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EXAMINING GLOBAL WARMING ISSUES IN THE POWER PLANT SECTOR

HEARING

BEFORE THE

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

JUNE 28, 2007

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ONE HUNDRED TENTH CONGRESS
FIRST SESSION

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EXAMINING GLOBAL WARMING ISSUES IN THE POWER PLANT SECTOR

THURSDAY, JUNE 28, 2007

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

The committee met, pursuant to notice, at 10 a.m. in room 406, Dirksen Senate Office Building, Hon. Barbara Boxer (chairman of the committee) presiding.

Present: Senators Boxer, Inhofe, Lieberman, Carper, Cardin, Klobuchar, Whitehouse, Warner, Voinovich, Craig, and Alexander.

STATEMENT OF HON. BARBARA BOXER, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Senator BOXER. Welcome, everybody. We are really looking forward to your testimony.

We are starting right on time, we have a busy morning. We are going to have to take a break an hour from now, so we are going to get through as much as we can in that time. Therefore, I am limiting the opening statements for all of us to 2 minutes each. Hopefully you can do your statements in 5 minutes.

Before we start today, I want to talk about two wonderful pieces of news. First of all, today the bald eagle is being de-listed from the Endangered Species List. In 1968, there were 417 mating pairs, and now there are 10,000 mating pairs. I think what it shows is that the Endangered Species Act works, that environmental laws work, and we are better for it.

Also, I want to call attention to yesterday's groundbreaking announcement by Senators Warner and Lieberman to jointly craft an economy-wide cap and trade global warming bill. It is an important step forward, and I look forward to the results of their efforts. Then we will move forward in the full committee as soon as possible.

I also want to thank Senator Alexander, who has addressed the power plant sector's contribution to global warming, both in his power plant legislation and in the Capitol Power Plant bill that passed as part of the energy bill last week. I have asked Senator Carper to sit close to me today, because he has been such a leader in looking at this particular sector. His work has made a tremendous difference already.

I want to welcome from my home State of California Peter Darbee, the CEO of PG&E, as well as the other utility CEOs here today: Mr. Lewis Hay, of FPL Group and Mr. Jim Rogers of Duke, and all of our other distinguished witnesses. With the announcement by Senators Lieberman and Warner, we are on our way to-

ward reporting economy-wide global warming legislation, which is the most efficient way to deal with this issue.

However, this hearing is key, because power plants are the single largest CO_2 emitting sector in the U.S. economy. They account for 40 percent of all emissions. The single largest source of fuel for power plants is coal, which accounts for 50 percent of our electricity generation.

In the fight against global warming, the electricity sector will play a critical role, both as a source of emissions and as a source of emission reductions. In other words, the utility sector can be a huge part of solving our problem. That is what we hope, that is the spirit in which I have invited you here today.

The technological choices we make in this area will affect our ability to combat global warming for many years to come. These choices can lead to large decreases in emissions or commit us to large increases in emissions. These choices can commit us to low cost solutions or to high cost solutions later. We need to act wisely and decisively.

With the help of the experts and CEOs who are here today, and with my colleagues from both sides of the aisle, I am confident we can find such a solution. I look forward to hearing all of the witnesses' testimony and to learn more about these important issues.

Senator Inhofe, you are recognized for 2 minutes.

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

Senator INHOFE. Well, before you start the 2 minutes, let me on behalf of my people who are calling in to register our objection to the way this is being run, it is my understanding just late last night you decided that everyone would have just 2 minutes. I don't mind that, really. In fact, we have had so many of these hearings, I don't think that there is a lot more we can talk about in opening remarks.

Senator BOXER. Would you start the 2-minute clock, because I had 2 minutes?

Senator INHOFE. OK. First of all, I think this is what, the 14th hearing we have had now on global warming. This is really a lot of fun, I know that. But sooner or later, I would recommend to my distinguished Chairman that we had better start getting some bills out there. We are not doing anything in this committee. We haven't done anything since January. We have hearing after hearing after hearing.

Let me suggest also that you should get some bills out, because time is not your friend. It is not every month or every week, but every day that goes by there are more and more scientists who are coming over who were in the other camp, coming over now and saying, the science is flawed and it is not real. I have talked about all the universities here in the United States in the last hearing that we have had the professors that come over. But we have another list right now that I will submit for the record. It includes professors from the University of Ottawa, from the Australian government and from the University of Auckland in New Zealand.

So it just seems to me that one of the things that you folks, and I know there are a lot of you, and we will have a chance to talk

to you, that are in the utility business, you are going to have to understand that there is going to be a huge cost. The science is in question, the cost is not. Just recently, in looking at the only two bills that are up for consideration right now, the Boxer bill and I believe the Lieberman-McCain bill, MIT recently came out and said that the cost of the Lieberman-McCain bill to our energy consumers is about $3,500 a family; the Sanders-Boxer bill would be about $4,500 per family.

