or the relative effectiveness of all of these multiple moving parts. Perhaps, there could be a built in assessment process within the provision of the role of the NAS to evaluate the different provisions for effectiveness in achieving their goals.

6) International Implications

There is understandable concern over what action other nations will take to address climate change, and what will be the outcome of the negotiations that begin in December in Indonesia. Just 15 years ago this month, the United States Senate took decisive action to unanimously ratify the UN Framework Convention on Climate Change. The convention was signed by President George H.W. Bush at the Rio summit, and submitted by him to the Senate for ratification. The United State was the fifth nation of what are now 192 nations to ratify this important treaty. Among the important provisions of this agreement is that industrial nations should lead the way in addressing climate change, and should work with developing countries to meet their common but differentiated responsibilities” to do the same. Unfortunately, little has been done by any industrial country to implement this goal, and as a result most nations have been adding increasing amounts of heat trapping greenhouse gases to the atmosphere. It is important to our nation’s interest as well as to the global climate system that the United States enter the discussions in December from a position of strength. We will have much more credibility over the coming years of negotiation if we have taken the lead to create policies that will reduce our emissions of greenhouse gases. This action more than any other will encourage developing countries to take the issue seriously and work with us to redirect their development away from a form that threatens the atmosphere just as we will be doing.

7) Capturing Economic Opportunity

While we cannot expect a free ride for this energy transition, it is important to note that economic studies are finding that the cost of addressing climate change is in the range of 1% of GDP. There are many ways to achieve the 3% annual reductions required to meet the emission reduction goals needed to keep heat trapping gas concentrations within 450 ppm carbon dioxide equivalents¹⁰

It may also be useful to look to history. The United States has undergone a similar energy revolution just 100 years ago. Soon after Thomas Edison invented the electric lamp, the New York Times editorialized that while it was a clever invention, it would find only limited use, and could not compete with cheap gas lamps.

By 1905, 3% of US homes had electricity, and Henry Ford started producing Model T cars on his assembly line. Who could have imagined then that by the mid-twentieth century virtually every American home would have electricity and lighting, and that the automobile would redefine American lifestyles as suburban living? Fast forward to 2005. Just under 3% of electricity was generated by non-hydro renewable sources. There were just a handful of efficient gasoline-electric hybrid vehicles in the market place. Does it seem so impossible that by mid-twenty-first century after all existing power stations have been replaced and all existing vehicles will have been replaced three times over, that a low carbon future could be a reality that is economically viable? To achieve such a transformation will require forward-looking legislation of the type that is being proposed today.

I encourage Senator Lieberman and Senator Warner to continue strengthening this legislation to address some of the points that I and other witnesses have raised so that we can reduce our risks from climate change, enhance our economic and national security, strengthen our hand internationally and create the New American Economy.

I wish to thank the Senators for this opportunity, and look forward to working with them and other members of this committee to enact effective climate protection legislation.

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