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ADDRESSING PRICE VOLATILITY IN CLIMATE CHANGE LEGISLATION

HEARING

BEFORE THE

COMMITTEE ON WAYS AND MEANS
U.S. HOUSE OF REPRESENTATIVES

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ADDRESSING PRICE VOLATILITY IN CLIMATE CHANGE LEGISLATION

THURSDAY, MARCH 26, 2009

U.S. HOUSE OF REPRESENTATIVES,
COMMITTEE ON WAYS AND MEANS,
Washington, DC.

The Committee met, pursuant to notice, at 10:16 a.m., in room 1100, Longworth House Office Building, Hon. Charles B. Rangel (Chairman of the Committee) presiding.

[The advisory announcing the hearing follows:]

ADVISORY

FROM THE COMMITTEE ON WAYS AND MEANS

FOR IMMEDIATE RELEASE
March 19, 2009
FC–5

CONTACT: (202) 225–1721

Chairman Rangel Announces Hearing on Addressing Price Volatility in Climate Change Legislation

House Ways and Means Committee Chairman Charles B. Rangel today announced that the Committee on Ways and Means will continue its series of hearings on climate change. **The next hearing will take place on Thursday, March 26, 2009, in 1100 Longworth House Office Building, beginning at 10:00 a.m.**

In view of the limited time available to hear witnesses, oral testimony at this hearing will be from invited witnesses only. However, any individual or organization not scheduled for an oral appearance may submit a written statement for consideration by the Committee and for inclusion in the printed record of the hearing. A list of invited witnesses will follow.

BACKGROUND:

During the 110th Congress, the Committee on Ways and Means began a series of hearings on climate change. In the first hearing, the Committee heard testimony that human greenhouse gas emissions are having an adverse impact on our planet's climate. In the second hearing, the Committee heard testimony from numerous witnesses recommending that Congress implement revenue measures (e.g., auction-based cap-and-trade proposals or carbon taxes) that would reduce human greenhouse gas emissions. In connection with the development of these revenue measures, witnesses at this hearing also encouraged the Committee to (1) promote a comprehensive global effort to address climate change and to ensure a level regulatory playingfield for U.S. manufacturers, (2) mitigate higher energy costs borne by consumers, (3) maximize the impact that climate change legislation will have on growing the U.S. economy, and (4) maintain the competitiveness of U.S. businesses, farmers and workers.

During the 111th Congress, the Committee continued this series of hearings by holding a hearing on the scientific objectives of climate change legislation. This hearing provided a discussion of the goals that climate change legislation should seek to achieve from a scientific perspective over both the short term and the long term. Furthermore, the Subcommittee on Income Security and Family Support held a hearing on protecting low- and moderate-income families while curbing global warming, and the Subcommittee on Trade has announced a hearing on the trade aspects of climate change legislation.

In announcing this hearing, Chairman Rangel said, **"As we develop climate change legislation, we must ensure that the program is structured to achieve specific environmental goals at the lowest possible cost to the economy and consumers."**

FOCUS OF THE HEARING:

The hearing will focus on a discussion of the ways that climate change legislation can be designed to reduce or eliminate price volatility while still achieving specific science-based environmental objectives.

DETAILS FOR SUBMISSION OF WRITTEN COMMENTS:

Please Note: Any person(s) and/or organization(s) wishing to submit for the hearing record must follow the appropriate link on the hearing page of the Committee website and complete the informational forms. From the Committee homepage, *http://waysandmeans.house.gov*, select "*Committee Hearings*". Select the hearing for which you would like to submit, and click on the link entitled, "*Click here to provide a submission for the record.*" Once you have followed the online instructions, complete all informational forms and click "submit" on the final page. ***ATTACH*** your submission as a Word or WordPerfect document, in compliance with the formatting requirements listed below, by close of business **Thursday, April 9, 2009**. Finally, please note that due to the change in House mail policy, the U.S. Capitol Police will refuse sealed-package deliveries to all House Office Buildings. For questions, or if you encounter technical problems, please call (202) 225–1721.

FORMATTING REQUIREMENTS:

The Committee relies on electronic submissions for printing the official hearing record. As always, submissions will be included in the record according to the discretion of the Committee. The Committee will not alter the content of your submission, but we reserve the right to format it according to our guidelines. Any submission provided to the Committee by a witness, any supplementary materials submitted for the printed record, and any written comments in response to a request for written comments must conform to the guidelines listed below. Any submission or supplementary item not in compliance with these guidelines will not be printed, but will be maintained in the Committee files for review and use by the Committee.

1. All submissions and supplementary materials must be provided in Word or WordPerfect format and MUST NOT exceed a total of 10 pages, including attachments. Witnesses and submitters are advised that the Committee relies on electronic submissions for printing the official hearing record.

2. Copies of whole documents submitted as exhibit material will not be accepted for printing. Instead, exhibit material should be referenced and quoted or paraphrased. All exhibit material not meeting these specifications will be maintained in the Committee files for review and use by the Committee.

3. All submissions must include a list of all clients, persons, and/or organizations on whose behalf the witness appears. A supplemental sheet must accompany each submission listing the name, company, address, telephone, and fax numbers of each witness.

Note: All Committee advisories and news releases are available on the World Wide Web at *http://waysandmeans.house.gov*.

The Committee seeks to make its facilities accessible to persons with disabilities. If you are in need of special accommodations, please call 202–225–1721 or 202–226–3411 TTD/TTY in advance of the event (four business days notice is requested). Questions with regard to special accommodation needs in general (including availability of Committee materials in alternative formats) may be directed to the Committee as noted above.

Chairman RANGEL. The Committee and the hearing will come to order. I want to thank our invited guests for lending us their expertise as we move forward with this historic mission.

The CBO director, Douglas Elmendorf, will give his testimony, as traditionally done, singly on the panel. But before we go into questions, the additional panel members will join him, and he is willing to remain in his seat and be a part of the six-witness panels as they give their testimony.

I think it is safe to say that we are embarking on waters that have been uncharted and that, indeed, this is a historic move on this Committee's part, the House, and hopefully the country. It is not that well known as to the dangers and increase of cost of making certain we have climate control. I think in our initial panels,

it was abundantly clear that gas emissions is having a severe, dangerous, adverse effect on our planet.

We have had hearings where the scientific objectives of climate control has been heard. I think that there is very little controversy in terms of the accepted scientific directions in which we curb global warming.

We have had our Trade Committee look into the costs of bringing some equity in terms of the costs and commitment of foreign countries with their imports, as well as given incentives to American companies that export.

Now we get to a part as to how can people depend on the costs or the method of climate control, whether or not there is going to be a new commodity market, how the private sector can have some degree of confidence that we are not going to be changing the rules, whether we create a derivative market, and what is the impact of the different directions that we take. Whether we call it cap and trade or carbon tax, ultimately we know that it is going to be a tremendous expense in doing what we believe has to be done.

So I yield now to David Camp to get his views, and look forward to hearing the witnesses.

Mr. CAMP. Well, thank you very much, Mr. Chairman. I look forward to our witnesses as well, and want to welcome them to the Committee.

The issue of price volatility and climate change legislation is a critical issue for the Committee to consider. I am pleased the full Committee and the relevant Subcommittees are taking the appropriate time to study the complex issues of cap and tax.

Many of our witnesses today will get into great detail about the varying methods to deal with volatility. But there is a larger issue I would like to raise, and that is the certain impact on American families, especially the increase in electricity rates they will face under the President's proposal.

At this time, I would like to submit for the record a state-by-state analysis of annual increases in electricity costs that would occur under a 100 percent auction, as the President has called for to meet the President's target carbon emissions reductions.

Chairman RANGEL. Without objection.

The information referred to follows:

COMMITTEE ON
WAYS AND MEANS REPUBLICANS
DAVE CAMP, RANKING REPUBLICAN

Annual Increase in Electricity Costs

(based on the Stern Review's recommended carbon price of $85 per ton)

State	Total Increase in Electricity Prices (in millions)	Per Capita Increase in Electricity Costs
Alabama	$7,124.6	$1,528.26
Alaska	$367.5	$535.49
Arizona	$4,365.3	$671.57
Arkansas	$2,240.6	$784.69
California	$4,647.8	$126.45
Colorado	$3,471.5	$702.81
Connecticut	$981.0	$280.19
Delaware	$19.9	$22.79
District of Columbia	$578.4	$977.30
Florida	$11,077.6	$604.40
Georgia	$7,586.5	$783.26
Hawaii	$767.6	$595.87
Idaho	$113.4	$74.42
Illinois	$8,567.2	$664.04
Indiana	$10,378.0	$1,627.46
Iowa	$3,417.6	$1,138.23
Kansas	$3,199.6	$1,141.84
Kentucky	$7,677.1	$1,798.23
Louisiana	$4,853.6	$1,100.39
Maine	$599.9	$455.69
Maryland	$2,832.7	$502.82
Massachusetts	$2,279.6	$350.82
Michigan	$6,691.7	$668.94
Minnesota	$3,304.7	$633.04
Mississippi	$2,137.4	$727.35
Missouri	$6,785.5	$1,147.83
Montana	$1,661.7	$1,717.63
Nebraska	$1,876.7	$1,052.30
Nevada	$2,206.1	$848.45
New Hampshire	$694.1	$527.51
New Jersey	$1,793.8	$206.60
New Mexico	$2,782.9	$1,402.42
New York	$5,137.8	$263.61
North Carolina	$6,450.7	$699.46
North Dakota	$2,790.8	$4,350.56
Ohio	$11,205.6	$975.60
Oklahoma	$4,373.3	$1,200.68
Oregon	$762.1	$201.08

Pennsylvania	$10,770.6	$865.23
Rhode Island	$221.2	$210.51
South Carolina	$3,473.7	$775.41
South Dakota	$280.5	$348.80
Tennessee	$5,090.0	$819.00
Texas	$21,986.2	$903.78
Utah	$3,052.4	$1,115.47
Vermont	$1.2	$1.93
Virginia	$4,055.2	$521.97
Washington	$1,267.1	$193.47
West Virginia	$7,207.6	$3,972.29
Wisconsin	$4,587.4	$815.11
Wyoming	$3,861.6	$7,249.54

Source: Committee on Ways & Means Republican Staff analysis

Mr. CAMP. In my home state of Michigan, electricity price increases total $6.7 billion, $668 for every man, woman, and child, $2,676 for a family of four. Those are staggering costs for a family to pay, especially in these already difficult economic times.

We have price information for every state and broken down for every Member of the Committee so you can see the impact on your constituents. Let me just say in almost every case, these increases in electricity rates alone would exceed the full Make Work Pay benefit.

I know some will say this analysis doesn't take into account everything. You are right. This doesn't even begin to consider price fluctuations in other utilities, let alone goods and services. This is simply the impact of cap and tax on electricity prices alone.

No one—I repeat, no one—is arguing against reducing carbon emissions. Each of us in this room, including those from coal states, has long advocated for the greater use of clean, renewable energy sources.

In fact, with the help of this Committee and when Republicans were in charge of Congress, we implemented clean renewable energy bonds; tax credits for production of wind, solar, and advanced nuclear power; energy-efficient new homes tax credit; energy-efficient appliance tax credit; alternative motor vehicle fuel tax credit, one I worked very hard on; alternative fuel vehicle refueling property tax credit; tax credits for biodiesel and renewable diesel used as fuel; tax credit for residential energy-efficient property. We also continue to support the environmental goods and services negotiations in the WTO, which would further slow emissions without penalizing American workers.

These incentives are making a difference. If you look at the latest scientific data available, U.S. emissions have been relatively flat and even decreased in 2006, the last year for which data is available. That was despite a booming economy in those years.

So, my question today is this: When carrots work, why is the Committee so readily resorting to the stick? The severe costs and penalties of the cap and tax system will cause hardships for American families and eliminate American jobs, as Dr. Margo Thorning, the senior vice president and chief economist with the American Council for Capital Formation, will testify.

Mr. Chairman, I will repeat and I have said in the past, and something every expert agrees to, unilateral action by the U.S. will not impact climate change, but it will put millions of Americans out of work. This is not a solution, let alone one this Committee should endorse.

With that, I yield back the balance of my time. Thank you.

Chairman RANGEL. Dr. Elmendorf, we appreciate especially, and we agree with you, the great work that is done by the Congressional Budget Office. We thank you for taking time out to share your professional views with us.

As you know, unfortunately, we limit the witnesses to 5 minutes. But certainly we want you to rest assured that we would want to get as much from you as we can during that limited time. Then after you conclude your testimony, we would ask you to remain with the rest of the panel.

You can proceed. You know the method of the lights and the 5 minutes as best as anyone else. Thank you so much for being with us.

STATEMENT OF DOUGLAS ELMENDORF, DIRECTOR, CONGRESSIONAL BUDGET OFFICE

Mr. ELMENDORF. Thank you, Chairman Rangel, Ranking Member Camp, and Members of the Committee. I appreciate the invitation to talk with you today about ways to reduce the economic cost of a cap and trade program for greenhouse gas emissions by increasing flexibility in the timing of the emission reductions. Analysts have developed a number of options for increasing timing flexibility, and my testimony reviews the advantages and disadvantages of some leading options.

Accumulating evidence about the pace and potential extent of global warming has heightened policy-makers' interest in cost-effective ways to achieve substantial reductions in emissions of greenhouse gases. Although the potential damage from climate change is large, the potential cost of avoiding change is large as well.

Many analysts agree that putting a price on carbon emissions rather than dictating specific technologies or changes in behavior would lead households and firms to reduce emissions where and how it was least costly to do so. Allowing flexibility about when emissions were reduced would lower costs further because changes in weather, fuel markets, and other factors lead the costs of the emissions reduction to vary substantially from year to year.

Moreover, this flexibility in timing can be achieved without lowering the benefits of emission reduction because climate change depends not on the amount of greenhouse gases released in a given year, but on the buildup in the atmosphere over decades.

Let me make five points about incorporating flexibility in the timing of emission reductions. First, permitting firms to bank allowances—that is, save allowances for the future—has helped lower compliance costs in existing cap and trade programs. However, the cost savings from banking are limited by firms' difficulty in distinguishing between temporary and permanent factors affecting allowance prices.

Indeed, existing cap and trade programs that use banking still experience volatility in allowance prices that appears to be greater than can be explained by changes in expectations about future compliance costs.

The first figure shows allowance prices in the acid rain program where prices varied from less than $75 to more than $200 in roughly 3 years. Similarly, allowance prices in the European Union's emission trading scheme have varied considerably over time, even though banking and some limited borrowing are allowed. This figure shows that prices started 2008 at less than $20, rose to over $28, dropped to roughly $16 by the end of last year, and continue to fall in the beginning of this year.

My second point is that permitting firms to borrow future allowances, as well as to bank them, could further lower compliance costs. However, existing cap and trade programs typically preclude borrowing, in part because of concerns that firms that borrow allowances might be unable to pay them back later.

The third key point is that permitting firms to purchase allowances from a public reserve pool composed of allowances that were borrowed from future years or that supplemented the initial supply could partially substitute for borrowing by individual firms.

The reserve pool could help reduce costs by giving firms the opportunity to exceed annual caps in years when the cost of complying was temporarily high. Its effectiveness in realizing cost savings would depend on the size of the pool and the threshold price at which firms could purchase the reserve allowances.

Fourth, setting a floor and ceiling for the price of allowances would also lower a firm's compliance costs, but it would not ensure a particular level of emissions in the end.

Fifth, a so-called managed price approach could allow for substantial cost savings by eliminating short-term volatility in the price of allowances, while accommodating longer-term shifts in prices that would be necessary to keep emissions within a long-term cap. In the managed price arrangement, firms could purchase allowances from the government each year at a price specified by regulators. The policy would be similar to a tax in that respect.

However, the policy is like a cap and trade program in other key respects. Policy-makers could choose to distribute some allowances for free. They could allow firms to comply by purchasing offsets or credits for emissions reductions made in sectors not covered by the cap. Cumulative emissions over a period of several decades would be capped.

To implement this approach, regulators would establish a path of rising prices for allowances, with a goal of complying with the cumulative cap that legislators had set. That path would be adjusted periodically if new information indicated that future compliance costs were going to be higher or lower than anticipated, or progress in meeting the cumulative cap was less than expected.

In conclusion, let me emphasize the main theme of my testimony. The more flexibility that is granted regarding the timing of emission reductions, the less short-term volatility in the price of emissions and the lower the cost of meeting any given emissions target. Thank you.

[The prepared statement of Mr. Elmendorf follows:]

Statement of Dr. Douglas Elmendorf, Director, Congressional Budget Office

Congressional Budget Office

Testimony

Statement of
Douglas W. Elmendorf
Director

Flexibility in the Timing of Emission Reductions Under a Cap-and-Trade Program

before the
Committee on Ways and Means
U.S. House of Representatives

March 26, 2009

This document is embargoed until it is delivered at 10:00 a.m. (EDT) on Thursday, March 26, 2009. The contents may not be published, transmitted, or otherwise communicated by any print, broadcast, or electronic media before that time.

CONGRESSIONAL BUDGET OFFICE
SECOND AND D STREETS, S.W.
WASHINGTON, D.C. 20515

Chairman Rangel, Ranking Member Camp, and Members of the Committee, thank you for the invitation to discuss ways to reduce the economic cost of a cap-and-trade program for greenhouse-gas emissions. That cost would depend importantly on firms' flexibility in the timing of their emission reductions. Analysts have developed a number of options for increasing timing flexibility, and this testimony reviews the advantages and disadvantages of leading options.

Accumulating evidence about the pace and potential extent of global warming has heightened policymakers' interest in cost-effective ways to achieve substantial reductions in emissions of greenhouse gases. Although the potential damage from climate change is large, the potential cost of avoiding change is large as well. Meaningfully reducing the risk of damage would require that the United States and other nations make fundamental changes in the way that energy is produced and used. Those changes could include replacing carbon dioxide-emitting fossil fuels with appropriate renewable fuels or nuclear power; reducing energy use, perhaps through major gains in energy efficiency; and capturing and storing greenhouse gases on a large scale.

Many analysts agree that the most cost-effective way to spur significant changes in the production and use of energy is to put a price on carbon emissions. By establishing such a price—rather than by dictating specific technologies or changes in behavior—the government would encourage households and firms to reduce emissions in the least costly ways. Either a carbon tax or a cap-and-trade program would effectively put a price on carbon emissions and lead to emission reductions *where* and *how* it was least costly to achieve them.

Allowing flexibility about *when* emissions were reduced would further lower the costs—and would do so without lowering the benefits—because climate change depends not on the amount of greenhouse gases released in a given year but on their buildup in the atmosphere over decades. To successfully capture all of the potential cost savings from shifting emission-cutting efforts from high-cost years to low-cost years, a cap-and-trade program would have allowance prices that did not fluctuate in response to *temporary* factors that affect compliance costs—such as the weather, economic activity, and disruptions in critical fuel markets—but that did respond to new information about more *permanent* factors that affect compliance costs over a period of many years—such as the introduction of a new technology. In practice, differentiating between temporary and permanent factors could be difficult.

My testimony makes the following key points about incorporating flexibility in the timing of emission reductions in a cap-and-trade program:

- First, permitting firms to "bank" allowances—that is, to save allowances for use in the future—has helped lower compliance costs (relative to those under inflexible annual caps) in existing cap-and-trade programs. However, the cost savings from banking are limited by the difficulty of predicting future allowance prices. Specifically, firms need to distinguish between temporary and permanent factors affecting allowance prices.

- Second, permitting firms to borrow future allowances, as well as to bank them, could further lower compliance costs. Existing cap-and-trade programs typically preclude borrowing, in part because of concerns that firms that borrow allowances might be unable to pay them back later.

- Third, permitting firms to purchase allowances from a public "reserve pool"—composed of allowances that were borrowed from future years or that supplemented the initial supply—could partially substitute for allowing borrowing by individual firms. The reserve pool could help reduce costs by giving firms the opportunity to exceed annual caps in years when the cost of complying was temporarily high. Its effectiveness in realizing cost savings would depend on the size of the pool and the threshold price at which firms could purchase the reserve allowances. The cost savings would be limited, as with banking and borrowing, by the difficulty of predicting future allowance prices.

- Fourth, setting a floor and ceiling for the price of allowances would also lower firms' compliance costs, but it would not ensure a particular level of emissions. Adjusting the floor and ceiling prices over time in order to achieve a long-term target for emissions would be complicated by firms' efforts to anticipate those shifts and to bank or borrow allowances in advance of them.

- Finally, a "managed-price" approach would allow for substantial cost savings by eliminating short-term volatility in the price of allowances while accommodating longer-term shifts in prices that would be necessary to keep emissions within a multidecade cap set by legislators. In a managed-price arrangement, firms could purchase allowances from the government each year at a price specified by regulators. The policy would be similar to a tax in that respect. Unlike a tax, however, the policy would not require firms to purchase *all* of their allowances from the government: Policymakers could choose to distribute some allowances to firms for free and could allow them to comply by purchasing "offsets," or credits for emission reductions made in sectors not covered by the cap. Regulators would establish a path of rising prices for allowances, with the goal of complying with the cumulative cap that legislators set. That path would be adjusted periodically if new information indicated that future compliance costs were going to be higher or lower than anticipated or if progress in meeting the cumulative cap was less than expected. A key issue would be how frequently to adjust the price path: Increasing the length of time between adjustments would help policymakers distinguish between temporary and permanent cost factors but could also require larger adjustments to keep emissions on track to meet the long-run cap.

Minimizing Costs Over Time in a Cap-and-Trade Program

Under a cap-and-trade program, policymakers would typically set an annual cap on emissions for each of the years covered by the policy and allocate an allowance for

each ton of emissions permitted under the cap. The cap would become more stringent over time, resulting in a decline in the number of allowances allocated.

Compared with regulations requiring the use of particular technologies or reductions from particular sources of emissions, the cap-and-trade program would reduce the cost of obtaining the desired level of emissions by allowing firms to reduce emissions where and how it was least costly to do so. After the allowances were initially distributed, firms would be free to trade them. As a result, firms that could reduce emissions most cheaply would profit by selling their excess allowances to firms facing higher emission-cutting costs.

Offering the firms subject to the cap additional flexibility as to *when* cuts in greenhouse gases were made—by requiring that they meet the annual caps only on average—could result in substantial additional cost savings, while producing the same effect on the climate. That opportunity to reduce the cost of a cap-and-trade program without reducing its benefits stems from the long-run nature of climate change. Climate change results from the accumulation of greenhouse gases in the atmosphere over many decades and centuries, yet year-to-year fluctuations in emissions have little effect. By contrast, the economic cost of reducing emissions can vary a lot from year to year—depending on the weather, economic activity, and the prices of fossil fuels. In order to minimize the cost of achieving a cap, firms would want to weigh the cost of reducing emissions today against the cost of reducing them later, and allocate their emission-cutting efforts accordingly. In making that trade-off, firms would discount future costs at a rate equal to the rate of return on alternative investments that they might make in lieu of reducing emissions.[1]

To capture all of the potential cost savings from shifting emission-cutting efforts from high-cost years to low-cost years, the allowance price should not fluctuate in response to temporary factors. If prices did respond to temporary factors, additional costs would be incurred because too many emission reductions would be made when prices were high and too few when prices were low. The variation in the cost of reductions could disrupt production processes and economic activity and make planning difficult for firms and households.[2]

Although prices in an efficient cap-and-trade program would not fluctuate in response to temporary cost factors, they would change in response to new information about lasting or permanent factors that affected compliance costs over many years. For example, if a new emission-reducing technology proved to be more expensive than previously anticipated, then current and future allowance prices would have to

1. For a discussion of why a cost-minimizing tax would increase at that rate, see Gilbert E. Metcalf and others, *Analysis of a Carbon Tax to Reduce U.S. Greenhouse Gas Emissions* (Cambridge, Mass.: Massachusetts Institute of Technology Joint Program on the Science and Policy of Global Change, 2008), pp. 28–29.

2. Metin Celebi and Frank Graves, "CO_2 Price Volatility: Consequences and Cures" (discussion paper, The Brattle Group, January 2009).

be higher in order to keep emissions within the desired cap. In contrast, if a technology proved to be less costly than anticipated, allowance prices could be lower. Unlike the effect of temporary cost factors, the new information about future costs would generally lead to a one-time increase or decrease in both current and future prices.

While new information about future compliance costs would require an adjustment to both current and future prices, those adjustments would not lead to a change in the emissions made over the period that the policy was in effect. In contrast, new information indicating that the damage from climate change might be greater or lesser than previously anticipated would necessitate both a change in the cumulative cap and a shift in the path for prices.

Options for Providing Intertemporal Flexibility

Reducing the potential risk of climate change would entail reducing the emissions of greenhouse gases that could occur over multiple decades. Options for granting flexibility as to when the emission reductions occur fall into two categories: The first category, which includes banking and borrowing allowances or creating a public reserve pool of them, would permit firms to transfer allowances across time. The second category, which includes setting a floor and a ceiling for the price of allowances or using a managed-price approach to specify a path for allowance prices over time, would permit regulators to set allowance prices in a manner that induced a cost-effective time pattern of emissions.

Banking

Banking would provide firms with the ability to take advantage of the cost-saving opportunities created when the cost of reducing emissions to meet an annual cap was unusually low. Firms could trim emissions further and bank allowances in that situation and then use the banked allowances, or sell them at a profit, when trimming emissions was more difficult and compliance costs were high. Because banking would increase the demand for allowances in low-cost periods (when firms wanted to accumulate them) and increase the supply of allowances in high-cost periods (when firms withdrew allowances from the bank), banking would reduce price fluctuations and lower the cost of achieving a cumulative cap.

Experience with existing programs that did *not* include banking illustrates the crucial role it can play in helping to prevent major disruptions in allowance prices. For example, the lack of banking contributed to an extreme spike in allowance prices in the Regional Clean Air Incentives Market (RECLAIM), a program that was designed to address nitrogen oxide, a contributor to ozone pollution in the Los Angeles basin region. In the initial years after RECLAIM went into effect in 1994, light trading occurred and allowance prices were low. But prices changed radically during the summer of 2000: Allowance prices in that year averaged $45,609—more than 10 times higher than in previous years—and spot prices reached as high as $90,000.

Although the cost of meeting the cap in the initial years of the program was low, firms were not allowed to reduce emissions below the cap and build up a bank of allowances. When a heat wave in the summer of 2000 caused a surge in demand for electricity in California and a spike in electricity prices, the demand for allowances increased.[3] But because only a limited supply of allowances existed, prices shot up. As a result, regulators removed energy generators from the cap-and-trade program and returned them to relatively costly command-and-control regulations.

The success of banking in minimizing compliance costs over time depends on firms' ability to discern the difference between temporary cost factors that lead to a short dip in compliance costs and more permanent cost factors that result in a sustained reduction in compliance costs. Firms would find it cost-effective to bank allowances in the former case but not in the latter. But discerning the difference between temporary and permanent cost factors can be difficult (for both firms and policymakers). As a result, banking would allow firms to capture some, but not all, of the cost savings that could be obtained from shifting emission-cutting efforts across time. Recent research indicates that the cost savings from banking in a greenhouse-gas cap-and-trade program would be larger if shocks in compliance costs did not persist over time.[4]

To the extent that firms were successful in differentiating between temporary and permanent cost factors, banking would decrease volatility in allowance prices. Even successful banking, however, would not eliminate price changes. If new information indicated that the cost of complying with caps in the future was going to be higher than previously anticipated—for example, because of information that a new technology was going to cost more than anticipated—then the current price of allowances would increase and firms would appropriately reduce emissions further today.

Yet even with banking in place, volatility in allowance prices in existing cap-and-trade programs appears to be greater than can be explained by changes in expectations about future compliance costs. In the Acid Rain Program, which capped sulfur dioxide emissions beginning in 1995, prices for allowances fluctuated considerably within short periods of time. Prices varied from less than $75 to more than $200 in roughly three years, in spite of the fact that firms were allowed unlimited banking (see Figure 1).[5] Similarly, allowance prices have fluctuated considerably in a cap-and-trade program designed to reduce carbon dioxide emissions in the European Union—even

3. Carol Coy and others, "Stabilization of NOx RTC Prices" (white paper, South Coast Air Quality Management District, January 11, 2001), p. 12.

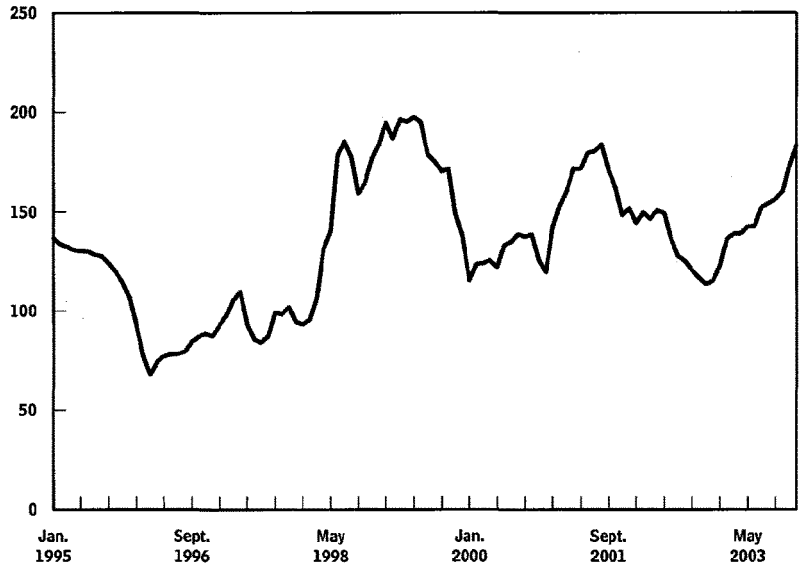
4. See Harrison Fell, Ian A. MacKenzie, and William A. Pizer, *Prices Versus Bankable Quantities*, Discussion Paper DP 08-32-Rev (Washington, D.C.: Resources for the Future, July 2008). Another key factor is the rate at which firms discount future costs. A lower rate induces more banking and generally lowers aggregate compliance costs over the period of the policy.

5. Prices after 2003 were affected by an anticipated change in the stringency of future caps. Banking enabled allowance prices to adjust in anticipation of that tightening, but that adjustment could have ultimately increased, not decreased, compliance costs because the increase in allowance prices far exceeded estimates of the cost of meeting the tighter cap.

Figure 1.

Prices for Sulfur Dioxide Allowances in the Acid Rain Program

(1994 dollars per ton)



Source: Congressional Budget Office based on data from Resources for the Future.

though firms can bank allowances both within the phase of the program covering 2008 to 2012 and into the next phase, and they can borrow allowances from one year ahead. For example, prices for what are termed "vintage 2009" allowances, which may be used to comply with emission requirements in either 2008 or 2009, varied considerably throughout 2008. They started the year at less than $20, rose to over $28, dropped to roughly $16 by the end of 2008, and continued to fall in the beginning of 2009 (see Figure 2). Those prices were closely correlated with oil prices.

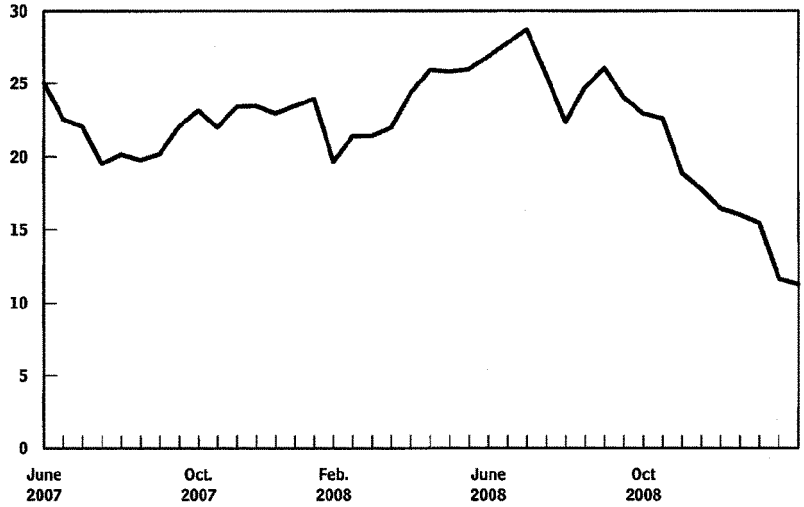
Borrowing

Firms would have a motivation to borrow future allowances whenever they thought that current prices for allowances were high relative to future prices. That circumstance could be the result of a temporary spike in current prices or the expectation that a new technology would fundamentally lower compliance costs in the future. Some proposals for cap-and-trade programs would allow firms to meet a limited amount of their current requirement (typically no more than 15 percent) to reduce emissions with allowances borrowed from the future (typically no more than five years out). Like banking, the extent to which borrowing would lower firms' compliance

Figure 2.

Allowance Prices in the European Union's Cap-and-Trade Program

(Dollars per ton)



Source: Congressional Budget Office based on data from the European Energy Exchange.

Note: Prices are for "vintage 2009" allowances, which may be used to comply with emission requirements in either 2008 or 2009.

costs over the life of the policy depends on firms' assessment of future costs. There is very little evidence on the effectiveness of borrowing: California's RECLAIM program did not permit borrowing, and the Acid Rain Program does not allow it, in part because of concerns about some firms' borrowing indefinitely and about determining liability if a firm that borrowed allowances was unable to accomplish the necessary emission reductions. As noted above, the cap-and-trade program for carbon dioxide emissions in the European Union permits firms only a very limited form of borrowing by allowing them to comply by using allowances one year in advance of the current year.

Reserve Pool

Policymakers could add additional flexibility to a cap-and-trade system that included banking by allowing firms an opportunity to purchase allowances from a publicly available reserve pool at, or above, a threshold price. If firms did not have a substantial bank of allowances to draw upon and if borrowing were restricted, then the reserve pool would be the primary method of preventing price spikes and relatively costly emission reductions. Thus, the reserve pool could play an especially important role in

the initial years of a cap-and-trade program before firms had the chance to build up a bank. The importance of the reserve pool in later years would depend, in part, on the size of the banks that firms had built up.

A spike in compliance costs could make it advantageous for firms to purchase reserve allowances. For example, if allowances in 2020 would cost $40 in the absence of a reserve pool and the threshold price for allowances was $35, then firms would find it cost-effective to purchase reserve allowances. That additional supply of reserve allowances would tend to reduce the price of allowances in 2020 below the $40 it would have otherwise been. Thus, the reserve pool could help limit price increases that might otherwise occur as the result of temporary factors.

The extent to which the reserve pool would be successful in limiting temporary price increases, however, would depend on policymakers' decisions about the level of the threshold price and the size of the reserve pool. A higher threshold price would allow for a larger price spike because it would permit allowance prices to climb higher before firms found it cost-effective to purchase allowances from the reserve pool. In contrast, a lower threshold price would increase the likelihood that firms would want to purchase reserve allowances: The reserve pool would prevent allowance prices from climbing above the threshold price only if the number of allowances that firms wanted to buy at the threshold price was less than the quantity in the pool. That condition would be more likely to hold when the demand for reserve pool allowances was driven by the expectation that compliance costs were *temporarily* high.

Although the reserve pool could help limit temporary spikes in allowance prices, it would not serve as a ceiling for the price of allowances. In particular, the price of allowances might exceed the threshold price if firms anticipated that the cost of meeting annual caps was likely to increase significantly in the future and therefore wanted to bank allowances for future use. Indeed, demand for reserve allowances induced by higher expected prices in future years would come not only from firms subject to the cap but also from third-party traders who might choose to buy reserve allowances, bank them, and sell them at a profit in the future. The size of the allowance market anticipated under a cap-and-trade program for greenhouse-gas emissions would ensure that third-party traders would be interested in taking advantage of any such opportunities for intertemporal arbitrage. For example, the Congressional Budget Office estimated that the value of the allowances created under the cap-and-trade legislation order reported by the Senate Committee on the Environment and Public Works on December 5, 2007, would total nearly $1.2 trillion from 2012 to 2018.[6]

The demand for allowances for banking purposes would increase their prices until they equaled the present value of expected future prices, regardless of the current threshold price. Still, intertemporal arbitrage could lower compliance costs in the aggregate: If firms' expectations about future prices were correct, such arbitrage would

6. Congressional Budget Office, cost estimate for S. 2191, America's Climate Security Act of 2007 (April 10, 2008).

shift the price path for allowances in a manner that lowered total compliance costs over time—with allowance prices lower in the future than they otherwise would have been.

Depending on the design of the reserve pool, firms' purchases of reserve allowances might or might not affect cumulative emissions over time. If the reserve pool was composed of allowances that otherwise would not be allocated, then drawing on it would lead to higher total emissions than would otherwise occur. In contrast, if the reserve pool was composed of allowances that were borrowed from future periods and returned if not used, then using the pool would not lead to higher total emissions.

Finally, if firms expected lower allowance prices in the future (because of the introduction of a new technology, for example), they would want to defer some of their emission reductions. In that case, the reserve pool would be unlikely to help them realize cost savings: Firms would not buy reserve allowances at a threshold price that was higher than the allowance prices they anticipated in the future. As a result, the reserve pool would not facilitate a downward shift of the price path.[7]

Price Floor and Price Ceiling

Policymakers could help reduce fluctuations in allowance prices by setting a floor and a ceiling (often referred to as a safety valve) for the price of allowances. The price floor would induce firms to make more emission reductions than would be necessary to meet the cap in low-cost years. Creating such a price floor would be fairly straightforward if the government chose to sell a significant share of the allowances rather than giving them free of charge to affected businesses: Policymakers could specify a reserve auction price and restrict the supply of allowances to maintain that price. The price ceiling would allow firms to make fewer emission reductions in high-cost years, thereby exceeding the annual cap. Creating such a price ceiling simply would require the government to sell as many allowances as buyers desired at that price.[8]

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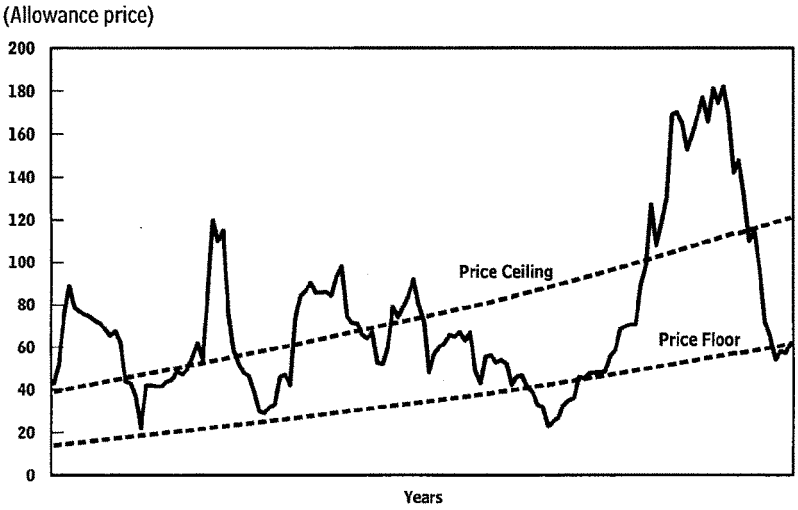
7. However, if firms had been banking in expectation of higher future prices, news of lower compliance costs in the future could motivate them to cut back on their banking, which, in turn, would shift the price path down.

8. One criticism of a cap-and-trade program that includes only a price ceiling is that it could reduce firms' incentives to replace carbon-intensive capital equipment and to develop new technologies for lowering carbon dioxide emissions. The fact that the range of potential future prices would be truncated at the high end by the price ceiling, but not at the low end, would reduce the expected price for allowances. See Dallas Burtraw and Karen Palmer, "Dynamic Adjustment to Incentive Based Policy to Improve Efficiency and Performance" (draft, Resources for the Future, Washington, D.C., November 30, 2006); and Congressional Budget Office, *Policy Options for Reducing CO_2 Emissions* (February 2008).