What that constitutes is a tax increase 10 times greater than the largest tax increase in history to the American people. I know that you folks have boards of directors and some of you are going to have to do what you can to your bottom line. But my board of directors are the taxpayers.

Thank you, Madam Chairman.

[The referenced information was not received at time of print.]

[The prepared statement of Senator Inhofe follows:]

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

Madame Chairman, we have never had a legislative hearing to examine the many proposed climate bills, and this hearing is no exception. But at least today we are discussing some broad concepts. So I would like to thank you for taking a half-step forward and urge you to take the next half-step. To date, we have had a dozen hearings talking endlessly about how urgent and important this issue is, and I believe that they have been useless and a complete waste of time.

For instance, we had a hearing to examine perspectives of religious leaders and little was learned. Indeed, you used the hearing to imply one of our witnesses of misrepresenting the views of the Southern Baptists Convention. But in a direct vindication of his statements, on June 13th, the Southern Baptist Convention (SBC) approved a resolution on global warming that questions the belief that humans are largely to blame for the phenomenon and also warns that increased regulation of greenhouse gases will hurt the poor.

Madame Chairman, you need to hurry if you want to pass legislation and you should have hearings on each of the bills. Just last month, it was discovered that increasing wind shear from warming will reduce hurricanes, not increase them. Increasingly, prominent scientists are beginning to reject the global warming hype. Some recent converts include Paleoclimatologist Dr. Ian D. Clark, professor of the Department of Earth Sciences at University of Ottawa, Mathematician & engineer Dr. David Evans, who did carbon accounting for the Australian Government, and Climate scientist Dr. Chris de Freitas of The University of Auckland, New Zealand.

But I cannot believe the Senate will pass cap and trade mandates. According to MIT, the Lieberman-McCain bill will impose costs on our energy sector that are passed onto consumers equal to $3,500 per family. The Sanders-Boxer bill would be equal to $4,500 per family.

Hopefully, today's hearing will be more constructive than past hearings. I strongly disagree with the approach being taken by the 3 utilities represented here today. But I want to be clear—as Ronald Reagan used to say, "my 80-percent ally is not my 20-percent enemy."

I have long been a sturdy supporter of our energy sector and championed legislation that would increase our supplies and minimize regulatory costs. In fact, when I chaired this committee, one of the witnesses today, Jim Rogers, testified in favor of my Clear Skies bill. Welcome, Mr. Rogers.

While we disagreed then and now about the need for regulating carbon dioxide, we shared the view that 70 percent cuts in air pollution could be achieved if we were smart about it. A key aspect of that legislation is something that too often gets sugar-coated in this debate—we cannot get ahead of the technology and we must not disrupt energy markets.

I also believe our Nation needs more energy and more diverse energy. While we continue to move toward greater efficiency, we will continue to need more energy to supply our growing nation. We need more nuclear generation, more natural gas exploration, more coal and more hydro. We need clean coal and coal-to-liquids. And the legislation I have supported makes it clear that I back up my beliefs with action.

The Edison Electric Institute has said that any mandatory legislation should be economy-wide. I agree with the sentiment that the utility industry should not be singled out for special treatment.

As I go through the list of things where we agree and disagree, when it comes to a utility that parts company with me on this issue, I consider it to be my 80 percent ally. Madame Chairman, I guess that means you probably belong in the 20 percent range.

Energy is the most fundamental ingredient of America's economic engine. Our Nation has done a poor job in keeping supply up and costs down. I would add that the energy bill we just passed does little to increase supply, but much to increase costs. Likewise, carbon cap and trade schemes would decrease supply while driving costs through the roof.

Ultimately, that means more costs passed onto the consumer in the form of higher prices. That is really what today's hearing is all about—how much will carbon schemes cost and who will bear the burden of these higher costs?

As each of our utility witnesses speak today, I would like to hear their views as to the issue of economy-wide versus utility specific, the differences between regulating carbon where the technologies are in their infancy and regulating something such as sulfur dioxide where the technologies are mature? And I would like all the witnesses to discuss the elephant in the living room—costs to consumers and jobs moving to China, the biggest emitter of greenhouse gases on the planet.

Senator BOXER. Thank you, Senator. We will put into the record the four bills that deal with global warming that have already not only passed the committee but passed the Senate.

[The above mentioned bills may be found in committee files.]

Senator BOXER. Senator Lieberman.

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

Senator LIEBERMAN. Thanks, Madam Chair. Obviously, Senator Inhofe and I have a difference of opinion on this. I suppose also I should say on the record of the committee, we have brought out a number of bills, most of which or perhaps all of which were included in the Energy bill, which passed the Senate last week.