Figure 3.

Example of a Floor and Ceiling for Allowance Prices Based on Illustrative Price Fluctuations



Source: Congressional Budget Office.

Just as firms would wish to allocate their compliance costs over time to match the opportunity costs of other investments, the price floor and ceiling could be increased over time at the same rate that firms would discount future costs. The rising floor and ceiling would, on average, induce greater emission reductions in successive years.

A cap-and-trade program that included both a floor and a ceiling could limit the potential range of allowance prices (see the illustrative example in Figure 3), but it would not ensure any particular outcome for reducing emissions. Emissions would exceed the cumulative limit implied by the sum of annual caps if the additional emissions that occurred when firms purchased allowances at the price ceiling exceeded the additional reductions induced by the price floor. Conversely, emissions would fall short of the cumulative limit if additional emissions when prices hit the ceiling were outweighed by additional reductions when prices reached the floor.

Policymakers could attempt to adjust the price floor and ceiling in order to achieve a desired long-term target—for example, by shifting the "price corridor" upward if reductions were falling below the desired level—but such adjustments could be less effective if firms were allowed to bank allowances. If firms anticipated an upward shift in the price corridor, they would have an incentive to buy large quantities of allowances at the current ceiling price, bank them, and use them in the future after the price ceiling had increased. That action could lead to excess emissions (above the cap)

after the price increase occurred: If firms banked the allowances bought at the ceiling price, those allowances would be used later without having brought about actual reductions in emissions.

Policymakers could attempt to minimize that adverse outcome by limiting the amount of allowances that could be banked or by eliminating banking altogether, but doing so could restore some price variability and reduce some cost savings. In particular, eliminating banking would not let firms smooth allowance prices between the boundaries defined by the floor and ceiling; the greater the distance between the floor and ceiling, the more costly that problem would be. In addition, significant restrictions on banking could lead to volatile allowance prices at the end of each compliance period. For example, if firms anticipated that fewer allowances would be available than required to meet the demand at a price below the ceiling, then allowance prices would jump to the ceiling level. In contrast, if firms anticipated that the supply of allowances was ample to meet the demand at a price below the floor, the price would drop to the level of the floor. The most disruptive outcome would occur if expectations about the supply of and demand for allowances changed. In that case, allowance prices could bounce between the floor and ceiling prices.

The Managed-Price Approach

A managed price for allowances takes the notion of defining a price corridor a step further, in essence eliminating the distance between the floor and the ceiling. Under this approach, legislators would set a cap on cumulative emissions over a period of several decades but would not set annual caps. Regulators, in turn, would be charged with setting allowance prices for each year of the policy—with the objective of choosing prices that would minimize the cost of achieving the multidecade cumulative cap. For example, legislators might specify a limit on cumulative emissions occurring from 2012 to 2050. Regulators would then specify a single allowance price for each year of that span.[9]

To achieve the goal of minimizing total compliance costs, regulators would weigh the cost of reducing emissions today against the cost of reducing them at a future date, just as firms would with banking and borrowing. The specified allowance prices would then rise annually at a rate equal to an estimated average rate of return on investments that firms could have made in lieu of reducing emissions. The key decision for regulators would be, What initial price (which would then rise at the defined rate) would be necessary to set the economy on track for achieving the desired cap on emissions? Regulators would need to adjust the chosen price path periodically to ensure that the level of emissions was on target for achieving the cap.

9. A variation of the concept may be found in Center for Clean Air Policy, *Preventing Market Disruptions in Cap-and-Trade Programs* (October 2008), available at www.ccap.org. Under that approach, regulators would attempt control the price of allowances sold in four separate lots over the course of each year during the initial years of the cap-and-trade program.

Under this approach, firms would be able to purchase allowances from the government in each year at the specified price. Firms would cut emissions if the cost of doing so was less than the price of an allowance. Firms would not be allowed to bank or borrow allowances, but smoothly increasing allowance prices would automatically capture much of the intertemporal cost savings that banking and borrowing were designed to achieve.

This option is similar to a tax on greenhouse gases that regulators would adjust periodically on the basis of new information.[10] But it also has features of a traditional cap-and-trade program, including these:

- It would allow policymakers to distribute a share of the allowances to firms for free if they wished to do so. For example, they could give allowances to coal producers, electricity generators, or to dislocated workers in the coal industry. Firms could sell any allowances that they were given but did not use. However, giving away too many allowances could undermine regulators' ability to maintain the managed price.

- It would allow firms to meet a portion (specified by policymakers) of their requirement for allowances by purchasing "offsets," which are credits for qualifying emission reductions in areas not subject to the cap. For example, individuals or firms not subject to the cap might generate offsets through biological sequestration that stored carbon in plants and soil (by pursuing afforestation or adopting certain agricultural practices, for instance) and then those offsets could be available for purchase by firms subject to the cap.[11]

- It would allow firms to reduce uncertainty about their future compliance costs by entering into futures contracts. For example, firms subject to the cap could agree to buy allowances at fixed prices in the future from traders that were willing to absorb the risk that the price of allowances would turn out to be higher or lower than anticipated.

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10. For a discussion of a tax on carbon dioxide emissions that could be adjusted over time, see Gilbert Metcalf and David Weisbach, *Design of a Carbon Tax*, Olin Working Paper No. 447 and Public Law Working Paper No. 254 (University of Chicago, December 2008). For an overall discussion of timing flexibility, a tax on carbon dioxide emissions, and an overview of the design features that can be included in a cap-and-trade program to provide timing flexibility, see Congressional Budget Office, *Policy Options for Reducing CO2 Emissions*. For a discussion of the potential advantages of reducing greenhouse-gas emissions by a tax, see Gilbert Metcalf, "An Equitable Tax Reform to Address Climate Change" (discussion paper, Brookings Institution, The Hamilton Project, October 2007), available at www.brookings.edu/papers/2007/10carbontax_metcalf.aspx. For a discussion of the potential advantages of a cap-and-trade program, see Robert Stavins, "A U.S. Cap-and-Trade Program to Address Climate Change" (discussion paper, Brookings Institution, The Hamilton Project, October 2007), available at www.brookings.edu/papers/2007/10climate_stavins.aspx.

11. See Congressional Budget Office, *The Potential for Carbon Sequestration in the United States* (September 2007).

- It would set a fixed cap on cumulative emissions over a period of several decades.

In order to forecast the price path that would minimize the cost of achieving the desired limit on cumulative emissions, regulators would rely on information about trends in future emissions, firms' and households' responses to higher energy prices, and the availability of technologies in the future. (Analysts would use that same information to predict the allowance prices under cap-and-trade programs that included annual caps and allowed banking.)

By design, the managed-price option would prevent temporary factors—such as fluctuations in the economy, the weather, or energy markets—from affecting allowance prices and from increasing the cost of achieving a multidecade cap. However, the initial price path that regulators set might lead to more or less cumulative emissions than they had anticipated. They would need to make periodic adjustments to the price path to ensure that adequate progress was being made toward the cap and to reflect significant changes in trends in future emissions and new information about future technologies. For example, an increase in underlying emission trends would mean that allowance prices had to be higher than regulators originally foresaw to keep emissions from exceeding the cap; in contrast, the development of an unexpectedly cheap technology for reducing emissions would mean that the target could be met with lower prices and less economic cost. Those adjustments would entail one-time increases or decreases in the current and future prices—that is, upward or downward shifts in the price path.

Allowing a longer time between adjustments to the price path would provide longer periods of certainty about prices for firms that needed to comply with the policy and that wished to invest in new technologies for reducing emissions. In addition, longer intervals would provide more time for the effect of temporary influences on emissions to balance out (for a cold winter to be offset by a mild winter, for example). However, infrequent adjustments to the price path—say, every 8 to 10 years rather than every 3 to 5 years— might also need to be larger: Cumulative emissions would have had more time to get off course if the initial price path was set too high or too low, and more information about new technologies and baseline emission trends would have accumulated.[12]

Lawmakers might decide to delegate responsibility for setting and modifying allowance prices to regulators, such as a regulatory agency, commission, or the executive branch. In that case, the Congress could specify a mandatory cap for period covered (through 2050, for example), specify how frequently prices should be adjusted, and require reports on that updating process. Regulators would then use forecasts of the cost of reducing emissions to estimate the least-cost path for allowance prices and to

12. In contrast, banking would allow firms to immediately adjust to new information suggesting that compliance costs might be higher than previously anticipated. Firms would be able to adjust to new information indicating that compliance costs might be lower than previously anticipated only if they were allowed to borrow future allowances.

make periodic adjustments. If lawmakers did not wish to delegate that responsibility and did not want to rely on additional legislation, which might be quite cumbersome, the Congress could specify how prices should be modified under alternative conditions. A disadvantage of this approach compared with delegating price-setting authority is that it could be less flexible in responding to new information.

Chairman RANGEL. Witnesses to join the good doctor. Dr. Dallas Burtraw has done outstanding work on this subject, including the European union. Dr. Lashof is an old friend of the Committee who has done work on limits of carbon dioxide, and has testified before the Congress many times.

Dr. William Whitesell, director of policy research, Center for Clean Air Policy. Devoted himself to consulting and writing on these issues. Dr. Chan, who is the program manager of the green investment projects in Friends of the Earth, who has had decades of work in this area.

Dr. Gilbert Metcalf, professor of economics at Tufts University, who has spent quite a time researching this important issue and will share with us the different provisions of funding and protecting the consumer. Of course, an old friend, Dr. Margo Thorning, who is senior vice president and chief economist of the American Council for Capital Formation.

We know that 5 minutes is a very limited time in which you can help us. But because you have spent so much time in this subject, we hope you understand that the closer we get to some degree of harmony in both the scientific approach of the control of carbon dioxide and the more complex question of how we protect the consumer, that we will be calling you back in a less formal way to share the legislation and to get a critique from it so that before we go to the House, we will again have the benefit of not just talking about the subject but getting your specific understanding of the direction in which we have decided to go.

So if I could call now on Dr. Lashof, it would be appreciated if you start off this panel.

STATEMENT OF DANIEL LASHOF, DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Mr. LASHOF. Thank you very much, Mr. Chairman. I appreciate the opportunity to address this Committee, Mr. Chairman, and Members of the Committee.

The atmosphere is too big to fail. A bailout will not restore our coastlines. We cannot replace the natural capital that nourishes our heartline. The good news is that we still have an opportunity to avoid a meltdown of our climate system.

Repowering America with clean energy is the work of a generation, millions of good jobs, building real and sustainable growth, not a bubble economy. We need to begin cutting the atmospheric deficit now and steadily reduce emissions of global warming and pollution by 80 percent or more by the middle of this century.

As the President has said, in order to accomplish that, we need to make clean energy the profitable kind of energy. The best way to do that, in my view, is to establish a firm cap on global warming pollution that declines each year.

The cap is the cornerstone of the policy that we need to reduce emissions. But it is important to emphasize that it is not the entire strategy. We should compliment the cap with specific measures that are targeted at unleashing profitable energy efficiency opportunities, and a robust program to promote continuous innovation that can reduce the costs of advanced technologies that will be

needed to get us across the finish line of the emission reductions that we need.

A comprehensive cap and robust, complimentary efficiency policies are the most important elements of cost containment. They are not always thought of as cost containment, but I think they are critical.

Another key provision, as we have just heard, is allowing the banking of allowances. I will just spend a minute on that. This is the European Union's emission trading system price history. You can see in the yellow curve, in their pilot phase they did not allow banking. That resulted in extreme price volatility and a collapse of allowance prices because they couldn't save allowances from the pilot phase into the future phase.

In the current period, allowance prices have fallen about 50 percent in the last 6 months due to the economic downturn. But that type of price reduction is not necessarily problematic. In fact, it is beneficial. As we have seen with other commodity prices that fall during an economic downturn, this actually provides a form of economic stimulus. So having some price responsiveness in the system is actually beneficial for consumers and for the economy. Banking allows that without prices collapse.

Let me spend the rest of my time focusing on the proposal included in my testimony for strategic offset and allowance reserve, not because I think this is necessarily the most important mechanism, but because it is perhaps the least understood.

The idea here is to create a pool of allowances and offsets that are available to be released into the market if prices exceed a certain threshold. There are a couple of questions that have to be answered. What should the price threshold be, and how big does this pool need to be?

In this example, rather than predetermining what the threshold should be, the first 3 years the price threshold is set based on a forecast, and it is twice the expected amount. But after that, a rolling average of actual prices is used, and the threshold is set at twice that level.

In this example—and these allowance prices are really just an example—I basically synthesized them with a random component plus a systemic component.

The price stays below the threshold in most years. But, for example, in 2019, it approaches the price threshold. The idea would be to have an auction with a reserve price in this case of $29 a ton. Bidders could purchase additional allowances or offsets at that price, and that would put downward pressure on prices and tend to keep the price of allowances from exceeding that price threshold in that year.

The last point I want to make is on how big does this have to be to be effective in reducing extreme price volatility. What I have done is to look at the actual variations in U.S. greenhouse gas emissions since 1990, when data became available, compared with just a linear trend drawn through that data.

What I have found is that there are variations from year to year based on whether, in economic conditions, they have not exceeded 200 million tons in any 1 year during that period. That suggests to me that if we allow some cushion, perhaps double that number,

and allow up to 400 million tons of allowances to be purchased in the strategic offset and allowance auction, that that should be sufficient to limit price volatility.

So, Mr. Chairman, let me just finish where I began. Getting the details of climate legislation right is very important, and I appreciate the opportunity to discuss these suggestions that I have. The bottom line is our atmosphere is too big to fail. Delaying action to address the threat of global warming is not a viable option. Thank you.

[The prepared statement of Dr. Lashof follows:]

Statement of Dr. Daniel Lashof, Director, Climate Center, Natural Resources Defense Council

Daniel A. Lashof, Ph.D.

Director, Climate Center

Natural Resources Defense Council

Testimony

Before the
Committee on Ways and Means
Unites States House of Representatives

Hearing on

Addressing Price Volatility in Climate Change Legislation

March 26, 2009

Testimony of Daniel A. Lashof, Ph.D.
Director, NRDC Climate Center

Introduction

Thank you for the opportunity to testify today on the subject of addressing price volatility in climate change legislation. My name is Daniel Lashof. I am director the Climate Center at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles, San Francisco, Chicago and Beijing.

NRDC is a member of the United States Climate Action Partnership (USCAP), an organization of 25 major companies and 5 leading non-governmental organizations that has come together to call on Congress to enact comprehensive climate protection legislation this year requiring significant reductions of greenhouse gas emissions. While I am only testifying on behalf of NRDC, my testimony will draw substantially from USCAP's Blueprint for Legislative Action.[1] In some cases I will make recommendations that, while consistent with the Blueprint, go beyond its scope or provide greater specificity, and I will try to make this distinction clear.

The current economic crisis presents enormous challenges, but it also provides a tremendous opportunity to rebuild our economy in a way that ensures sustainable, long-term growth. In the next 20 years, the United States will invest more than $3 trillion in our energy infrastructure – electric power plants, fuel refineries, transmission and transportation infrastructure – and trillions more on energy-consuming buildings, appliances, and vehicles.[2] If we reduce the amount of money we spend importing fuels and building antiquated power plants and redirect these resources toward cleaner, energy-efficient technologies, we can improve our competitive position while creating millions of quality jobs, strengthen our national security by cutting our reliance on fossil fuels, and avert the climate crisis by dramatically reducing global warming pollution.

Guaranteeing Reduced Emission of Global Warming Pollution

A cap on global warming pollution that gradually reduces the number of emission permits available is the most effective way to repower America with clean energy and ensure that the United States reduces emissions of heat-trapping gases by 80 percent or more, as the best science indicates is needed to reduce the risk of catastrophic climate change. A pollution cap is designed to directly regulate the quantity of dangerous pollution emitted, providing the highest possible level of certainty that our environmental goals will be achieved.

Regardless of whether emission allowances are initially distributed through an auction, a statutory allocation formula, or some combination, allowances will trade on a secondary market at a clearing price that balances supply and demand. This creates some uncertainty about allowance prices and gives rise to concerns about allowance price volatility. A well designed and regulated carbon market, however, can provide environmental certainty while avoiding the risk of excessive price volatility.

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[1] http://us-cap.org/index.asp

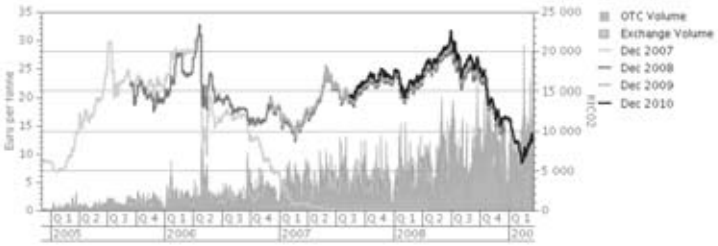
[2] World Energy Outlook 2006, International Energy Agency.

Price Fluctuations versus Price Volatility

Before discussing recommendations for climate legislation that can achieve this goal, let me emphasize that fluctuations in emission allowance prices are not necessarily a problem. Indeed, in a well-functioning carbon market the price of allowances will respond to fluctuations in the economy in ways that reduce carbon emissions without creating an undue burden during difficult economic times. The price of carbon allowances will fall during economic downturns as the CO_2 output from the economy slows, depressing demand for allowances, and will rise as the CO_2 output from the economy accelerates. This responsive way of pricing carbon means that a cap and trade system provides a degree of automatic economic stabilization, just as recent declines in the price of oil and other commodities is currently providing some relief for consumers and stimulating demand for a broad range of goods and services.

The recent decline in the price of allowances in the European Union's Emissions Trading System (EU ETS) is an example of just this kind of appropriate market behavior. This should not be confused with the collapse in pre-2008 vintage EU ETS allowance prices, which was due to serious flaws in the initial design of the market that have since been corrected. In particular, allowances issued for the EU ETS pilot phase, which ended on December 31, 2007, could not be held (or "banked") for use during the compliance periods beginning on January 1, 2008. When it became clear that there were excess allowances available for the pilot phase their price collapsed (Figure 1.)

Figure 1. EU ETS Allowance Prices

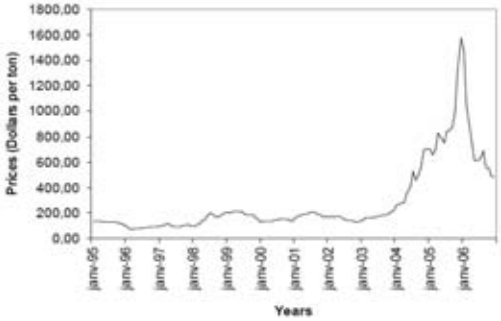


Source: Point Carbon EUA OTC assessment

The sulfur dioxide (SO_2) cap established by the acid rain program of the 1990 Clean Air Act amendments provides a longer history of allowance prices that is worth examining. The SO_2 cap began in 1995 and has succeeded in substantially reducing emissions at costs that have been far lower than anticipated. From 1995 until 2004 SO_2 allowance prices were quite stable, with spot prices generally between $150 and $200 per ton. Prices began to rise in 2004 in anticipation of further restrictions of SO_2 emissions and spiked in December 2005 largely due to this policy uncertainty, but also reflecting very tight markets for related commodities at that time, particularly natural gas. SO_2 prices fell sharply in early 2006 and since the second quarter of 2006 stability has returned to the SO_2 market, although at a higher average price point than previously, reflecting expectations that the SO_2 cap will become tighter in the near future.

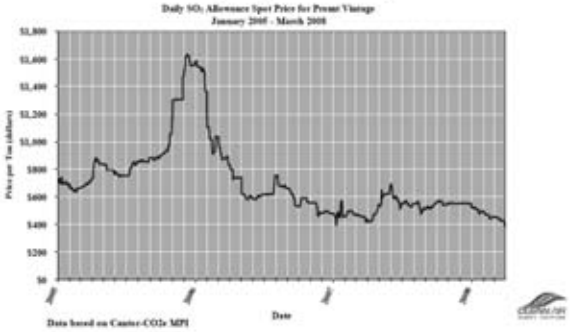
While the experience of the SO_2 market is instructive, it is important to recognize the difference in scope between the SO_2 cap and a future CO_2 cap. The SO_2 cap applies to a relatively limited number of coal-fired power plants, whereas as a comprehensive CO_2 cap, while still manageable, would include all large facilities that burn fossil fuels as well as petroleum products regulated at the refinery gate or importer. The overall value of SO_2 allowances at $400 per ton is roughly $3 billion per year, compared to greenhouse gases allowances which at $10-$20 per ton would be worth $60-$120 billion per year.

Figure 2. History of SO_2 Allowance Prices



Source: Denny Ellerman, MIT

A detailed look at the last 3 years finds prices are down following the December 2005 price spike and relatively stable



Source: Sam Napolitano, EPA

Avoiding Excessive Price Volatility

While modest allowance price fluctuations are expected and can be beneficial, excessive volatility driven by unnecessary market uncertainty or market manipulation is problematic and should be avoided. This can be accomplished by including the following features in climate legislation:

1. A comprehensive cap covering the broadest feasible set of emission sources.
2. Banking of emission allowances.
3. Effective carbon market regulation.
4. Ample access to high quality offsets.
5. Robust complementary measures to promote energy efficiency, cleaner transportation options, and energy supply technology transformation.
6. An allowance price floor established through a reserve price in the primary allowance auction.
7. A strategic offset and allowance reserve made available at a trigger price set to avoid undue economic harm.

1. Comprehensive Cap

The most basic way to limit the risk of allowance price volatility is to establish the broadest possible program to limit global warming pollution. Covering as many emission sources as possible increases the opportunities to find low cost emission reductions and provides the maximum degree of compliance flexibility while ensuring that the overall emission limits are achieved. USCAP recommends covering emissions from large stationary sources and the carbon content of fossil fuels used by remaining sources (with large defined as existing facilities that emit more than 25,000 tons of CO_2-equivalent per year and new facilities that emit more than 10,000 tons). A cap defined in this way can cover 85 percent or more of total U.S. greenhouse gas emissions.

2. Banking of Emission Allowances

Allowing firms to hold, or "bank" unused emission allowances and offsets for use in future years provides a very beneficial form of compliance flexibility that will dampen allowance price volatility. Unlike other commodities, there are no physical storage costs for banking emission allowances and there are clear environmental benefits from the early emission reductions that would be achieved in order to leave unused allowances available for banking.

Firms will tend to bank allowances if they believe that current allowance prices are relatively low and they expect that allowance prices will rise at a rate faster than the rate of return they could earn on the cash value of their allowances. This will prevent allowance prices from falling excessively as increased banking reduces the supply of allowances in the short term. If firms build up a bank of emission allowances or offsets during the early years of the program they can draw down this bank when allowance prices rise, putting downward pressure on prices during years when allowances are in relatively short supply. This has been the case in the acid rain program, and is one reason why SO_2 allowance prices have been relatively stable with the exception of a short period when prices spiked primarily due to policy uncertainty. As mentioned above, inability to bank allowances during the EU ETS pilot phase was a key reason EU allowance prices were so volatile during that period.

USCAP recommends allowing unlimited banking by firms with compliance obligations, with appropriate restrictions that may be needed for firms that do not have compliance obligations aimed at preventing market manipulation.

3. Effective Carbon Market Regulation
Recent turmoil in the financial markets clearly demonstrates the dangers of unregulated trading of financial derivatives. The solution is not to prevent allowance trading, but rather to ensure effective oversight of allowance markets by an adequately-staffed regulatory agency. NRDC recommends enforcing contract limits in the spot market and limits on total positions (in excess of compliance requirements) to ensure that no one can exercise market power. Off balance sheet trades should be prohibited to ensure that all trading occurs on a transparent exchange, and sufficient margin requirements should be established to discourage speculative trades.

4. Ample Access to High Quality Offsets
A cap that covers as many sources as possible is the most effective way to provide compliance flexibility while ensuring that the environmental objectives are achieved. Some sources, however, will be administratively or politically infeasible to include within the cap. Provided that rigorous quality standards are enforced, allowing "offsets" generated by reducing emissions from these sources or by increasing carbon sequestration in farm fields and forests can further expand compliance options and reduce the risk of excessive allowance prices. The ability to use international offsets can further expand opportunities for low-cost emissions abatement, provided that rigorous baselines are established that, over time, represent nationally appropriate country or sector-specific emission reduction commitments that cover a suitable share of a country's emissions, consistent with the global goal of avoiding dangerous climate change.

Congress should establish overall limits on the use of offsets to help EPA enforce offset quality standards and to serve as a backstop to prevent excessive use of offsets from overly depressing allowance prices and interfering with needed investments in transformative technology. USCAP recommends setting an initial annual limit of 2 billion tons on the use of offsets from all sources, and establishing a Carbon Market Board with the authority to raise this limit to no more than 3 billion tons if necessary to prevent undue economic harm from excessively high allowance prices. USCAP further recommends limiting the use of offsets for compliance to no more than 1.5 billion tons of domestic offsets and 1.5 billion tons of international offsets in any year.

5. Complementary Measures
A declining cap on global warming pollution will be the cornerstone of a comprehensive climate protection program, but by itself it will not achieve the emission reductions we need at the lowest possible overall cost to society. Complementary measures are needed to overcome market barriers to cost-effective energy efficiency measures as well as to accelerate innovations in low-emissions energy supplies that provide benefits to the economy at large that can not be captured by individual firms. Effective complementary measures, such as enforcing energy-efficient building codes and establishing a national Renewable Electricity Standard, will reduce demand for electricity, natural gas and transportation fuels, thereby reducing demand for and the price of emission allowances.

6. Allowance Price Floor
Price expectations help drive technology innovation and deployment. Therefore, cost containment measures should permit allowance price signals to become stronger over time. Further, USCAP recommends that Congress set a reserve price for the auction of allowances at a level that helps to avoid prices that are too low to encourage long-term capital investments in low- and no-carbon technologies. USCAP suggests that the price that could accomplish this objective is approximately $10 per ton at the outset of the program, and that this price could escalate over time at a rate greater than inflation and then flatten out around 2025.

7. Strategic Offset and Allowance Reserve

As a backstop measure to further limit the risk of extreme volatility and spikes in allowance prices USCAP recommends the establishment of a strategic reserve pool that includes: a) offsets, including but not limited to forest carbon tons derived from reducing tropical deforestation; and b) allowances borrowed from future compliance periods. Offsets and/or allowances in the strategic reserve pool would be released into the market when allowance prices reach a specific threshold price. The reserve pool auction threshold price should be set at a level that prevents undue economic harm from excessively high allowance prices, while being high enough to encourage technology transformation. USCAP recommends establishing a carbon market board to monitor the operation of the market and set the threshold price based on statutory criteria.

This approach to cost containment is intended to provide a high degree of confidence that allowance prices will remain within an acceptable band while maintaining the environmental integrity of the emissions cap. To accomplish these goals the reserve should contain a large number of offsets, and borrowed allowances should only be released as a last resort. If offsets are released from the reserve, revenue from their sale should be used to replenish the offset pool.

While USCAP does not make a specific recommendation about how the threshold price should be set or how offsets or allowances should be released from the reserve, let me provide a specific example of how the reserve could operate in order to make this approach more concrete. Congress could direct EPA to forecast expected allowance prices within six months after enactment of legislation establishing the cap. While retaining discretion to make adjustments if needed to prevent undue economic harm, the carbon market board could be directed to set the threshold price at twice the expected allowance price for the first three years of the program. After three years of market experience the threshold price could be set at twice the rolling average of actual prices over the previous three years. Offsets (or a limited number of allowances if the offset pool has been exhausted) could be released from the pool through regular auctions with a reserve price set at the threshold price. If market prices are expected to remain below the threshold price this auction would have no bidders and nothing would be released from the strategic reserve pool. If market prices would otherwise be expected to rise above the threshold price, provided that the available pool is large enough, allowance prices will be stabilized at the threshold price. Allowance prices would only rise above the threshold price if the offsets in the reserve pool were exhausted and bidders expected all borrowed allowance made available by the board to be purchased. Even in this unlikely event, the extra supply of compliance instruments injected into the market through this mechanism would substantially dampen price volatility.

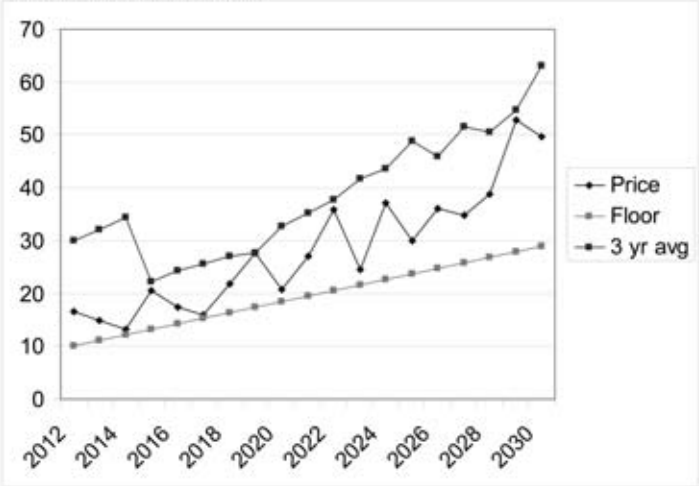
Figure 3 illustrates how the strategic reserve might operate with the price threshold specified in this way. To construct this simplified example I assume that allowance prices have a fundamental and a random component. The fundamental component begins at $15 per ton in 2012 and increases 7 percent per year. The random component allows allowance prices to fluctuate by up to 50% around this trend (which is an arbitrary assumption). The bottom curve shows the price floor, which is set at $10/ton in 2012 and increases by 5 percent per year. In this example allowance prices remain above the floor except in 2017, when the main auction reserve price result in some allowances remaining unsold. The upper curve starts at $30/ton and increases 7 percent per year until 2015, when it becomes twice the rolling average of the illustrative allowance prices during the previous three years. In this example the strategic reserve would only come into play in 2019, when the uncontrolled market price of allowances would exceed the threshold price. In this case additional offsets or allowances would be sold from the reserve, exerting downward pressure on allowance prices and keeping the actual price of allowances close to the threshold price.

The other key questions that must be addressed in the design of the strategic offset and allowance reserve are the size of the pool and the limit on how many borrowed allowances can be released in any given period. USCAP recommends that the strategic reserve contain "a very large number of offsets" and that the use of borrowed allowances be limited, but does not attempt to further define these features. NRDC recommends expanding the offset reserve with forest carbon tons from reduced tropical deforestation at an annual rate equal to at least 10 percent of current U.S. emissions (i.e. about 700 million tons per year) for a period of 10 years. These emission reductions will serve as a further contribution to reducing global warming to the extent that they are not actually tapped to prevent excessive allowance prices.

For the allowance component we recommend filling the reserve with 5 billion tons of allowances borrowed from the 2030-2050 caps. This represents about 70% of current annual emissions and about 9% of the total 2030-2050 allowance pool. Any unused allowances remaining in the reserve would be made available through the regular auction during the year from which it was drawn. To provide an indication of how many extra allowances might be needed in any given year to prevent price spikes I examined the year-to-year variability of total U.S. emissions of global warming pollution using data from the EPA emission inventory, which extends back to 1990 (Figure 4). Comparing annual emissions to the linear trend, I found that the maximum deviation was less than 200 million tons, with far smaller difference in most years. This suggests that expanding the supply of allowances by a few hundred million tons through an auction with a reserve price set at the threshold price should be sufficient to dampen price spikes caused by unexpectedly strong allowance demand in any given year. To provide an extra cushion I recommend limiting annual sales of borrowed allowance (over and above the use of offsets from the reserve) to no more than 400 million tons, which represents 6% of current annual emissions and 8% of the recommended allowance reserve pool.

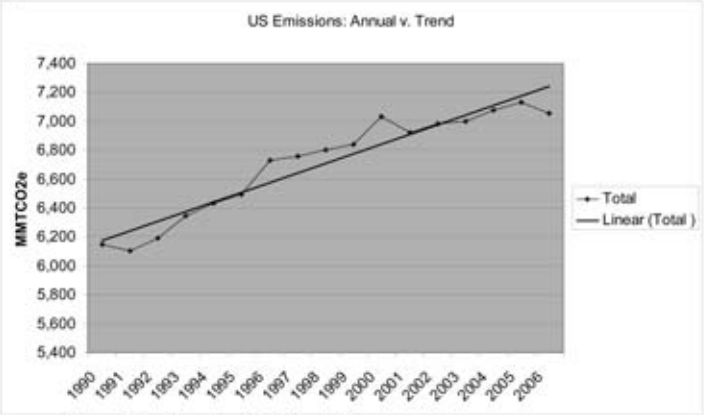
Mr. Chairman, that completes my testimony, I will be happy to take any questions you or other members of the subcommittee may have.

Figure 3. Price Threshold Illustration



Source: NRDC analysis

Figure 4. Annual U.S. Greenhouse Gas Emissions Compared to a Linear Trend



Source: EPA emissions Inventory; NRDC analysis

Chairman RANGEL. Thank you.

I would like to hear from Dr. Dallas Burtraw, Senior Follow, Resources for the Future.

STATEMENT OF DALLAS BURTRAW, SENIOR FELLOW, RESOURCES FOR THE FUTURE

Mr. BURTRAW. Thank you. I am with Resources for the Future. RFF does not take stands on specific issues, and the view I express today are my own.

The main point I want to communicate today is the opportunity for cost management through the introduction of a price collar or a symmetric safety valve around the price and allowance trading program. The price collar would set a price ceiling and a price floor for trading emission allowances.

We have heard about a one-sided safety valve previously which would place a ceiling on the price of emission allowances, and it has been criticized for two reasons. One is that if it was triggered, it would lead to the introduction of additional emission allowances into the market, and lead to emissions that exceeded the emissions target.

Second, the possibility that that might occur means that the return to investment in innovation and new technologies would be less than it otherwise would be because investors would anticipate that maybe their investments would be undermined through the introduction of additional emission allowances. Both of these criticisms have merit, and both of them can be overcome with a symmetric approach to a safety valve because it recovers expected emissions and expected returns on investment.

The floor price is simple to administer through a reserve price in an auction, and a reserve price is a standard feature of good auction design. A symmetric safety valve also contributes in a serious manner to guarding against market manipulation and speculation by limiting the range within which prices can fluctuate in the market.

But most importantly, the symmetric safety valve reduces price volatility, and that is important for investment in new technology. A volatile price erodes the incentive to invest because it raises the hurdle rate on new investment. Consequently, volatility actually ends up raising the cost of climate policy because it leads to lower levels of investment, slowing the pace of technological change.

We already saw this slide of the degree of price volatility in the E.U. emissions trading program. The spot price in phase 1 rose to 30 Euros before collapsing. The price in phase 2 has fluctuated substantially from a peak of around 30 Euros to a recent low of 8 Euros.

The next slide indicates the role of a systemic safety valve situated at plus or minus 30 percent of the expected price path. The last cost path should rise at the interest rate, which I illustrate is 7 percent per year. Many of the peaks and valleys could be limited with a loose safety valve. The safety valve could be tightened further, here indicating a price collar that is plus or minus 15 percent around the expected price path.

In the limit, of course, the safety valve converges to a single price that provides the greatest possible stability in prices. Whether a

loose price collar is chosen or a single price is chosen, it is very important that the program be able to self-correct. A symmetric safety valve provides some measure of this because it allows the program to automatically adjust in a predictable way when costs deviate from expectations.

The importance of this is evidenced in the SO2 trading program, where the optimistic EPA forecasts from 1990 anticipated that to achieve the emissions target under the Clean Air Act would require a price of about $885 in 2010. Various factors, including emissions trading and banking, contributed to the outcome that allowance price today has now fallen to just $65 per ton.

Low cost is good news, but one would think that congressional intent to purchase benefits, environmental and public health benefits, at $885 per ton would lead us to want to take advantage of a bargain sale when the price turned out to be much less. However, the quantity target left our feet in cement. A symmetric safety valve would have harvested billions of dollars in net economic benefits that have been left unrealized.

With either a quantity cap or a price approach, it is important that the program be flexible to new information. A price collar helps achieve this with a decision rule that is transparent to the investment community and to the public.

Thank you for the opportunity to testify today.

[The prepared statement of Mr. Burtraw follows:]

Statement of Dr. Dallas Burtraw, Senior Fellow, Resources for the Future

Hearing on Addressing Price Volatility in Climate Change Legislation

Written Testimony of Dallas Burtraw

Senior Fellow, Resources for the Future, Washington, D.C.

Prepared for the U.S. House of Representatives

Committee on Ways and Means

March 26, 2009

Summary of Testimony

A symmetric safety valve can be expected to lower price volatility in a cap-and-trade program, thereby reducing unproductive economic disruptions. It can be expected to lower the hurdle rate for new investments in innovative technology, thereby reducing the overall cost of the program. And it provides a safeguard against potential manipulation of the market by limiting the potential payoff to such behavior.

A cap-and-trade policy and an emissions tax can be designed to share a set of attributes that are often associated with the other. Whether the choice is a cap or a tax, it would be a mistake to adopt an inflexible policy. Both can be designed to automatically adjust to information about program performance, according to decision rules that can be transparent to investors.

Hearing on Addressing Price Volatility in Climate Change Legislation

WRITTEN TESTIMONY OF DALLAS BURTRAW

Mr. Chairman, thank you for the opportunity to testify before the House Committee on Ways and Means. My name is **Dallas Burtraw,** and I am a senior fellow at Resources for the Future (RFF), a 57-year-old research institution based in Washington, DC, that focuses on energy, environmental, and natural resource issues. RFF is independent and nonpartisan, and shares the results of its economic and policy analyses with environmental and business advocates, academics, government agencies and legislative staff, members of the press, and interested citizens. RFF neither lobbies nor takes positions on specific legislative or regulatory proposals. I emphasize that the views I present today are my own.

I have studied the performance of emissions cap-and-trade programs from both scholarly and practical perspectives, including evaluation of the sulfur dioxide (SO_2) emissions allowance trading program created by the 1990 Clean Air Act Amendments, the nitrogen oxide (NO_X) trading program in the northeastern United States, and the European Union Emission Trading Scheme (EU ETS). I have conducted analysis and modeling to support the state and regional efforts to design trading programs, and I served on California's Market Advisory Board overseeing the state's greenhouse gas initiative. Recently, with colleagues at RFF, I have conducted economic analysis of mechanisms to contain the costs and the variability of costs of implementing climate policy.

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The issue of how to set climate policy in the presence of uncertainty about the cost of emissions reductions has two features. One addresses how expected costs may change over a long time horizon, which gives rise to proposals for cost containment. A second aspect is how prices may vary in the short run. A market for emissions allowances in a cap-and-trade program would resemble a commodity market and experience with previous programs indicates that prices can be volatile. The two issues are related because excessive volatility in prices will undermine the incentives for new investment, slow technological change, and raise the long-run cost of climate policy.

How climate policy legislation is designed can have a significant impact on price volatility. From an economic perspective, a smooth price signal that increases over time is the most efficient way to provide incentives for investors and to minimize disruptions in the economy. An emissions tax or direct sale of emissions allowances would have none, or minimal, price volatility. A cap-and-trade program can be designed to obtain this result with a symmetric safety valve.

A symmetric safety valve is a price collar that provides a floor as well as a ceiling on the price of emissions allowances. This design does a better job of insuring against price volatility. In addition, a one-sided safety valve leads necessarily to exceeding the emissions target and thereby undermines the incentive for new investment. The introduction of a symmetric price floor leads the program to recover its expected emissions target. This in turn recovers the expected return on innovation. Moreover, the reduced price volatility resulting from the introduction of a ceiling and a floor enhances the investment climate for new investment beyond that which results from unbridled price volatility.[1]

The administration of a symmetric safety valve is straightforward. At the price ceiling, additional allowances would be sold directly into the market. Revenues from the sale of additional allowances might be dedicated to program-reinforcing investments, such as investment stimulus in technology or energy efficiency. The price floor is enforced through the introduction of a reserve price in an auction. If bids in the auction fall below the specified floor, then the given lot of allowances would not be sold. That would tighten supply in the market and bring up the spot price. Economists generally consider a reserve price to be a good feature of auction design in any event, and they are found frequently in actual auctions, including the auction for carbon dioxide (CO_2) emissions allowances in the northeast Regional Greenhouse Gas Initiative.