So there is a beginning. I am very proud and grateful that Senator Warner and I have, as Chair and Ranking Member of the subcommittee of this committee on Climate Change have joined together with a clearly stated goal, which is that we want to bring to our subcommittee and then hopefully with the support of the subcommittee the full committee a bill that really does deal in a comprehensive way with the genuine threat of climate change and the desire of a lot of people on this panel who have said to me, it is time for national leadership on this, it is time to give businesses particularly a consistent, predictable environment in which to respond to this problem. Everybody that I talk to says it is coming. Let's not have us picked apart by the various States or others. Let's have, this is a national, it is an international problem. We have a national responsibility. Let's do it.

Senator Warner and I have agreed on a set of principles. We are going to bring forward an economy-wide cap and trade system. Our staffs are beginning this week to meet with stakeholders. We invite all of you to be in touch with us to do that. We want this to be an open process.

But we have a clear goal, which is to report a bill, to bring a bill, a mark to our subcommittee before the August recess, and then hopefully that subcommittee to report it on a bipartisan basis. That to me is the significance of John Warner, a distinguished member

of this committee, this Senate, joining together with me on this and then hopefully to the full committee.

I would say, Senator Warner's support gives us reason to be believe that for the first time in the history of the U.S. Senate, there will be a bill on climate change, a real one, reported out of a Senate committee to the floor. That is our commitment.

John said it yesterday, I will just say this in a sentence. Most of his career in the Senate has been spent trying to protect America from threats to our security. He sees this effort to deal with global climate change as consistent with all that he has done to protect American security.

I thank you for your leadership, Madam Chairman, and I yield back to you.

[The prepared statement of Senator Lieberman follows:]

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

Thank you, Madame Chairman. Thank you for your kind words.

As you know, I have the privilege of chairing the Subcommittee on Private Sector and Consumer Solutions to Global Warming. I want to take this opportunity to thank my esteemed ranking member, Senator Warner, for being willing to embark with me on the process within our subcommittee of drawing upon existing bills and new ideas to construct a new, bipartisan, economy-wide, cap-and-trade climate bill over the weeks ahead. I believe that his commitment to this effort represents a true breakthrough.

In the meetings that we have had already, Senator Warner has impressed me enormously—as he always has in our years here together—with his common sense, his concern for the long-term well-being of the American people, and his apolitical, fact-based approach to problem-solving. I am very fortunate to lead a subcommittee with him, and I am confident that the two of us can come to a bipartisan accord that will form the basis of broader bipartisan agreement in our subcommittee, and then, with the help of all of our colleagues here, in the full committee.

As all of you know, I am already the author, along with my friend Senator McCain, of an economy-wide, cap-and-trade climate bill that we reintroduced earlier this year. Senator McCain and I remain close partners on this issue. I think he expects me to use my position on this, the committee of jurisdiction, to help deliver to the Senate floor a bill that lives up to the principles around which our Climate Stewardship and Innovation Act is built. As Senator McCain and I have noted, that bill is not written in stone, and a lot of very promising new ideas have arisen in just the last 6 months. I believe the bill that Senator Warner and I construct together will take advantage of those new ideas, including ones that colleagues of ours have written into their own climate bills.

Senator McCain and I have been honored that 10 of our colleagues, including Senators Carper and Clinton on this committee, have co-sponsored the Climate Stewardship and Innovation Act. When Senator Blanche Lincoln became a cosponsor in January, she spoke eloquently about the responsibility she feels to protect the economic well-being of low- and middle-income energy consumers in Arkansas. She made clear that she was putting her trust in me and others to ensure that, as the legislation proceeded and evolved, it preserved and indeed enhanced protections for those Americans with little or no disposable income.

When Senator Norm Coleman honored me and Senator McCain with his co-sponsorship last month, he and I introduced a resolution to memorialize our shared commitment to ensure that the Senate's climate legislation would not increase the poverty rate in this country, would not drive manufacturing jobs abroad, would ensure that other nations did their part too, and would drive investment toward advanced, clean energy technologies. Those priorities matter to me, and I know that they matter to Senator Warner very much indeed. I think Senator Coleman can rest assured that we will meet the commitments of that resolution.

And we of course will not do it alone. This committee is a powerhouse of talent and commitment. I can't wait to roll up my sleeves with Senator Warner. And I can't wait to engage with all of my colleagues on my subcommittee and this full committee.

Thank you, Madame Chairman. And thank you for convening this hearing, in which we will all roll up our sleeves on this issue together. I thank the witnesses for coming and look forward to their testimony.

Senator BOXER. Thank you, Senator Lieberman, for your amazing, breakthrough work on this committee.

Senator Voinovich.

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

Senator VOINOVICH. Chairman Boxer, I hope today's hearing will provide for a well-informed debate on climate change. This is a difficult and polarizing topic, and much of what we hear in the media and elsewhere does little to advance a reasonable solution to the problem.