In the limit, if the *price collar* created by a price ceiling and floor collapses to a single point, the program would resemble an emissions tax or direct sale of emissions allowances. In general, free allocation is likely to lead to greater price volatility because the market has to discover the price through a series of trades. An auction would have less volatility than free allocation because a large number of

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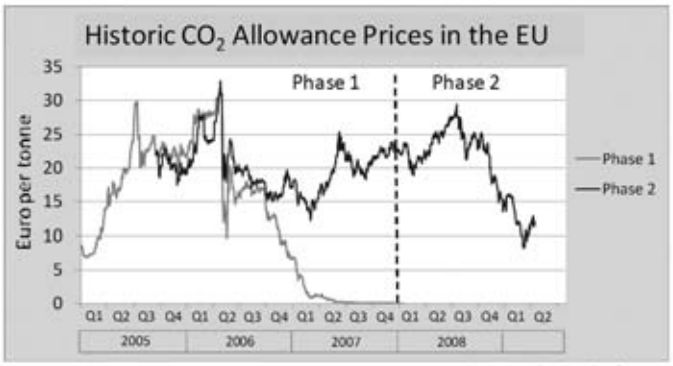
[1] Several recent papers have concluded that a symmetric safety valve would add important efficiency benefits to a cap and trade program. See: Burtraw, Palmer and Kahn, 2009. "A Symmetric Safety Valve," Resources for the Future Discussion Paper 09-06; Philibert, 2008. "Price Caps and Price Floors in Climate Policy – A Quantitative Assessment," International Energy Agency Information Paper; Fell and Morgenstern, 2009. "Alternative Approaches to Cost Containment in a Cap-and-Trade System," Resources for the Future Discussion Paper in preparation.

trades occur at a market-clearing price. A direct sale of allowances, or an emissions tax, would minimize the amount of price volatility.

The leading proposal to reduce emissions of greenhouse gases is a cap-and-trade policy whereby the economy is subject to an overall cap on total emissions. Price volatility has been a notable characteristic of previous emissions trading programs. For the most part, the problem has not been a price spike, but rather a price collapse. The exception is Southern California's RECLAIM program, which suffered a price spike during the state's electricity crisis. However, experience with a price collapse has been much more troublesome.

Figure 1.



Source: Point Carbon

We have seen a price collapse in both of the first two phases of the EU–Emissions Trading System. The first phase covered the period from 2005-2007, and the second phase covers 2008-2012. The spot price for each of these program phases is illustrated in Figure 1. Less than a year ago the spot price was 30 Euros ($40.64) per metric tonne; but most recently the price had fallen to 12 Euros ($16.26) per metric tonne. This is unfortunate because it does not reflect the expected cost of abatement through phase 3 of the program running through 2020. But, because the price has collapsed, it has undermined the rewards for innovation and investments in low-emitting technology. Furthermore, the price volatility actually raises the cost of such investment by raising the hurdle rate that firms place on investments. Consequently, less investment in innovation will occur this will

slow the pace of technological change and raise the cost in phase 3. In addition, another aspect of the price collapse in the EU system is a potential collapse of the international offsets market.

This issue is an important concern of the business community. In the last week, I heard a representative of one of the largest chemical companies in Europe say: "We see the CO_2 price go up and down and we got so fed up with price variation we developed an internal CO_2 price. We need an idea of a stable price in order to make investment decisions." In fact, major investment in new technologies is risky and requires greater price stability than we have seen previously. Indeed, industry seems to signal that they would trade off a higher price in exchange for price stability.

In the United States, a price fall is also the prominent characteristic of the familiar SO_2 trading program. President Bush senior and the 1990 Congress adopted an emissions target of 8.95 million tons per year based on an expected price of $766-$1,005 per ton in 2010 (2006 dollars), which was provided by EPA at the time. This target reflected a considered balancing by Congress of the tradeoffs between environmental and public health benefits and the costs to firms and consumers of emissions reductions. As it turned out, we quickly learned that the price per ton of emissions reduction was one-quarter of that. Today, the price of an emissions allowance is $65 per ton. One would think that Congressional intent to purchase benefits at a cost of $766-$1,005 per ton would lead Congress to take advantage of a bargain sale when the price turned out to be so much less and to purchase additional emissions reductions.

Unfortunately the 1990 Clean Air Act amendments left our feet in cement with regards to the emissions target. The cost of this inability to adapt is that billions of dollars a year in environmental and public health benefits are left on the table, based on what Congress knew when it enacted the policy in 1990. We estimate that a symmetric safety valve at plus or minus 30 percent of the EPA's expected price level in 1990 would have introduced a floor on allowance prices of $605 (30 percent below the midpoint of the range above). If this price floor had been implemented it would have yielded billions of dollars each year in net economic benefits, even after accounting for the cost of emissions reductions, because that cost is much lower than was originally anticipated.[2]

A symmetric safety valve also contributes in a serious manner to guarding against market manipulation by limiting the range within which prices might

[2] Burtraw, Palmer, and Kahn, 2009. "A Symmetric Safety Valve," Resources for the Future Discussion Paper 09-06.

fluctuate. The returns to price speculation or market manipulation derive from taking advantage of price volatility and potentially fueling that volatility. There is little evidence of such manipulation in previous markets, outside of the RECLAIM experience, but concern about such manipulation can be substantially reduced with the introduction of a symmetric safety valve.

What a symmetric safety valve can be expected to do is lower price volatility in a cap-and-trade program, thereby reducing unproductive economic disruptions. It can also lower the hurdle rate for new investments in innovative technology, thereby reducing the overall cost of the program. And it provides a safeguard against potential manipulation of the market by limiting the potential payoff for such behavior.

There are a variety of proposals that are intended to have an effect that would be similar in some ways to a symmetric safety valve. One is a fixed-quantity strategic allowance reserve. This approach would provide a limited number of additional allowances that could be introduced into the market at a fixed price if the allowance price reaches some critical level. Hence, it functions only as a one-sided safety valve, and thereby introduces asymmetric incentives that erode the payoff to investment unless it was coupled with an emissions floor. Further, after the allowance reserve is exhausted, the allowance price would be allowed to rise again, probably signaling an inevitable program review.

Another measure that would have effects similar to that of a symmetric safety valve is banking. A bank effectively expands the liquidity of the market at any point in time, and price volatility tends to be diminished in deeper markets. Further, in the presence of an emissions bank, the price at any one point in time is related to other time periods by the cost of holding allowances as an asset, so effectively the market is very deep because the current price would be related to prices in future periods.

Banking can help contain costs by enabling firms to plan investments over a longer time horizon. In previous trading programs, we observed that firms tend to behave in a risk-averse manner, especially in the early years of the program. The ability to hold allowances in their own account to cover contingencies is comforting to management. It is also comforting to investors. For example, in the SO_2 program, especially early on, they required firms to hold allowances to cover several years of the facility's operation or show they had contracts for allowances. This behavior was amplified when prices appeared volatile, something that is lessened with a symmetric safety valve.

In a general economic context, emissions banking provides an important opportunity to achieve a cost-effective path for emissions reductions under cap and trade. This is important because it allows private firms to make decisions based on their opportunity cost of capital, and thereby leads to a cost minimum over time. Congress might specify annual emissions targets without banking, intending to mimic the decisions of firms in this regard, but it would introduce another potential element that could be incorrect and unnecessarily inflexible. If one assumes that banking is in place, the price collar allows for further cost effectiveness in the event that the forecast of the opportunity cost of capital differs from the actual outcome. It frequently has been shown in theoretical and simulation modeling, that the annual rate of change in the marginal compliance cost equals the opportunity cost of capital (the interest rate). In sum, banking is complementary to a symmetric safety valve and a feature considered to be a good part of a cap-and-trade program.

Banking also has the effect of creating an interest group that is vested in the success of the program. We saw in the SO_2 program that the regulated community that makes investments and changes behavior to achieve emissions reductions becomes the owner of a bankable valuable asset that retains value only if the program is successful. This community becomes an advocate for rigorous monitoring and enforcement because this reinforces the value of their own investments.

The same cannot be said about borrowing. Proposed borrowing in a cap-and-trade program might be implemented at a system level or at the firm level. In either case, it creates a severe moral hazard, where the regulated entities that incur a liability accrue an interest in the program's demise. That is because the borrowed allowances are a debt. At the system level, it reflects a future reduction in the cap beyond the original design, with associated costs for firms. If borrowing by individual firms is allowed, they have an individual incentive to see the program fail. The moral hazard stems from the fact that firms that are the least solvent have an incentive to borrow more, betting on the possibility of insolvency for the system, or potentially their own insolvency.

The Medicare program illustrates the kind of dilemma that can emerge with such a system of incentives. Medicare spending goals are linked to the growth of the economy. Currently, when actual spending on doctor's services exceeds the goals under Medicare, payments to doctors are supposed to be reduced or else Medicare is supposed to recoup the money by making deeper cuts in payments for services in future years. Essentially, Medicare runs a debt that is growing to significant levels.

This does not mean we need to remove every element of flexibility where it might be helpful in administering the system and to straightforward compliance actions for firms. In some programs, the "true-up" period before allowances must be surrendered overlaps with the next year's allocation or sale of allowances, enabling the use of a small portion of the next year's allowances in a previous year. This resembles a small bit of borrowing. The feature may be innocuous, as long as there is a symmetric safety valve in place to guard against adverse outcomes.

How might the symmetric safety valves or price collars be determined? There is no specific theory emerging from the literature about this yet. The size of the collar or the difference between the ceiling and floor is less important than the midpoint because the midpoint represents a signal to investors about the level of effort Congress and society expect to have to make to achieve climate goals. In setting a symmetric safety valve, the opportunity for shenanigans exists if the collar is not aligned with price expectations generally reflected in the modeling community. For example, if the price ceiling were below the expected price path associated with an emissions target, then the price ceiling would be expected to bind immediately at the start of the program.

A number of models are available to predict the cost of various emissions targets. Although models are inevitably wrong and they differ to some degree, the differences are primarily driven by differences in assumptions about program design. General guidance from the modeling community can provide a reasonable expectation about allowance prices. For a given program design, the expected price path in the models maintained by EIA and EPA provide a reasonable range that can be used as a basis for expected costs. I suggest that a symmetric safety valve with the ceiling and floor set equal distance from that expected path would be a good design.

How large should the collar be? I will nominate a range of plus or minus 30 percent of the expected price as a reasonable price collar. A feature of this decision is to pay attention to the ceiling relative to the price that is expected to be necessary to bring in private sector investment for what we refer to as backstop technology, that is, a technology that is expected to deliver significant emissions reductions if it is available. An obvious focal point for this is carbon capture and storage. A couple years ago, the Massachusetts Institute of Technology suggested an allowance price of $30 per ton CO_2 would be necessary, if coupled with substantial public-sector investment in research and development.[3] More recently, Carnegie Mellon University suggested a greater value, depending also on the amount of public sector

[3] MIT, 2007. *The Future of Coal: Options for a Carbon-Constrained World.*

investment.[4] For illustration, I observe that the EIA suggests a price of $20.91 (2006 dollars) in 2015, and $29.88 in 2020, would have been necessary to implement the Lieberman-Warner legislation. This represents an annual rate of growth in the allowance price of 6.89 percent per year. A safety valve of plus or minus 30 percent would have created a price collar of $14.64-$27.18 in 2015 and $20.92-$38.84 in 2020 (2006 dollars). I defer on the underlying question of the stringency of the program overall.

If we expect allowance prices to rise at the interest rate we should also expect a similar change in the price ceiling and floor. It would be reasonable to expect, as a consequence, that the decision rule I suggest the initial spread of plus or minus 30 percent would be maintained.

There is a trade-off between price certainty and other attributes. If the goal is to provide maximum price certainty, the policy design option to be preferred would be an emissions tax. A frequent dichotomy is poised between a cap-and-trade program and an emissions tax policy, suggesting that each provide a different type of certainty, but this difference is sometimes overblown. It is suggested a cap provides emissions certainty, but it is not providing environmental certainty.

Emissions certainty is even an illusion since the United States is responsible for just 22 percent of global emissions, and emissions certainty depends on our successful engagement of the international community especially developing nations. The introduction of a symmetric safety valve introduces some uncertainty about domestic emissions but the outcome could be they are either greater or less than anticipated. It could actually provide additional certainty about emissions targets by demonstrating a self-correcting feature of the program design that gives investors and others confidence in the longevity of the program.

A tax, in contrast, is expected to provide cost certainty but not emissions certainty. On the other hand, the emissions target is not rudderless under a tax. First, one would expect the tax to rise at the anticipated opportunity cost of capital over time. If the anticipated opportunity cost of capital is incorrect, then the tax itself would deviate from a constant relative price in the economy, yielding a change in the emissions path from expected levels. Second, technological change and economic activity will vary, leading to a change in emissions from expected levels. Hence, a well-designed tax system should have a self-correcting mechanism built in to allow it to change over time.

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[4] Samaras, et al. 2009. *Cap and Trade is Not Enough: Improving U.S. Climate Policy*, Carnegie Mellon University.

The available information to inform this evolution is observed emissions. Associated with a price path is an expected emissions path that can be identified from modeling. Congress could adopt an emissions path as the goal of the policy, and choose a price instrument as the mechanism for achieving that goal. The price path, that is the path of the emissions tax, could *automatically* evolve according to a predetermined rule by adjusting its annual rate of change around the opportunity cost of capital. For example, if the rate is expected to be 6.89 percent per year, but emissions start to grow faster than expected, the rate of growth of the tax could automatically increment by 0.2 percent to 7.09 percent and subsequently to 7.29 percent, as necessary to retain an emissions goal. These small adjustments would not provide short-run jolts to the decision calculus of investors. But since the rate compounds over time, a difference of even 0.2 percent would accumulate to a substantial difference in the tax over time. Similarly, a reduction in the tax could be implemented automatically if emissions fall below expectations.

The advantage of either of these processes, either a symmetric safety valve or a tax that can adjust, is that the program could be self correcting, unlike the experience in the SO_2 program or the EU Emissions Trading program. There is a difference in this regard. In large measure, the lesson is that each instrument can be implemented to achieve a combination of goals.

In summary, a cap-and-trade program and an emissions tax can each be designed to share a set of attributes that are often associated with the other. The ultimate decision may involve many criteria. Whether the choice is cap and trade, or an emissions tax, it would be a mistake to adopt an inflexible version of the policy. In particular, an emissions cap for CO_2 should be coupled with a symmetric safety valve in order to capture some of the flavor of a tax approach. Similarly, a tax approach should have an associated emissions goal and an automatic mechanism so the rate of change in the tax adjusts over time to adjust emissions trends back toward original goals. The administration of either of these flexible aspects of design is easy to develop, communicate, and implement. That is important for the creation of a new environmental market. Moreover, there are substantial economic benefits to such flexible designs, in either case.

I have focused on relatively narrow aspects of the architecture of a cap-and-trade program. In general, costs can be kept to a minimum by good program design that achieves cost-effective emissions reductions and encourages innovation and investment to bring down the cost of compliance over time.

Thank you for the opportunity to testify today.

Dr. Burtraw is a senior fellow at Resources for the Future. He holds a Ph.D. in economics and a master's in public policy from the University of Michigan. Dr. Burtraw has conducted research in the design of incentive-based environmental policies in the electricity industry and written extensively on the performance of emissions trading programs in the United States for sulfur dioxide and nitrogen oxides and the European Union's Emission Trading System for carbon dioxide. He also has advised on the design of climate policy for U.S. state governments. He currently serves on the EPA Advisory Council on Clean Air Compliance Analysis and on the National Academies of Science Board on Environmental Studies and Toxicology.

Chairman RANGEL. Thank you.

Dr. William Whitesell, director of policy research, Center for Clean Air Policy.

STATEMENT OF WILLIAM WHITESELL, DIRECTOR OF POLICY RESEARCH, CENTER FOR CLEAN AIR POLICY

Mr. WHITESELL. Thank you, Mr. Chairman, Ranking Member Camp, and Members of the Committee. I appreciate the opportunity to testify today. I am an economist with 20 years experience at the Federal Reserve Board before recently becoming director of policy research at the Center for Clean Air Policy.

CCAP, as we are called, has helped design climate and air quality policies at the international, national, and local levels since 1985, including cap and trade for acid rain and for the European carbon program. We convene discussions among climate negotiators from over 30 countries, and also sponsor other dialogs, including one with U.S. corporations, environmental groups, and government representatives to address national climate policies.

CCAP strongly favors the passage of cap and trade legislation to control greenhouse gas emissions. I would like to emphasize three messages today.

First, price volatility is a key risk in the early years of a new climate program. Second, a carbon tax is the surest way to fix prices, while cap and trade is the surest way to meet environmental goals. Third, the safe markets approach to cap and trade, which I will discuss, would make prices predictable while still ensuring environmental goals.

A new cap and trade program creates a new market for mission allowances, which are a commodity that could be subject to the booms and busts in prices we have seen in many markets recently, including general commodity prices, as shown on the chart, and also prices in the European carbon market, as you have seen in many charts today, including this one.

Such price swings would be especially harmful as a new carbon market takes shape in the United States. Uncertain prices will cause some firms to mistakenly invest in projects to reduce emissions that are too costly, while other firms will fail to invest in low-cost projects that should go forward. The overall cost of reducing emissions will therefore be higher than necessary.

In addition, fears of and the reality of market manipulation could undermine support for the program. A carbon tax would avoid price volatility by eliminating the market. Regulated firms would merely pay the Treasury for their emissions.

However, with a carbon tax or other fixed price approach, we may not reduce emissions enough. Even if legislation specifies a rising tax over time, the level of the tax or its rate of increase may be too low to reduce climate risks to respectable levels.

We believe the safe markets approach to cap and trade is a better way to address price volatility. It makes carbon prices as predictable as possible, while still achieving a hard 2020 emission cap and ensuring cumulative emission reductions.

Before 2020, it acts as training wheels for a new carbon market, eliminating opportunities for market manipulation and thereby allowing companies and regulators time to gain experience with the

market. We were very pleased to work with Representatives Doggett and Cooper on the Safe Markets Development Act, which reflects these concepts.

Under this approach, an independent board manages carbon prices prior to 2020 with procedures similar to those used by the Federal Reserve to manage interest rates. The board announces a multi-year forecast for allowance prices, and before each year sets a target for the average market price that year.

The board keeps prices close to the target by adjusting the number of allowances sold in auctions. Emissions may differ from expectations in a year as the board makes sure that firms get all the allowances they need at roughly the target price. This is okay because the emissions of carbon dioxide in a single year, unlike a traditional air pollutant, do not cause local health risks.

Stable prices, along with limits of allowance banking or hoarding of allowances, eliminates opportunities for gaming of the system and excess speculation, as those behaviors would fail to move prices. At year end, the board would compare actual emissions with expectations, revise its forecasts if needed, and report to Congress on its decisions and program results.

The next chart shows an example. The board's initial forecast of rising allowance prices is the solid blue line. That price path is designed to achieve the gradual reductions in emissions indicated by the lower black line with square markers.

Actual emissions might come in above or below expectations in the first year. In the example shown the round dot, they exceed expectations. If emissions were higher than expected because of temporary factors like unusual weather, the board would not change its forecasts.

The chart assumes a worst-case scenario, where the excess emissions are caused—are likely to persist in future years. The board therefore revises up its price forecast, as shown by the dashed blue line. The revised path for expected emissions is the dashed red line with triangle markers.

This annual revision in prices helps to keep cumulative emissions on track better than if prices were fixed or a price ceiling were used. While excess emissions are made up after 2020, the risk of large borrowings from the future is much lower than in the case of an allowance reserve. The safe markets approach allows a traditional cap and trade program to begin in 2020, or the features of the early years to be continued.

In sum, we believe this approach combines the best features of cap and trade and carbon taxes. It provides a high level of environmental integrity along with predictable carbon prices. It eliminates incentives for manipulation and excess speculation, creating confidence in a new carbon market. Thank you.

[The prepared statement of Mr. Whitesell follows:]

Statement of Dr. William Whitesell, Director of Policy Research, Center for Clean Air Policy

Testimony of William Whitesell

Director of Policy Research,

Center for Clean Air Policy

before the

U.S. House of Representatives

Committee on Ways and Means

The Safe Markets Development

Approach to Cap and Trade

March 26, 2009

Mr. Chairman, Ranking Member Camp, and Members of the Committee: Thank you for the opportunity to testify today. My name is William Whitesell and I am the Director of Policy Research at the Center for Clean Air Policy (CCAP), a Washington, DC and Brussels-based environmental think tank with on-the-ground programs in New York, San Francisco, Mexico City, Beijing, Jakarta and many other places. I am an economist who previously served at the Federal Reserve, where I had responsibilities for the analysis of financial market developments and the implementation of monetary policy.

Since 1985, CCAP has been a recognized world leader in climate and air quality policy and is the only independent, non-profit think tank working exclusively on those issues at the local, national and international levels. CCAP helps policymakers around the world to develop, promote and implement innovative, market-based solutions to major climate, air quality and energy problems that balance both environmental and economic interests.

CCAP is actively working on national legislation in the United States and is advising European governments as well as developing countries such as China, Brazil, and Mexico on climate and energy policy. Our behind the scenes dialogues educate policymakers and help them find economically and politically workable solutions. Our Future Actions Dialogue provides in-depth analyses and a "shadow process" for climate negotiators from 30 nations from around the world to help them develop the post-2012 international response to climate change. We also facilitate policy dialogues with leading businesses, environmental groups and governments in the European Union and the U.S. on designing the details of future national and transatlantic climate change mitigation, adaptation and transportation policies.

CCAP played a major role in the design and passage of the SO2 trading system enacted in the 1990 Clean Air Act Amendments and was the lead consultant in the original design of the European Union's Emissions Trading System (EU ETS). It has also helped develop national, regional, state and local climate policies in the U.S. and many other nations, including emission mitigation policies, smart growth initiatives, forestry policies and innovative approaches to climate adaptation.

Mr. Chairman, CCAP strongly favors the passage of cap-and-trade legislation to control greenhouse gas emissions. You have asked us to comment today on addressing price volatility in climate change legislation. Alternatives for climate change legislation differ significantly in the manner in which they address price volatility and also in the extent to which they ensure environmental certainty and foster the development of a carbon market.

At one end of the spectrum is a carbon tax which—barring Congressional intervention—would provide certainty about the price of each ton of emissions. It would also eliminate volatility, as there would be no carbon market. Firms would merely pay the U.S. Treasury for their emissions. However, the trade-off for the carbon price guarantee is that the quantity of emissions cannot be predicted or guaranteed. Even if legislation provided for a rising carbon tax over time, the level of the tax or its rate of increase might be too low to achieve the reductions in emissions that we will need to meet climate objectives.

At the other end of the spectrum is a pure cap-and-trade program that lacks an effective method for limiting price volatility. It guarantees annual emission levels by setting a cap and creates a carbon market by allowing trading in carbon emission allowances. The trading of allowances, along with allowance banking (the ability of firms to carryover extra allowances from one year to the next), gives regulated firms additional flexibility in timing their compliance investments. However, allowance prices may become volatile in a cap-and-trade program. Moreover, market manipulation and excess speculation could cause booms and busts in prices just as we have seen recently in commodity and financial markets.

Today, I would like to tell you about an idea CCAP developed called the Safe Markets Development Approach. It is a cap-and-trade program that incorporates some of the beneficial features of a carbon tax. During the early years of the program (2012 – 2019), it combines the greater price predictability of a carbon tax with the emissions certainty of

a cap-and-trade program. As its name implies, it provides "training wheels" for the development of a new carbon market, eliminating opportunities for market manipulation and excess speculation while providing companies and regulators time to gain experience with the new market. To create more predictable emissions allowance prices, the Approach borrows time-tested methods that the Federal Reserve uses to manage interest rates. The Safe Markets Development Approach also enforces cumulative emissions reductions while allowing some fluctuation in annual emissions as needed to stabilize allowance prices in the early years of the program. Beginning in 2020, the program moves to a more traditional cap-and-trade program with annual emissions caps.

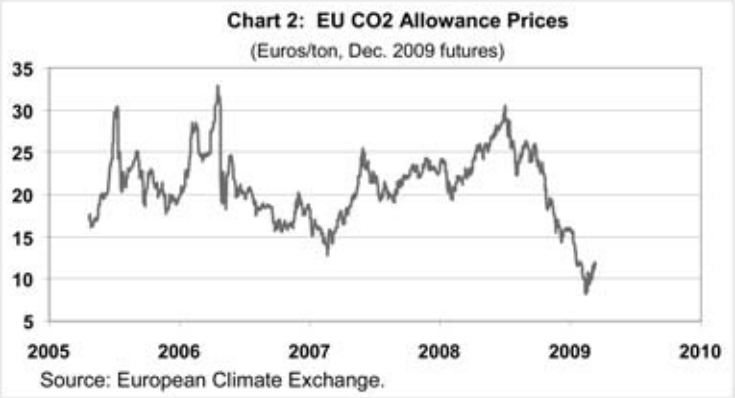
We are very pleased to have worked closely with Representatives Doggett and Cooper on their bill called the Safe Markets Development Act, which reflects these concepts. We would like to thank them for their leadership and effort to find a middle ground solution that both carbon tax and cap-and-trade advocates could support.

Why Did CCAP Develop the Safe Markets Development Approach?

CCAP developed the Safe Markets Development Approach for two reasons. First, we are concerned with the possibility that carbon allowance prices in a cap-and-trade program could fluctuate widely much like the prices of other commodities and carbon allowances in the European Emissions Trading System (EU ETS). Second, we are concerned with proposals that would set a fixed price or a formulaic increase in carbon prices over time that would be insufficient to reduce emissions enough to avert the worst effects of climate change.

Chart 1 demonstrates clearly what has happened to commodity prices in recent years. It shows prices since 1994 for a broad index of commodities that includes energy, metals, and agricultural goods. Prices surged to unprecedented levels in mid-2008 before collapsing in recent months.

Chart 2 shows the December 2009 futures price for carbon allowances in the EU ETS. It is a good barometer for emission allowance prices in general over the last year or so. While allowance price fluctuations in the 2005-to-2007 period were to be expected as this was a pilot phase focused on "learning by doing," the price fluctuations in 2008 appear to reflect the problems in the larger economy. The price of carbon allowances peaked at over 30 Euros per ton in mid-2008 before dropping to around 10 Euros in recent months. Application of a Safe Markets Approach in this period would have stabilized those prices and produced greater emissions reductions and environmental benefits.



Price booms and busts may occur in financial and commodity markets for many reasons. Some fluctuations in prices occur because supply and demand rises and falls. More severe swings in prices may occur because of manipulation, gaming of the system, and excess speculation. In addition, financial markets are subject to herd behavior in that investors are often influenced by the expectations of other investors about future developments.

In recent years, large amounts of financial capital from hedge funds, pension funds, and endowments have moved in and out of commodity investments, contributing to the swings in prices. Many of these institutional investors chose to diversify their financial portfolios by investing in mutual funds that track commodity price indexes. It is entirely conceivable that the market for greenhouse gas emission allowances will become large and liquid enough that the price of allowances will be included in an index of commodity prices. If so, investors placing money in a commodity index fund would be indirectly investing in emission allowances. The flows of financial capital in and out of carbon allowances from institutional investors, whether through index funds or other means, could contribute to the creation of large fluctuations in allowance prices.

Price Volatility Undermines Investments That Reduce Emissions

Wide price swings would be harmful to the development of a new carbon market in the United States. In the early years of a cap-and-trade program, regulated firms will be planning to reduce their emissions. If carbon prices are uncertain, these firms will face more difficult investment choices. Some firms may mistakenly invest in high-cost projects they should not have invested in while others may fail to invest in low-cost projects that should have gone forward. The overall costs of reducing emissions would therefore be higher than necessary. In addition, fears of or the reality of manipulation in the trading of allowances could undermine support for a cap-and-trade program.

Cap and Trade Provides Needed Environmental Integrity

Concerns about price volatility and market disruptions must be balanced with the need to meet specific emission reduction goals that could help avoid the worst effects of climate change. It is well accepted that fixing the price of carbon permanently by law through a carbon tax or other means may not generate sufficient emission reductions to reduce climate risks to acceptable levels. That is why CCAP has anchored the Safe Markets Development Approach in a cap-and-trade framework, which sets an emissions cap and is widely viewed as most likely to achieve needed emissions goals.

However, the Safe Markets Development Approach modifies a traditional cap-and-trade program in its early years by shifting from enforcing annual emissions targets to enforcing cumulative emissions over several years. By doing so, we gain the ability to create more predictable allowance prices without sacrificing environmental integrity. We believe the weight of scientific evidence does not compel solutions focused only on fixed annual emissions reductions. Carbon dioxide (CO_2) is unlike conventional air pollutants, such as particulate matter, which have direct local and regional health impacts based on the concentration of the pollutants released at a given time to the atmosphere. In contrast, CO_2 is very long-lived in the atmosphere and its impacts are long term rather than acute. What matters for the climate are the cumulative global greenhouse gas emissions through

2050. We care about medium term levels such as the cap in 2020 because it affects our ability to meet cumulative emission goals. CO_2 is an ideal pollutant for application of the Safe Markets Development Approach as we do not face any short-term environmental health trade-off by allowing some year-to-year variability in cap levels.

How Does the Safe Markets Development Approach Work?

Between 2012 and 2019, Phase I of the program, an independent Board would manage carbon prices to achieve price predictability and meet environmental goals. Before each year, the Board will publish a forecast for the entire Phase I period which will include gradually rising allowance prices and declining emissions needed to reach a hard 2020 emission cap. The forecast price for the coming year will be set as a target price for that year. The Board will adjust the number of allowances sold in quarterly auctions during the year to keep the average allowance price for the year fairly close to the target price. The Board will consider both the auction and the secondary markets in deciding how many allowances to sell. Regulated firms will be permitted to bank a small number of allowances year-to-year. That will help maintain the price target and provide a cushion for regulated firms so they don't need to buy the number of allowances that exactly matches their emissions for the year. The relative stability of prices within a trading year, along with limits on allowance banking, will eliminate opportunities for manipulation, gaming of the system, and excess speculation, as those types of behavior would fail to move market prices.

This method of setting a price target and managing the auction process to maintain that price is adapted from the procedures the Federal Reserve (Fed) uses in managing interest rates. Many people think that the Fed directly sets the key interest rate it uses to implement monetary policy. However, the truth is that the Fed does not directly control that interest rate. The interest rate is determined in a private sector market in which more than $100 billion is traded every day. The Fed tries to achieve its target interest rate by announcing the target and then using auctions that are called open market operations. The Fed adjusts the size of these auctions as needed to achieve its target interest rate on

average in trading in the private sector market. While some trading occurs at interest rates slightly different from the Fed's target, the Fed is very successful at keeping most trading close to the target. The resulting price stability also means that market manipulation and excess speculation are virtually absent from this market.

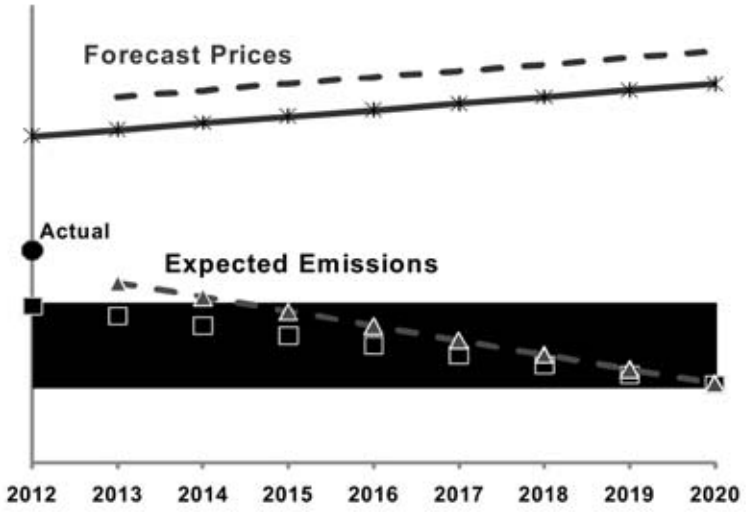
One of the strengths of the Safe Markets Development Approach to cap-and-trade relative to a carbon tax is that the Board will reassess progress at the end of each year and adjust the allowance price to stay on track for meeting the 2020 emissions goal. To do this, at the end of the year, the Board will compare actual emissions with its prior expectations. It will then revise its forecast price path if needed to ensure that the trend path of gradual emissions reductions is in line to achieve the 2020 emissions target. In deciding whether to modify its price and emissions forecast each year, the Board will analyze the reasons why actual emissions during the prior year were above or below the forecasted level. If the differences are attributable to temporary influences, such as unusual weather or transitory fluctuations in economic activity and energy use, the Board will not adjust the forecast path for prices. These temporary factors are expected to average out over time.

If the differences are likely to persist in future years, such as changes in the baseline emissions intensity of the economy (i.e., the emissions per unit of gross domestic product) or in the long run costs of new technology to reduce emissions, the Board will revise the overall forecast path for prices. After completing its review of the price forecast, the Board will announce its target price for the year ahead. The Board must then provide a full report to Congress in writing and in testimony before the appropriate committees in both the House and Senate. The report will assess the progress toward emissions goals, the effectiveness of the program procedures, the behavior of carbon markets, the revision — if any — in the price forecast, and the reasons why the Board chose the coming year's target price.

Chart 3 is a simple example of how the Board would adjust its forecast price path to meet 2020 emission goals. The Board's initial forecast of rising allowance prices is the solid

blue line. That price path would be designed to achieve a gradual decline in emissions, such as that shown by the lower black line with square markers. Actual emissions might come in above or below expectations in the first year. In the example shown by the round dot, actual emissions exceed expectations. If emissions were higher than expected because of temporary factors, the Board would make no change in its price forecast. However, the chart assumes a worst case situation, where the excess emissions are largely attributable to causes likely to persist in future years. The Board therefore needs to revise up its price forecast, as shown by the dashed blue line. The revised forecast path for emissions is the dashed red line with triangle markers.

Chart 3: An Example of the Safe Markets Development Approach



The Board would consider adjustments in the forecast price path each year. In some years, actual emissions will be below expectations, just as they would be this year if this program had been in effect because of weaknesses in the economy. In those years, if emissions were likely to continue to be below original expectations, the price forecast could be lowered. Ultimately, the Safe Markets Development Approach ensures that emissions will be on a gradual path to the specific emissions goal for 2020 and should be very close to the cumulative emissions required through 2020. To the extent that cumulative emissions exceed the required levels, this small amount will be automatically made up in the next ten-year period. If cumulative emissions come in less than expected during Phase I, it would be taken as a gain for the environment and no upward adjustment would be made in future allowances.

We believe this approach will be more effective than either a safety valve (which sets a price at which allowances will automatically be issued) or an allowance reserve (which creates a reserve pool of allowances that are released at a given threshold price). Both of these price ceiling approaches are less effective at controlling price volatility and, even more importantly, involve much greater environmental risks. With either a safety valve or an allowance reserve, if the price ceiling turns out to be too low, a large amount of allowances will be released. When a safety valve is used, the cumulative emissions budget is violated. In the case of an allowance reserve, the borrowing of allowances from the future may be so substantial that it can never be repaid except at an allowance price that causes severe economic harm. Thus, with either of these price ceiling approaches, the crucial cumulative emissions budget and the ultimate environmental goal could be profoundly threatened.

Beginning in 2020, the Safe Markets Development Approach will transition to a traditional cap-and-trade program, with hard annual emission caps and looser limits on allowance banking. Alternatively, the features used in Phase I could be continued. The Board will conduct a thorough review of the program in 2017 and include any recommendations for adjustments in the design features for Phase II. The experience gained by regulated firms and by market regulators during the early years of the program

will help ensure confidence in the operation of the carbon market when the "training wheels" are removed.

In sum, CCAP believes that the Safe Markets Development Approach combines the best features of cap-and-trade and carbon taxes: It provides a high level of environmental integrity along with predictable carbon prices. It eliminates incentives for manipulation and speculative excess in the early years of the program, thereby creating confidence in a new carbon market.

Chairman RANGEL. Thank you, Doctor.

Michelle Chan, program director for the green investments, Friends of the Earth United States, from California.

STATEMENT OF MICHELLE CHAN, PROGRAM DIRECTOR, GREEN INVESTMENTS, FRIENDS OF THE EARTH—UNITED STATES, SAN FRANCISCO, CALIFORNIA

Ms. CHAN. Thank you Chairman Rangel and Ranking Member Camp and Members of the Committee for inviting me today. My name is Michelle Chan, I am with Friends of the Earth, and my testimony today will focus on four lessons learned from the current financial crisis and how we might think about how they could apply to a cap and trade system.

So, lesson one: Avoid speculative bubbles. By 2020, the U.S. carbon markets are expected to be a $2 trillion business and the biggest derivatives market in the world. That is because most carbon trading is not done by companies needing to comply with carbon caps. Instead, they are done by financial speculators.

So, if you look at this chart, which you have seen now for the fifth time this morning, but I would like to point out something different. It is the grey line on the bottom, which shows trading volumes. You can see that even though carbon prices have softened recently, that trading volumes continue to skyrocket. A lot of this churn comes from speculators. In the long term, I believe that a market that is dominated by speculators will run the risk of creating an asset bubble.

This brings us to lesson two: Bubbles encourage excessive risk-taking like, for example, making home loans to people with no income because it seems like housing prices will go up and up with no end.

So, the same thing could happen in carbon. Most cap and trade proposals, as you know, include two types of carbon commodities. The first is allowances, which the government creates, and the second are offset credits, which are earned by companies that are not subject to carbon caps.

So, an example of this would be: a pulverized coal-fired power plant in India makes its operations marginally more efficient, and then it sells those credits into the U.S. or the E.U. markets. This is where the issue of subprime carbon comes in.

Now, we have just released a new report in which we explain how a carbon bubble could actually create a temptation for carbon offset developers to over-promise to their investors—for example, selling carbon credits based on projects that don't exist, or simply just don't create the greenhouse gas reductions that they are supposed to. So if that happened, those derivatives would collapse in value and the investors holding those derivatives would be, well, holding the bag.

Which brings us to our third lesson: Financial innovation, if unchecked, can get out of hand. Now, we all saw in the mortgage debacle that financial engineers created increasingly exotic and complex financial instruments because it seemed like there was an unlimited demand from investors to sop up all of these mortgage-backed securities. With a $2 trillion carbon market, you can bet

that Wall Street is going to not just sell plain old carbon derivatives. They are going to get creative.

So, for example, last year a big Swiss bank actually put together a $200 million deal in which they bundled together offset projects which were in various stages of completion, right, not finished yet, from three different developing countries. They sliced them into tranches, and they sold them as securities into the secondary markets.

Now, if this looks familiar, it is because it is the exact same structure that we saw with mortgage-backed securities. So, if some of the offset projects were to fail, then we would see that they could collapse in value and they could contaminate the tranches of securities that were sold and spread subprime carbon risk to the broader economy. Of course, it would also be an environmental failure as well.

So that leads us to lesson four, which is that we all know Wall Street is not well regulated, especially derivatives. So, for example, we now see that there was a really long value chain between mortgage brokers and investment banks and credit default swappers like AIG.

We had a patchwork of different rules and regulators that were responsible at different parts of the chain, but actually nobody was responsible for looking out at the entire chain, at the entire system. Nobody had the responsibility for responding to the risks that were building up in the system.

Now, the carbon value chain also is going to be pretty long and complex. So, in the blue, we have offset project markets. In the yellow, we have the primary carbon trading markets, which have both credits from offsets as well as allowances. Then we will have a secondary market, which will have carbon derivatives and financial products based off of those carbon derivatives.

I would say that unless Wall Street cleans up—unless Congress cleans up Wall Street and introduces new and robust systems for actually governing Wall Street, that it seems imprudent to create a really large and complex derivatives market and foist it upon an untested regulatory regime.

So, what are our options? I mean, we can create the system, and we can try to curb the most excessive behaviors through rules like margin limits and anti-speculation and antifraud rules. That is absolutely necessary.

But it may just be better to design a system that is more simple in the first place. So, for example, here is what would occur under a system proposed by Mr. Doggett—or, sorry, excuse me, by Mr. McDermott. This slide, as you can tell, does not allow for carbon offsets. So, subprime carbon wouldn't buildup in the system. There isn't a space for the proliferation of exotic financial products and so, of course, it is more manageable from a regulatory standpoint.

This hybrid approach has both a cap on emissions, which gives us environmental certainty, and it also has us setting a stable price for carbon, which prevents this boom/bust cycle that other testifiers have talked about, where the boom stage sets the stage for excessive risk-taking and pushing up prices and making life more expensive for consumers and companies; and in the bust, you have tanking carbon prices, which pull the rug out from underneath

those who have invested in breakthrough technologies and those holding carbon securities.

So, in closing, we commend Representative McDermott for his hybrid approach that he presents in H.R. 1683. We also thank the Committee for the opportunity to testify today.

[The prepared statement of Ms. Chan follows:]

House Committee on Ways and Means

Statement of Michelle Chan, Program Director, Green Investments, Friends of the Earth—United States, San Francisco, California

Lessons Learned from the Financial Crisis:

Designing Carbon Markets for Environmental Effectiveness and Financial Stability

Testimony before the U.S. House Committee on Ways and Means
Michelle Chan, Director, Green Investments Program
Friends of the Earth - US
March 26, 2009

Chairman Rangel, Congressman Camp, and Members of the Committee, thank you for the invitation to testify on the issue of a managed carbon price within a national climate policy. My name is Michelle Chan and I am the Director of Friends of the Earth – US's Green Investments Program. Friends of the Earth (FoE) – US is a 40-year old national environmental organization which is part of the world's largest grassroots environmental network, FoE International, with chapters in 77 counties some 5,000 local activist groups.

A Cautionary Tale

The spectacular regulatory and market failures we have witnessed in the current financial crisis provide a cautionary tale for any future carbon trading program. The crisis had many causes, including a breakdown of regulation, a potentially flawed model for managing systemic risks, too much leverage, and excessive risk-taking.

Congress and the Administration are currently debating new financial regulations to govern Wall Street. But if the newly-created financial rules and regulatory bodies only curb the most visible and extreme pathologies exposed by the financial crisis, and do not address the fundamental weaknesses that created it, in the future other catalysts – such as the collapse of the U.S. carbon markets – could also create reverberations across the broader economy.

This testimony will outline several lessons learned from the current financial crisis and apply them to carbon markets. It will also examine some regulatory weaknesses exposed by the crisis, and how, if uncorrected, they may play out in carbon derivative markets. Finally, it will examine the McDermott bill and other approaches to design and regulate carbon markets in ways that minimize risks to the broader financial markets.

Lessons Learned from the Financial Crisis, and Their Application to Carbon Trading

1. Size matters: speculation and the bubble economy

Asset bubbles are characterized by self-perpetuating but ultimately destructive cycles. In the current financial crisis, lax lending standards contributed to over-borrowing, which pumped up real estate prices, and encouraged mortgage originators to sell even more bad loans. Carbon markets too are at risk of experiencing boom-bust cycles.

Today, as a result of the economic downturn, carbon prices in Europe have collapsed after posting record years. Despite the global economic downturn, and soft carbon prices, the carbon market is growing rapidly; between 2006 and 2007 market values doubled, and increased 84% in 2008.[1]

The boom was largely driven by a flood of new traders seeking financial returns. Asset managers began marketing carbon as a new asset class, encouraging investors to increasingly allocate a portion of their portfolio to carbon derivatives. Investment banks developed financial instruments such as indexes to allow even more investors to gain exposure to carbon, and new carbon funds (set up to finance offset projects and/or buy carbon credits) were formed. Today, **speculators do the majority of carbon trading, and they will continue to dominate as carbon markets grow.** In fact, about two-thirds of carbon investment funds by volume were not established to help companies comply with carbon caps, but rather for capital gains purposes.[2]

In 2006 Mark Trexler of EcoSecurities warned against "market speculators, whose role has been getting rather dangerous in contributing (in our view) to a 'carbon dot com' bubble analogous to the technology 'dot com' bubble."[3] In a speculative bubble, too much money chases too few viable investments, which can spur the development of shoddy assets. In retrospect, the behaviors exhibited in bubble economies – such as mortgage brokers approving "ninja loans" (loans to borrowers with no income, job, or assets) – seem reckless and ludicrous, yet in the absence of counter-cyclical financial policies, boom-bust cycles continue to occur.

A market dominated by speculators may push up prices, create a bubble and spur the development of subprime assets. In a carbon bubble, unscrupulous intermediaries may overpromise on offset projects by selling future credits based on projects that do not yet exist, are not additional, or which simply do not deliver the promised greenhouse gas (GHG) reductions. This would not only have financial impacts, but also environmental consequences, as economies fail to meet GHGs reduction targets.

2. *The buildup of subprime assets poses systemic risks*

The financial crisis was sparked by bad mortgages, and U.S. carbon markets could pose similar problems through the creation of "bad carbon" or "**subprime carbon**." Subprime carbon -- called "junk carbon" by traders -- are contracts to deliver carbon that carry a relatively high risk of not being fulfilled and may collapse in value. They are comparable to subprime loans or junk bonds, which are debts that carry a relatively high risk of not being paid.

Subprime carbon would most likely come from shoddy carbon offset credits, which could trade alongside emission allowances in carbon markets. Offset credits are earned by implementing projects to reduce, avoid or sequester GHGs (compared to a business-as-usual scenario). They are generated outside the capped economy and can be sold to emitters within the

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[1] "Carbon market up 84% in 2008 at $118bn," New Carbon Finance, press release 8 Jan 2009.
[2] *Carbon Funds 2007-2008*, Environmental Finance Publications, 2007.
[3] Trexler, Mark, "I've heard the carbon market in Europe melted down a couple of weeks ago? What happened?," [Weblog entry]. Climatebiz, May 15, 2006 at http://www.climatebiz.com/blog/2006/05/15/i%E2%80%99ve-heard-carbon-market-europe-melted-down-a-couple-weeks-ago-what-happened

capped economy to help them comply with their GHG limits. The largest market for carbon credits come from projects based in developing countries, under the Kyoto Protocol's Clean Development Mechanism (CDM). Compared to allowances, which are created by government fiat, offset providers must accomplish many steps before their projects actually earn credits. In addition to overcoming ordinary risks (related to factors such as interest and exchange rates, technical performance, etc.), projects need to create independently-verified GHG emissions reductions. Such emissions savings are not easy to prove with certainty.

The most common, and in fact universal, risk associated with offset projects relates to "additionality" – proof that the GHG savings which would not have occurred otherwise. Projects must demonstrate that they are additional in order for the CDM Executive Board to issue credits. But a recent study found that about three-quarters of dams (a major type of CDM project) receiving CDM credits were not additional; they were already built by the time they received the credits.[4] The CDM has come under pressure to be stricter in issuing credits, but **it is nearly impossible to establish with certainty that an offset project is additional, a major risk contributing to subprime carbon.** A study by Stanford University found that "offset schemes are unable to determine reliably whether credits are issued for activities that would have happened anyway"[5]; a 2008 GAO report similarly concluded that "it is not possible to ensure that every [CDM] credit represents a real, measurable, and long-term reduction in emissions."[6]

Carbon credits can carry high risks because sellers often make promises to deliver carbon credits before the CDM Executive Board (or other crediting body) officially issues the credits, or sometimes even before verifiers confirm how much or if GHGs have been reduced. **Some cap-and-trade bills establish carbon trading schemes that allow carbon offset credits to make up 30% of carbon traded, which opens the door wide to subprime carbon.** Given the potentially huge size of the carbon trading market, and the increasing complexity of carbon derivatives products, subprime carbon creates a danger, not only to the environment but to the broader financial markets. Subprime carbon may not spark a financial contagion of a similar magnitude to that of subprime mortgages, but policy makers should take careful stock of the lessons learned from the current crisis before establishing what Merrill Lynch predicted could be "one of the fasting-growing markets ever, with volumes comparable to credit derivatives inside of a decade."[7]

3. "Financial innovation" can hide risk; securitization can spread it

In today's financial markets, rapidly inflating asset bubbles can also set the stage for the kinds of "financial innovation" that take straightforward transactions, such as using futures to

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[4] *Rip-Offsets:The Failure Of The Kyoto Protocol's Clean Development Mechanism*, International Rivers at http://www.internationalrivers.org/files/CDM_factsheet_low-rez.pdf

[5] Wara, Michael W. & Victor, David G. "A Realistic Policy on International Carbon Offsets" Program on Energy and Sustainable Development, Working Paper #74: April 2008. http://iis-b.stanford.edu/pubs/22157/WP74_final_final.pdf

[6] *International Climate Change Programs: Lessons Learned From The European Union's Emissions Trading Scheme And The Kyoto Protocol's Clean Development Mechanism*, US Government Accountability Office, Nov 2008 at http://www.Gao.Gov/New.Items/D09151.Pdf

[7] Kanter, James, " In London's Financial World, Carbon Trading Is the New Big Thing," *New York Times,* July 6, 2007

hedge against risks (e.g. buying carbon allowances or credits to comply with regulations), to dangerous new levels. As we realized in the aftermath of the financial crisis, financial engineers developed and successfully sold increasingly complex and exotic products to sop up the seemingly limitless demand for mortgage-backed securities and related products.

Proponents of a cap-and-trade system tend to focus on the environmental objective of carbon trading, often drawing parallels with the experience of earlier emissions trading schemes. **But financial markets have become vastly more complex and exotic since the early 1990s, when the U.S. introduced sulfur dioxide trading, and carbon markets will be much larger.** A 2008 Credit Suisse securitized carbon deal illustrates how modern financial engineering is already being used in the carbon markets. The bank bundled together carbon credits from 25 offset projects *at various stages of UN approval*, sourced from three countries, and five project developers.[8] They then split these assets into three tranches representing different risk levels and sold them to investors, a process known as securitization. Carbon-backed securities sound hauntingly close to mortgage-backed securities because they are indeed very similar in structure.

Although the Credit Suisse deal was relatively modest, future deals could become bigger and more complex, bundling hundreds or thousands of carbon assets of mixed types and origins, perhaps enhanced with agreements to swap more risky carbon credits for safer assets (such as government-issued emissions allowances) as "insurance" against junk carbon. Reportedly, Credit Suisse is securitizing another carbon deal for 2009, and other banks such as Lehman Brothers, JPMorgan Chase, and BNP Paribas are not far behind.[9]

As deals get more complex, securities can become more opaque. **It could be as difficult, if not more, to analyze the quality of the numerous underlying carbon offset projects as it is to analyze U.S. mortgages.** By now it is well known that credit rating agencies could not analyze the thousands of individual mortgages which comprised mortgage backed securities, so they instead relied instead on financial models which were ultimately flawed. Mathematical models are probably even less suited to analyzing a portfolio of diverse carbon offset projects.

A large market dominated by gamblers provides fertile ground for the development of complex and opaque products that can unwittingly spread subprime carbon through the broader financial marketplace. Although securitizations are currently down, they will probably increase in the future, as financial regulators continue to employ the "originate and distribute" approach for managing systemic risks.[10] But as we have seen, without effective oversight this approach can instead provide vectors for financial contagion.

3. Conflicts of interest spur excessive risk taking

In the aftermath of the financial crisis, it is clear that many complex structured products, derivatives, off-balance sheet entities, etc. were inordinately risky, but very profitable in the

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[8] Szabo, Michael, "Credit Suisse to offer largest structured CO2 deal," *Reuters*, 22 Oct 08.
[9] Burne, Katy, "CS Preps Structured Carbon Credit Sale," DW Online, 13 Jan 2009.

[10] This model is based on the premise that securitizing assets and selling them to the broader capital markets is the most effective mechanism for transferring risk to those best equipped to handle it.

short-term. The lure of short-term fees, profits, and stock options meant that few CEOs questioned the growth of these risky new practices and products. In response, some new regulations have been issued, but conflicts of interest are still a problem, both in the broader financial sector and in the emerging carbon finance market.

For example, similar to how credit rating agencies helped design complex structured finance products and rated them, consulting firms that offer advice on developing carbon offset projects may also earn fees for verifying emissions reductions from projects. Banks that own equity stakes in carbon offset projects may also be carbon brokers or sector analysts, creating a temptation to bid up carbon prices to increase the value of their own carbon assets. For example, in October 2008 Goldman Sachs bought a stake in BlueSource, a carbon offset developer, and JPMorganChase bought stakes in ClimateCare, another offset specialist. Such **conflicts of interest are not unique to the carbon markets, but they compromise their integrity, from both a financial and environmental perspective.**

Regulatory Weaknesses Exposed by the Crisis; Implications for Carbon Trading

Policy makers and regulators have widely acknowledged that inadequate financial regulation was a key contributor to the current credit crisis. Regulatory lessons learned include:

1. Self-regulation and self-interest are inadequate for protecting market integrity

For more than a decade, Wall Street successfully promoted a deregulatory agenda that lifted governmental oversight in favor of self-regulation. In the wake of the credit crisis, many policy makers now recognize the harm that was caused by financial deregulation. Relying on the self-interest of Wall Street to properly regulate itself, as many policy makers long believed was possible, is clearly inadequate to protect the integrity of the markets. **Carbon trading firms have strongly advocated for self-regulation as a way to govern this market, and most cap-and-trade bills implicitly reflect this mode of governance**. In a letter to Senators Feinstein and Snowe, who introduced a carbon market governance bill, the International Emissions Trading Association asserted that "the market itself recognizes the importance of integrity and exerts discipline on participants." They cite a number of self-policing tactics, saying for example that "trading companies set their own trading limits to guard against excessive speculation."[11]

2. Our regulatory patchwork must be fixed

Another lesson learned from the crisis is that a variety of state and federal regulators were responsible for discrete segments of the primary and secondary mortgage markets, but they did not coordinate with each other and sometimes had different policy objectives.

In the primary market, banks were subject to a host of consumer protection laws, such as the Truth in Lending Act and the Home Mortgage Disclosure Act, and regulated by numerous state and national agencies. In the secondary market, regulation was similarly scattered. Conforming mortgages bought by Fannie Mae and Freddie Mac were supervised by the Office of

[11] IETA letter to Sens. Feinstein and Snowe, 4 March 2008 at http://www.ieta.org/ieta/www/pages/getfile.php?docID=2938

Federal Housing Enterprise Oversight; non-conforming loans securitized by broker-dealers were overseen by SEC.[12]

Along the lengthy financial value chain from mortgage brokers to credit default swap counterparties, these various regulators did not share information and coordinate with each other. In addition, no agency had purview over monitoring and responding to the growing real estate asset bubble and dangerous trends building up in the primary and secondary mortgage markets. **Unless regulatory coordination dramatically improves, similar dynamics will likely play out in the project, primary and secondary carbon markets**.

3. Derivatives must come out from the shadows, and be subject to regulation

While on the one hand lack of regulatory coordination led to an inability to perceive and manage the broader risks developing in the mortgage markets, it is also clear that huge regulatory gaps existed in some key parts of Wall Street. Known as the "shadow banking sector," these largely under- or unregulated parts of the financial sector are dominated by off-the-books structured investment vehicles, hedge funds and most of all, derivatives. **The lack of regulation in the derivatives market has particularly significant implications for the carbon markets**. While most carbon derivatives are currently quite simple, as the markets mature, more exotic instruments will likely develop. Because carbon markets are expected to be so large, the need for adequate oversight is even more critical.

Since the financial crisis, various proposals, legislative and otherwise, have been made to improve governance of over the counter (OTC) derivatives. Since the vast majority of carbon derivatives trading is done OTC (for example, about 70 percent of European Union Allowances trade OTC[13]), the OTC derivatives rules will play a key role in future of carbon trading regulation. However, most derivatives proposals have focused on credit default swaps, rather than the broader derivatives market.

4. Regulatory capture and undue political influence undermined financial governance

One of the most sobering lessons from the financial crisis is how Wall Street's deregulatory achievements were made possible through aggressive political lobbying and campaign contributions. Since 1990, the financial industry has more than quadrupled its federal campaign contributions, and is now the leading source of campaign contributions to federal candidates and parties. (In 2006, for example, the industry donated $252 million and spent $368 million in federal lobbying efforts.[14])

For carbon trading to be successful – from an environmental, financial and governance perspective – policy makers and market regulators must be even more insulated from political

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[12] Statement of the Honorable Steve Bartlett, President and Chief Executive Officer, The Financial Services Roundtable, before the Committee on Financial Services, U.S. House of Representatives, October 21, 2008 at http://www.house.gov/apps/list/hearing/financialsvcs_dem/financial_modernization_testimony_steve_bartlett_.pdf
[13] Point Carbon, *Carbon 2008: Post 2012 is Now,* 11 Mar 08.
[14] Center for Responsive Politics, http://www.opensecrets.org/industries/background.php?cycle=2008&ind=F and http://www.opensecrets.org/industries/indus.php?cycle=2008&ind=F

influence. The UK financial regulator noted, "The key differences in the emissions market, compared with other commodities markets, are that it is a politically-generated and managed market and that the underlying [instrument] is a dematerialised allowance certificate, as opposed to a physical commodity. Also, there is a compliance aspect to the underlying market." [15]

It is precisely these politically-generated and managed aspects of carbon trading, as well as its compliance aspects, which make carbon markets particularly vulnerable to inappropriate lobbying and regulatory capture. Wall Street firms, eager to gain more carbon brokerage business, have advocated for an increasing proportion of carbon offsets to be allowed in a carbon trading system, despite the fact that this would make the market more vulnerable to subprime carbon risks. Today, the finance industry has 130 climate change lobbyists seeking to influence carbon market development.[16]

Designing for Integrity

In light of the abovementioned risks and lessons learned, it is critical to ensure integrity and adequate governance in newly-created carbon markets. In general policymakers seem to be taking four approaches to achieving this:

1. Subjecting carbon to general commodities/derivatives regulation

This governance approach essentially treats carbon like other commodities, and relies on existing and emerging commodities/derivatives regulations to oversee carbon markets. This approach is essentially the "default" mode for regulating carbon, in the absence of specific or new mechanisms. Future regulations will likely include: requiring some derivatives to be traded on exchanges rather than over the counter, introducing higher margin requirements, enforcing position limits, enhancing regulatory capacity, etc.

FoE supports measures to bring more accountability and stability to the derivatives markets in general. However, carbon trading has some unique components that may need to be covered by entirely new regulations. In addition, we believe **it is imprudent to so hastily create the largest derivatives market in the world and foist it upon an untested regulatory regime**. Rather, since carbon commodities are being created from government fiat, it is better to fundamentally structure carbon markets in ways that minimize their size and complexity, avoiding problems in the first place, rather than trying to contain market excesses.

2. Subjecting carbon to specific regulation

A few bills introduced in the 110th Congress propose various mechanisms to govern carbon markets. As described in a newly-released report,[17] FoE notes that most bills focus on which regulatory agencies have jurisdiction over carbon derivatives, and borrow from existing

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[15] UK Financial Services Authority Commodities Group, "The Emissions Trading Market: Risks and Challenges," March 2008 at http://www.fsa.gov.uk/pubs/other/emissions_trading.pdf

[16] "The Climate Change Lobby Explosion," The Center for Public Integrity, 24 Feb 2009 at http://www.publicintegrity.org/investigations/climate_change/articles/entry/1171/

[17] *Subprime carbon?: Re-thinking the world's largest new derivatives market,* Friends of the Earth, March 2009 at www.foe.org

securities and commodities regulations. Friends of the Earth agrees that jurisdictional questions must be clarified, and that carbon must be well-integrated with broader financial governance. But again, **carbon market design can play a relatively more important role than regulations in ensuring market integrity.**

3. Adopting modest design elements to a cap-and-trade system

Another approach is to design carbon markets to include various options that have been proposed in "traditional" cap-and-trade bills. For example, **FoE strongly endorses prohibiting offsets, as we believe it is the best way to prevent the development of subprime carbon**. Other options, such as establishing price floors and ceilings and prohibiting/limiting banking, may reduce price volatility. This would, to some extent, curb speculation, prevent the development of a carbon bubble, and have other attendant benefits. However, adopting more fundamental reforms in carbon markets may better limit manipulation and deliver price stability.

4. Fundamentally re-designing carbon markets for stability and integrity

For example, Congressman McDermott's bill would design carbon markets to have a stable price path. This **would eliminate the basic incentive for speculation**, because there would be very limited arbitrage opportunities with quarterly sales and stable, predictable prices.

In contrast, most "traditional" cap-and-trade bills would create markets dominated by financial speculators seeking to profit from carbon price movements. Secondary markets would be particularly dominated by financials, and will likely overshadow primary trading. As more investors get involved in the market, it will likely spur the creation of new financial products, and open the door to "innovative" and complex carbon instruments which pose regulatory and market risks while providing few environmental benefits.

Stable prices, as envisioned in the McDermott bill, also would help prevent a boom-bust cycle in carbon markets. In boom years, skyrocketing carbon prices would increase compliance costs for companies, which may be passed onto consumers. In bust years, plummeting carbon prices may undermine low-carbon technology and capital investments, for example. The bill also limits trading to carbon allowances only. By eschewing offsets, it largely eliminates the market risks associated with subprime carbon and ensures asset quality.

Finally, Friends of the Earth welcomes the creative problem-solving that Congressman McDermott has demonstrated in this bill. For too long, the discourse on national climate policy has been polarized into a debate between the risks/merits of a cap-and-trade system versus a climate tax. In fact, the dominance of this debate has even shut out a broader discussion of the role that other strategies can have in a national greenhouse gas reduction plan. **Friends of the Earth commends Congressman McDermott for his efforts to propose a system which attempts to capture the benefits of both approaches – the price stability afforded by a tax and the environmental certainty of a carbon cap.** We believe that this bill is a vital contribution to a much-needed discussion on how to best solve one of the most pressing environmental problems of our time.

Chairman RANGEL. Thank you so much, Ms. Chan.

Dr. Gilbert Metcalf, the professor of economics at Tufts.

STATEMENT OF GILBERT METCALF, PROFESSOR OF ECONOMICS, TUFTS UNIVERSITY, MEDFORD, MASSACHUSETTS

Mr. METCALF. Chairman Rangel, Congressman Camp, and Members of the Committee, thank you for the invitation to testify this morning.

Price volatility is of considerable concern to the business community and to the public. It will be very important for Congress to design a program to limit emissions in a way that minimizes unexpected price shocks to which firms and consumers cannot easily adjust.

My testimony makes the following key points about these issues. First, policy should distinguish between short-run price uncertainty, which the policy should try to minimize, and long-run uncertainty. Second, a carbon tax provides the greatest certainty over the future carbon price.

Third, hybrid policies can bridge the difference between the desire for price certainty and emissions certainty, and I will describe in a moment a proposal for a hybrid tax system. Finally, cost containment mechanisms and cap and trade systems may have unintended outcomes.

As we have seen already today, price volatility for cap and trade systems is well-known. This is the graph you have seen already for the European Union emission trading scheme. Prices vary over the past 3 years by a factor of four, ranging from 8 to over 32 Euros. The permanent price volatility experienced in the E.U. program is not unique. We have also seen this in domestic cap and trade programs, as I discuss in my written testimony.

Concern about volatility has led to a number of cost containment proposals for cap and trade systems. One approach we have heard about today is a safety valve provision, with a price floor combined with a ceiling, as described by Dr. Burtraw. If one is going to take the cap and trade approach, the safety valve has much to commend. It is transparent, and it puts clear limits on the up side and down side price movement.

One problem with a traditional safety valve approach is that anticipation of future government policy tightening to reduce emissions creates an arbitrage opportunity. Permits can potentially be purchased today at the safety valve price and banked for use in future high permit price years in a way that loosens aggregate caps.

One way to address this concern is to limit the number of permits that may be purchased at the safety valve price. This is the approach that a strategic allowance reserve policy takes.

But this also raises its own issues. Many of the cap and trade policies currently under consideration call for extremely sharp reductions in emissions by the middle of the century. Various analyses of these policies, including work I have done with colleagues at MIT, suggest that allowance banking will be sizeable in the early phase of the program. Making more permits available in the present through an allowance reserve that borrows against future allocations may simply lead to further banking. In other words, the reserve may be ineffective at damping price volatility.

I would like to suggest an alternative approach whereby a carbon tax is designed to meet emission targets during a control period, while minimizing price uncertainty. I call this the responsive emissions autonomous carbon tax, or REACT. It works as follows.

An initial tax and standard growth rate for the tax is set. Benchmark targets for cumulative emissions are set for the control period, which might run, say, from 2012 to 2050. The law would require that the targets be met at 5-year intervals, for example, some target intervals.

If cumulative emissions exceed the target in the benchmark years, the growth rate of the tax would increase from its standard growth rate to a higher catch-up rate until cumulative emissions fall below the target again.

This graph illustrates the price path of a carbon tax designed to limit emissions between 2012 and 2050 to 250 billion metric tons of carbon dioxide. This is consistent with a moderate control regime. Emissions respond to price, but have some amount of randomness to represent short-run weather events and other random shocks.

I assume the fixed rate carbon tax grows at a 4 percent annual rate plus inflation. The REACT rate has a standard growth rate of 4 percent plus inflation, and a catch-up rate of 10 percent real.

A fixed rate carbon tax that would achieve these cumulative emission targets leads to excess emissions equal to 4 percent of the target, given the randomness I have assumed for emissions with this particular simulation. REACT, on the other hand, ensures the cumulative target is met. While there are a few instances of the tax rate increasing at an annual rate of 10 percent, it predominately grows at a 4 percent rate.

While this graph is simply illustrative of a possible price path, it demonstrates the smoother and more predictable price path for emissions as compared to the price path that I showed for the European Union emission trading scheme.

The advantages of REACT are, first, that short-run price volatility is eliminated. Long-run price uncertainty is reduced. It is a transparent mechanism for price changes. Emission targets over the control period are maintained. The approach I am taking in REACT is similar in spirit to the approach proposed in Congressman Larson's H.B. 1337 and Congressman McDermott's H.B. 1683.

Summing up, policy should focus on eliminating short-run price volatility. A carbon tax provides the greatest certainty over future carbon prices. REACT is a tax-based approach that ensures long-run emission targets are met.

Thank you for the opportunity to testify today.

[The prepared statement of Dr. Metcalf follows:]

Statement of Dr. Gilbert Metcalf, Professor of Economics, Tufts University, Medford, Massachusetts

TESTIMONY

Statement of
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Price Volatility in Climate Change Legislation

before the
Committee on Ways and Means
U.S. House of Representatives

March 26, 2009

Chairman Rangel, Congressman Camp, and Members of the Committee, thank you for the invitation to testify this morning on the issue of addressing price volatility in climate change legislation.

Growing concentrations of greenhouse gases raise the specter of large-scale climate change and global warming over the next hundred years. Atmospheric concentrations of carbon dioxide have risen from a pre-industrial level of 280 parts per million to the current level of over 380. Because greenhouse gases persist in the atmosphere for many hundreds of years, the impact of emissions today will have a significant impact on atmospheric concentrations for centuries to come. The magnitude and distribution of damages from climate change is uncertain but the risks are high from inaction.[1]

The United States has the opportunity to take a leading role in the international arena on climate change. While it is highly unlikely that we can achieve significant reductions in global concentrations of greenhouse gases without an international agreement that includes China and other large developing countries, it is equally true that we are unlikely to obtain their agreement to undertake significant actions until the United States takes action. By taking global leadership the United States can help to break the impasse that stands in the way of a truly international agreement that can realistically address this problem.

The subject of today's hearing is price volatility in climate change legislation. Price volatility is of considerable concern to the business community and to the public. While people dislike high gasoline prices, for example, they *especially* dislike unexpectedly high gas prices to which they cannot adjust. It will be important for Congress to design a program to limit emissions in a way that minimizes unexpected price shocks to which firms cannot easily adjust and anticipate.

Economists are generally in agreement that using market-based mechanisms is a superior approach on efficiency grounds to reduce greenhouse gas emissions. The two main approaches are a carbon tax and a cap-and-trade system of marketable permits for emissions. These market-based approaches are superior to regulatory approaches in a number of dimensions. They ensure that all polluters, regardless of industrial sector, face the same marginal cost of abatement – a necessary condition for efficiency. They provide the right incentive for greater pollution reductions to shift from firms or sectors with high marginal abatement costs to those with low marginal abatement costs. Pricing pollution also encourages innovation, given the potential for reducing pollution at lower cost with new technology and thus reducing the price that needs to be paid for emissions of greenhouse gases.

The two approaches differ in the degree of certainty they provide on one of two dimensions. A pure cap-and-trade system provides certainty over the path of emissions from the regulated sector during the control period.[2] It does not, however, provide any

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[1] I discuss the risks of climate change in greater detail in an appendix to this testimony.

[2] Note that emissions from any sector not included in the system are not controlled. Nor is it possible to ensure that substitution between emissions from the controlled to the uncontrolled sector does not occur.

certainty over the price of the permits for regulated firms. In contrast, a carbon tax provides certainty over the price regulated firms will face – the tax rate – but does not provide certainty over emissions. These observations must be qualified in two ways. First, hybrid cap-and-trade approaches can be designed to reduce price volatility. Other witnesses today will be speaking about these approaches. Hybrid tax approaches also exist and I will discuss one such approach below. Second, a pure tax or cap-and-trade-system can be adjusted by future lawmakers. Thus the certainty over emissions or price is conditional on whatever policy is enacted and does not account for future policy changes.

My testimony makes the following key points about these issues:

- Price volatility may reflect short-run fluctuations in weather, equipment outages, unexpected demand or other temporary phenomena. This differs from long-run uncertainty due to fundamental uncertainties over technological innovation, adaptation opportunities or other such long-run phenomena. Climate change policy should allow prices to respond to long-run impacts and insulate firms and consumers from short-run price volatility.
- A pure carbon tax with a legislatively established set of tax rates over the control period provides the greatest certainty over the future carbon price.
- The trade-off between price volatility and certainty over emissions is unavoidable. But smart policy can mitigate this trade-off. This can be done under either a cap-and-trade or tax approach.
- Cost containment mechanisms in cap-and-trade systems can be complex and lead to unintended and undesirable outcomes.
- A carbon tax has other desirable properties that should be taken into account. It can be implemented in reasonable short order and can piggyback on existing tax structures.

Price Volatility Under Existing Cap-and-Trade Programs

Price uncertainty is a significant concern with cap-and-trade programs. At the outset, it is important to distinguish between short-run and long-run price uncertainty. Short-run price uncertainty (or volatility) can reflect short-term weather conditions, equipment outages and other temporary phenomena. It is not desirable for firms to face fluctuating prices on a daily (or perhaps hourly) basis due to these sorts of phenomena.

Long-run price uncertainty reflects our inability to predict whether and when various technologies to reduce greenhouse gas emissions come on line. Considerable uncertainty exists, for example, over the feasibility of carbon capture and storage at scale. Similarly political and technological constraints on nuclear power could significantly affect long-run permit prices.

Carbon taxes ensure a given price for carbon emissions while permit prices in a cap-and-trade system are uncertain. Price volatility for cap-and-trade systems is well known. The EU ETS illustrated this dramatically in April 2006 when CO_2 permit prices fell sharply on the release of information indicating that the ETS Phase I permit allocations were overly generous. The December 2009 futures price fell from a peak of €32.90 on April 20 to €18.90 on May 3. Prices rebounded briefly but drifted downward for much of the rest of the year (Figure 1). They then gradually rose during 2007 and reached a peak of €30.53 on July 1, 2008. Since then the price collapsed to a low of €8.20 on Feb. 12, 2009. Currently they are hovering in the range of €12 per ton.

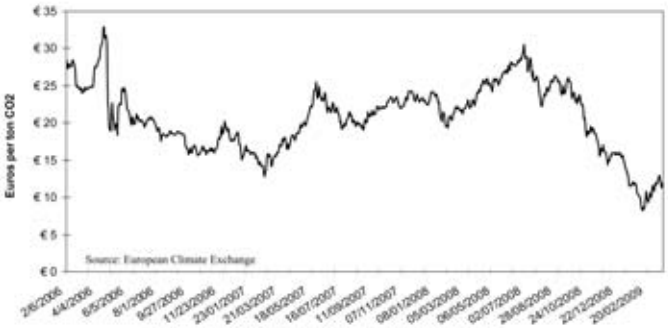

Figure 1. ECX Futures Contract Settlement Price

The permit price volatility experienced in the Europe's cap-and-trade program is not unique. NO_x prices in the Northeast states' Ozone Transport Commission jumped to nearly $8,000 per ton in early 1999 before falling back to more typical levels between $1,000 and $2,000 per ton. Permit prices for the California Regional Clean Air Incentives Market (RECLAIM) rose abruptly from under $5,000 per ton of NO_x to nearly $45,000 per ton in the summer of 2000. Permit prices in EPA's Acid Rain Program rose to nearly $1,600 per ton SO_2 in late 2005 from a price of roughly $900 at the beginning of the year.

Unexpectedly high permit prices erode political support for the program and led in the RECLAIM market to a relaxation of the permit cap in response to the high prices. The response in the RECLAIM market in particular should provide a cautionary note for policy makers. Highly volatile permit prices are likely to create dissatisfaction with a cap-and-trade program and make business long run investment planning difficult.

Cost Containment Mechanisms in Cap-and-Trade Systems

Provisions to limit short run volatility will be essential to build political and popular support for any climate change legislation. The first point to make here is that cost containment provisions are entirely unnecessary under a carbon tax. Second, while

various approaches exist for reducing short run volatility in a cap-and-trade system, all such approaches come with some degree of complexity and uncertainty over their ultimate ability to dampen price volatility.

One approach to limiting volatility is to include a "safety-valve" provision – perhaps with a price floor combined with a ceiling.[3] This allows firms to purchase an unlimited number of permits at a set price and thus sets a ceiling on the price of permits. If the market price for permits is below the safety valve price, then firms will simply purchase permits in the open market. Once permit prices reach the value of the safety valve, firms will purchase any needed permits directly from the government. A floor price on emissions – as contained in the symmetrical safety valve proposal – is equivalent to a cap-and-trade system combined with a carbon tax set at the floor price.

If one is going to take the cap-and-trade approach the safety valve approach has much to commend. It is transparent and it puts clear limits on the upside and downside price movement. If the safety valve is binding then, in effect, the cap-and-trade system has been converted into a carbon tax. But it does so while maintaining the complexity of the cap-and-trade system.

One problem with the traditional safety valve approach is that anticipation of future government policy to reduce emissions creates an arbitrage opportunity. If a cap-and-trade program with unlimited banking is designed, then incentives will exist to bank low price permits in anticipation of future tightening of the cap. While one can require that any permits purchased through a safety valve be used in the year they are purchased, they can still free up other permits to be banked for the future thereby achieving the result of substituting low price permits for future higher price permits.

One way to address this concern is to limit the number of permits that may be purchased at the safety valve price. This is the approach that a strategic allowance reserve policy takes.[4]

Putting constraints on the number of safety valve permits that may be purchased may address the arbitrage opportunity raised by the anticipation of future policy tightening. But it also raises its own issues. Many of the cap-and-trade policies currently under consideration call for extremely sharp reductions in emissions (more precisely allowance allocations) by the middle of the century. Various analyses of these policies suggest that allowance banking will be sizable in the early phase of the program.[5] Making more

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[3] See, for example, Dallas Burtraw's testimony to the Committee on Ways and Means on Sept. 18, 2008.

[4] See Brian C. Murray, Richard G. Newell and William A. Pizer. 2009. "Balancing Cost and Emissions Certainty: An Allowance Reserve for Cap-and-Trade." *Review of Environmental Economics and Policy*, 3(1), pp. 84-103.

[5] See, for example, Sergey Paltsev, John M. Reilly, Henry D. Jacoby, Angelo C. Gurgel, Gilbert E. Metcalf, Andrei P. Sokolov and Jennifer F. Holak. 2007. "Assessment of U.S. Cap-and-Trade Proposals: Appendix D – Analysis of the Cap and Trade Features of the Leiberman-Warner Climate Security Act (S. 2191)." Cambridge, MA: MIT Joint Program on the Science and Policy of Global Change.

permits available in the present through an allowance reserve that borrows against future allocations may simply lead to further banking to offset anticipated higher future prices due to a tightening of the future cap. In other words the reserve may be ineffective at damping price volatility.

Designing a Carbon Tax to Address Concerns About Emissions

A price based approach has two critical design elements (among others). First, it must specify the price for carbon emissions in the initial year of the program. Second, it must specify a price path over time. The initial tax rate should be low enough to avoid adverse economic impacts. But it should be high enough to send the signal to firms and consumers that a serious climate change policy has been enacted. Increasing the tax over time in a predictable manner to a sufficiently high level to trigger the technological innovations we will need to move to a carbon free economy is also essential. The principle of a low initial tax that gradually increases over time is embedded in Cong. Stark's Save Our Climate Act of 2009 (H.R. 594), Cong. Larson's America's Energy Security Trust Fund Act of 2009 (H.R. 1337), and Cong. McDermott's Clean Environment and Stable Energy Market Act of 2009 (H.R. 1683).

As others have suggested the two positions of pure cap-and-trade and carbon tax are extremes on a continuum of policies of market-based instruments to reduce emissions. Other witnesses today have or will testify to the possibility of hybrid cap-and-trade systems that reduce price volatility. I would like to suggest an alternative approach whereby a carbon tax is designed to meet emissions targets during a control period while minimizing price uncertainty. I call this the Responsive Emissions Autonomous Carbon Tax (REACT).[6] It works as follows.

- An initial tax and standard growth rate for the tax is set for the first year of a control period.
- Benchmark targets for cumulative emissions are set for the control period. The law could require that the targets be met at annual, five-year, ten-year or some other time interval.
- If cumulative emissions exceed the target in the given years, the growth rate of the tax would increase from its standard growth rate to a higher catch-up rate until cumulative emissions fall below the target again.

This policy approach ensures that long-run targets are met while price stability is achieved in the short run. Given the ability to predict emissions in the short run and the transparent nature of the tax, firms would be able to predict with considerable certainty what the growth rate of the tax will be in the near term thereby providing greater clarity for their planning purposes.

[6] See Gilbert E. Metcalf, "Designing a Carbon Tax to Provide Certainty Over Long-Run Emissions Reductions," Tufts University, Unpublished manuscript.

The approach I am taking in REACT is similar in spirit to the approach proposed in H.R. 1337. The main difference is that I use a percentage adjustment to the tax rate rather than a fixed dollar amount. It is also similar to H.R. 1683 with the main difference being that the tax adjustment is built into the law rather than delegated to the Secretary of the Treasury.

As an example of how REACT could be designed, assume benchmark targets based on the permit allocations in the Warner-Lieberman Climate Security Act of 2007 (S. 2191). Also assume that the tax goes into effect in 2012 with a control period running through 2050. The standard growth rate for the tax is 4 percent (plus inflation) and a higher catch-up rate of 10 percent (plus inflation). The catch-up rate is triggered when cumulative emissions in any year exceed cumulative target emissions.