Utilities are one of the most heavily regulated sectors of our economy and have unique experiences in addressing environmental concerns. There is much we can learn from their experience. I am particularly happy to see one current and one former Ohioan here. I thank Bob Murray and Jim Rogers for being here today. I have known Bob Murray since I was Mayor of Cleveland ran Cleveland Public Power, and Jim and I worked together when he was running Synergy.

As we move forward with this debate, we must be realistic about our ability to affect the outcome. We contribute to a warming climate. But as most scientists will admit, even the elimination of U.S. greenhouse gas emissions would have negligible effects on temperature. Assuming we can make a contribution, we must remember this is a global problem and will require a long-term solution.

We should be deliberate in our actions, but not at the expense of our energy security and economy. Again, harmonize our environment, energy and economy. In this regard, I note the vital importance of coal. Coal is our most abundant and affordable domestic energy source. Advancing technologies to capture and store carbon is the most important way we can address this problem responsibly. Any reduction requirements must be harmonized with the pace of technology.

Unrealistic requirements will encourage fuel switching, drive up costs for manufacturers and consumers and move jobs and even emissions overseas. These costs are not real to States with little or no coal, nor are they real to individuals who can easily afford them. Any sacrifice too often is meaningless to them. But it is not meaningless to coal-dependent States like Ohio where our economy is in trouble and natural gas prices have increased 300 percent in 7 years. It is not meaningless to low-income families who are sacrificing an ever-increasing percentage of their income to pay their utility bills.

A solution to one problem must not create another, perhaps larger problem. I look forward to today's testimony and appreciate this panel's participation.

Senator BOXER. Thank you, Senator.

I must apologize to my colleagues, because I didn't do the early bird rule today. So I will just continue going with seniority, since it is just 2-minute openings. I do apologize.

Senator Carper.

STATEMENT OF HON. THOMAS R. CARPER, U.S. SENATOR FROM THE STATE OF DELAWARE

Senator CARPER. Thanks, Madam Chair. To our witnesses, welcome, thank you for joining us today and helping us in an important undertaking, that is, developing consensus around a subject around which we need to develop that consensus.

I agree with most of my colleagues that global warming is real. I agree with my colleagues and the President and I think most American citizens that we as individuals, our businesses and otherwise are contributing to the problem and we need to contribute to its solution.

As a former Governor, I know that among the things businesses need is they need certainty. They need to know what the rules of engagement are going to be and we need to provide that for them. The American people need for us to bear down and find common ground on this subject. They need for us to do it in a way that harnesses market forces and of course, to do it in a way that doesn't put our economy in a tailspin. They need for us to do it in a way that doesn't cost consumers an arm and a leg.

There is ironically a whole lot more that we agree on among the three pieces of legislation, I think, that are before us: Senator Alexander's legislation, Senator Sanders' legislation and my proposal. Lamar and I worked actually for the last several years to develop that consensus. I think the only major area that divides us is how do you allocate the credits. We will have some discussion of that today.

I understand there is actually a new approach that is on the table, and we are interested in hearing that fleshed out.

My preference overall is for an economy-wide bill. I am encouraged with the legislation, Madam Chair, and my colleagues, that we passed last week. Because we addressed at least the emissions from mobile sources for CO_2 and almost a third of our CO_2 comes from our mobile sources, roughly 40 percent from utilities. If you put them together, that is 75 percent of the emissions of CO_2 in this country. That is mighty substantial.

The last thing I would say is, the rest of the world needs for us to provide some leadership here. This is the United States of America. We shouldn't be waiting for the Chinese or the Indians or others to decide what to do. We should provide that leadership and it starts right here.

Senator BOXER. Thank you, Senator.

Senator Craig.

STATEMENT OF HON. LARRY E. CRAIG, U.S. SENATOR FROM THE STATE OF IDAHO

Senator CRAIG. Congratulations, Madam Chairman, I understand you are a new grandmother.

Senator BOXER. Thank you very much.

Senator CRAIG. That is exciting.

Senator BOXER. I do have a picture to show you later.

[Laughter.]

Senator CRAIG. I am anxious to see. Boy or girl?

Senator BOXER. It's my second grandson.

Senator VOINOVICH. When?

Senator BOXER. I will tell you later.

[Laughter.]

Senator BOXER. Yes, we will definitely start the clock again.

Senator CRAIG. The reason I know that is, we were all waiting you hopefully to get back for that vote the other evening and you missed it. I know none of us like to miss votes on energy bills. Then I found out why you had. That was all the right reason.

Thank you for this hearing today, Madam Chairman. I am always amazed how busy we get here talking about energy. We don't produce one drop of oil nor one kilowatt of electricity. But we can sure get in its way.

Now, we talk a lot about it, because it is the politically correct thing to do right now. We wring our hands and stand on street corners and we pontificate beyond anyone's imagination.