Initial modeling that I have done with these assumptions suggests that such an approach can minimize price volatility while ensuring that long-run emission reductions are achieved. This typically occurs with near-term increases in the tax at the lower rate of growth with mid-term – fifteen to twenty years out – increases in the growth rate to the high rate followed by returns to the lower growth rate near the end of the control period. My modeling has not taken into account an important behavioral effect that may occur. Firms may anticipate cumulative emissions rising to the point where they may trigger a shift to the high growth rate in the tax and undertake additional abatement activities to avoid this outcome. Further modeling is needed to understand whether this is a potentially significant response or not.

The REACT approach addresses the objection that a carbon tax does not ensure a hard cap on greenhouse gas emissions over the control period. An overall cap can be maintained while insulating consumers and businesses from short-run fluctuations in carbon prices that add volatility to energy prices and undermine support for climate change legislation. It does this with a transparent mechanism for adjusting the price of emissions over the control period.

Other Advantages of a Price Based Approach

While the focus of this hearing is on price volatility, it is useful to consider additional advantages of a price-based approach to pricing emissions. Let me focus on three: transparency, ease of implementation, and the principle of double neutrality.

As we have learned in the recent financial crisis involving sub-prime mortgages, collateralized debt obligations, credit default swaps, and other new structured investment instruments, transparency is essential to the smooth functioning of financial markets. Going down the path of a cap-and-trade system with some form of cost containment, we are creating new financial instruments with an annual value ten or more times greater than the value of any other environmental permit-based system enacted to date in the United States. We face great uncertainty over how financial players will respond to this new market and how it will develop over time. A price based approach, on the other hand, faces none of this uncertainty.

Implementation is also more straightforward with a price based approach. We have a time-tested administrative structure for collecting taxes that can ramp up an upstream carbon tax in relatively short order. Firms that would be subject to a carbon tax are already registered with the IRS and have whole departments within their firms that carry out the record keeping and reporting for tax payments. Coal producers already pay an excise tax to fund the Black Lung Trust Fund and oil producers pay a tax to fund the Oil Spill Trust Fund. We also have precedents for refundable credits for sequestration activities in federal fuels tax credits. In contrast, we have no administrative structure for running an upstream carbon cap-and-trade program. A recent CBO report details the lead-time required to establish allocations.[7] All this suggests that we can implement carbon pricing through a tax more quickly than through a cap-and-trade system.

Finally, a key principle of any carbon control scheme should be the double neutrality principle: revenue neutrality and distributional neutrality. While this principle can be upheld under either a cap-and-trade system or a carbon tax, I would argue that it is more straightforward under the latter approach. Revenue neutrality means using the revenue to lower other existing taxes to avoid the charge that we are raising the fiscal burden on American taxpayers. Distributional neutrality means that we direct the refunded taxes in a way that ensures that lower-income households do not bear a disproportionate burden of carbon pricing. Double neutrality can be achieved while providing the appropriate incentive to reduce carbon emissions through a higher price for carbon intensive activities.

Thank you for this opportunity to testify today.

[7] Congressional Budget Office. 2008. Policy Options for Reducing CO_2 Emissions. Washington, DC: Congressional Budget Office.

Appendix: The Risks of Climate Change

The most recent set of reports by Intergovernmental Panel on Climate Change Fourth Assessment Report's Working Groups provide additional evidence to support the role and consequences of anthropogenic warming.[8] Working Group I describes the build-up of greenhouse gas concentrations and the role of human activity clearly:

> Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use and land use change, while those of methane and nitrous oxide are primarily due to agriculture.
>
> IPCC (2007) p. 2

Figure A1 from Working Group I's report provides a record of changes in temperature, sea level, and snow cover. The data points measure changes from the 1961 – 1990 averages. The solid lines graph smoothed decade averages and the blue shading indicates uncertainty intervals (see report discussion on page 6).

The figure illustrates that global average temperatures have increased over the twentieth century with accelerated warming in the past thirty years. Sea levels on average are also rising with an average increase over the twentieth century of roughly 150 mm. Sea level rise is due to thermal expansion of the oceans along with run off from glaciers and ice caps. According to Working Group I's report, thermal expansion can account for roughly 40 percent of the explainable sea level rise between 1961 and 2003 (Table SPM.1.). For the period 1993 to 2003, ice melt from glaciers and ice caps as well as the Greenland and Antarctic Ice Sheets are predominantly responsible for observed sea level rise. While Northern Hemisphere snow cover appears to be trending downward, the uncertainty is sufficiently large that one cannot rule out the absence of change in snow cover, based on the data reported in Figure A1.

[8] Intergovernmental Panel on Climate Change. "Contribution of Working Group I to the Fourth Assessment Report, Summary for Policymakers." IPCC, 2007.

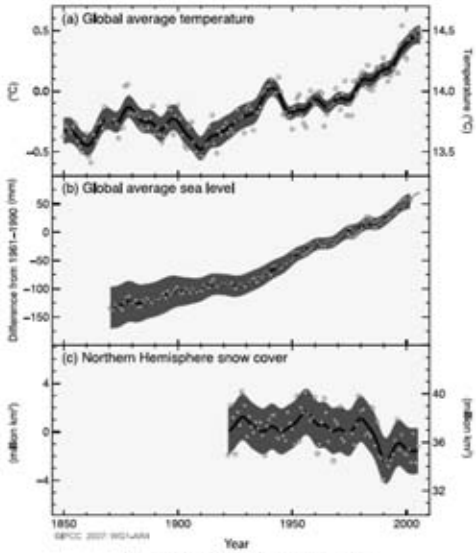

Figure A1: Climate Change Record

Projections of future warming are less precise. The IPCC developed a number of emission scenarios in their Special Report on Emission Scenarios (SRES) and asked modelers to run scenarios using those assumptions.[9] Figure A2 from IPCC Working Group I's report provides projections of temperature increases arising from those scenarios.

The solid lines are averages across different models of temperature changes for different scenarios relative to the 1980-1999 average temperature. The grey bars at right provide the likely range of temperature changes for each scenario with the horizontal line a measure of the mean estimate in 2100.[10] Scenario A1F1 is a scenario with rapid economic growth in a fossil fuel-intensive world. In contrast the B1 scenario models a world shifting away from energy intensive activities towards a more service-oriented economy. While great uncertainty is represented across (and within) the various

[9] See page 18 of Intergovernmental Panel on Climate Change. "Contribution of Working Group I to the Fourth Assessment Report, Summary for Policymakers." IPCC, 2007 for a description of the scenarios and the SRES.

[10] "Likely" is defined in the IPCC report as the probability that the actual temperature increase will lie in this grey area is greater than 66 percent.

scenarios illustrated here, none suggest that temperature will stabilize in the absence of a climate policy.

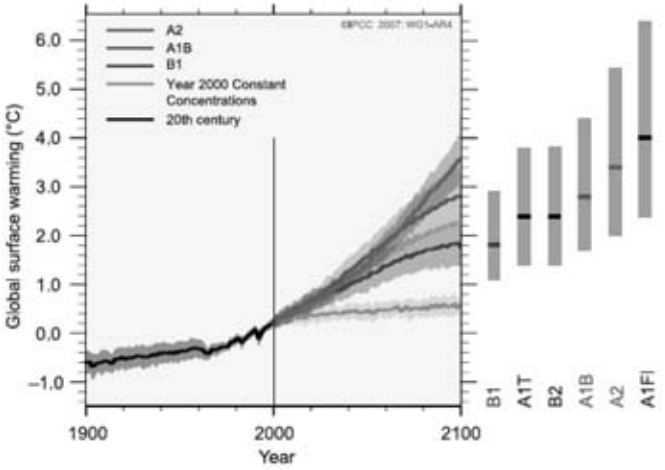

Figure A2: Possible Temperature Increases

The IPCC's Working Group II focused on the impacts of climate change.[11] They concluded that "many natural systems are being affected by regional climate changes, particularly temperature increases," p. 1. The report goes on to enumerate a number of potential impacts. Africa is especially at risk. By 2020, the IPCC report notes that "between 75 and 250 million people are projected to be exposed to an increase of water stress due to climate change. If coupled with increased demand, this will adversely affect livelihoods and exacerbate water-related problems" page 8. The report goes on to note that

> Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. This would further adversely affect food security and exacerbate malnutrition in the continent. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.
>
> IPCC Working Group II, page 8.

[11] Intergovernmental Panel on Climate Change. "Contribution of Working Group II to the Fourth Assessment Report, Summary for Policymakers." IPCC, 2007

North America will also be impacted. The report notes issues of reduced snow pack in Western mountains and decreased summertime water flows, for example. This would place additional strains on already taxed water systems in the West. Forest fire risk rises and heat-sensitive crops (such as corn and soybeans) may be adversely affected. On the other hand, some crops (such as oranges and grapes) may experience an increase in yield with warmer temperatures, illustrating the point that climate change is a complex process with winners as well as losers. All the impacts described above suggest the importance of significant action now.

Gilbert E. Metcalf is a Professor of Economics at Tufts University and a Research Associate at the National Bureau of Economic Research. He is also a Research Associate at the Joint Program on the Science and Policy of Global Change at MIT. Metcalf has taught at Princeton University and the Kennedy School of Government at Harvard University and been a visiting scholar at MIT.

Metcalf has served as a consultant to numerous organizations including, among others, the U.S. Department of the Treasury, the U.S. Department of Energy, and Argonne National Laboratory. He currently serves as a member of the National Academy of Sciences Committee on Health, Environmental, and Other External Costs and Benefits of Energy Production and Consumption. In addition he serves or has served on the editorial boards of *The Journal of Economic Perspectives*, *The American Economic Review*, and the *Berkeley Electronic Journals in Economic Analysis and Policy*.

Metcalf's primary research area is applied public finance with particular interests in taxation, energy, and environmental economics. His current research focuses on policy evaluation and design in the area of energy and climate change. He has published papers in numerous academic journals, has edited two books, and has contributed chapters to several books on tax policy. Metcalf received a B.A. in Mathematics from Amherst College, an M.S. in Agricultural and Resource Economics from the University of Massachusetts Amherst, and a Ph.D. in Economics from Harvard University.

Chairman RANGEL. Thank you, Doctor.

Our last witness on this panel is Dr. Margo Thorning, who is the senior vice president and chief economist for the American Council for Capital Formation. We thank you for being with us.

STATEMENT OF MARGO THORNING, SENIOR VICE PRESIDENT AND CHIEF ECONOMIST, AMERICAN COUNCIL FOR CAPITAL FORMATION

Ms. THORNING. Thank you, Chairman Rangel, Ranking Member Camp, Members of the Committee, for allowing me to appear before you today.

I would like to focus on two key issues: First, what is the impact of a cap and trade system on energy price volatility and on energy prices, GDP, job growth? Second, what is the impact of the U.S. achieving targets similar to some of the legislation that has been proposed, including the Lieberman-Warner bill, the Administration's proposal, and others out there?

I would like to talk first very briefly about the work that—the impact of a cap and trade system on GDP and job growth. As you can see in table 1 of my testimony, there is a range of results presented, from the ACCF/NAM, from MIT, from Charles Rivers, from EPA, from EIA.

The range of results shows significant impact on GDP from imposing the Lieberman-Warner bill, which is a similar target to the Administration bill. GDP falls by a range of .2 percent by 2020 to 1.5 percent. By 2030, the range is significantly higher, .3 to as much as 2.7 percent. There are jobs lost ranging from 270,000 in 2020 up to 3.2 million, according to one set of estimates. By 2030, the job losses are even larger.

The allowance prices, which are also shown in table 1, vary from about $31 a ton of CO_2 to approximately $73 a ton of CO_2 in 2020. By 2030, the cost of a payment to emit a ton of carbon ranges from $62 to $271. So, the impact of the cap and trade system is to increase unemployment relative to the baseline, to reduce GDP, and to significantly impact price volatility.

I would like to show one slide from my testimony. The results from the NAM/ACCF study, which we released last year looking at Lieberman-Warner, shows significant impact on energy prices for gasoline, residential electricity, industrial electricity, and natural gas prices. These price increases occur because companies have to pay for the right to emit a ton of CO_2.

The model we used was the National Energy Modeling System, EIA's model, with constraints as to how quickly we could build new nuclear generation capacity. Our high-cost case assumed 10 gigawatts, 10 new nuclear plants by 2030, the low-cost case 25 new nuclear plants by 2030.

We assumed carbon capture and storage for coal and natural gas became available at rates of between 50 and 25 gigawatts, depending on high—or low-cost case. We assumed growth in renewables, and assumed carbon capture and storage did begin to be available.

So, we built in reasonable assumptions, and when we do that and constrain nuclear, constrain carbon capture to what experts think is doable rather than, you know, what people might like to see, we see that gasoline prices by 2020 could be 20 percent higher

than the baseline case under the—or as much as 70 percent higher under the high-cost case.

Residential electricity prices rise by as much as 28 to 33 percent. If we look at the high-cost case, which may prevail if we can't build the nuclear and capture the carbon, we will see industrial electricity prices rising by as much as 49 percent by 2020 and 185 percent by 2030.

Natural gas prices for the industrial sector might be as high as 244 percent higher by 2030 because, of course, electric generating plants will have to switch to natural gas to try to meet the carbon reduction targets.

So, the impact of this type legislation is almost certain to increase price volatility for energy, with negative consequences for economic growth, for jobs. The unfortunate consequence of this type of legislation is that if the U.S. goes it alone, according to the Administration's own estimates, there will be virtually no difference in global concentrations of GHGs by the end of this century.

This chart is taken from the new CEA report. The red line shows the referenced case for GHG emissions in the atmosphere, concentrations in the atmosphere. The blue line shows the reductions that would be made if the U.S. achieved targets similar to the Lieberman-Warner bill, or some of the other emission reduction proposals out there.

So, the bottom line is there will be significant economic, negative economic consequences of the U.S. embarking on this path. If we go it alone, without China and India participating to reduce emissions, we will suffer economic loss and there will be no environmental benefit. Thank you.

[The prepared statement of Dr. Thorning follows:]

Statement of Dr. Margo Thorning, Senior Vice President and Chief Economist, American Council for Capital Formation

U.S. Climate Change Policy, Price Volatility and U.S. Competitiveness

By

Margo Thorning, Ph.D.
Senior Vice President and Chief Economist
American Council for Capital Formation

Before the
Committee on Ways and Means
U.S. House of Representatives

March 26, 2009

Executive Summary

Climate Change Policy, the U.S. Economy and Competitiveness: Recent private and government analyses of the impact of cap and trade proposals such as the Lieberman-Warner bill (S.2191) which sets targets to reduce GHGs to 15 percent below 2005 levels by 2020 and to 70 percent below by 2050, show that there are likely to be significant adverse consequences for the U.S. economy and job growth. Higher energy prices slow economic growth. An ACCF/NAM study shows that GDP declines by as much as 1 percent in 2020 and by up to 2.7 percent in 2030. Total U.S. employment (net of new jobs created in green industries) declines by 1,210,000 to 1,800.000 jobs in 2020 and by as many as 4,100,000 in 2030, compared to the baseline forecast.

Climate Change Policy and Price Volatility: The ACCF/NAM analysis of the Lieberman/Warner bill shows significant energy price increases by 2030.The cost of electricity to the residential sector will rise by 101 to 129 percent by 2030, while the industrial natural gas price increase is projected to range between 180 and 244 percent. The effect of mandatory GHG reduction targets is to significantly increase the share of U.S. electricity generated by natural gas compared to the baseline forecast and industrial natural gas prices would rise by 180 to 244 percent by 2030.

Obama Administration Climate Change Proposal: Impact on the U.S. Economy: The climate change plan outlined in the Administration's FY 2010 budget sets a target of 14 percent below 2005 levels by 2020 and 83 percent below by 2050 with 100 percent auctioning from the beginning. The Administration appears to expect the price of a carbon allowance to be approximately $13 to $16 dollars per ton of CO2 and that its cap and trade proposal would yield $675 billion over the 2012-2019. Based on the various studies, the estimated payments to the Federal government for carbon permits seem far too low.

Environmental Impact of U.S. Climate Change Policy: As noted in the new *Council of Economic Adviser's Report to the President,* U.S. policies to reduce GHGs will have virtually no environmental benefits unless developing countries, whose emissions are growing strongly, also participate. The CEA report states that global concentrations of

CO_2 in 2100 will be almost unaffected by U.S. emission reductions unless developing countries participate. Thus, sacrificing U.S. economic and job growth through unilateral climate change policies would yield little environmental benefit.

Conclusion: To be effective, policies to reduce global GHG emission growth must include both developed and developing countries. Polices that enhance technology development and transfer are likely to be more widely accepted than those that require sharp, near term reductions in per capita energy use.

US Climate Change Policy, Price Volatility and U.S. Competitiveness

By

Margo Thorning, Ph.D.
Senior Vice President and Chief Economist
American Council for Capital Formation

Before the
Committee on Ways and Means
U.S. House of Representatives

March 26, 2009

Introduction

Mr. Chairman and members of the Committee on Ways and Means, my name is Margo Thorning, senior vice president and chief economist, American Council for Capital Formation (ACCF),* Washington, D.C. I am pleased to present this testimony to the Committee.

The American Council for Capital Formation represents a broad cross-section of the American business community, including the manufacturing and financial sectors, Fortune 500 companies and smaller firms, investors, and associations from all sectors of the economy. Our distinguished board of directors includes cabinet members of prior Democratic and Republican administrations, former members of Congress, prominent business leaders, and public finance and environmental policy experts. The ACCF is celebrating over 30 years of leadership in advocating tax, regulatory, environmental, and trade policies to increase U.S. economic growth and environmental quality.

Chairman Rangel, Ranking Member Camp, and the Members of the House Ways and Means Committee are to be commended for their focus on the question of how the volatility of the price of carbon allowance permits could affect the U.S. economy and job growth. Given the extremely weak state of the U.S. economy, a cautious approach to reducing greenhouse gas emission growth is clearly warranted. The questions we need to ask are first, what are the likely impacts of cap and trade or carbon tax legislation on the U.S economy, job growth and competitiveness and second, what are the economic and environmental impacts of the U.S. proceeding with climate policy legislation without the participation of our trading partners in the developing world? My testimony will address these key issues.

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* *The mission of the American Council for Capital Formation is to promote economic growth through sound tax, environmental, and trade policies. For more information about the Council or for copies of this testimony, please contact the ACCF, 1750 K Street, N.W., Suite 400, Washington, D.C. 20006-2302; telephone: 202.293.5811; fax: 202.785.8165; e-mail: info@accf.org; website: www.accf.org*

I. Impact of Climate Change Policy on the U.S. Economy, Energy Prices and Competitiveness

• Impact on U.S. GDP and Employment

Recent private and government analyses of the impact of cap and trade proposals such as the Lieberman-Warner bill (S.2191), which sets targets to reduce GHGs to 15 percent below 2005 levels by 2020 and to 70 percent below by 2050, show that there are likely to be significant adverse consequences for the U.S. economy and job growth. **(See Table 1)**. For example, an analysis by the American Council for Capital Formation and the National Association of Manufacturers of S.2191 showed that by 2020, the cost of an emission allowance that industry would need to purchase that year for each ton of CO2 emitted would range from $55 to $64 dollars (see study at http://www.accf.org/pdf/NAM/fullstudy031208.pdf).

Results of other modeling efforts from CRA International, DOE's Energy Information Administration, the U.S. Environmental Protection Agency and the Massachusetts Institute of Technology show a similar range of allowance prices, especially when the availability of carbon capture and storage and new nuclear generation capacity are constrained **(see Table 1)**. By 2030, carbon allowance prices are higher due to the tightening of emission reduction targets, increased demand and U.S. population growth.

Higher energy prices slow economic growth. The ACCF/NAM study shows that GDP declines by as much as 1 percent in 2020 and by up to 2.7 percent in 2030. GDP losses in the other studies reported in **Table 1** show losses of up to 1.5 percent in 2020 and 2.3 percent in 2030.

The ACCF/NAM analysis shows that the drag of higher energy prices caused by the cap and trade system in S.2191 reduces total U.S. employment (net of new jobs created in green industries) by 1,210,000 to 1,800,000 jobs in 2020 and by as many as 4,100,000 in 2030, compared to the baseline forecast. In other analyses cited in **Table 1**, job losses range from 270,000 to 3,269,000 in 2020 and up to 2,393,000 by 2030.

• Impact on Household and Industrial Energy Prices

The ACCF/NAM analysis of the Lieberman/Warner bill shows significant energy price increases by 2030, primarily due to the impact of the cost of purchasing carbon permits but also from the construction and operation of a more costly suite of energy conversion technologies that help satisfy emission limits. As shown in **Table 2**, a revamped power generation sector is projected to increase the cost of electricity to the residential sector between 101 (Low Cost case) and 129 percent (High Cost case) by 2030, while the industrial natural gas price increase is projected to range between 180 (Low Cost case) to 244 percent (High Cost case). The effect of mandatory GHG reduction targets is to significantly increase the share of U.S. electricity generated by natural gas compared to the baseline forecast. By 2020, thirty percent more of the U.S. electricity supply would be generated by natural gas, and over 100 percent more by 2030 (see **Figure 1**).

In constant 2007 dollars, most energy prices are projected to increase under S. 2191, particularly, coal, oil, and natural gas, directly reflecting the impact of increasing CO_2

allowance prices. The price of gasoline would increase between 13 and 50 percent in 2014 and by 20 to 69 percent by 2020. For example, motorists would pay an additional $0.28 to $1.07 dollars per gallon in 2014 and an additional $0.43 to $1.46 per gallon by 2020. Heating oil prices in the Northeast would increase by 19 to 60 percent by 2014, by 28 to 81 percent by 2020, and by 104 to 178 percent by 2030. Residential natural gas price increases range between 108 to 146 percent in 2030 (see Table 1 of full report at http://www.accf.org/media/dynamic/1/media_190.pdf)

II. Obama Administration Climate Change Proposal: Impact on the U.S. Economy

- **Administration Revenue Estimates**

The climate change plan outlined in the Administration's FY 2010 budget sets a target of 14 percent below 2005 levels by 2020 and 83 percent below by 2050 with 100 percent auctioning from the beginning. The magnitude of the effort is shown in **Figure 2.** By 2020, CO2 emissions will have declined by over 1 billion tons and by 2030 the gap is approximately 3.5 billion tons (see **Figure 2**). Required reductions in per capita emissions will mean large changes in consumer behavior and in business practices. Currently, the average U.S. citizen is responsible for about 23 tons of CO2 per year. Under the Obama Administration proposal per capita emissions would have to fall to 18 tons in 2020 and 12 tons per capita by 2030 (See **Figure 3**). Such large, rapid changes in emissions would mean sharp cutbacks in energy use by households and business and significant changes in consumption patterns.

The Administration appears to expect that the price of a carbon allowance will be approximately $13 to $16 dollars per ton of CO2 and that its cap and trade proposal would yield $675 billion over the 2012-2019 period. Based on the various studies cited above, the estimated payments to the Federal government for carbon permits seem far too low. In fact, the Administration's FY 2010 budget, "*A New Era of Responsibility, Renewing America's Promis,*" appears to recognize that carbon auction revenues could exceed the projected $80 billion per year. Footnote 5 on page 129 of the Administration's budget states, in reference to the proceeds from the auctioning of carbon allowances that "All additional net proceeds will be used to further compensate the public."

Based on DOE-EIA analysis, a comparison of the revenues that would have been generated under the Lieberman/Warner bill (S.2191), if all allowances were auctioned further supports the idea that the Administration's revenue estimates are significantly understated. As shown in **Figure 4**, if all allowances were auctioned under Lieberman/ Warner, total revenues to the government would have ranged from $1,200 billion to $3,000 billion over the 2012-2019 period. (See bars with hash marks). Adjusting the Lieberman-Warner data for the fact that the Obama Administration target is less stringent in the early years than the L/W target shows that even under EIA's core case, which assumes carbon capture and storage (CCS) is available, rapid expansion of new nuclear generation capacity, large use of domestic and international offsets, etc. shows that government revenues would exceed those estimated by the Administration (red bars). Using EIA's more realistic cases, where costs are higher, CCS is not readily available and nuclear generation capacity does not expand rapidly, shows that government revenues

from the carbon auction would be double or triple the $675 billion revenue estimate for 2012-2019 in the Administration's budget.

- **Energy Prices and U.S. Growth and Competitiveness**

The importance of getting the estimates of auction revenue (or carbon trading allowance proceeds) right from any climate change proposal is that higher energy prices will make it harder to restart U.S. economic and job growth. Each one percent increase in U.S. GDP growth is accompanied by a 0.3 percent increase in energy use: therefore, the higher the price of energy, the slower the rate of economic recovery. Adjusting to a cap on emissions is costly because the U.S. capital stock is long-lived and sharply higher energy prices render it prematurely obsolete. As a result, productivity growth slows along with GDP, jobs and household income.

A real world example of the effect that increased energy prices have on U.S. industry and employment can be observed by examining trends in the U.S. chemical industry. For example, chlorine is an essential chemical building block used in the production of pharmaceuticals, medical devices, safety equipment, computers, automobiles, aircraft parts and crop protection chemicals. Chlorine production is based on electro-chemistry and is one of the most energy-intensive production processes. In recent years, U.S. chlorine capacity has been shut down because of record high electricity costs arising from high natural gas prices, according to the American Chemistry Council. In addition, a report by SRI Consulting indicates that ammonia capacity fell from 14.8 million tons in 1999 to 13.6 million tons in 2007, an 8 percent reduction. Data on global natural gas prices for the third quarter of 2008 show that U.S. producers face much higher prices than many other countries, thus it is not surprising that much chemical production has migrated to lower cost locations.

Similarly, nitrogenous fertilizers play a major role in boosting crop yields and ammonia is the key raw material for these fertilizers. Ammonia production has also been affected by sharply rising natural gas prices. According to The Fertilizer Institute, from 1999-2007, 25 ammonia plants have been closed and a report by SRI Consulting indicates that ammonia capacity fell from 15.5 million metric tons in 1999 to 9.8 million metric tons in 2003, a 37 percent reduction. Approximately 120,000 jobs have been lost in the U.S. chemical industry since 1999, when natural gas prices began their sharp rise, according to the American Chemistry Council.

III. Role of Green Jobs in Promoting U.S. Economic Growth

Several recent studies suggest that by imposing mandatory GHG reductions on the U.S. economy, mandating renewable portfolio standards for electricity generation, requiring more use of renewable fuels, tightening CAFÉ and other efficiency standards, we would experience higher levels of economic and job growth compared to the baseline forecast. However, a substantial body of research suggests that the opposite is true. For example, the ACCF/NAM analysis of the Lieberman/Warner bill showed that even thought the legislation would have produced additional "green" jobs by increased spending on renewable energy, energy efficiency and carbon capture and storage, the U.S. would still lose a net 1.2 to 1.8 million jobs in 2020 and 3.0 to 4.0 jobs in 2030 (see study at

http://www.acef.org/media/dynamic/1/media_190.pdf) due to higher energy prices and slower productivity growth.

A recent careful analysis of the impact of government mandates, subsidies and forced technological innovation for renewable energy and energy efficiency released by the University of Illinois College of Law, *7 Myths About Green Jobs* concludes that the special interests promoting the idea of green jobs have embedded dubious assumptions and techniques in their analyses. The University of Illinois report notes that the fundamental flaws in the studies promoting green jobs as a means of U.S. economic recovery are: (1) lack of standard definition of green jobs, and (2) fundamental errors in economic analysis such as rejecting the importance of comparative advantage, suggesting the need to avoid international trade (see University of Illinois report at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1357440).

IV. Economic and Environmental Impact of Strategies to Reduce Global and U.S. GHG Emission Growth

Climate change is a global issue which cannot be solved unless all major countries, including developing countries, curb their GHG emissions. As they approach this issue, policymakers, the media and the public need to understand the relative role of U.S. emissions, the E.U. experience with mandatory GHG reduction targets and the possible impacts on energy price volatility caused by the adoption of a cap and trade system to limit GHG emissions.

- **Global CO2 Emission growth and the Economic and Environmental Impact of Mandatory U.S. GHG Emission Reductions**

Most of the growth in CO2 emissions in the 21st century will be in the developing world (see **Figure 5).** As described above, meeting the mandatory reduction targets of proposed legislation such as the Lieberman/ Warner bill or the Obama Administration proposal are likely to have a significant impact on U.S. economic and job growth due to the sharply higher energy prices needed to bring down emissions. However, the U.S. climate change policies will have virtually no environmental benefits unless developing countries, whose emissions are growing strongly also participate. As noted in the new 2009 *Council of Economic Adviser's Report to the President*, global concentrations of CO2 in 2100 will be almost unaffected by U.S. emission reductions (See **Figure 6**). Thus, without strong international participation to reduce GHGs, the slower U.S. economic and job growth that would result from the emission reduction targets being debated by U.S. policymakers would yield little environmental benefit.

- **Impact of the European Union's Emission Trading System**

As we attempt to choose cost effective climate change policies for the U.S., it is useful to examine the cost-effectiveness of current policies to reduce GHG emissions in developed countries. In the European Union, reduction of GHGs has become a major policy goal and billions of Euros, from both the private and the public sector, have been spent on this policy objective. Many policymakers, the media and the public believe that the European Union's Emission Trading System (ETS) has produced reductions in GHG emissions and that their system could serve as a model for the U.S. The ETS, created in 2005, is a

market-based, EU-wide system that allows countries to "trade" (i.e., buy and sell) permits to emit CO_2. The ETS covers about 11,500 installations and almost half of the EU's GHG emissions.

The EU 15 (the major industrial countries) has a Kyoto Protocol target of an 8 percent reduction below 1990 levels in GHGs by 2010-2012. The European Environmental Agency's latest projections (October 2008) show that without strong new measures, EU 15 emissions will be almost 5 percent above 1990 levels in 2010, rather than 8 percent below as required by the Kyoto Protocol (**see Figure 7**). Given the challenges of meeting the Kyoto Protocol target, it seems unlikely that the EU will be able to meet its new 2020 GHG reduction goals of a 20 to 30 percent reduction in emissions and a 20 percent of energy use from renewables by 2020 (see http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/08/34 for details). EU member state politicians would face significant opposition to increases in energy prices and taxes sufficient to meet the stringent new emission and renewable targets.

- **Energy Price Volatility under a Cap and Trade System Compared to a Carbon Tax**

Two initiatives, a cap and trade approach and a tax on carbon emissions are currently receiving support from policymakers. A cap and trade system puts an absolute restriction on the quantity of emissions allowed (i.e., the cap) and allows the price of emissions to adjust to the marginal abatement cost (i.e., the cost of controlling a unit of emissions). A carbon tax, in contrast, sets a price for a ton of emissions and allows the quantity of emissions to adjust to the level at which marginal abatement cost is equal to the level of the tax. While neither approach, if adopted by the U.S. would have a meaningful impact in slowing the growth of global greenhouse gas emissions, the carbon tax approach is likely to cause less volatility in energy prices than would a cap and trade system.

Price volatility for a permit to emit CO_2 can arise under a cap and trade program because the supply of permits is fixed by the government, but the demand for permits may vary considerably year to year with changes in fuel prices and the demand for energy. As mentioned above, price volatility for energy has negative impacts on economic growth. In contrast, a carbon tax fixes the price of CO_2, allowing the amount of emissions to vary with prevailing economic conditions. A carbon tax, as a system of inducing emissions reductions, is not without drawbacks. First, revenues from a CO_2 tax (or auctioned permits) might end up being wasted; for example, if the revenue went toward special interests, rather than substituting for other taxes. Second, progress on emissions reductions is uncertain under a CO_2 tax because emissions vary from year to year with economic conditions. However, a CO2 tax could be adjusted gradually upward if the desired reductions in emissions were not occurring.

V. Conclusion

To be effective, policies to reduce global GHG emission growth must include both developed and developing countries. Policies that enhance technology development and transfer are likely to be more widely accepted than those that require sharp, near term reductions in per capita energy use. Extending the framework of the Asia Pacific

Partnership on Clean Development and Climate and other international partnerships will allow developed countries to focus their efforts where they will get the largest return, in terms of emission reductions for the least cost.

Table 1. Economic Impact of the Lieberman-Warner Bill: Summary of Key Modeling Results

	2020		
	Allowance Prices (2007$ per metric ton)	GDP Impact (% Change from BAU)	Impact on Jobs (%Change from BAU)
ACCF/NAM-Low Cost[1]	$55	-0.8%	-1,210,000
ACCF/NAM-High Cost[1]	$64	-1.1%	-1,800,000
CRA/NMA[2]	$47	-1.2%	-3,269,000
EIA- NEMS Core Case[3]	$31	-0.3%	-270,000
EIA- NEMS Limited[3]	$44	-0.5%	-450,000
EPA- Scenario 2[4]	$39	-0.7%	-
EPA- Scenario 7[4]	$73	-1.5%	-
MIT- No Offsets, No CCS Subsidy[5]	$72	-0.7%	-
MIT- 15%, CCS Subsidy[5]	$61	-0.8%	-

	2030		
	Allowance Prices (2007$ per metric ton)	GDP (% Change) (% Change from BAU)	Impact on Jobs (%Change from BAU)
ACCF/NAM-Low Cost[1]	$228	-2.6%	-3,100,000
ACCF/NAM-High Cost[1]	$271	-2.7%	-4,100,000
CRA/NMA[2]	$68	-1.0%	-2,393,000
EIA- NEMS Core Case[3]	$62	-0.3%	-280,000
EIA- NEMS Limited[3]	$93	-0.7%	-710,000
EPA- Scenario 2[4]	$64	-0.9%	-
EPA- Scenario 7[4]	$118	-2.3%	-
MIT- No Offsets, No CCS Subsidy[5]	$105	-0.3%	-
MIT- 15%, CCS Subsidy[5]	$89	-0.4%	-

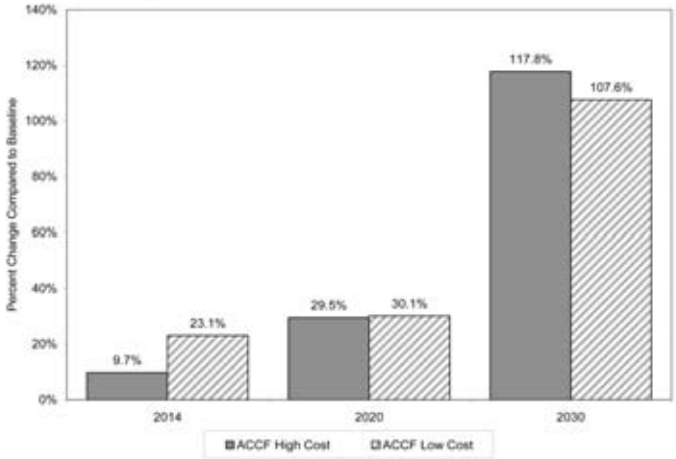
1. "Analysis of The Lieberman-Warner Climate Security Act (S.2191) Using The National Energy Modeling System
(NEMS/ACCF/NAM)," A Report by the American Council for Capital Formation and the National Association of Manufacturers, March 2008.
2. "Economic Analysis of the Lieberman-Warner Climate Security Act of 2007 Using CRA's MRN-NEEM Model," by CRA International, April 2008.
3. "Energy Market and Economic Impacts of S.2191, the Lieberman-Warner Climate Security Act of 2007," by the Energy Information Administration, U.S. Department of Energy, April 2008.
4. "EPA Analysis of the Lieberman-Warner Climate Security Act of 2007," by the U.S. Environmental Protection Agency, March 2008.
5. "Appendix D: Analysis of the Cap and Trade Features of the Lieberman-Warner Climate Security Act," by MIT.

Table 2. Impact of Lieberman-Warner Bill on the United States: Change in Energy Prices Compared to Baseline Forecast

	Low Cost Case			High Cost Case		
	2014	2020	2030	2014	2020	2030
Rise in Gasoline Prices	13%	20%	77%	50%	69%	145%
Rise in Residential Electricity Prices	13%	28%	101%	14%	33%	129%
Rise in Industrial Electricity Prices	22%	41%	142%	23%	49%	185%
Rise in Industrial Natural Gas Prices	36%	49%	180%	40%	66%	244%

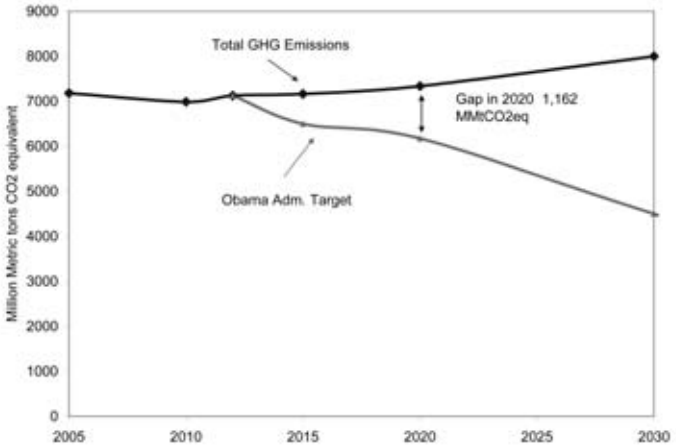
Source: "Analysis of The Lieberman-Warner Climate Security Act (S.2191) Using The National Energy Modeling System (NEMS/ACCF/NAM)," A Report by the American Council for Capital Formation and the National Association of Manufacturers, March 2008.

Figure 1. Change in Electricity Generated by Natural Gas under Lieberman-Warner Bill (S.2191) (Compared to Baseline Forecast)



Source: "Analysis of The Lieberman-Warner Climate Security Act (S.2191) Using The National Energy Modeling System (NEMS/ACCF/NAM)," A Report by the American Council for Capital Formation and the National Association of Manufacturers, March 2008.

Figure 2: Greenhouse Gas Emissions: Under EIA Baseline Forecast* and Obama Administration Proposal (Million Metric Tons CO2 Equivalent)**



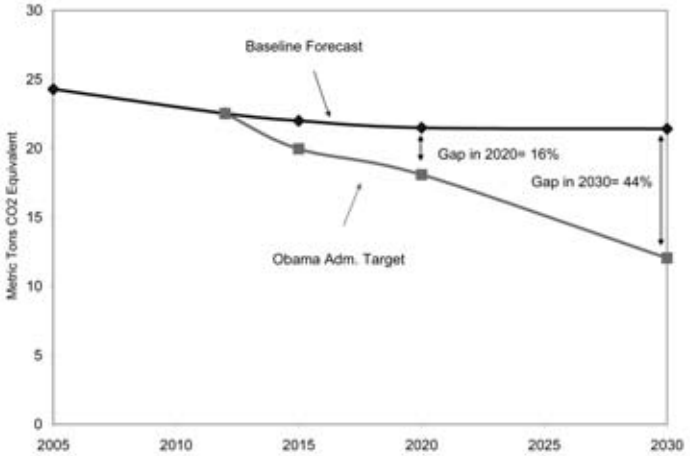
* Baseline forecast calculated by adding energy related CO2 emissions from Annual Energy Outlook 2009 and total other greenhouse gases as forecasted in EIA's S.2191 Analysis
** President Obama's budget proposal specifies a reduction of greenhouse gas emissions 14% below 2005 levels by 2020 and 83% below 2005 levels by 2050.