Now and then we construct policy that gets in the way of its production or partners in it. I would hope, Madam Chairman, that anything we do now and into the future shapes a partnership, a relationship that doesn't distort the marketplace, looks at the reality of what is doable and what is not doable, doesn't set up huge obstacles that do two things for the American consumer, either deny it energy or cause it to have to pay extremely high costs for its energy.

That is the reality of what we can or cannot do. I am always fascinated in cap and trade schemes, and I underline the word scheme. Because I watch Europe play the game, not so well. They don't understand the scheme except for those who can buy it and profit from it. They didn't produce one kilowatt hour of power out of it. My guess is they are not much cleaner as a result of it.

But I am always fascinated in the phenomenal innovative character of the American economy if we help it, if we partner with it. This world would become a very clean place over the next three decades because of us, not in spite of us, because we are the ones that are going to create the technology, we are the ones that are going to innovate, and we are the ones that are going to pass it off to the rest of the world to use. Why? Because we are rich. Because we have the ability to do it. Because we are going to do it, because we are committed to do it.

The only reason we wouldn't do it is if we decided that our Government was going to stand in its way, not partner, create obstacles and create a less wealthier nation. I have traveled to nearly every climate change conference in the world. I have watched the cottage industry of climate change grow and prosper over the years, and talk about the great problem that the world was beset by. None of them could solve it, other than to suggest that we all did less, that we move to caves and lighted our reading with candles.

Well, that didn't work. The world rejected that. Poor nations said no, they weren't going to put their people through it, even though some of our politicians thought it was a neat idea.

Those concepts all got rejected. I am one who early on said yes, our world is warming and we ought to know why. If we are contributing to it, we ought to stop.

We are not quite sure yet why it is.

Senator BOXER. Senator, you have gone a minute over your time.

Senator CRAIG. Oh, I am so sorry. Well, do I get a little grandbaby time?

Senator BOXER. I gave you that grandbaby time.

[Laughter.]

Senator BOXER. I gave you so much extra time because you were so nice about my grandson. But your time is running out.

Senator CRAIG. All right. Enough said. My point is this, Madam Chairman. Let's partner, let's don't stand in the way, let's don't play politics with the consuming public and a wealthy nation's ability to create and pass those technologies through to less capable countries. Thank you.

Senator BOXER. Thank you so much.

Senator Sanders.

STATEMENT OF HON. BERNARD SANDERS, U.S. SENATOR FROM THE STATE OF VERMONT

Senator SANDERS. Thank you, Madam Chair. If I say nice things about your grandchildren, will I get extra time, too? This is a cap and trade situation.

[Laughter.]

Senator SANDERS. First, let me say that I look forward to working with Senator Lieberman and Senator Warner as a member of that committee. We have a major responsibility and we look forward to coming up with very strong legislation.

I would say also, I am delighted to welcome our guests here today. I would say to my friend, Senator Craig and others, frankly, I think we in the Congress are way, way, way behind the American people. I think the American people understand that in many ways the debate over global warming is over. The scientific community, with almost unanimous belief, believes that global warming is real and with almost unanimous belief believes that it is man-made, understands that the impact of global warming is taking place today, and that if we don't get a handle on it, it will be catastrophic in years to come. Our job is to catch up to the American people, reverse global warming, cut greenhouse gas emissions significantly. I happen to believe that the genius of our society, the society that put a man on the moon, that rebuilt our war-time economy in the early 1940s in a short period of time and then defeated Nazism, certainly has the capability, with all of the technology that is out there, to break our dependence on fossil fuel, to move in a very, very significant way forward in terms of energy efficiency, to move to solar energy, to move to wind technology, to move to geothermal technology and other technologies that are sitting out there right now.

A month ago, I drove in an automobile that got 150 miles per gallon. It is sitting out there waiting to happen. I must respectfully disagree with my friends, who say that there will be terrible economic implications if we do those things. The truth is, the Congress, if we do not act boldly, there will be terrible economic implications. If we act boldly, we can create millions of good-paying jobs, breaking our dependence on fossil fuel.

Thank you, Madam Chair.

[The prepared statement of Senator Sanders follows:]

STATEMENT OF HON. BERNARD SANDERS, U.S. SENATOR FROM THE STATE OF VERMONT

Madam Chair, Ranking Member Inhofe, thank you for holding today's hearing on global warming issues in the power plant sector.

As members of this committee know, I am a strong believer in the need for the Federal Government to be very bold in reversing global warming—the largest environmental challenge humanity has ever faced. I have an economy-wide global warming bill, S. 309, that many members of this committee, including the Chair, support. That legislation lays out a path for reducing our greenhouse gas emissions in a way that will give us at least a 50–50 chance to avoid the catastrophic effects that the best scientists in the world tell us we can expect if we increase global temperatures by over 2 °C. And, I note with extreme interest that just yesterday Senator Lieberman and Senator Warner, the leadership of the Subcommittee on Private Solutions to Global Warming, announced their intent to craft an economy-wide global warming bill based on already-introduced proposals as well as new ideas.

I will continue to stand firm for the need for an economy-wide approach, and I look forward to working with Senator Lieberman and Senator Warner as a member of their subcommittee, but it does seem appropriate to be thinking about the various individual sectors that would need to be addressed in such an approach. Power plants are responsible for roughly 40 percent of U.S. global warming emissions. That's a significant amount of our problem. Along with Senators Carper and Alexander, I recognized the need for attention to reductions in power plant emissions of CO_2—and three other harmful pollutants: nitrogen oxide, sulfur dioxide, and mercury, and introduced a power plant bill, S. 1201. While I know that today's hearing is focused on global warming emissions from power plants, I do want to go on record as saying that this committee needs to stand up and address the other three pollutants too, given the clear public health threats posed by air pollution.

I think that there is much promise as we look to the power plant portion of our global warming emissions. The targets and timelines for CO_2 reductions in Senator Alexander's bill are identical to the targets and timelines for CO_2 reductions in my bill. Our targets and timelines are consistent with reducing the emissions from power plants to 1990 levels by 2020. While Senator Carper's targets and timelines are a bit different, they are close—so it is clear we have much in common.

While there is much promise for agreement, part of our responsibility is to use hearings like today's to learn more about the places we have yet to come to agreement and to that end, I want to at least mention a few areas of particular interest to me.

First off, while there is widespread agreement that we need a firm cap on emissions and that a cap and trade system will serve the purpose, especially for the power plant sector, there are other steps that we should be taking to reduce our emissions of greenhouse gases. For example, wider use of renewables as well as more efficient products will go a long way.

I would like to see households across the country generating their own energy from photovoltaic panels on their roofs and had the Finance Committee's renewable energy tax incentives legislation not been derailed by some of my colleagues on the other side last week, we would have been one step closer to extending the financial incentives for such investment. I would also like to see family farmers generating electricity from small wind sources—and again, I sure hope we can reinvigorate the Finance Committee package so that, for the first time, we will provide financial incentives for residential installation of wind power.

On the efficiency front, Philips Lighting has told me that by adopting much more efficient lighting we could save the energy equivalent of what is generated by 30 nuclear power plants or up to 80 coal burning power plants—not to mention save consumers and businesses approximately $18 billion annually in their electricity bills!

But, the point I am trying to make is that reduction of our emissions from the power plant sector can come through greater use of renewables, both by the utilities as well as by individual Americans who want to stand up and make a personal contribution to solving global warming, and of course, through better energy efficiency efforts. So, it is with some concern that I note, to my best knowledge, that my bill is the only one of the power plant bills to include a renewable portfolio standard and an energy efficiency performance standard. While we clearly need an overall cap on emissions, I think that we can help move the ball forward by taking concrete steps to increase our use of renewables and to be more efficient.

Second, the issue of how we decide to distribute allocations is tremendously important. My power plant legislation calls for an auction of at least 50 percent of the allowances, with a 100 percent auction within 15 years of enactment. I want to be very careful as we move forward to not make some of the mistakes that others have made. I want to be sure that we don't give companies windfall profits through free allocation of allowances. Additionally, I believe that the proceeds of an auction should be used to help low income families and others who might need assistance as we reduce our use of fossil fuels.

Finally, I want to quickly mention that my power plant bill is the only one that makes an explicit connection to the economy wide reductions of global warming emissions that are required to avert catastrophic changes in our climate. While I understand that the provision wouldn't be popular with many of the witnesses here today, my bill states that if Congress fails to pass legislation affecting at least 85 percent of manmade sources of global warming pollutants by 2012, then emissions from power plants must be decreased each year by 3 percent through 2050. I mention this here today because I am committed to seeing the needed reductions occur on an economy wide basis, however, I must be very clear that getting the actual reductions must be our overall goal—it is what the future of the planet demands from us.

I appreciate your determined leadership of the Chair to tackle global warming and look forward to hearing from our witnesses.

Senator BOXER. Thank you, Senator.

Senator Alexander.

STATEMENT OF HON. LAMAR ALEXANDER, U.S. SENATOR FROM THE STATE OF TENNESSEE

Senator ALEXANDER. Thank you, Madam Chairman.

I am very pleased with the steps that we have taken in Congress this year to reduce emissions of greenhouse gases. My message is that the best way to get to a so-called economy-wide proposal I believe is sector by sector. First, we have already acted to reduce greenhouse gas emissions from the transportation sector. Senator Carper mentioned that. By 2020, the new fuel economy standards that the Senate passed are estimated to save 1.2 million barrels of oil a day and will remove 206 million metric tons of CO_2 from the atmosphere. We also increased the renewable fuel standard, which would reduce greenhouse gases. So that is the fuel part.