Sources: "Annual Energy Outlook 2009," Energy Information Administration, Department of Energy, Table 19, http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html

"Energy Market and Economic Impacts of S.2191, the Lieberman-Warner Climate Security Act of 2007," Energy Information Administration, Department of Energy, Reference Case, Table 20, http://www.eia.doe.gov/oiaf/servicerpt/s2191/excel/aeo2008.xls

"A New Era of Responsibility, Renewing America's Promise," Office of Management and Budget, pg 21, http://www.whitehouse.gov/omb/assets/fy2010_new_era/A_New_Era_of_Responsibility2.pdf

Figure 3: Per Capita Greenhouse Gas Emissions: Under EIA Baseline Forecast* and Obama Administration Proposal (Metric Tons CO2 Equivalent Per Person)**



* Baseline forecast calculated by adding energy related CO2 emissions from Annual Energy Outlook 2009 and total other greenhouse gases as forecasted in EIA's S.2191 Analysis and by dividing by population numbers from U.S. Census.
** President Obama's budget proposal specifies a reduction of greenhouse gas emissions 14% below 2005 levels by 2020 and 83% below 2005 levels by 2050.

Sources: "Annual Energy Outlook 2009," Energy Information Administration, Department of Energy, Table 19, http://www.eia.doe.gov/oiaf/aeo/aeoref_tab.html

"Energy Market and Economic Impacts of S.2191, the Lieberman-Warner Climate Security Act of 2007," Energy Information Administration, Department of Energy, Reference Case, Table 20, http://www.eia.doe.gov/oiaf/servicerpt/s2191/excel/aeo2008.xls

"National Population Projections," U.S. Census Bureau, http://www.census.gov/population/www/projections/files/nation/download/NP2008_D1.xls

"A New Era of Responsibility, Renewing America's Promise," Office of Management and Budget, pg 21, http://www.whitehouse.gov/omb/assets/fy2010_new_era/A_New_Era_of_Responsibility2.pdf

Figure 4: Obama Administration Climate Revenues (2012-2019) and EIA's Analysis of Lieberman/Warner (S.2191, assuming all allowanced auctioned) ($ in billions)

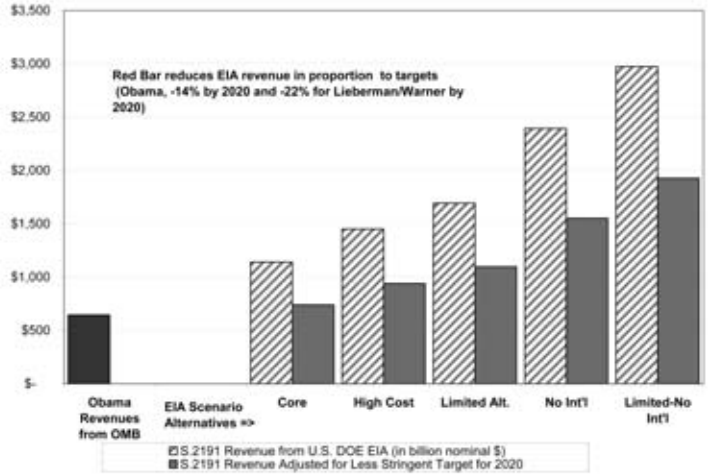
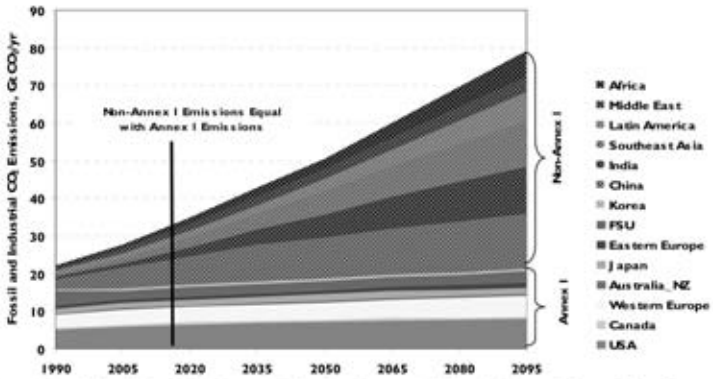
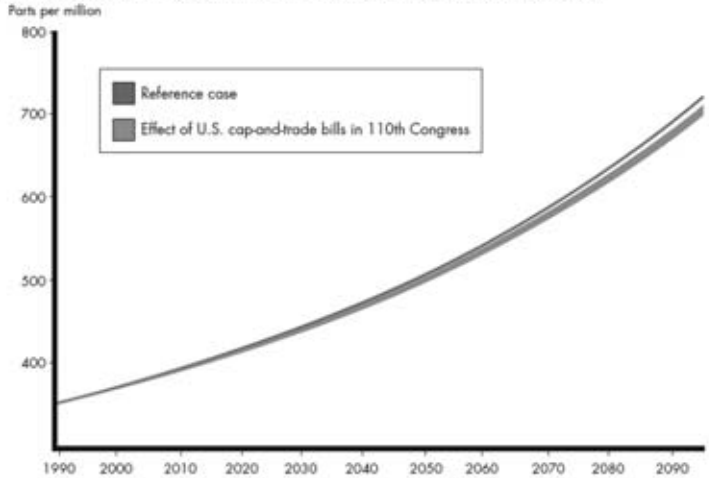


Figure 5. World Carbon Dioxide Emissions



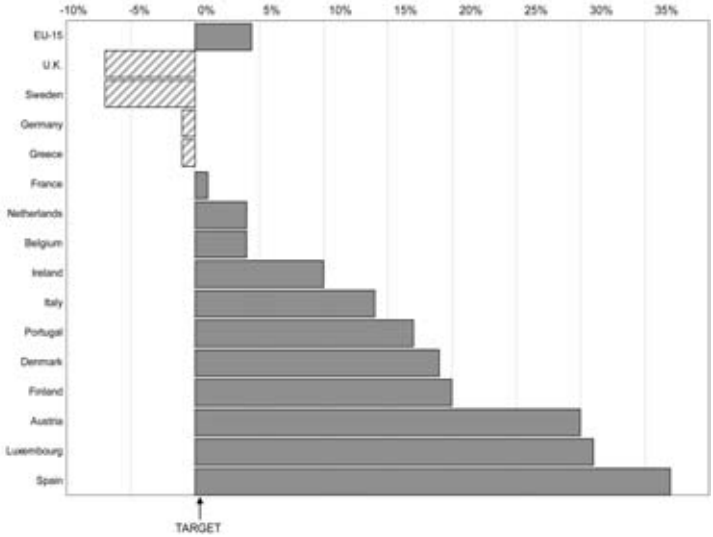
Source: Data derived from Global Energy Technology Strategy, Addressing Climate Change: Phase 2 Findings from an International Public-Private Sponsored Research Program, Battelle Memorial Institute, 2007.

Figure 6: Global CO2 Concentrations:
Carbon emissions are projected to rise over the next several decades



Source: Economic Report of the President, Annual Report of the Council of Economic Advisers, January 2009, Chart 3-6, pg 124.

Figure 7: Greenhouse Gas Emissions in the European Union: Gap between Projections* and Kyoto Targets in 2010



* Projections assume existing measures already in place.
Source: European Environmental Agency, October 2008.

Chairman RANGEL. Thank you, Doctor.

How many of you believe that cap and trade is the most efficient way to go in terms of reducing emissions?

[Show of hands.]

Chairman RANGEL. Of the three of you, do any of you violently oppose a carbon tax?

Mr. ELMENDORF. CBO, just to—as you know, Mr. Chairman, CBO does not make policy recommendations, so I am not for or against any particular policy. On the matter of efficiency, I think analysts widely agree that a carbon tax is an efficient way to reduce carbon emissions.

A cap and trade system is certainly more efficient than a command and control approach, maybe less efficient than a tax. It depends importantly on the sorts of mechanisms that we have been talking about today that can help to reduce the short-term price volatility in the cap and trade system.

Chairman RANGEL. I appreciate that. I think that most Members of Congress, like knowing Americans, believe that we have to do something. We have to do it fast. But they also acknowledge it is going to be a tremendous cost on the consumer in terms of the increase that is going to be passed on to them.

So we have Members going in two different directions. A lot of us are concerned with what protection can we give the consumer, and believe that the tax system is the most efficient way to cushion the additional costs.

But I am concerned with those people that favor the tax and trade even though, as far as I am concerned, I would want the most efficient way and have that proven to me as to what would be wrong.

In terms of the common objective we want, if the carbon tax was the method that we decided on, where would you see the shortfall in terms of accomplishing our common mission?

Mr. WHITESELL. Mr. Chairman, perhaps I could speak to that. I am an economist, and so I know the economic agreements for a tax. It is basically based on the idea that if emission reduction costs are uncertain, you want to set a price close to where you think the damage costs are from the emission of CO_2. So you get as much reduction in emissions as needed to reach those damage costs.

So, that is a reason why a tax has advantages over a cap and trade. However, with the climate, we are not dealing with risks that are symmetric around possible outcomes. There is a huge risk that if we don't do enough, we could be facing tipping points in the climate and a potential catastrophe.

So, because of the fact that the risks are not balanced on either side, that is an added reason to focus on emission goals and make sure that cumulative emissions are within what scientists are arguing are necessary to reduce climate risks to acceptable levels. So, that is the reason for a cap.

So I think that is a reason to kind of combine the best approach, the best features, of a tax with the emission caps that would reduce climate risks to acceptable levels.

Chairman RANGEL. Well, it doesn't seem, from what you say, that you are violently opposed to using the tax system in part in terms of being able to cushion the additional costs to the consumer.

Mr. WHITESELL. Yes. I think that the price stability of a tax is very helpful because it will allow us to get reductions that we need. However, I think you can get that price stability while still giving attention to cumulative emission goals, and I think that the approach in the Doggett-Cooper bill actually achieves that.

Chairman RANGEL. Okay.

Mr. LASHOF. If I could, I think in any policy designed to deal with global warming, we certainly have to pay attention to consumers. But I want to focus on energy efficiency as a critical component of a comprehensive policy because if we get that right, consumer energy costs can actually go down as we are reducing pollution.

The reason for that is even though prices per kilowatt hour of electricity may go up as power companies are forced to pay for putting pollution into the atmosphere, if consumers are able to use electricity more efficiently so they are using fewer kilowatt hours, what they care about is their bills. Our analysis suggests that consumer bills can go down while we are driving down pollution.

So, whatever mechanism is required to make clean energy the profitable kind, we need to be sure that we are investing in energy efficiency technologies that will help consumers drive their bills down, and I think that is a critical component.

The other component of it is whether——

Chairman RANGEL. Before you go to the other one, are you talking about an immediate moving toward penalizing those who don't stay within the cap, that there will not be an increase initially to the consumer, that efficiency would drive the electricity costs down?

Mr. LASHOF. No. I am talking about getting incentives right so that utility companies have a profit motive to actually help their consumers be more efficient in how they use electricity. I am talking about building codes that are effective and enforced.

Chairman RANGEL. I am asking how long. We have 2-year contracts in here in the Congress, and I just want to know how long would it take for a consumer-voter to recognize that efficiency is going to drive down his or her electricity costs.

We are anxious to make certain that they don't feel—they feel at least paying this possible. Are you suggesting that they don't have to feel any in the short run?

Mr. LASHOF. Well, I am suggesting that we should, as we have with the economic recovery bill, start investing in efficiency right now——

Chairman RANGEL. Assuming we do all of that, are you suggesting that if we do everything that you are suggesting we do, that initially the consumer electricity costs would not be increased or indeed may be driven down?

Mr. LASHOF. Monthly bills could be driven down. Now, I do believe that we—the second part of it, particularly for low income consumers, we need to have particular provisions. That is where the Tax Code certainly comes in to ensure that their costs are managed.

Chairman RANGEL. Okay. Mr. Camp.

Mr. CAMP. Thank you, Mr. Chairman.

Dr. Elmendorf, I just want to talk about a couple fundamental principles. In the short run, would a climate change policy that places a price on carbon, whether it's cap and tax or straight carbon tax, would that mean higher energy prices across the entire economy?

Mr. ELMENDORF. Yes. I don't know what you mean by the short run, but at any point in which we are putting a price of carbon emissions, that would be passed through to the cost that consumers face in energy products, but also all other products that are made using fossil fuels.

Mr. CAMP. Thank you. Are there any goods and services that would not rise in price in response to that policy?

Mr. ELMENDORF. I don't know if there are any goods that use no energy in their production. It seems to me unlikely.

Mr. CAMP. Dr. Elmendorf, two weeks ago, CBO testified that a 15 percent reduction in greenhouse gas emissions from 1998 levels would cost the average household about $1600 per year. That seems like a far less ambitious target than the President's desire to get emissions 83 percent below 2005 levels.

So, accordingly, wouldn't the $1600 per household per year cost likely understate the true cost to families of the policies in the President's budget?

Mr. ELMENDORF. I think there are two answers. One is about the time scale. The change that we talked about in our testimony a few weeks ago was the 15 percent reduction in the fairly—in the near or medium term. The reduction that people discuss on the order of 70, 80 percent in the emissions are in the order of 40 years from now. So, the time scale of that process is quite different.

I think the second comment is that the cost to households depends very critically on what is done with the revenue that is raised from a carbon tax or from auctioning cap and trade allowances. As you know, our testimony discussed the ways in which that revenue might be used in different ways to affect the efficiency and distribution in the economy.

Mr. CAMP. But when CBO estimates the impact of imposing, say, a cap and tax system on the economy, isn't it true that when CBO scores those proposals, that it assumes the increases in energy taxes—that the increase in energy taxes act as a drag on the economy and thereby reduce other income and payroll receipts?

Mr. ELMENDORF. Yes. An indirect tax—sales taxes, other sorts of indirect taxes—and the carbon tax, so the price of cap and trade allowances would fit in that category, that kind of revenue then reduces the incomes that people have and the taxes they pay to the government. That is part of what we estimate when we estimate the effects of these bills.

Mr. CAMP. Isn't it also correct to say that while the exact amount of this offsetting loss and other revenues depends on the design of the specific policy, and the CBO in January noted that traditionally there is a 25 percent offset, meaning that for every dollar of revenue generated by cap and tax, other tax receipts fall by 25 cents?

Mr. ELMENDORF. Yes.

Mr. CAMP. So, that the net extra burden is not the amount of the tax or the price of the allowances. It is less than that.

Mr. ELMENDORF. I think that 25-percent reduction in payroll and income tax receipts, that reflects CBO's view that policies like cap and tax will result in a slowing of the economy, and therefore more unemployment and slower wage growth.

The unemployment is more complicated. The estimates that people make suggest that an ambitious cap and trade plan of the sort that Senator Lieberman and Warner talked about and that we have estimated might reduce the level of GDP by 1 to 3 percent, about 20 years from now by 2 to 5 percent, or 2 to 6 percent 40 years from now.

Unemployment effects are more likely to be transitional issues. It is the shift of the economy from a fossil fuel-centered production toward other forms of energy that then creates some new jobs and costs some jobs. It is that transition that tends to affect unemployment. In the long run, I don't think the effects on unemployment would be——

Mr. CAMP. Well, and just quickly, going back to this 25 percent offset issue one more time, we have heard about a number of proposals that attempt to mitigate the damage to American families from cap and tax by returning revenue raised via other programs, like energy stamps.

Isn't it true that if we were to return every dollar raised from cap and tax, the reduction in income and payroll tax receipts would mean the proposal would add to the deficit?

Mr. ELMENDORF. If you returned every net dollar the government gains from a carbon tax or selling cap and trade allowances, then that would have a net zero effect on household——

Mr. CAMP. No. I am talking about making families whole.

Mr. ELMENDORF. A net zero effect on——

Mr. CAMP. I am talking about making families and employers whole.

Mr. ELMENDORF. But that is what I am saying, too. I am saying that if you collect a dollar for carbon tax, the offset that we discuss is that with the dollar less that firms or households have, they will pay less in tax on that. So, in fact, you have collected a dollar in the carbon tax, but you as the government have collected 25 cents less through some other tax.

So, the government has collected a net of only 75 more cents. Those 75 cents can be returned to households and firms and make them whole and leave the government whole.

Mr. CAMP. Your testimony today is that this is budget-neutral? This would be budget-neutral?

Mr. ELMENDORF. I am not sure what "this" is. So, a specific proposal could do different things, and we would——

Mr. CAMP. Let's say cap and tax.

Mr. ELMENDORF [continuing]. The proposal.

Mr. CAMP. In my question I referred to cap and tax.

Mr. ELMENDORF. But there are lots of different cap and taxes. What I am trying to follow through on is your, I think, hypothetical case in which the government collects the dollar of revenue directly through a carbon tax, but it collects 25 cents less in revenue because households and firms have less income.

So, the government has collected a net of only 75 cents for that apparent dollar, and that 75 cents could then be recycled to households and firms that would be then in a neutral position.

Mr. CAMP. I see I am out of time. But I would just say that if you raise a trillion and you give back a trillion, it is not revenue-neutral because you haven't raised a trillion dollars. But I see my time is expired, and I thank you, Mr. Chairman.

Chairman RANGEL. Thank you. Let me share with the panel: Assume the bells will ring, and it is my understanding that we will have several votes, including a motion to recommit, that would cause us not to be able to get back for an hour.

Certainly I would not want the panelists to remain here unless I knew that there were Members that would be coming back here when that is over. I think they tend to adjourn. That would be at 12:30, approximately.

So, could I get by show of hands how many Members would be coming back in an hour?

[Show of hands.]

Chairman RANGEL. So, we will continue the way we are, and I hope that—and I apologize to the panel that it will be a break while we go to the floor and vote. But there is clear interest in Members that are here and Members that probably would be returning later.

So I would like to yield to Mr. Stark, who many, many years ago, when George Washington's hair was black, he started in this down here in the Congress. I yield to you for 5 minutes.

Mr. STARK. Thanks, Dad.

[Laughter.]

Mr. STARK. It was that many years ago that I guess I introduced the first carbon tax. I guess I would ask: Is there anybody on the panel where the carbon tax wouldn't be your second choice? Wouldn't be your second choice?

Ms. THORNING. It would be my first.

Mr. STARK. First choice? Okay. I go back and I think, for instance, gas taxes. This Committee collects an awful lot of gasoline taxes, which eventually get spent by the states to build roads, pretty much. I don't see any reason why we couldn't change that to a cap and trade, and let the states swap their right to tax gasoline, and California could buy from Nevada, who doesn't really need any roads any more because everybody flies to Las Vegas.

When we had the Superfund—Dr. Elmendorf, you probably weren't even out of high school then—but was there any major——

Mr. ELMENDORF. Thanks, Dad.

[Laughter.]

Mr. STARK. Was there any major change in the economy or employment when the Superfund went in or when it went out?

Mr. ELMENDORF. Well, changes in where the government spends money and collects money affect those sectors of the economy. Jobs are created where money is spent, and jobs are lost where money is no longer spent.

Mr. STARK. Wouldn't it be your understanding that at the rate the government is now spending money, that any carbon tax would get spent, if it hasn't already been spent a dozen times over——

Mr. ELMENDORF. I don't think I want to speculate on the actions of the Committee.

Mr. STARK [continuing]. So that while there is an issue, I guess, about—and I don't know if anybody here would deny that consumers would pay eventually, whether it is cap and trade or tax—but the issue that somehow we have avoided is what is the cost to the country or to consumers if we do nothing.

We haven't heard a lot of testimony from the panel there. There is some disagreement, I guess, as to how important it is that we stop global warming, and there is a question of whether the United States by itself makes any difference unless we can encourage the rest of the free world, or the rest of the world to follow suit.

I guess my question, Dr. Elmendorf, would be: What would be the economic pressure, if any, on the rest of the world to follow suit if we enacted any kind of a program, whether it be cap and trade or taxes? Would there be anything besides just moral suasion on the rest of the world to indeed follow suit?

Mr. ELMENDORF. I think the crucial part of economic pressure can be how we treated imported goods. If we force imported goods that come from countries without compatible carbon prices to pay an extra duty on admission to this country, that puts economic pressure on other countries to raise carbon prices.

The issue, as you know, is whether those sorts of border adjustments are consistent with WTO rules. I am not a lawyer. I am told there is uncertainty about that issue.

Mr. STARK. The risk of retaliation, I suppose, from those countries who would——

Mr. ELMENDORF. Yes. There are provisions of the WTO Agreement that seem—that in some people's judgment provides the opportunity for the sort of border adjustment that people are discussing. There are other interpretations that this particular thing that people would try to do, if we did the cap and trade system with border adjustments, would not pass muster with those rules.

Mr. STARK. Thank you. I want to thank the panel for their patience and their efforts to help us understand what is the best way to go forward. Thank you all very much.

Chairman RANGEL. An update on the floor situation. It may be a little less than an hour, but we will say that Members will return as soon as the last vote.

I would like to yield to Mr. Herger.

Mr. HERGER. Mr. Chairman, Mr. Nunes needs to be leaving on an airplane. Would it be possible to——

Chairman RANGEL. It is your time. You can do what you want.

Mr. HERGER. Could I exchange with him and then have my question in his time slot?

Chairman RANGEL. Of course you could.

Mr. HERGER. Good. So, I will yield, too.

Mr. NUNES. Thank you, Mr. Herger. Thank you, Mr. Chairman, for obliging me so I can make my flight. I appreciate it.

I will be very quick with the panel. I want to get you all on the record. I just have some very simple questions that I would like to have answered, and it is ABC type of questions. So I will just start on the left. We will just go all the way to the right.

But the first question is that in your professional opinion—I don't need scientific data or anything—but to take more carbon out of the air, would it be better off to, A, build 200 nuclear reactors, B, institute a cap and trade or carbon tax, or C, you don't know? We will just start here with Dr. Lashof.

Mr. LASHOF. I would say to institute a carbon cap, depending on the level of the cap, but because it is comprehensive.

Mr. NUNES. Thank you, Doctor. Dr. Burtraw?

Mr. BURTRAW. Not understanding the level of the cap that you speak of, I would agree that a cap would be better.

Mr. WHITESELL. A price on carbon through either means would provide incentives for a lot of adjustments to be made, including nuclear power to be used more.

Mr. NUNES. Thank you.

Mr. ELMENDORF. I agree with the other statements from the panelists.

Mr. NUNES. B. All right.

Ms. CHAN. As well.

Mr. NUNES. B.

Mr. METCALF. I would agree with that.

Ms. THORNING. I would suggest that it might be more efficient to try to build the nuclear plants as fast as possible because they would have a meaningful impact on slowing emission growth.

Mr. NUNES. Thank you. The second question I have is yes or no. But should we put a carbon tax and/or a cap and trade scheme on animal agriculture? Yes or no?

Mr. LASHOF. I believe that concentrated animal feeding operations that would otherwise meet the emissions threshold for a large stationary source, say, 10,000 tons of carbon dioxide equivalent, could be regulated.

Mr. NUNES. So, you mean a larger sized farm? Is that——

Mr. LASHOF. We are talking about large factory farms should be treated as factories.

Mr. NUNES. Okay.

Mr. BURTRAW. No, sir, I don't. I believe that they could be subjected successfully to some direct regulation, or qualify for offsets, bringing valuable revenue into the agricultural sector from a cap and trade program in the rest of the economy.

Mr. NUNES. Thank you.

Mr. WHITESELL. I agree that larger farms, where you can measure the emissions, could perhaps be brought into a cap and trade system. But for smaller units, it is easier to measure the capture of greenhouse gases rather than the emissions that occur without special projects, and there are ways of handling that through an offset mechanism associated with a cap and trade system.

Mr. ELMENDORF. As you know, Congressman, I don't make policy recommendations.

Mr. NUNES. Thank you, Dr. Elmendorf.

Ms. CHAN. Friends of the Earth would agree that CAFOs, concentrated animal feeding operations, should be subject to a cap.

Mr. METCALF. I think certain elements of agriculture can be brought into the system. We are not going to be able to get all elements. The way to proceed is to look at where we can measure,

monitor, and verify easily, whether under a tax or cap and trade. Those systems should be brought in, and they would tend to be the large feed lots and some other applications.

Mr. NUNES. Thank you.

Ms. THORNING. I doubt that the costs of such a program would be worth the benefits, particularly in light of my slide showing that if the U.S. cannot get China and India and other countries to participate, what we do here will have virtually no impact.

Mr. NUNES. Thank you. Mr. Chairman, I would like to thank the panel, and I would like to thank your kindness for letting me jump in front of Mr. Herger.

Chairman RANGEL. Thank you. Have a good flight.

The Committee will adjourn until the last vote. I hope that the panelists would be able to stay with us. I apologize for this delay.

[Recess.]

Chairman RANGEL. First, thank our witnesses for your patience in coming back and for understanding our legislative process in causing this. Again, I would say that the closer we get to resolving this, I hope you don't mind if we call you back in informal session to try to make certain that we have a bill which is going to be successful in the House and Senate.

I would like to call on my dear friend from Michigan, who has quite a few emission problems in his hometown, besides other problems. Mr. Levin.

Mr. LEVIN. Thank you, Mr. Chairman. We all join in thanking the witnesses. I said to several of you, your schedule has to assume we don't really have one. So thank you.

There are so many important details that need to be thrashed out, and it is tempting to focus in on them. But I thought instead, for my turn, I would ask questions, question a little more broadly, because I think the only hope of having any bipartisan approach to this is if there is acknowledgment of two things:

No. 1, that there is a climate crisis in the world, and if that isn't acknowledged, there is no hope, I think, of having an approach that cuts across some of the lines; and secondly, that there is a way to put together a plan that addresses the issues of the economic impact on manufacturing, on the economic impact on consumers, and also the issue of competitiveness.

Let me zero in on an issue that has been raised here, and that is the impact on consumers. Maybe I will start with you, Dr. Elmendorf, and others will comment if you can if there is time.

Whether one takes a cap and trade approach or a carbon tax approach or some combination, the agreement has been given that there will be kind of automatic impacts on the consumer, and that their costs will automatically increase dramatically.

So, I would like to ask you your judgment. Isn't there a way to address that issue, for example, to take revenues that would come and make sure part or many of them would be returned? Address this issue of the potential impact on the consumer and ways that might be addressed, if there are any, to—ways to address that issue.

Mr. ELMENDORF. Yes, sir. An increase in the price of carbon emissions would be passed through to the prices of goods that households buy, and in that way, would affect households' ability

to buy what they have been buying before. They would need to have more money or buy less.

But the revenue that the government would collect if it sold allowances in the cap and trade system or had a carbon tax can be used to offset the burden that households face, at least in the aggregate.

I think the harder issues are how one directs that money, if one wants to direct it; what mechanisms are used, and in part can be through proposals that have been raised for using the earned income tax credit or other tax means. There are government programs that adjust automatically with higher prices, so Social Security benefits would rise with higher prices. So, there are some things that would happen automatically, others that would have to be constructed separately.

The other distributional effect worth noting is that there are people in particular industries that will be particularly hurt. That is different from the sort of rich versus poor distributional analysis that is often done, but also, I think, quite important, and those are people in particular industries or particular parts of the country.

Mr. LEVIN. There are ways to address those issues as well?

Mr. ELMENDORF. Yes. So, again, if the allowances are sold and the government collects revenue, or if it uses a tax, then it can use those revenues to compensate people who are being hurt.

Again, it would need to develop a mechanism for directing money to people in particular industries, so one idea that has been proposed is to provide a subsidy for industries that continue to operate, and thus continue to employ people in those businesses. That is one mechanism that could be used.

Mr. LEVIN. I think—yes, Ms. Chan. I have just a few seconds. Because I think if we simply raise red flags, any hope of a bipartisan approach will end. Yes, Ms. Chan.

Ms. CHAN. I would just like to add very briefly that a couple of weeks ago, Friends of the Earth submitted some written testimony for another hearing, along with a couple of other organizations such as the National Community Action Fund and Public Citizen. It was focusing on how lower and middle income consumers could be protected.

I would note also that this Committee has some really unique jurisdiction in their ability to use tax policy to keep consumers whole, such as the earned income tax credit, maybe electronic debit transfer systems, and things like that. So, there are some things that we might be able to submit for the record here.

Mr. LEVIN. My time is up. Thank you.

Chairman RANGEL. Thank you.

I recognize Mr. Herger.

Mr. HERGER. Thank you, Mr. Chairman.

Dr. Burtraw, 2 weeks ago in your testimony before the Income Security Subcommittee, you stated that we would need to devote 3 to 4 percent of allowances to offset the decline in international competitiveness of U.S. manufacturers. Is that correct?

Mr. BURTRAW. Yes, sir. What I was saying was that that amount of allowance value, according to some, would be sufficient to keep those industries that are exposed to unfair import and export competition to provide a subsidy to production onshore to

make sure they keep jobs onshore. That does not reduce or remove all of the possibility for leakage, but it does protect jobs.

Mr. HERGER. Now, on Tuesday, one of the witnesses invited by Congressman Levin stated that we would need at least 13 percent of allowances to offset some of the decline in international competitiveness for only some industries.

Based on just the increase in energy prices projected by EPA's analysis under the Lieberman-Warner bill, which would impose a less severe reduction in emissions than what the President has proposed, we have statistics that show that 52 different sectors of the economy would see declines in exports of at least half a billion dollars each.

Many of these sectors are not covered by the plan described on Tuesday, and presumably are not covered under your plan. I want to list some of the sectors that would see significant declines in both exports and employment, and I would like you to give me a yes or no as to whether you think these sectors will suffer a decline in international competitiveness.

Automotive stamping and parts?

Mr. BURTRAW. Sir, I would defer to my colleagues on that, and be happy to send information to you about that and correspond with your staff further. But I don't claim this is my own personal area of expertise. I am sorry.

Mr. HERGER. Okay. Is there anyone who would like to comment on automotive stamping and parts? Would you have——

Mr. ELMENDORF. Congressman, I am sorry. I don't think the Congressional Budget Office has done analysis on an industry basis. As a general matter, if there are not appropriate border adjustments made, then the industries that tend to be more carbon energy-intensive will be hurt worse. But I also don't have specifics on that to offer you right now.

Mr. HERGER. Okay. Well, what would you think on automotive stamping and parts?

Mr. BURTRAW. I would think that that's possible. Yes, sir.

Mr. HERGER. How about fruits?

Mr. BURTRAW. Fruits is a subcategory of food. If it is processed fruits or fresh fruits, I don't really have the information to be able to answer that.

Mr. HERGER. Car and tractor engines. You are nodding your head yes?

Mr. BURTRAW. Yes. I think that that could be an exposed industry that we should be concerned about.

Mr. HERGER. Semiconductors.

Mr. BURTRAW. I don't know.

Mr. HERGER. Paint.

Mr. BURTRAW. I have heard that mentioned before, but I don't know, sir. I can't speak with expertise. It could be an important one.

Mr. HERGER. It could be. Soybeans.

Mr. BURTRAW. I don't know.

Mr. HERGER. Textiles and fibers.

Mr. BURTRAW. I don't know.

Mr. HERGER. Tools and dies.

Mr. BURTRAW. I would imagine that would be, but I am guessing, sir.

Mr. HERGER. Now, we used energy prices that assume slow growth in nuclear power and clean coal, which are consistent with the positions of two of your colleagues at the witness table today that oppose nuclear and clean coal. The estimates do not include the impact of allowances on cost.

Let me turn and—but these are just some—and this is the point of the question—these are just some of the sectors that we would see significant declines in exports. I think many would say that the answer would be yes to each of those. I am very concerned that folks are rushing toward a policy without understanding the full ramification of its impacts.

Director Elmendorf, has the CBO estimated how many allowances would be necessary to offset the decline in the international competitiveness of U.S. manufacturers?

Mr. ELMENDORF. No, we have not. I think you raise an important issue, Congressman, and I think we need to do more work on the distribution of economic effects of this sort of legislation.

Mr. HERGER. Well, I appreciate your saying that. I would like to urge you and ask you to do this analysis. I think it is crucial to our economy, to jobs, particularly now when we are in a down time. I really believe that Congress needs this information.

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

Chairman RANGEL. I would like to join with Mr. Herger in making that request because it is so important no matter which solution people are seeking that we have to know the number of people and the nature of the impact.

I want to thank Dr. McDermott, as I recognize him, for the hard work that he has put in this over the years. I hope your day has come.

Dr. MCDERMOTT. Thank you, Mr. Chairman.

Dr. Thorning, I want to pose a hypothetical for you and then let you respond to it. We need to have energy independence from Middle East oil. We need to deal with climate effects. So, change is going to happen. Let's assume that. Business is going to have to respond to one of these proposals made by various people up here.

I would like to hear your choice as to which one you think would be best for the economy. Since you are the only one that is directly representing business—we have got a lot of people who are peripherally business, but you are the business person—which one of these plans?

Do you want cap and trade, or do you want a cap with a fixed price and a guideline decline over the next 40 years? What is it you want? Since you have to take something. This is hypothetical.

Ms. THORNING. Well, I think what—the long-term solution to reducing greenhouse gas emissions is going to depend on technology. It is going to depend on more use of nuclear power. It is going to depend on capturing and storing carbon.

So, I think we need to continue the large government programs and private programs that are underway to develop these technologies. I think, as I said in my testimony, because whatever the U.S. does will have almost no impact on a couple of——

Dr. MCDERMOTT. Please, don't go into the rest of the world. It is going to happen here in the United States. The solar and the wind and the coal and the geothermal and all these energy proposals, what is the best one for them economically?

Ms. THORNING. The least bad proposal, I think, would be a tax on emissions. But as I said, we will incur substantial costs with no environmental benefit from trying to hit near-term targets.

Dr. MCDERMOTT. I take your point. I know that part of your argument. I want to know—because I think the business community is divided. I think that there are some industries who don't want anything to happen, and there are other green energy kinds of industries who want to be able to predict the price and then put a plan in place to develop, over 3 or 4 or 5 years, a plan.

I would like to hear Ms. Chan talk about that.

Ms. CHAN. Well, I would agree with Dr. Thorning in that we will need some breakthrough technologies to come our way. That is going to take investment. It is going to take investment in R&D, capital investments, infrastructure investments. These investments are going to perhaps be significant for some industries.

That is actually why it is helpful to have a stable and predictable price path, because you can do the business planning for that. If you had very volatile carbon prices, there would be a bit of an uncertainty for a company that wanted to make investments, in breakthrough R&D, for example, and then find out by the time they are paying back their bankers that they could have just really done it cheaper by just buying relatively inexpensive offsets or allowances right off the market.

So, I think that because we really will need these breakthroughs in cleaner technologies to transition to a low carbon economy, that the clear price signals that are offered, for example, by your bill, by Mr. Doggett's bill as well, provide that kind of stable path that allows companies to actually plan.

Dr. MCDERMOTT. Mr. Lashof, I want to add a little because I see you would like to answer. Let me ask a further question for you.

What does a carbon-trading scheme, with all the inherent potential problems of derivatives and all the rest, what does that add to—rather than doing a tax? Why do that? Because you are just struggling, I think, to find stability in a cap and trade system, which is never going to get to zero. You are always going to have some fluctuations, whether you bring the lines together or however you do it. I would like to hear your answer.

Mr. LASHOF. Well, I think the primary advantage that we see from a cap is providing greater certainty about achieving the emission reductions. Then the trading part——

Dr. MCDERMOTT. But my—let me just stop you. The bill that we put in has a cap that declines over the next 40 years, to 2050. So, we have already a cap in the bill.

Mr. LASHOF. Right. No, and I——

Dr. MCDERMOTT. That's what you want. You want a cap.

Mr. LASHOF. I appreciate the—you know, I think a lot of thoughtful and interesting proposals that you and Mr. Doggett have put out, and I think there—and we are sort of converging

here between—you know, I think all of us have talked about various versions of hybrids.

I think when you do that, though, you have to have some ability to adjust the price in order to make sure that you actually achieve those emission reductions. So, in that sense, it also becomes a little bit more like a cap and trade. So, I wanted to address——

Dr. MCDERMOTT. Would you trust the Secretary of Treasury and the Secretary of Energy and the head of EPA more than the derivative traders on Wall Street to set the price? If you gave the change capacity to those department chairmen in the government versus the traders?

Mr. LASHOF. Well, I would—you know, what I proposed and what many businesses that are members of the U.S. Climate Action Partnership have called for is a cap. I trust EPA to address the environmental problem, which is limiting emissions. The price would be set not on the derivatives market but in the actual market for allowances.

I think it is very important to regulate the derivatives market to ensure that any derivatives related to carbon allowances are traded on an exchange, and that it is transparent. I certainly agree that an unregulated derivatives market in this area, as in other areas, is a problem. But I think that can be addressed through proper market oversight rather than moving away from the cap mechanism.

Dr. MCDERMOTT. With just one bit of—more question, where have you seen a regulated derivative market?

Mr. LASHOF. Well, I think that——

Dr. MCDERMOTT. I think you called it a well-regulated derivative market.

Mr. LASHOF. The Commodities Futures Trading Corporation has, I think, moved in that direction, in some commodities. I am not saying that—I am sure that can be improved on.

Dr. MCDERMOTT. Thank you, Mr. Chairman.

Chairman RANGEL. Thank you. We have to follow up in that area.

Who was it? Oh, yes. Mr. Reichert of Washington may inquire.

Mr. REICHERT. Thank you, Mr. Chairman. Thank you for hanging around while we had to go vote, and appreciate your presence here today. I know some of these questions might seem repetitive, but we are all trying to understand a very complicated issue. I think it also gives the citizens across the country who happen to be watching, who might catch this hearing at another time, to hear the answers more than once.

We have heard that the United States must show leadership in the international climate change debate by imposing emissions reductions without requiring other countries to do the same. But concerns have also been raised that unilateral action by the United States won't reduce global greenhouse gas levels. Even this week, the president, Mr. Gerard, of the Steel Workers Union expressed some concern over maybe the possibility that China and India won't participate in this effort.

If the United States acts and others don't, U.S. employers and workers could be disadvantaged in the international markets. My

question is: What happens if the United States goes first, then other countries don't follow our lead?

Mr. ELMENDORF. Well, I think it is important to note that we have not gone first. In fact, the European Union has already started the process. So, we are in a sense playing catch-up.

Mr. REICHERT. What about India and China, though? What if we go before India and China?

Mr. ELMENDORF. So, I think it is very important to do two things in legislation. The first is to make sure that you include in the legislation a GATT legal form of border tax adjustment that allows you to put a tax on the carbon-intensive products—paper, cement, steel, glass. There are a number that are critical.

What is interesting is that in fact, if you look at some of these carbon-intensive products, they actually—many of them don't come from China. They actually come from Canada, from the E.U., from other countries that either have or will have a carbon price.

But I think it is still important to do that, and it is important to do that in a GATT legal way. I think that is one reason why the tax-based approach is something that you really do want to be looking at because there is this uncertainty about the legality, but it may be easier to do with the tax.

The second piece is that you may want to revisit—I think a necessary condition to get China and India on board with a policy is that the United States has to act. They are simply not going to do anything unless we act. Then if we do, then we have to use the moral suasion that we have by having a policy in place to lobby for their involvement.

Mr. REICHERT. Are you calling these safety valves? Is that what those two things would be defined as? If India and China don't work, is that the two issues you just mentioned?

Mr. ELMENDORF. So, we have—the two issues are that we have taxes on carbon-intensive products in the imports of fossil fuels at the border to level the playing field between domestic production and imports. I think that is a very important piece.

Then we go from there in terms of bringing China and India into a system within the next 10 to 15——

Mr. REICHERT. Dr. Thorning, real quick.

Ms. THORNING. Yes. I would just like to point out that the European Union's record is not very good. The E.U. 15 emissions have increased .8 percent since 2000. E.U. 27, all the 27 countries, have increased 1.5 percent over the 2000–2006 period. So, while the European Union has an emission trading system in place, it is not being enforced.

Second, if we impose a border tax adjustment on imported goods from countries like China, who are funding a large portion of our deficits, I don't think that is going to be helpful in terms of their being willing to continue to buy our debt. So, I think that border tax adjustment that people are looking at to try to save our manufacturing and energy-intensive jobs is probably not going to work.

Mr. REICHERT. Was there some—yes, sir?

Mr. WHITESELL. So, the border tax adjustment is something that applies to a particular foreign country that does not have a comparable carbon program. It may be better for the U.S. to put in place an output-based rebate along the lines of the Inslee-Doyle

proposal for the first several years of our carbon policy, which would protect our industries irrespective of the direction of the competition that they face in future years.