On the efficiency part, the Senate and this Congress has taken many initiatives to increase energy efficiency in buildings, lighting and appliances, with estimates to save 1.2 million metric tons of carbon dioxide. So as Senator Carper indicated, if you add up fuel and efficiency and then if you put making electricity in there, too, which is 40 percent of the carbon, you get most of the economy. You add the stationary sources, you get most of what is left. I don't believe you will ever come up with a real economy-wide cap and trade, because you won't end up wanting to put in the service stations and the small businesses, et cetera.

Senator Carper and I worked for a long time on a cap and trade system for the electricity sector, which we believe is reasonable. The only difference we ended up with it on was allocation. I went from one view to another view during the time I started. So I am very interested in learning from you how to allocate costs.

I believe, Madam Chairman, in conclusion, that the best way to deal with, in a practical and cost-effective way, with carbon emissions, is sector by sector. I hope to learn a lot today about how to allocate that cost in the most efficient way at the lowest cost to the ratepayer.

Senator BOXER. Senator Alexander, thank you very much.

Senator Klobuchar has been a real leader in trying to get us to count the carbon, with the carbon registry. Welcome.

STATEMENT OF HON. AMY KLOBUCHAR, U.S. SENATOR FROM THE STATE OF MINNESOTA

Senator KLOBUCHAR. Thank you, Senator Boxer. I heard from my staff that everyone has been congratulating you on your grandchild. I am going to congratulate you instead on your work on the energy bill.

But I think that was a good start. I believe there is a lot more work that needs to be done. I think the fact that I am on the Commerce Committee, that we were able to, on a bipartisan basis, get the increased gas mileage standards in place, should be a good model for us on this committee. I appreciate the work that Senator Lieberman and Senator Warner are doing together, as well as the work that Senator Carper and Senator Alexander have done. I think that this could be in the same model. It is actually one of the more bold things we did with the gas mileage standards. It came out of the Commerce Committee on a bipartisan basis.

I have said many times that in my State, people have seen global warming. They have seen climate change, whether it is people who ice-fish or people who own ski resorts, they are starting to see the effects and they are very concerned about it. So it is not just the scientists talking about it any more.

We also have a thriving business community in my State that sees the technological possibilities of what Tom Friedman of the New York Times has called the Green New Deal if we do this right. That we should be, in our country, developing the technology instead of letting China and Indian and other countries on the front line.

So I look at this as not only a potential, huge potential hazard, as Senator Sanders expressed, but also as an opportunity if we do this right. I will say that I have been impressed by the numbers of businesses and CEOs that have come before them. I would have liked to have seen them, Senator Boxer, as vocal as they were when they do appear before a committee when we had the carbon counter bill come up. But I know there will be other opportunities for that.

I think that people need to, if they are going to be talking about wanting to do something about climate change, we clearly need to collect accurate data nationally. Otherwise we are going to have 31 States doing it on their own. I think a lot of the business people here are nodding their heads about that. Then I think we need to act. I think it is going to come out of this committee. Thank you very much.

Senator BOXER. Thank you so much.

Before I call on you to add your words about Mary Frances, I want to say that Senator Carper has reminded me, Mary Francis Repko, that this is your last hearing at the committee as you go on to meet new challenges in your life. You started in July 1994, you joined EPW in December 2003. You started in the Congress in 1994. You joined EPW in December 2003.

So we will miss you, and Senator Carper, you wanted to say a word.

Senator CARPER. I think my colleagues will agree, I would say we are only as good as our staff. We are hopefully at least as good as our staff, but we are strengthened by our staff. Mary Francis Repko has been just a terrific member of this committee staff; for a number of years before that, she served with Senator Feingold, as a member of his team.

She goes to work with one of my favorite people over in the House, she goes to work for Steny Hoyer in the Majority Leader's office, where she will be a senior environmental policy advisor. So we will have a chance to work with her and hopefully with him. He will be strengthened, and I think the House will be strengthened by her addition.

Senator BOXER. Mary Frances, stand up a minute, take your applause.

[Applause.]

Senator BOXER. OK. Now we are going to get back to the basics of this hearing, and we are going to hold you to 5 minutes so we can get through.

Oh, Senator Warner. We are delighted to see you. You have been much praised and we wonder if you have an opening statement.

Senator WARNER. Why don't I rest my case on what has been said and we will proceed. Thank you very much.

[Laughter.]

Senator BOXER. Since it was all beautiful.

Do you want us to put your statement into the record, Senator?

Senator WARNER. Why not.

Senator BOXER. OK, we will do that.