After other countries, to a large extent, have implemented a comparable climate policy and there are few remaining holdouts, then you could apply a border tax adjustment specifically against a few countries.

The advantage of taking a sector-based approach to the application of output-based rebates would also be a way of encouraging developing countries to take a more sector-based approach to trying to solve their emissions problems as well.

That might be a better way of creating an incentive structure through international negotiations and some technological and financing help from rich countries, rather than simply relying on the fact that you are putting a small tax on a very small share of their exports.

For example, China exports like only about 1 percent of its steel production, I believe. If we put a small tax on steel, then—or cement is another case. That would not have much of an incentive effect on getting China to the table in terms of climate policies.

Mr. REICHERT. I thank the witnesses for their answers, and thank you, Mr. Chairman.

Chairman RANGEL. Thank you.

The chair recognizes my friend Richard Neal.

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

Dr. Elmendorf, this is fairly confusing to people even who pay attention to it. Price volatility, short-term consequences, how do you design a climate change program to account for what might be short-term or volatile changes in price?

Mr. ELMENDORF. The price volatility in the short term arises in cases where there is a cap on emissions over a short time period, and then shifts in the cost of achieving that emissions cap. That can come from changes in the weather.

Mr. NEAL. Right.

Mr. ELMENDORF. It can come from economic conditions, or so on. So, the ways to reduce volatility, and thus the ways to reduce the cost of meeting any long-term emissions target, is to provide flexibility in the timing of when emissions reductions are achieved.

The sorts of ideas we have all been talking about today in terms of price ceilings and floors, banking and borrowing, and managed price approaches are all different ways of trying to limit variability in the year, but allow over time for some level of confidence about the level of emissions reductions that occur.

These different approaches make some different tradeoffs in how much emissions uncertainty they are willing to tolerate and how much price volatility they are willing to tolerate.

Mr. NEAL. What does that mean to the consumer?

Mr. ELMENDORF. Well, if prices are less volatile in the short run, then that reduces the dislocations in the economy. We have all seen, as the price of gasoline doubled and then fell sharply again, that causes distortions in people's behavior.

It hinders advanced planning by households and firms. It causes abrupt shifts in the things people do and the products they buy and who they buy them from, and so on. All those things make a cap

and trade program more costly for any given level of emissions, or which is to say if you keep the prices more stable, you can get the same level of emissions at a lower overall cost.

Mr. NEAL. Are there any others that wish to comment?

[No response.]

Mr. NEAL. Thank you, Mr. Chairman.

Chairman RANGEL. The chair recognizes Mr. Doggett for—and also for the hard work he has put in this subject over the years.

Mr. DOGGETT. Thank you, Mr. Chairman, and thank you for convening this hearing. You know, it is obvious that some people can just not envision the tremendous economic benefits of moving to a clean energy economy. "Just say no" or its companion, "Just say higher taxes," or its cousin, "Just say higher energy cost," is not a policy. It is a state of denial. That is what we have seen here this morning.

Fortunately—and the attacks on the Lieberman-Warner bill, Warner is Senator John Warner, the former Chairman of the Armed Services Committee, who recognized this is a serious national security challenge, and that just relying on the goodwill of polluters at home and abroad will not solve this program, is not a solution.

Dr. Lashof, I agree with you that there is something of a convergence here this morning. We have at least six people who have come to testify, all of whom are about trying to construct a solution. There are an almost endless number of problems with this whole issue, but we can't abandon a solution. We need to try to figure out how to resolve each of these problems.

I happen to think, and that is why I filed the safe market legislation, that Dr. Whitesell has with his work identified a mid-ground, a position that tries to get the benefits of limited price volatility with maximum emission reduction.

Let me just ask you, Ms. Chan, in that regard: Doesn't the safe market approach that Congressman Cooper and I have filed meet all of the objectives that you have set forth that you want to see addressed here?

Ms. CHAN. I think it does. Friends of the Earth obviously cares about the environmental certainty. So to the extent that your bill provides for that, that is our first concern.

Then on top of that, with the report that we released on subprime carbon, we are also pointing to the need to avoid the kind of market and regulatory train wreck that we are still sort of digging ourselves out of, especially when we don't have a really set and tested regulatory regime to handle what Wall Street will take and make into a very, very complex market.

So, I think that the benefits of price stability are not just in terms of being able to provide companies with the ability to plan and to make the breakthrough technology investments that they need to, but it also ends up really addressing the "subprime carbon," the financial—the runaway financial innovation questions which we raised in our report as well.

So, I would definitely say that your bill helps get us there to a good hybrid approach, as well as Mr. McDermott's bill.

Mr. DOGGETT. Thank you. Dr. Elmendorf, you have noted the tension between trying to get price certainty and no market manip-

ulation, and trying to get emission certainty. There is a certain tension there.

But doesn't the safe markets approach achieve most of what one would seek on the price side, while assuring some emissions certainty?

Mr. ELMENDORF. Well, as you say, Congressman, there is often a tradeoff there. I think the safe markets approach picks a particular time horizon over which to achieve this uncertainty—achieve the certainty of emissions.

Relative to a longer time horizon, your plan achieves certainty more quickly, but would generate somewhat more price volatility as a result. I think you are right that your plan balances those various considerations in a particular way.

Mr. DOGGETT. You have pointed out, and this is true of a number of questions including those that Chairman Rangel has asked, it is possible to design a system where the net cost to the consumer, whether it is a consumer in Harlem or a consumer in Austin, Texas, is zero. It all depends on how you collect the revenue and how you redistribute it. It is difficult to do that, but it is possible to do that.

Mr. ELMENDORF. So, I think the—I want to be clear about this—the money that is raised through selling allowances or having a carbon tax can be—your question of legislation—redistributed.

Mr. DOGGETT. Right.

Mr. ELMENDORF. Two cautions, though. The consumer in Harlem and the consumer in Austin, Texas have different lifestyles.

Mr. DOGGETT. Right.

Mr. ELMENDORF. They buy different goods in different proportions. So, holding harmless every individual person, regardless of where they work and what they do, is a much more challenging task than what I described in terms of the aggregate distribution.

Mr. DOGGETT. Is a challenge. It requires people coming together, as you are today, trying to figure out how to solve the problem instead of how to deny it.

Mr. ELMENDORF. The second caution is that imposing a price on carbon emissions would, in the estimate of all analysts that I have seen, reduce GDP as it is measured to some extent over time because we would be spending resources on limiting carbon emissions and not doing other things.

Mr. DOGGETT. Just two final points, Mr. Chairman, if I might.

We have got a chart here that has been passed out about what the cost is of addressing this problem. What we don't have is a chart on the cost per state of not addressing it. I believe that these witnesses will concede—will be the first, in fact, to say—that the cost of inaction, the economic cost, can be disastrous for our economy.

Finally, as to Dr. Lashof's position, my only disagreement with this U.S. Climate Action Network is the solving the problem through giving away allowances. I don't think that has worked in Europe. I think that it is contrary to the objectives that we have here.

We would be much better off using the tax system in trying to get these moneys back into the hands of people most directly affected rather than trying to give away allowances to utilities and

hoping they pass along some of the benefits to the consumer. Thank you.

Chairman RANGEL. You should all know in the course of your studies that the proponents of the cap and trade have not been very effective in explaining how they would prepare or cushion the consumer. I am not saying they are not thinking about it, but it is not as clear as those that believe that the Internal Revenue Service should be used for this purpose. You can wrestle with that and come back with some answers.

Mr. Boustany.

Mr. BOUSTANY. Thank you, Mr. Chairman.

Dr. Elmendorf, does CBO have a definition of green job? What is a green job?

Mr. ELMENDORF. We don't have a definition of that.

Mr. BOUSTANY. Shouldn't we have a definition, an operational definition, if we are going to look at the economic impacts of this type of program, particularly as we start to look at job loss in certain sectors?

Mr. ELMENDORF. Well, as I said to Congressman Herger, I think that we need to do more analysis at CBO of the economic effects of a cap and trade system or a carbon tax. We have done some work in that area, and as you know, we testified several weeks ago about distributional impacts across broad pieces of the income distribution.

But in terms of more specific analysis about the sorts of jobs that might be lost and the sorts of jobs that might be gained and where that would occur, that is not an analysis that we have done. But we will try to proceed in that direction.

Mr. BOUSTANY. I would hope so because I think it is a critical issue as we go forward on this.

Dr. Thorning, in your testimony you showed us some information about the increase in the prices of natural gas and some of the other energy areas that would occur substantially if we moved forward with something like this.

Do those projections take into account President Obama's budget provision to increase oil and gas taxes by $31 billion?

Ms. THORNING. No, they do not. This analysis was prepared last year on the Lieberman-Warner bill. But clearly, anything that we do that raises taxes on U.S. industry, particularly oil and gas, will mean we are going to get less oil and gas production. That will put increased pressure on prices. So, those would be incremental to the numbers we are showing.

Mr. BOUSTANY. If we look back historically and we look at what the impact was on the windfall profits tax on the oil and gas industry, the domestic oil and gas industry, what ended up happening was we shipped a lot of jobs overseas and became more dependent, in effect, on foreign oil.

Ms. THORNING. Yes.

Mr. BOUSTANY. Is it your opinion, if we move forward with this type of proposal, that we will indeed increase our dependence on foreign oil at a time when we don't have other options or transition strategy going forward to the next energy economy?

Ms. THORNING. Yes, I think that would be the case. I think there was a CBO report dealing with that windfall profits tax issue

that suggested we did lose domestic production. If we impose carbon taxes or cap and trade on domestic production, refineries will have to bear increased costs, which will mean—I believe we are importing about 15 percent of our refined product right now.

We will certainly tend to import refined product from countries who do not have caps on emissions, so we will see leakage, not only of the jobs, but of the carbon emissions, and have less energy security.

Mr. BOUSTANY. In the absence of a transition strategy which—it looks like the two promising areas, in my mind, as somebody who has studied the energy markets, would be that natural gas is a transitioned fuel, as would be increasing our nuclear capacity.

If we deny building out nuclear capacity, we run up the cost of natural gas. What are we doing to our economy?

Ms. THORNING. Well, you can look at the chlorine industry and the ammonia industry, which I mention in my testimony. We have lost large chunks of jobs in those industries because of high natural gas prices over the last decade. The aluminum industry has also been impacted.

So, we have some real-world examples of what high energy prices do to segments of U.S. industry. I think certainly the cap and trade or the tax on emissions would have similar impacts.

Mr. BOUSTANY. Thank you.

Dr. Elmendorf, I think it is safe to say that without the analysis on employment and unemployment in all these different sectors, we don't really have a full understanding of how pervasive the impact would be in creating levels of unemployment in certain sectors, that we might—maybe on service we are not considering it at this time.

Obviously, the oil and gas industry, the domestic oil and gas industry, would be severely impacted by something like this. But there are other areas that are, you know, second, third degree removed from the oil and gas industry, but yet depend on these products.

So this analysis, I think, is extremely important if we go forward. Wouldn't you agree?

Mr. ELMENDORF. So, I think it is important for us to do. The uncertainty surrounding every aspect of climate change is very large. That is one of the themes of CBO's work in this area. The uncertainty about economic effects is important. Uncertainty about the effects of further greenhouse gas emissions on temperature and then on other aspects of the climate is also very important.

I think the challenge that you and your colleagues face is in acting under a certain amount of uncertainty. We and obviously other people at this table are doing our best to learn about the economic effects, and scientists are doing their best to learn about the physical effects. But we don't know the answers yet.

Mr. BOUSTANY. One final question. I know there are specific proposals out there that have been introduced as legislation. Have you modeled job loss based on those proposals?

Mr. ELMENDORF. I don't believe we have modeled job loss.

Mr. BOUSTANY. Okay. Do you plan to?

Mr. ELMENDORF. We have estimated a number of other aspects of the proposals. I don't think we have done job loss. As I say,

that is an area that we think we need to move into. It is very challenging. I don't know at what point we would have estimates that we would be comfortable with.

Mr. BOUSTANY. Thank you. I yield back.

Chairman RANGEL. Thank you.

Does my friend Mr. Blumenauer have any thoughts on this subject?

Mr. BLUMENAUER. A few thoughts and observations, and maybe even a question, Mr. Chairman.

Chairman RANGEL. You are recognized.

Mr. BLUMENAUER. Thank you very much, and I appreciate your forbearance and our witnesses' sticking with us on a dreary afternoon.

One of the things that I think is important, I want to be sure that we are precise about terminology when people are talking about holding harmless because the whole point of having a fee on carbon pollution is to change behaviors.

If we come up with a lot of elaborate procedures that end up putting everybody exactly where they were before we started, we have got a lot of administrative costs and hoops and bells and whistles, but we haven't dealt with the notion of discouraging industrial practices and personal behaviors that are slowly cooking the planet.

So, it is absolutely certain that we can take the resources or the regulatory scheme or whatever it is and make sure that this money somehow—and I spent 10 hours yesterday in the Budget Committee hearing every other Republican friend of mine across the aisle assume that somehow all this money is generated and it disappears, that it isn't spent to revitalize the economy, that it's not spent to help people who may have higher utility rates but lower utility bills because of what we incent and the practice as we go forward.

I hope, Mr. Chairman, that we can be sensitive, absolutely sensitive, to the impacts on some people who are locked into certain practices in rural America, or some industries that are going to require time to transition. But the whole point of this is to not keep everybody where they were when we started because then we haven't accomplished anything for saving the planet.

The second observation I would make, and I hope we have a chance with CBO and some of our other experts, to deal with the costs that people are bearing now. It isn't the imagination of people in Alaska that has permafrost no longer perma, roads buckling, villages washing away, the costs of drought, amazing costs that the city of Las Vegas—I am sorry our friend Shelley is not here to talk about not only are they the No. 1 in this and the No. 1 in this and the No. 1—they are having probably the most serious water problems in America as the water level of Lake Mead goes down and down and down, below the intakes.

So, being able to understands costs and consequences because I am deeply troubled the traditional way that we model. The most productive man in America is a rich businessman who is in a critical auto accident and is in intensive care and is going through a divorce because we measure all sorts of economic activity rather than value that is added.

We are going to need your help to be able to craft this as we go forward. I am not going to ask speculative questions based on a bill that hasn't yet been designed about what the costs and consequences are. But I wonder if you might be able to help us with a little research.

We don't need it now, but I heard my friend Mr. Nunes talk about the value, you know, of 200 nuclear plants. I am wondering if any of you has access to research you can benefit about the carbon footprint of constructing 200 nuclear power plants—the concrete, a ton of carbon for every ton of carbon; the carbon that is expended to mine and process uranium. If we can have your help to look at the big picture, it would be helpful.

I am concerned that we are moving in a situation here where we are not looking at both the costs and the consequences. I am hopeful that we can work with you to be able to deal with the notion of certainty.

I would like to conclude on this point, and if I haven't exhausted my time and your patience, because there will be regulation of carbon. It is happening around the world. Businesses are moving in this direction. The EPA just decided that unlike 8 years of the Bush Administration, getting slapped not once but twice by this Supreme Court for ignoring the law, that they are going to obey the law with carbon as a pollution.

So, it is going to happen. It may happen in a regulatory fashion. It may happen in the cap and trade or a tax. In terms of certainty, do we get more certainty if carbon is regulated via administrative regulation, or the give and take of a legislation process like we hopefully can do in Congress?

Mr. ELMENDORF. I was just going to say, very briefly, that CBO will be releasing shortly a review of the extensive literature on the consequences of climate change. I think that would address at least some of the issues you just raised, Congressman.

Mr. BLUMENAUER. Super. Thanks, Mr. Chairman.

Chairman RANGEL. Thank you.

The chair recognizes Mr. Brady of Texas.

Mr. BRADY. Thank you, Mr. Chairman. Just as an aside, I know that sort of throwing around claims like denial and do-nothing probably poll well. But I would just caution this Committee against such frivolous charges on such a serious subject. It seems to me that this is a complicated one, and it deserves legitimate questioning.

I mean, just in the last—the hearing today and the hearing Tuesday we had on this, which I really appreciate you holding, Mr. Chairman, you know, we have discussed different opinions on everything from cap and trade versus carbon tax versus a hybrid free versus auction emission allowances, and direct versus indirect emissions, core versus downstream industries, price caps, borrowing allowances, banking allowances, tax credits, offsets, exemptions, non-carbon costs, border taxes, tariffs, and sanctions, determining carbon intensity by process, feed stocks, firm versus national levels, questions of compatibility, leveraging, and leakage. This is a complicated issue.

I would encourage Members to keep an open mind, but to ask questions. Because we have already seen as a Congress the impact

of us not questioning sophisticated modeling of financial risk. We have already seen the impact of that. I think we would be remiss in not fully examining the modeling and science that goes into an issue that has such a direct impact on this economy.

I want to raise that issue. This week, analysis was done using the Lieberman-Warner bill EPA numbers modeled by the International Trade Commission. Chairman, what it shows is that if the Lieberman-Warner bill were enacted, or some version of it, that it would have a devastating impact on our U.S. exports, the American-made products and services here in the United States.

On the screen right now is the result of this analysis, and what it shows is they just took a look at the top 52 sectors in manufacturing and agriculture and services in America. It shows that we would lose $162 billion in lost sales overseas from our American-made products. It is a 31 percent decline in exports.

Those are a lot of U.S. jobs, and something we need to be concerned about as we deal with this issue. It is important we not rush to legislation. It is important we look at this whole issue very carefully, which again is why I appreciate Chairman Rangel holding these hearings. It is important to talk about of these.

On the pricing issue today, so far we have heard at least four, and as of this morning five, ways to spend the money to keep American competitiveness as a result of auctions off these allowances. They are used to lower electric utility costs to finance transition to renewable energy, to offset the cost to core industries and carbon-intensive industries in America, and tax relief.

As of this morning, Senator Harry Reid said that we ought to use the cap and trade dollars as a down payment for health care reform. So, now have promised these dollars to at least five different sectors. That is sort of how Washington works.

My question, though, to Dr. Thorning is: If we divert—you know, in addition to electric costs, which are going to hurt our U.S. exports, but if Congress imposes these costs, increases these taxes, and then diverts those dollars to other issues, doesn't that exacerbate our competitiveness with other countries, especially if we fail to convince China and India to go along with us?

Ms. THORNING. Well, clearly energy costs are an important aspect of U.S. competitiveness. In fact, if you look at EIA data over the, say, 10 years, each 1 percent increase in gross domestic product is accompanied by a .3 percent increase in energy use.

So, in order to increase GDP, we are going to have to use more energy. If we force quicker uptake of renewables than is technologically cost-effective, we are going to be increasing energy prices. That will obviously hinder competitiveness.

So, I think we need to—another thing we need to remember is that the capital stock is long-lived. Refrigerators last 15 to 20 years. So, do washing machines. So, do drill presses. Electric utility plants last 50, 60, even 100 years. So, the capital stock in the U.S. turns over very slowly, and it is going to take time to adjust in a cost-effective way to higher energy prices.

So, the proposals that we are seeing discussed now will sharply increase energy prices and obviously render us less competitive. I think a host of other studies show the significant impact on leakage of jobs and imports—exports.

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

Chairman RANGEL. I want to thank Bob Etheridge and Mr. Davis for their patience. You are recognized for 5 minutes.

Mr. ETHERIDGE. Thank you, Mr. Chairman. Let me thank each of you for coming.

I am going to ask a little different question because I think we are in an area that is so complicated. It has been my experience through the years of working with folks and being in education that on complicated issues, that people don't understand, and if they don't understand it pretty quickly, they tend to be opposed to it until they have a better understanding. That is our first inclination. If you ask people do they want clean air, oh, of course we do. You start getting into the technicals of how we get there, that is the huge challenge.

Let me ask a little different question, and I hope each of you—I will try to do it quickly so each of you have a chance to touch on because each of you mentioned in one way or another the potential of market manipulation, depending on how we do it, and the proposed mechanisms that we would have to put in place to limit volatility if we go whatever route we go.

I am concerned about a larger question of oversight. Whoever wants to share their thoughts on this I would welcome because let me tell you why I say this. Last year I worked on legislation that sought to put some control mechanisms back into CFTC, and to try to rein in at that point what I thought everyone would agree was excessive speculation, maybe even a bit of manipulation, in the energy futures market.

Then it started to bleed over into the commodity markets. Not only did we see what amounted to a doubling of our energy cost to the consumer, but we also saw corn prices and all the commodity prices go up within a year, which in turn doubled feed prices, causing agriculture to have problems, made a difference at the consumers' table, and you know the rest of the story.

My question is: How can we be recollection that we will be able to manage such a new and unfamiliar market and keep it from being manipulated, not just in this country but on a worldwide scale?

I think that is a huge issue that maybe not just this Committee but others have to look at, assuming we go and finally—what can Congress do to make sure that there is appropriate oversight of a market to prevent the abuse? Are there new regulatory schemes we might need to look at, CFTC, SEC, et cetera, et cetera? Because if somebody is doing something, we have got to figure out how to make sure it is done right.

Mr. WHITESELL. So, perhaps I could speak up on that one. We do have existing regulation of commodity markets, and it has come across a number of loopholes. Congress has made efforts to try to close those loopholes.

Mr. ETHERIDGE. Oh, I know. I introduced legislation that didn't pass last year. It just got halfway through.

Mr. WHITESELL. Uh-huh. There will undoubtedly be—with whatever kind of regulatory structure we put in place for the new carbon markets, the inventiveness of financial markets will undoubtedly come up with potential loopholes in that regulation, too.

So, I think that we should have—we should think as carefully as we can about what kind of regulatory structure we need. But I think that Congress should have some help in providing the oversight function for the regulation of these markets, so that I think that it is useful to have an independent board of some kind that actually oversees the regulators of the markets, and itself——

Mr. ETHERIDGE. Do you really believe the public trusts the market right now?

Mr. WHITESELL. I believe the public has a lot of skepticism about the markets, and rightly so. So, that is why I think in addition to providing the best regulatory structure possible, we also want to structure a new a new climate program so that the incentives for this kind of behavior are removed to the extent possible so we don't need to rely exclusively on the regulators after the fact to go and police these markets and make sure that doesn't happen.

Mr. ETHERIDGE. Anyone else want to comment?

Mr. METCALF. Mr. Etheridge, you have identified an important issue here. I think this is one of the reasons why price-based approaches avoid this problem. It also speaks to the importance of trying to do this as far upstream as possible, which means that there are fewer entities that we need to actually regulate and monitor.

It also means that we can address the issue that, for example, for refineries, that we are applying the carbon price not only on domestic oil but on imported problem. It addresses that problem, too.

Ms. CHAN. I would just like to add that I think that the question of regulatory capacity is a serious one, obviously. There are a couple of ways we could go about it. We could rely on sort of the plain vanilla financial regulators to cover this new market—CFTC, FERC, SEC, you know, and try to figure it all out between those.

We could introduce or we could actually design these markets in a way that, as Bill had mentioned, are more stable in the first place, and eliminate the basic incentive for speculation, which is, you know, making prices more stable would cut out a lot of the pure speculators that are just in it for arbitrage, and would be more tempted to manipulate the markets, to resort to fraud, and those things like that.

The really unique opportunity that we have here, and this is so much unlike the energy markets or unlike commodities, other commodities, is that we are creating this market from scratch. We can create it in whatever way we see fit. We don't need to actually create it based on the same completely liberalized financial model that we have just seen, I mean, what it produces for us, for example in mortgages.

So, we have an amazing opportunity here to actually design it, not only for its own market stability but also for environmental effectiveness. So I think that some of the bills that have come out of this Committee take a really good stab at doing that.

Mr. ETHERIDGE. Thank you, Mr. Chairman. I yield back.

Chairman RANGEL. Thank you.

Mr. Davis, you are recognized for 5 minutes.

Mr. DAVIS OF ILLINOIS. Well, thank you very much, Mr. Chairman.

Dr. Thorning, I appreciate the analysis that you have included in your testimony. I would like to ask you: How much of a problem do you think global warming really is?

Ms. THORNING. Well, I think global warming is an issue that we all need to take seriously. But based on work of—for example, the Copenhagen Consensus convened 10 Nobel prize winners and looked at the world's worst economic and environmental problems.

They concluded that lack of clean water for the developing world is a particularly urgent problem. World Bank data show 5 million children die every year from lack of sanitation and clean water around the world.

The International Energy Agency data show that over a million women and children die every year because they cook over dung fires, and they breathe in and have respiratory infections, and so premature death. So, there are many environmental problems that need the world's attention.

Mr. DAVIS OF ILLINOIS. Well, let me ask if you think that greenhouse gas emissions are contributing significantly to this problem.

Dr. THORNING. I don't think they are contributing significantly to the burning of dung fires and the women and children dying from that. I think that is poverty. Poverty is the worst problem in the world, and climate change can better be addressed by promoting strong economic growth so that people have the wherewithal to adapt to change in climate.

So, I think we need to focus on an array of issues, and shouldn't devote an unduly large amount of society's resources to addressing one problem. We have a host of issues that need attention.

Mr. DAVIS OF ILLINOIS. Well, do you think that there would be significant long-term costs associated with this problem if we don't put forth some real effort?

Dr. THORNING. Well, as I showed the chart from the President's economic report this year, even if the U.S. were to meet targets as President Obama is suggesting we meet, because global emissions are growing so much faster around the world in developing countries, our efforts will not result in any meaningful improvement in the environment.

Therefore, I think we need to be cautious about putting our resources into programs that, when you look at the costs and the benefits, the costs far exceed the benefits. We need to continue to spend taxpayer money on R&D, which we are, on renewables, on carbon capture and storage so that we can burn our coal supplies, on nuclear generation, on renewable technologies. But we should not saddle our economy with a program that will be very costly and not materially improve the world's environment.

Most scholars think that China and India are not going to be swayed by moral suasion. What they care about is jobs, economic growth, and relieving the abject poverty of their citizens. Energy is necessary for economic growth, and right now we don't have the technology to make the kind of switch that will enable us to quickly phase out CO_2 emissions.

Mr. DAVIS OF ILLINOIS. Thank you very much.

Dr. Elmendorf, let me ask you: Could you give us a real world example of how a managed price approach and a strategic allow-

ance reserve and a cap and trade program would address extreme weather conditions in a short period of time? Say it is extremely hot in the summer, seriously cold in the winter, but averaged out over, say, a 5-year period, the climate change is not as great as either one of these extremes.

Mr. ELMENDORF. So, Congressman, in a managed price approach, a regulator would set a path of prices that would be consistent in its estimation with the emissions cap that Congress had legislated. Then this regulator would sell allowances at that price in each of those years.

If in certain years reducing emissions was more difficult because of weather conditions, then more emissions would be bought—more emission allowances would be bought at that price. If in other years it was easier to reduce emissions, then fewer allowances would be bought at that price.

If the regulator has correctly assessed the average conditions, the average cost of reducing emissions, then over that period the emissions target would be met. If the regulator is wrong, as it undoubtedly would be to some extent, then it would make adjustments over time.

So, prices would not be fixed forever. They would not be perfectly predictable. But the very large short-term volatility that we have seen in existing cap and trade programs that don't have this feature would be avoided.

Mr. DAVIS OF ILLINOIS. Thank you very much.

Mr. Chairman, could I have one additional question?

Dr. MCDERMOTT [presiding]. Yes, you may.

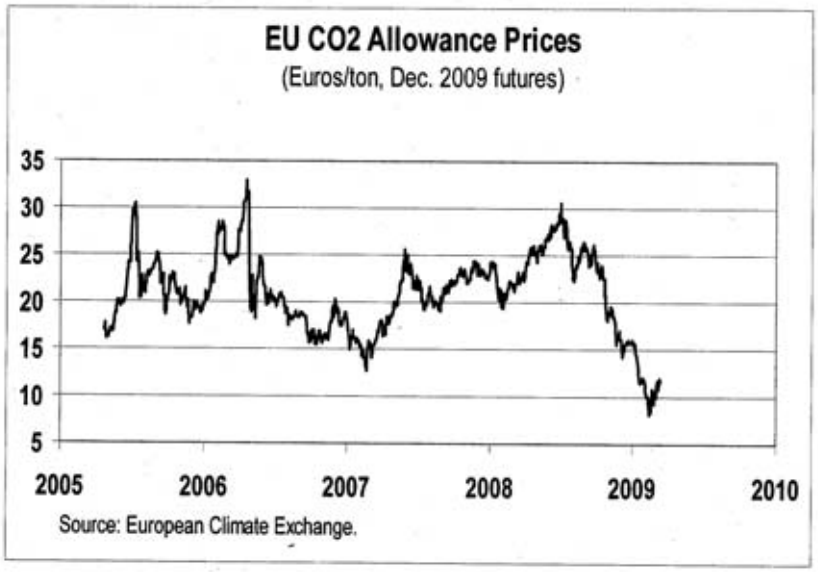
Mr. CAMP. Mr. Chairman, before we do that, I would ask unanimous consent to submit for the record an article and a slide referred to by Mr. Brady in his testimony.

Dr. MCDERMOTT. Without objection, so ordered.

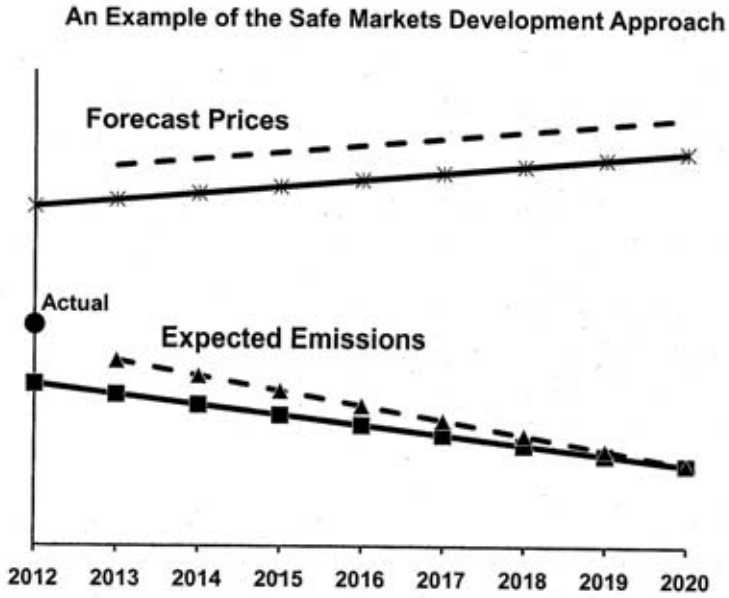
The information referred to follows:

A Broad Index of Commodity Prices
600
500
400
300
200
100
1994
1996
1998
2000
2002
2004
2006
2008
2010
Source: Reuters-Jefferies (month end CCI index)

1


EU CO2 Allowance Prices
(Euros/ton, Dec. 2009 futures)
35
30
25
20
15
10
5
2005
2006
2007
2008
2009
2010
Source: European Climate Exchange.

2



3

Statement of

Gilbert E. Metcalf
Professor of Economics
Tufts University

Price Volatility in Climate Change Legislation

before the
Committee on Ways and Means
U.S. House of Representatives
March 26, 2009

Key Points

- Policy should distinguish between short run and long run price uncertainty
- Carbon tax provides the greatest certainty over future price path
- Hybrid policies can bridge the difference between tax and cap-and-trade systems
- Cost containment mechanisms in cap-and-trade may have unintended consequences

Price Volatility in the EU-ETS

Source: European Climate Exchange

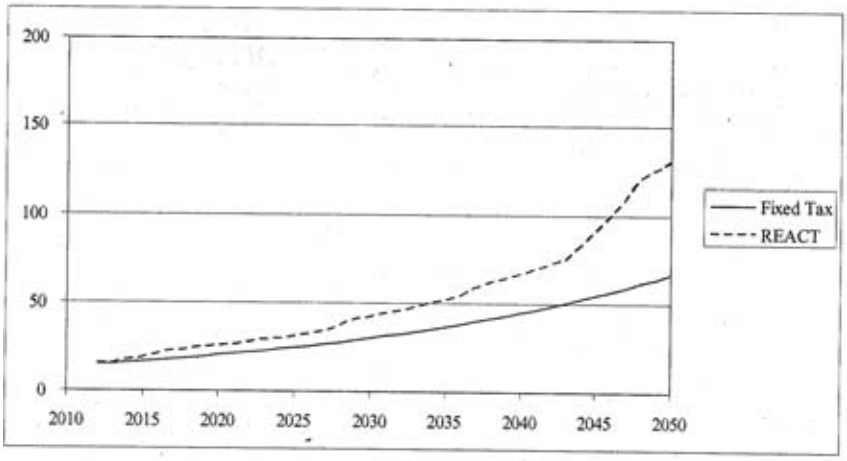
Cost Containment

- Safety valve approach is transparent
  - Potential arbitrage opportunity in anticipation of future tightening of policy
- Allowance reserve is a restricted safety valve
  - Less transparent
  - Effectiveness may be undermined by strong demand for banking

Responsive Emissions Autonomous Carbon Tax (REACT)

- An initial tax and standard growth rate for the tax
- Benchmark targets at set intervals for cumulative emissions over the control period
- Exceeding the target in benchmark years triggers an increase in the growth rate of the tax to a higher catch-up rate until cumulative emissions fall below the target again.

Sample Price Path



Benefits of REACT

- Short run price volatility eliminated
- Uncertainty over long run price path reduced
- Transparent mechanism for price changes
- Emission targets over the control period are maintained

Summary

- Policy should focus on eliminating short run price volatility
- A carbon tax provides the greatest certainty over future carbon prices
- REACT: a tax based approach that ensures long run emission targets are met

Dr. MCDERMOTT. Go ahead, Mr. Davis.

Mr. DAVIS OF ILLINOIS. Thank you. Yes. I would just like to ask Dr. Lashof: If your testimony, you state that the cap and trade system that the NRDC supports would provide the highest possible level of certainty that our environmental goals will be achieved.

Could you tell me why you believe that?

Mr. LASHOF. Yes. Thank you, Mr. Davis. You know, I think that we have heard a lot about a lot of details and complicated aspects, and I want to come back to the beginning.

This is a problem we have to address. When we talk about the costs of addressing it, we need to, as Mr. Doggett and others have reminded us, always ask, compared with what? Compared with what is an economy right now which is in serious trouble. We have an opportunity to put people to work actually building solutions to global warming.

I think that the key to the certainty is providing a long-term pathway for the emission reductions that have to be achieved. We can provide a lot of flexibility about how to achieve those emission reductions, and as we have heard Mr. McDermott's and Mr. Doggett's ideas, have a similar goal of achieving that long-term reductions.

But I think that is the key. We need a strategic decision to essentially phase out emissions of global warming pollution, and we need to get on that pathway as soon as we can. That will put people to work right now and will build a sustainable economy.

Mr. DAVIS OF ILLINOIS. So the sooner we start, the sooner we will ultimately get there?

Mr. LASHOF. Absolutely. In fact, we have an opportunity to use what are slack resources in the economy right now, putting people back to work to get started right away.

Mr. DAVIS OF ILLINOIS. Thank you all very much, and thank you, Mr. Chairman.

Dr. MCDERMOTT. Mr. Davis of Kentucky will inquire.

Mr. DAVIS OF KENTUCKY. Thank you, Mr. Chairman.

Just listening to all this testimony today, earlier in the week, and just in the last couple of months on the Committee on Ways and Means, I am reminded of an experience I learned as a young Ranger in the Army, that after publishing a number of articles and doing a lot of academic research, I suddenly found that those who come up with the most complicated plans often are the ones who have never actually had to implement what they have developed.

I spent many years in manufacturing, doing work in the energy industry. I am a big fan of alternatives. Provided a lot of support for the academic community on doing true, extensive alternative energy research to create jobs from the existing economy. I would like to build on the comments that Congressman Davis, my colleague from Chicago, made earlier.

You know, we have forgotten one cost in this process, and having had to actually create jobs professionally, and live with the consequences of regulation, and see many of these across the country.

The first thing I would point out is the rise in energy cost is a huge issue, and the human cost is profoundly beyond anything that has been talked about by any witnesses this morning.

Just in the last—from the fall of 2007 to the spring of 2008, the increase in energy prices drove 100 million people additionally in the world into daily malnutrition. That is a real number, and a real cost, and a real human cost, with implications vastly beyond economy into national security, stability of cultures, et cetera.

Where I would like to take this in this area is, having been an implementer, if you will, of a number of these policies in dealing with environmental compliance, and also wanting to be a good steward of the environment, I would like to follow up on these comments about electricity costs domestically that will rise under this.

When I look at—we talk about cap and trade, and we look at the costs relative to the states, the one thing that is forgotten is a premise in the analysis. States like Wyoming, Kentucky, Ohio, Illinois, Utah, that have huge, much larger per capita increases, actually also are exporting their electricity to California and New York, which benefit from this massively. Those are not being considered in the production numbers, you know.

I want to stress that the analysis in the proposed energy tax that the President has put forth—and it is a tax—I think is very conservative, but it assumes a 30 percent reduction in emissions, the one that we were shown here today, versus the 83 percent one the President wants. It assumes an allowance of $85 per ton, consistent with the recommendations of the Stern Review and consistent with the tax called for in Congressman Larson's bill.

In fact, if we adopt the policies recommended by some of the organizations represented here today, no new nuclear power—that actually does create jobs immediately—no clean coal, and limited to no offsets, the EPA has estimated that prices could cost more than $400 a ton. That means costs four times higher than the analysis shows.

You know, when we look at this real world issue, I don't know how you tell the elderly person in Kentucky—and there is no way to possibly provide a tax offset to this—that a $3300 increase for their household cost for energy is going to be sustainable on a small income.

Dr. Elmendorf, Dr. Thorning, do you disagree with the EPA's analysis that if we don't expand nuclear power, if we don't develop clean coal, if we prohibit or limit offsets, that this allowance would be as high as it is?

Mr. ELMENDORF. So, Congressman, I agree with the logic that the extent to which we limit alternative sources of energy from being used, that raises the cost of reducing our use of fossil fuels. I can't speak, I'm afraid, to the specific number that they use. I think it is——

Mr. DAVIS OF KENTUCKY. Reclaiming my time, you are a very strong advocate against much of the counsel that was brought by the Committee earlier, and thoroughly forward in those comments at the beginning of the hearing.

I think it does beg an answer, though, you know, from your organization because this cost is real. It is an unavoidable fact that individual working families can be effectively and whole communities can be legislated out of business as a result of this.

Mr. ELMENDORF. I am not sure what you think I was an advocate for in my testimony. I think I was very careful not to advocate. But I did in response to several questions talk about the harm that we inflicted on people in particular industries and particular parts of the country.

I have agreed with several people who think that we should be doing more analysis of that than we have done. So, I think I have been very clear in recognizing that, but——

Mr. DAVIS OF KENTUCKY. So, you do agree with the EPA provision that it would drive these costs up without offsets in the use of clean coal?

Mr. ELMENDORF. As I said, I agree with the logic that if one restricts alternative fuels, then that raises the cost of moving away from our current fossil fuel-based economy. But I cannot speak offhand to the specific numbers that you are citing.

Mr. DAVIS OF KENTUCKY. How about you, Dr. Thorning?

Ms. THORNING. Well, again, like Dr. Elmendorf, I haven't seen the new study. But if you look back at EPA's work last year on the Lieberman-Warner bill, they clearly show that without nuclear power, in their scenario No. 7, without a big ramp-up in nuclear, and without carbon capture and storage, the allowance costs would be substantially higher than under, you know, the more favorable assumption. So, I would tend to agree.

Mr. DAVIS OF KENTUCKY. Okay. Thank you.

Mr. Chairman, I just beg your indulgence for an additional moment for a follow-up question.

Dr. MCDERMOTT. Go ahead.

Mr. DAVIS OF KENTUCKY. Just open to the Committee: I am an engineer by background, coming from manufacturing. One of the things I would hear over and over from folks who actually have to carry out these programs is a request from the entrepreneurial community, particularly in research and development, to not impose command and control systems that pick winners and losers, which I believe much of these proposals inadvertently does.

I think the intentions are all very good. They are very well-meant. I think we all have common concerns on wanting to be effective stewards of the environment.

But just posing one point: When we look at the vast costs that could potentially be put out there, how would you feel—and I would leave it open to anybody—about instead of talking through very complex schemes of cost and balance, maybe to simplify, but to get to the intent of the goal of, I think, most of the parties that are in the hearing room today about going to an end state simply to find output levels rather than talking about trading regimes and things like that, and allow all alternative fuels, regardless of the nature, as long as they can hit compliance with acceptable environment standards.

Of course, the consensus would ultimately come through the Congress that we would agree that if the nuclear plant, the coal plant, people could burn any kind of as-yet-to-be-discovered technology or develop that, wouldn't that make sense?

Mr. LASHOF. Mr. Davis, if I could start.

Mr. DAVIS OF KENTUCKY. Yes, go ahead.

Mr. LASHOF. I mean, I think that that is the intent of the proposal that I have outlined, which is to provide an overall cap on global warming and pollution and allow the maximum flexibility for any teaching that can deliver electricity or transportation services that people want without exceeding those emission levels, to participate in the economy. So, I think that——

Mr. DAVIS OF KENTUCKY. It is just the one reason that—if I could just reclaim my time for one second as we close up here. I appreciate everybody's patience with the votes and everything else going on here today. I would be interested sincerely in follow-up from those of you who are interested in sharing this with me.

The reason that I bring this up is I think it does beg a place for alternatives because the one thing I hear over and over in looking at developing jobs in the private sector is the inability to comfortably plan some predictability for risk management on investment.

This is worldwide in a global economy where we are dealing with a variety of challenges. Many countries are simply not going to play, and in fact could afford not to play because of their—you know, our relative impact on their economies.

More to this point of how do you effectively make this kind of a transition? Why would nuclear or coal or some of these others not fit if we simply could set a SOX/NOX/mercury, some reasonable level for carbon emission, knowing that Earth has its own ability to generate that well—and this isn't disputing or refuting claims or assumptions, even.

That is where I am just coming into this and trying to understand the need for this. If you want to set a foundation base, it would be some fairly simple boundaries, and the tech and academic and research communities could come up with a lot of things in a lot of different areas. There are a lot of different regions to create jobs based on the resources they have.

Mr. LASHOF. I think you have identified the clarity of clear carbon pricing, that however we do it, that does then provide the incentive to come up with carbon capture and storage that gets—that doesn't get this price applied to it.

Mr. DAVIS OF KENTUCKY. Well, and to that point, I understand the question is always storage and sequestration. But you

can make stuff with CO_2. You can use it for oilfield reclamation. You can use it for biomass feed stock, you know. Every aspect, you can open up new ones in terms of research and value-added usages that aren't necessarily, though, going to get reflected in this where the average consumer could bear a huge burden.

We can continue this dialog at another time. I know that we are well past this. But I would be interested in follow-up communication with you on this as we address this because ultimately my concern is the huge cost that is going to be put on the working poor and working families.

Thank you, Mr. Chairman. I yield back.

Dr. MCDERMOTT. Thank you very much.

As we close here, I would like to give you one last opportunity around a question I will pose, and that is: We have heard today the fear, and certainly it has been expressed in many different ways, any system is going to be so costly to the American economy that it sounds almost like it would be brought to its knees.

Now, how is it that the Europeans were able to design a system and make some events—maybe not much, but they made some—that didn't bring the economy to its knees? I mean, I don't want to leave the last thing here is that this is the end of the American economy as we know it if we put a system in place one way or another.

I would like to hear what you say. How did the Europeans do this?

Mr. WHITESELL. Perhaps I could start this one off. I think if we avoid the kind of command and control approach that could result in substantial costs, and instead put a broad price on carbon, the American economy is very inventive and will adjust to the market price of carbon in ways that will probably result in more reductions in emissions than our models will forecast.

That seems to have been the case with other kinds of cap and trade programs. The inventiveness of the economy is often underrated, and its ability to respond to a reasonable price on carbon.

In addition to that, we also need to take account of the client scientists' views about the levels of emissions that could pose substantial risk to the climate. So, we need to take account of both price as well as emission levels. I think a lot of the proposals we have put forward today are ways of taking account of both of those objectives.

Dr. MCDERMOTT. Yes. Dr. Thorning?

Ms. THORNING. Yes. I would just like to point out, as I show in figure 7 of my testimony, according to the European Environmental Agency, the E.U. is not on track under current measures to even hit the Kyoto target. My testimony from last week—which maybe I could submit for the record—I had charts that showed that the European GDP growth over the last decade has been slower than that in the U.S., and their unemployment rate has been substantially higher.

So, not only are they not meeting their targets, as I mentioned earlier today, overall emissions are growing from 2000 to 2006. GHG emissions, according to their own data, are growing.

So, Europe is not making it. I think to try to base a system in the U.S. on what they are doing is to set us up for failure, too.

Dr. MCDERMOTT. I wasn't saying we would set up the same system. I was saying we would set up American system. I think that that is perhaps a nuance you might want to think about.

Yes.

Mr. ELMENDORF. I would just conclude where I began, Congressman, which is that either a carbon tax or a cap and trade system provide great flexibility in where and how emission reductions are achieved. That is why they are so much more cost-efficient than a command and control system would be.

But also allowing flexibility in when emission reductions are achieved through the sorts of mechanisms that have been discussed today can reduce the cost still further. Ultimately, it is a matter for you and your colleagues to decide whether those costs are worth bearing for the benefits of slowing climate change.

Dr. MCDERMOTT. Yes? Dr. Lashof?

Mr. LASHOF. Well, Dallas, too.

Dr. MCDERMOTT. After you, my dear Alphonse.

Mr. LASHOF. Well, thanks for that question. I would like to point out a couple of things about this.

First of all, if we look at Dr. Thorning's testimony, in the worst case in her analysis she talks about—she presents it as a reduction in GDP. But look at it a little more carefully, it is a reduction relative to the baseline projection of growth in GDP. In the very worst case of her analysis, that was a 1.1 percent reduction in 2020.

Now, I think that is wildly exaggerated in the fact that if we do this right, we will expand our GDP relative to baseline. But let's assume it is true. What that means is that the projected growth in our economy between now and 2020, which is probably on the order of 50 percent, would be achieved three or 4 months later than otherwise.

So, nobody's analysis, even the opponents of moving forward in this direction, is saying this is the end of our economy as we know it, to answer your question.

But beyond that, I think when you look at these scary numbers about cost, yes, if you assume that—you take 90 percent of the compliance options off the table by imposing artificial constraints on the use of carbon capture and storage. You don't account for energy efficiency, and you say you can't build as much wind in the future as we actually built in the United States last year.

You impose all of these constraints on your model. Then you can be sure that you can calculate very high costs. So, you can get any answer you want depending on how you torture the model.

But I think a realistic assessment says that there are huge opportunities to put Americans to work building the solutions to climate change, and actually build a much more robust and resilient economy going forward as we address this problem.

Dr. MCDERMOTT. Yes?

Mr. BURTRAW. Mr. McDermott, I would just sum by saying that, yes, we are trying to build an American system here. We have learned from the Europeans. The European cap and trade program covers only 50 percent of the emissions on the continent, so the growth is occurring in the uncapped portion of their economy.

That is why you hear most American proponents talking about any economy-wide approach, and you have heard a number of pro-

posals here today that can seriously help manage and constrain the overall costs to the economy.

Dr. MCDERMOTT. Ms. Chan?

Ms. CHAN. I would again reiterate your point that we are going to be creating our own system. So we can create one, for example, in which we auction or sell all of the permits, and that will reduce some of the problems that we have seen in the E.U.

We can design a system that covers a bigger part of the economy, and we can design one that actually closes down and shuts down the ability for Wall Street speculators to make havoc with potentially complex securities that will be built off of these markets. So, we can do it our own way.

Dr. MCDERMOTT. Mr. Metcalf.

Mr. METCALF. I would just caution one against looking at the European unemployment experience in trying to attribute to the cap and trade program. They have been struggling with high unemployment long before they were thinking about climate change.

As others have said, we will do an American, a U.S.-based approach. It will be very different than the European approach. In a sense, the European approach is how not to do it. It was very limited coverage done in a very complex way. I think we can learn from that and do a much more streamlined, efficient, and comprehensive approach, which will also address many of the leakage problems that have been raised today.

Dr. MCDERMOTT. Thank you all very much for your testimony. I want to say that your contribution to this is very important because you are educating a lot of people on this dais who do not understand all the nuances of what we are going to make decisions about.

So you spent a lot of time here, and I want you to know it is appreciated by all of us. Thank you very much. By the American people, frankly. Thank you.

[Whereupon, at 1:59 p.m., the hearing was adjourned.]

[Submissions for the Record follow:]

Statement of Joyce Dillard

We, voters, in the City of Los Angeles defeated a ballot measure called Proposition B Solar Energy and Job Creation Program. We voted against these popular issues of renewable energy and jobs because there is no long-range strategic planning for the anticipated costs, the validity of the applicable uses is questionable, and predetermined deals omitted the public. Cap and Trade is the financial element of Renewable Energy. Missing is that long-term planning that is a State-mandated issue such as the General Plan and its many Framework Elements. Required, consistent reporting is not occurring, leaving a void in execution of any such broad plans on Climate Change. Key is the watershed issue, yet watersheds are delegated to State and Regional Water Boards, the State Department of Water Resources and the City of Los Angeles' Department of Water and Power, a supplier; and the Bureau of Sanitation. Disadvantaged communities (DAC) are an item in the funding planning of State water propositions.

Unfortunately, State law allows non-profit corporations as a voice. The Citizens are absent from the equation. Christopher Field, Carnegie Institution, Department of Global Ecology, Stanford University and contributor to Nobel Peace Prize winning IPCC, gave a talk at the UCLA Marshak Colloquium in February, 2008.We got his message. It is the maintenance of the ecosystem that counts in Climate Change. Destruction of the rain forests causes destruction of the climate. Cap and Trade is not the answer for the long-term. The recognition and incorporation of the Ecosystems, and Ecoregions (non-political regional jurisdictions), are key elements for our future. It is not only the Oceans, but the Forests that will maintain a balance. It is the fish, flora, fauna and wildlife. It is not only the United States, but China, Russia,

India, Brazil, and Iraq that will maintain a balance. It is the atmosphere that counts, not the financial institutions. We are unique in Los Angeles as we are a City on oilfields with methane and other greenhouse gases. Yet, regulation is minimal and emissions inevitable. A construction worker at Belmont High School, now known as Roybal Learning Center, told an associate that this site was worse than the fields of Kuwait. Landfills, such as Sunshine Canyon, are surrounded by "cancer clusters." Methane issues have not been addressed. Public health is at risk. Disease costs are part of Climate Change. Real property is affected. That property gets devalued with greenhouse gas issues. Geothermal energy is up for discussion in Los Angeles as we address solar energy issues. Solar produces intermittent energy; geothermal produces baseline energy. Geothermal is deep into the earth, near earthquake fault, like the Salton Sea. California is known for earthquakes, so why is geothermal being addressed without the discussion of the damage caused by a quake.

The insurance industry is not at the table in these discussions. Cap and Trade has no effect here. That issue needs to be tabled. We need long-term strategic planning in land use, water, renewable energy, transportation and economic development. One without other leaves a void. Regulation needs to be review and updated. Cost is an issue. Quality of life is an issue. Green Job Creation is the hidden hook, but based on closed-door deals. Transparency? Let the public in. It is their money and their lives.

Joyce Dillard

Statement of Terence P. Stewart and Elizabeth J. Drake

The following comments are submitted in response to the Advisory from the Committee on Ways and Means, dated March 19, 2009, announcing an opportunity for the submission of public comments for the record regarding the ways that climate change legislation can be designed to reduce or eliminate price volatility while still achieving specific science-based environmental objectives. We attach hereto a paper we have written on criteria for a U.S. climate change initiative that is designed to meet the scientific objectives of reducing greenhouse gas emissions while avoiding excessive economic costs, price volatility, and unnecessary distortions to international trade.

We appreciate the opportunity to provide these comments to the Committee, and thank the Committee for its attention to this vitally important issue.

A Consumption-Based Approach to Combating Climate Change

By Terence P. Stewart and Elizabeth J. Drake [1]

Introduction

Recent debate over climate change policy in the U.S. Congress has focused primarily on programs that seek to regulate the production of greenhouse gas (GHG) emissions in the United States. For example, proposals for a cap-and-trade program to address climate change would require U.S. entities to obtain permits for the GHG emissions they produce, and permit such permits to be traded among entities.[2] Consensus on such an approach remains elusive, as stakeholders debate the proper scope and ambition of such a program, the administrative burdens of the program, the costs it would impose and who would bear those costs, the extent to which producers in other countries would bear similar costs and how any cost differentials can be best addressed, the consistency of certain elements of the program with existing international trade obligations and on-going international climate negotiations, and whether the program would deliver the emissions reductions required to reach scientific and environmental objectives.

A number of the limitations and difficulties posed by current cap-and-trade proposals stem from the program's focus on regulating GHG emissions associated with domestic production. Refocusing regulatory efforts on the emissions associated with domestic consumption, instead of production, can avoid many of these pitfalls. This assessment of the advantages and disadvantages of the different approaches is guided by three principles.

[1] The views expressed in these comments are those of the authors, and do not necessarily reflect the views of any clients of the firm.

[2] *See*, *e.g.*, Lieberman-Warner Climate Security Act of 2008, S. 2191, 110th Cong.

1) Maximize Environmental Benefits: Regulating the emissions associated with domestic production captures only a portion of the nation's carbon footprint. In manufacturing, for example, the U.S. is a large net importer, and goods purchased from abroad equal nearly 30 percent of all domestic production.[3] A consumption-based approach would maximize the environmental impact of a climate change program by regulating emissions associated with goods consumed in the U.S., regardless of their origin. A consumption-based approach further maximizes environmental benefits by avoiding the creation of incentives to relocate carbon-intensive production to less-regulated environments. This will help ensure that domestic climate change policies do not distort international trade and that emissions regulations do not inadvertently raise global emissions levels instead of lowering them.

2) Minimize Economic Costs: A production-based approach will impose a variety of costs on domestic entities, some of which may be volatile and unpredictable under a cap-and-trade system. Such costs may be particularly difficult for manufacturers to pass on to their customers in a recessionary environment, especially so if domestic manufacturers bear costs that are not borne by foreign producers. A consumption-based system, by contrast, is designed to increase the price of carbon-intensive goods consumed in the U.S. in a transparent, predictable and uniform manner, regardless of the good's origin. This approach sends the appropriate signals to consumers and creates demand for less carbon-intensive goods, while avoiding imposing disproportionate costs on U.S. producers.

3) Honor International Trade Rules and Principles: A system that seeks to impose costs on production may create WTO concerns, because efforts to impose similar costs on foreign producers (or rebate such costs for domestic producers or for export production) could be challenged as trade barriers or subsidies that would have to be justified under exceptions to WTO rules. In contrast, a system that regulates domestic consumption treats all domestically-consumed goods equally, no matter where they are produced, based only on their carbon-intensity. While it is possible to fashion WTO-consistent approaches under either approach, there is a higher likelihood of limited or no conflict from a system that is based on consumption with equal treatment for domestic and imported goods alike.

Based on the above principles, some of the advantages of targeting consumption instead of production in a climate change program are reviewed in more detail below, followed by suggestions for some possible elements of a consumption-based program.

II. The Advantages of Regulating Consumption Instead of Production

In assessing various proposals for addressing climate change, it is helpful to understand production-based and consumption-based approaches that have been used to address other environmental problems. Cap-and-trade systems regulating the GHG emissions associated with domestic production are primarily modeled on the acid rain program, which created tradable permits for domestic entities that emitted sulfur dioxide.[4] The primary mechanism for regulating emissions associated with domestic consumption would be a carbon tax or GHG emissions fee. There are several precedents for such a fee, including the excise tax on ozone depleting chemicals (ODCs) and the Superfund tax.[5] These precedents are discussed in more detail below.

While there are potentially many advantages to addressing climate change by regulating consumption of carbon-intensive goods rather than their production, the focus below is on ten key areas in which a consumption-based approach better achieves the core goals of maximizing environmental benefits, minimizing economic costs, and honoring international trade obligations. Finally, while these comments

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[3] The U.S. imported $1.491 trillion in manufactured goods in 2008. U.S. Census Bureau, U.S. Bureau of Economic Analysis, U.S. International Trade in Goods and Services: December 2008 (Feb. 11, 2009) at Ex. 15. In 2008, U.S. manufacturers had $5.185 trillion in shipments. U.S. Census Bureau, Full Report on Manufacturers' Shipments, Inventories and Orders: December 2008 (Feb. 5, 2009) at Table 1. Imports were thus equal to 29 percent of domestic production for 2008.

[4] *See, e.g.*, U.S. Environmental Protection Agency, "Cap and Trade: Acid Rain Program Basics," available on-line at http://www.epa.gov/airmarkets/cap-trade/docs/arbasics.pdf.

[5] The ozone-depleting chemicals tax is codified at 26 U.S.C. §§ 4681–4682. The superfund tax was codified at 26 U.S.C. § 4661 *et seq*. *See, e.g.*, J. Andrew Hoerner, *The Role of Border Tax Adjustments in Environmental Taxation: Theory and U.S. Experience*, Working Paper Presented at the International Workshop on Market Based Instruments and International Trade of the Institute for Environmental Studies, Amsterdam, the Netherlands (Mar. 19, 1998) at 9–12; Elizabeth Cook, ed., Ozone Protection in the United States: Elements of Success, World Resources Institute (Nov. 1996).

focus primarily on the contrast between a production-based cap-and-trade system and a consumption-based emissions fee system, it is important to recognize that some sectors with sufficiently special circumstances may merit alternative approaches, and a multitude of approaches may be appropriate.

1) Scope: For environmental harms that are localized at the site of emissions, such as the incidence of acid rain near the site of sulfur dioxide emissions, a production-based approach to regulating emissions is likely to achieve the appropriate scope of coverage to produce the desired environmental results.[6] By contrast, for environmental harms that are not so localized and that are instead global in nature, a consumption-based approach with a broader regulatory scope is more appropriate. Such an approach is particularly appropriate for nations that are large consumers of the goods that cause the harmful global impact of concern. For example, the use of ozone-depleting chemicals harmed the global environment regardless of where those chemicals were produced—thus, a consumption-based excise tax in the United States (a key consuming nation) was appropriately broad in scope. It drastically curtailed the use of ozone-depleting chemicals and effectively protected the ozone layer.[7] Similarly, climate change is a global phenomenon—a ton of carbon dioxide emissions will do the exact same harm to the earth's environment regardless of where it is produced. Thus, a consumption-based approach matches the scope of the environmental problem to be addressed by regulating emissions associated with all carbon-intensive goods consumed, no matter where those goods might have been produced.

2) Uniformity: A consumption-based approach has the additional advantage of automatically treating the emissions associated with a good exactly the same no matter where that good may originate from. Thus, the same science-based results are achieved, and environmental damage is prevented or mitigated to the exact same extent, for all goods subject to the same uniform, consumption-based regulation. A production-based approach, however, necessarily treats goods differently depending on where they are produced. This fails to recognize that, in the case of GHG emissions and climate change, the location of production is irrelevant from a scientific and environmental perspective. Attempts to correct for this differential treatment (by, for example, adding on "competitiveness" mechanisms to a cap-and-trade program) are extremely challenging because they force policy-makers to assess which other production locations should be regulated and how. The variety of complications that arise in trying to design such compensatory mechanisms only underscores how ill-suited an approach that differentiates treatment based on the site of production is to addressing the global problem of climate change.

3) Equal Treatment: With a consumption-based approach, emissions are regulated for all goods consumed domestically, and goods not consumed domestically are not subject to the domestic regulation. For example, the Superfund tax and the ODC excise tax were assessed on the same basis for domestic goods sold in the U.S. and for imported goods sold in the U.S.[8] In addition, the taxes were rebated on exports.[9] Because all goods were taxed upon consumption, no additional mechanisms were needed to ensure equal treatment of domestic and foreign goods—all domestic and foreign goods consumed domestically were taxed equally; all domestic and foreign goods not consumed domestically were equally exempt from the tax. A production-based approach, however, makes it much more difficult to achieve equal treatment. While some compensatory charges may be assessed on imported goods based on their own site of production, ensuring those charges treat domestic and foreign goods equally based on the environmental harm associated with that good's production has proven challenging.[10] Rebating the costs of domestic regulation on exports is also problematic, and not only because of problems with WTO consistency. Because the costs imposed on production provide the only incentive to meet environmental goals under such an approach, eliminating those costs necessarily reduces the desired environmental impact.

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[6] For a critique of the applicability of the acid rain model to climate change, see, e.g., Robert J. Shapiro, Addressing the Risks of Climate Change: The Environmental Effectiveness and Economic Efficiency of Emissions Caps and Tradable Permits, Compared to Carbon Taxes (Feb. 2007) at 18–19, available on-line at http://www.sonecon.com/docs/studies/climate_021407.pdf; Kenneth P. Green, Steven F. Hayward, and Kevin A. Hassett, "Climate Change: Cap vs. Taxes," Environmental Policy Outlook, No. 2, American Enterprise Institute (June 2007).

[7] Elizabeth Cook, ed., Ozone Protection in the United States: Elements of Success, World Resources Institute (Nov. 1996).

[8] 26 U.S.C. §§ 4661(a) (Superfund); 26 U.S.C. § 4681(a) (ODCs).

[9] 26 U.S.C. §§ 4662(e) (Superfund); 26 U.S.C. § 4682(d)(3)(A) (ODCs).

[10] *See*, *e.g.*, the international reserve allowance program contained in the Lieberman-Warner Climate Security Act of 2008, S. 2191, 110th Cong. § 6006.

4) Coverage: Even if regulation of some upstream products can be roughly equalized under a production-based program, downstream producers are likely to suffer differential treatment based on their location. For example, even if foreign and domestic steel are regulated on a somewhat equivalent basis under a production-based approach, domestic automakers will bear more costs in purchasing that steel than will foreign automakers who can source steel produced under unregulated conditions. Thus, the differential treatment, and the failure to uniformly address environmental impacts, is simply pushed further down the production chain. A consumption-based approach can avoid this unfortunate result by covering all goods that entail harmful emissions. For example, the Superfund tax and ODC excise tax, in addition to taxing upstream products consumed domestically regardless of their origin, also taxed imports of downstream goods that used more than a de minimis amount of such upstream goods in their production process.[11] The Superfund tax and ODC excise tax were not only assessed on imports that incorporated regulated chemicals, but it was also assessed on imports that entailed the use of such chemicals in their production process.[12] The amount of regulated chemicals consumed in the production process was evaluated based on foreign manufacturer certifications or the predominant method of manufacture for the product in question.[13]

5) Efficiency: A consumption-based approach can also be significantly more efficient than production-based approaches. For example, the Congressional Budget Office estimates that a tax on the consumption of carbon could achieve the same GHG emissions reductions as a cap-and-trade program, and that the net economic benefits of the tax could be up to five times greater than the net benefits of a cap.[14] Many economists agree that a carbon tax or emissions tax is significantly more efficient than a cap-and-trade program and would create much less of a drag on economic growth.[15] In part this is due to the advantages of transparency and predictability discussed below. In addition, the United States already has a tried and true system for assessing and collecting taxes, whereas the creation of a cap-and-trade program would require the establishment of a new bureaucracy to oversee the distribution of emissions permits, a new trading market, and new rules and regulators to ensure the adequate functioning of that market.

6) Transparency: The goal of a consumption-based approach is to increase the price of carbon-intensive goods, thus sending a clear signal to consumers and driving up demand for less carbon-intensive goods. Thus, the premium is on transparency. A consumption tax, for example, is set at a known level that clearly relays the same market signals to consumers, producers, and investors alike. The cost of GHG emissions—in terms of the environmental damage such emissions cause—is no longer hidden, but is openly represented in the additional tax levied on goods that produce such emissions. A production-based approach lacks such transparency. Because the focus is on imposing costs on producers, the extent to which such costs may be passed on to consumers is unknown and will likely vary based on the market conditions such producers face and other regulations they may be subject to.[16]

7) Predictability: Closely related to the greater transparency of consumption-based systems is the increased predictability they provide to market participants. For example, when a tax rate is set—either legislatively or administratively—it is public knowledge how much each excess ton of GHG emissions will cost, when that cost will be imposed, and, if the tax increases over time, when and how those costs will rise. Advance knowledge of these costs is extremely valuable in industries such as capital-intensive manufacturing, where firms must plan production schedules

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[11] 26 U.S.C. § 4672(a) (Superfund); 26 U.S.C. § 4682(c) (ODCs).

[12] 26 U.S.C. § 4671(b) (Superfund); 26 U.S.C. § 4681(b)(2) (ODCs).

[13] *Id. See also* 26 C.F.R. § 52.4682–3(e) (ODCs).

[14] Congressional Budget Office, *Policy Options for Reducing* CO_2 Emissions (Feb. 2008) at ix.

[15] *See, e.g.*, Robert Shapiro, Nam Pham and Arun Malik, *Addressing Climate Change Without Impairing the U.S. Economy: The Economics and Environmental Science of Combining a Carbon-Based Tax and Tax Relief*, The U.S. Climate Taskforce (June 2008); William D. Nordhaus, *To Tax or Not to Tax: Alternative Approaches to Slowing Global Warming*, 1 Review of Environmental Economics and Policy 26 (2007); Kenneth P. Green, Steven F. Hayward, and Kevin A. Hassett, "Climate Change: Cap vs. Taxes," *Environmental Policy Outlook*, No. 2, American Enterprise Institute (June 2007); Gilbert E. Metcalf, "A Green Employment Tax Swap: Using a Carbon Tax to Finance Payroll Tax Relief," *Tax Reform, Energy and the Environment Policy Brief*, Brookings Institution and World Resources Institute (June 2007); Richard N. Cooper, *The Kyoto Protocol: A Flawed Concept*, in Trade and Environment: Theory and Policy in the Context of EU Enlargement (John Maxwell and Rafael Reuveny, eds., 2005).

[16] For example, observers of the EU's Emissions Trading Scheme have noted that the regulatory environment for utilities enabled them to raise rates while emissions allowances were being allocated at no cost. *See* A. Denny Ellerman and Paul L. Joskow, *The European Union's Emissions Trading System in Perspective*, Pew Center on Global Climate Change (May 2008) at 24–31.

and solicit capital from investors to make that production possible. In addition, public certainty regarding the cost of excessive GHG emissions both now and in the future will stimulate entrepreneurs and investors to develop new abatement technologies and new energy sources as quickly as possible.[17] By contrast, a production-based system that lacks a transparent cost structure introduces significant uncertainty that makes it difficult for capital-intensive industries to raise funds and plan production strategies. Such uncertainty also provides little initial incentive to ramp up development of new technologies and alternative fuel sources. The problem is particularly acute with a cap-and-trade system, where the price of excess emissions is set by a trading market open to speculators and financiers. Past experience demonstrates that allowance prices in such markets can be extremely volatile from month to month or even day to day.[18]

8) Flexibility: A consumption-based system provides flexibility in two ways. First, by putting a price on emissions instead of a cap, the system allows producers to make technology improvements when it is most cost-effective to do so, instead of when the declining cap makes it cost-prohibitive not to do so.[19] Second, the level at which a consumption-based tax is set can be adjusted as necessary to ensure that environmental and economic goals are being met and to allow policy-makers to adapt to advancements in scientific and environmental knowledge. In a tax system, such adjustments only require a re-setting of the rate—they do not require a complicated re-balancing of trade-offs among sectors and producers.[20] Once stakeholders have signed on to a production-based system, however, and received certain quantities of allowances relative to other actors with similar expectations for the future, adjusting the system to reflect economic developments, advancing scientific knowledge, or new environmental realities could be extremely difficult both as a practical matter and a political one.

9) Development: One of the thorniest issues in designing a production-based system for addressing climate change is how to regulate emissions produced in developing countries. International negotiations under the UN Framework Convention on Climate Change (UNFCCC) are based on the principle of common but differentiated responsibilities for developing countries, in recognition of the fact that such countries will need to achieve significant economic growth to emerge from poverty and that such growth will likely entail rising emissions levels rather than declining ones.[21] Industries in developed countries who face competition from developing country producers are, however, justifiably concerned that such differentiated levels of emissions regulations will put them at a competitive disadvantage, leading to efforts to either mitigate the costs of developed country regulations or impose similar costs on developing country producers. A consumption-based approach avoids this dilemma by regulating goods based on their site of consumption, not their site of production. Thus, developing countries will be free to set their own national emissions reductions targets and design their own programs to meet those targets, consistent with their internationally-agreed rights and obligations. Only the goods such countries produce that are consumed in the U.S. would be subject to further regulation, and those goods would be treated like all other carbon-intensive goods consumed in the U.S. A consumption-based approach thus recognizes the need for wealthy nations to take full responsibility for their higher consumption levels and the emissions associated with that consumption, while providing the policy space for poorer countries to meet domestic emissions targets that reflect their development needs.

10) WTO Consistency: Another important advantage of a consumption-based approach is that it is more likely to be viewed internationally as consistent with international trade rules and principles. For example, GATT and WTO rules have long allowed indirect taxes (such as VAT taxes) to be adjusted at the border. Such taxes may be assessed on imports to the same extent they are charged on domestic goods without violating national treatment or other obligations, and such taxes may be re-

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[17] The ODC excise tax was considered to be a very successful means of spurring industry to develop and use alternative chemicals and technologies. *See* Elizabeth Cook, ed., Ozone Protection in the United States: Elements of Success, World Resources Institute (Nov. 1996) at 50.

[18] Allowance prices have been highly volatile in the European Emissions Trading Scheme, the Acid Rain program, and other cap-and-trade initiatives. *See* Gilbert E. Metcalf, *Designing a Carbon Tax to Reduce U.S. Greenhouse Gas Emissions*, NBER Working Paper 14375 (Oct. 2008) at 25–28.

[19] See Congressional Budget Office, Policy Options for Reducing CO_2 Emissions (Feb. 2008) at viii-ix.

[20] Taxes were raised as needed under the ODC program to ensure environmental goals were being met. *See* Elizabeth Cook, ed., Ozone Protection in the United States: Elements of Success, World Resources Institute (Nov. 1996) at 42–43.

[21] Bali Action Plan, Decision 1/CP.13, FCCC/CP/2007/6/Add.1* (Dec. 2007) at para. 1(a).

bated on exports without constituting a prohibited export subsidy.[22] To the extent any refinements to WTO rules or the conclusion of a stand-alone agreement under the auspices of the UNFCCC is needed to provide greater certainty that similar charges can be assessed based on a good's carbon intensity, such adjustments are not likely to be major and would be consistent with long-standing WTO principles. By contrast, attempts to patch "competitiveness" mechanisms on to a production-based system are likely to draw more scrutiny under international trade rules. While there are likely to be WTO-consistent approaches to a cap-and-trade system which is structured to minimize "leakage," many have written that such approaches could be challenged as disguised barriers to trade and/or export subsidies.[23] Absent modification to the WTO rules to specifically authorize the types of leakage prevention approaches being considered, the disadvantage of a cap-and-trade system with leakage mechanisms is the uncertainty that will surround U.S. policy until a final WTO decision is rendered and the U.S. considers how to respond if the decision is negative. While countries can always agree to amend WTO rules or reach other international agreement to permit such competitiveness mechanisms, the more significantly these competitiveness mechanisms depart from current trade rules the more difficult it may be to reach consensus regarding needed changes to those rules.

III. Elements of a Consumption-Based Approach

Two elements of a consumption-based approach are discussed below: 1) A fee on excess emissions associated with goods consumed in the United States; and 2) A program to spur consumer demand for more efficient vehicles. As noted above, the varying needs of different sectors may justify a variety of approaches for addressing climate change. These comments are intended to suggest some elements of a program, and not to exclude other approaches.

1) Excess Emissions Fee

A key element of a consumption-based approach would be the imposition of a fee on each ton of excess emissions associated with goods consumed in the U.S., whether those goods are of domestic or foreign origin. There are strong arguments for imposing a uniform emissions fee that would apply to excess emissions from all sectors in the economy, including electricity generation. The fee would operate in a manner similar to value-added taxes, putting a price on excess emissions at each stage of the production process. The amount of those fees borne by manufactured goods could be adjusted at the border by rebating them on exports and assessing them on imports. This would ensure that manufacturers' costs related to both their direct and indirect emissions do not create a competitive disadvantage.

However, an emissions fee could also be targeted specifically to manufacturing, while implementing a broader cap-and-trade program for other large emissions sources such as electricity generators and fuel suppliers. A separate program could be carved out specifically for manufacturing that would assess border-adjustable fees on industrial emissions, and manufacturers subject to the fees would be exempt from the requirements of the cap-and-trade program.[24]

An emissions fee would be assessed on manufacturers based on the tons of greenhouse gases they emit each year. By creating a cost for excess emissions, the fee would incentivize firms to adopt the most cost-effective emissions abatement technologies. An administratively determined fee rate would also provide more cost predictability to producers than a volatile market for emissions allowances, allowing producers in capital-intensive industries to plan ahead more effectively for investments in technology upgrades and emissions reductions. Any such fee should be structured to minimize costs to industry and maximize emissions reductions.

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[22] *See* GATT Art. III:2 and *Ad Note* Art. XVI. For an example of the application of these principles to permit the border adjustability of an environmental tax, *see* GATT Panel Report, *United States—Taxes on Petroleum and Certain Imported Substances*, BISD 34S/136, adopted on June 17, 1987.

[23] *See*, *e.g.*, Gary Clyde Hufbauer, Steve Charnovitz, and Jisun Kim, Global Warming and the World Trading System, Peterson Institute for International Economics (Mar. 2009).

[24] Under such an approach, manufacturers may still bear additional costs in the form of higher energy prices that are not reflected in the tax. Additional steps would then need to be taken to alleviate any disadvantage imposed on manufacturers due to higher energy costs. Such steps may include credits for manufacturers to compensate for higher energy costs and/or a system that includes a proxy for costs associated with such indirect emissions in the import assessments described above.

- First, producers emitting below a certain threshold each year would be exempt from the fee. The threshold could be set to only cover producers that account for a significant portion of emissions.
- Second, the fee could apply only to emissions that exceed a set quantity, and this level can decline over time. A floor below which no fees are assessed could be structured in a manner similar to a cap on emissions in a cap-and-trade program. Thus, producers who maintain emissions at current levels initially and gradually reduce them within the prescribed timeline would pay no fees.
- Third, the base rate of the fee per ton of excess emissions can rise gradually over time to increase the economic incentive to reduce emissions. Even if the fee rate needs to be adjusted later in time to ensure emissions targets are being met or to respond to new scientific or environmental developments, the fee still provides more predictability to manufacturers than a trading market for allowances.
- Fourth, proceeds from the fees can be recycled back to the industry in the form of tax credits or other assistance to reward firms that reduce emissions more quickly and/or to help finance the acquisition of emissions abatement technology, worker training, and other transition costs.

A major advantage of the emissions fee is that it can apply equally to both domestically-produced and imported goods. The fee could also be rebated on exports, eliminating the competitive disadvantage U.S. goods would face abroad. To rebate the emissions fee on exports, producers that have any fee liability at the end of the year can report the portion of their emissions that were generated by production for export and deduct a proportional amount from the fees owed. Any such export deductions would be subject to verification. There are several methods that could be used to assess an emissions fee on imports.

- First, the fee would be assessed on all imports regardless of origin and based solely on the emissions associated with the imported good. The emissions fee would apply to any import that generates emissions above a *de minimis* level, including downstream products.
- Second, the base rate of the fee per ton of emissions associated with imports would be equal to the base rate of the fee per ton of domestic emissions. Thus, the amount of the fee would increase over time to strengthen the incentive for emissions reductions.
- Third, adjustments to the import assessment can be made to account for the fact that the fee is only assessed on U.S. emissions that exceed a certain level.
- Fourth, to determine the amount of emissions generated by imported products, regulators could establish a greenhouse gas intensity rate for foreign industries. The intensity rate could be further refined down to a product-specific basis depending on the sector and on administrative feasibility.[25]
- Finally, a process could be created whereby an importer could apply to demonstrate that the emissions generated by specific merchandise are lower than the standard intensity rate for the country of origin (resulting in a lower assessment).[26] Similarly, other interested domestic parties should have the ability to apply to demonstrate that the actual emissions generated by specific merchandise are higher than the standard rate for the country of origin (resulting in a higher assessment).

2) Creating Demand for More Efficient Vehicles

Another element of a consumption-based approach would be a program to stimulate demand for new, more fuel-efficient cars or for the retrofitting of existing vehicles to make them more fuel efficient. Transportation is a significant source of GHG emissions in the United States.[27] As of 2001, there were 20 million cars and 15 million trucks on the road that were 15 years old or older.[28] While there are numerous ways to incentivize the production of more fuel-efficient cars, one way to do so would

[25] As noted above, the import tax on ODCs is assessed on a ten-digit HTS level according to a standard ODC weight for the product determined on the basis of the predominant method of manufacturing for that product. *See* 26 C.F.R. § 52.4682–3(f)(6).

[26] This process could incorporate elements of the foreign manufacturer letters that importers are required to present in order to be exempt from taxes on imports of ODCs. *See* 26 C.F.R. § 52.4682–3(e).

[27] U.S. Department of Energy, Transportation Energy Data Book, Edition 27 (2008) at Table 11.5.

[28] *Id*. at Tables 3.7 and 3.8.

be to retrofit older and less efficient vehicles from the road and stimulate consumer demand for more efficient cars.

There are several approaches that could contribute to this goal. First, consistent with the emissions fee proposed above, a tax on gasoline that reflects carbon content and increases over time would lead consumers to demand more fuel-efficient cars. Second, vehicles themselves could be subject to a consumption or use tax based on their gas mileage. For existing cars already on the road, application of such a tax would encourage drivers to invest in retrofitting older cars or turning them in for more efficient vehicles. Third, current state-level exceptions to emissions testing requirements for older cars could be phased out over time to require all vehicles on the road to meet emissions standards. Finally, any of the approaches above could be combined with targeted assistance for drivers who lack the means to upgrade or exchange their current vehicles. Together, policies to stimulate and support demand for more efficient vehicles could dramatically alter the emissions profile of the transportation sector in the United States.

Conclusion

The crisis of climate change demands solutions that address the global nature of the problem. Policies that focus on regulating the consumption of carbon-intensive goods rather than their production are much more likely to fulfill scientific objectives, improve environmental outcomes, maximize incentives for new technology development, and minimize economic costs, while honoring international trade rules and principles. Such consumption-based approaches have been used successfully in the past to address other global environmental challenges, such as the depletion of the ozone layer.

Regulating consumption by putting a price on GHG emissions has numerous advantages over regulating production by capping the quantity of GHG emissions. A consumption-based approach would cover more of the U.S. carbon footprint, treat all goods uniformly based solely on their associated emissions, ensure equal treatment of domestic and foreign goods, and cover downstream products made with carbon-intensive inputs. In addition, consumption-based approaches are likely to be more efficient, transparent, predictable, and flexible, providing significant economic and environmental benefits. Finally, a consumption-based approach will permit developing countries to pursue common but differentiated emissions reduction commitments without putting developed country industries at an unfair disadvantage, all while honoring international trade rules and principles.

Elements of a consumption-based approach to combating climate change could include a fee on excess emissions associated with goods consumed in the United States and programs to stimulate consumer demand for more efficient technologies and products.

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