[The prepared statement of Senator Warner follows:]

STATEMENT OF HON. JOHN W. WARNER, U.S. SENATOR FROM THE COMMONWEALTH OF VIRGINIA

Good morning, gentlemen, and thank you for participating in this key hearing of the Environment and Public Works Committee. I am eager to listen and learn the perspective of today's witnesses, and thank Chairman Boxer and Senator Inhofe, my ranking member, for holding this hearing.

Today's hearing is all the more important to me, given the announcement this week that I made jointly with my good friend, Senator Lieberman, to seek to come to agreement on a climate change bill in the near future. We will spend the next several weeks hearing from stakeholders, listening to our colleagues in the Senate, and analyzing both existing proposals and new ideas. I want all interested parties to have an opportunity to weigh in with us, and look forward to this process moving forward.

While I have already stated my support for an economy-wide approach to climate change, the power plant sector is going to compose a large portion of the bill Senator Lieberman and I craft, thus I will take seriously the testimony I hear today.

I thank the witnesses.

Senator BOXER. OK, we will get started now.

Peter Darbee, PG&E, welcome.

STATEMENT OF PETER A. DARBEE, CHAIRMAN, CEO AND PRESIDENT, PG&E CORPORATION

Mr. DARBEE. Chairman Boxer, Ranking Member Inhofe and members of the committee, thank you for the opportunity to be here today.

I am here today because it is clear that if our country is going to step up as a leader on climate change, as we believe we can and should, then the U.S. electric industry must also be ready to step

up and work constructively toward solutions. This belief is consistent with PG&E's participation as a founding member of both the Clean Energy Group and the U.S. Climate Action Partnership. It is consistent with our actions to lower PG&E's emissions while helping our customers do the same.

In fact, today we are launching the industry's first program that allows utility customers to voluntarily offset the emissions associated with their PG&E service. Our written testimony details a full set of principles that should guide a national strategy on climate change. I will quickly highlight a few of these.

We strongly support mandatory, flexible market-based solutions. We believe emissions reductions must ultimately come from multiple sectors of the economy. We believe companies that have taken early action should be recognized. We believe support for energy efficiency and clean technologies is critical, and we believe long-term clarity on emissions requirements is needed to help American business plan and invest effectively.

I want to note that Senator Carper's and Senator Feinstein's bills incorporate these ideas. We support the cap and trade strategy that they would create. It is worth focusing on a few issues addressed in these bills, because they especially go straight to the heart of today's hearing. Indeed, if the goal is to have the electric sector move effectively, efficiently and expeditiously, then these are the most important areas to consider.

The first issue is the time horizon for emissions caps. We believe caps on emissions should start slowly and then gradually ratchet down over several decades. This allows technology to evolve. It also provides a long-term price signal which can drive investment in low-carbon technologies. In the meantime, the caps can be met with existing technologies and strategies.

Energy efficiency deserves special mention here. In California, we meet half of our demand growth through energy efficiency. Over the past 30 years, we avoided the need to build 24 large power plants and we saved customers money. If we place a full court press on energy efficiency nationally, we could offset the need for significant investments in conventional power plants in the near term while advanced low and zero emitting technologies become available and competitive. This is a common sense, cost effective resource. It is critical that we take maximum advantage of it.

The second important issue is controlling costs by allowing flexible compliance options. These bills offer several mechanisms that we think are vital. One is utilizing high quality greenhouse gas offsets. This allows companies to invest in reductions outside of our sector, and it lowers costs by providing a broader set of reduction opportunities. For example, PG&E is partnering with dairy farms to produce pipeline quality biogass for natural gas customers. Other effective mechanisms include multi-year compliance periods, banking of emission allowances and credit for early action.

The final key issue for our sector is emissions allocations. This is perhaps the most complex and controversial aspect of designing a cap and trade program. So I would like to take a few principles and outline them that we believe are critical. Any effective and equitable allocation strategy has to do the following. First, create a smooth economic transition for those who are adversely impacted.

Second, help advance new technologies. Third, avoid penalizing early action. Fourth, recognize and compensate customers for higher costs. Fifth, avoid creating unintended windfalls for companies granting allowances whose value exceeds the cost of addressing the problem.

In our written testimony, we have outlined some of the ways we think a cap and trade program can be designed to meet these objectives. Thank you again for the opportunity to address this committee and for your leadership on this very important issue.

[The prepared statement of Mr. Darbee follows:]

STATEMENT OF PETER A. DARBEE, CHAIRMAN, CEO AND PRESIDENT, PG&E CORPORATION

Chairman Boxer, Ranking Member Inhofe, and Members of the Committee, I am honored to appear before you this morning to offer my views on global warming and options for mitigating greenhouse gas emissions in the power sector. I believe climate change and its implications is one of the most pressing issues of our time. It is clear that the link between greenhouse gas emissions and the Earth's warming climate is convincing, the potential consequences serious and the need for action urgent. I am pleased that this Committee is showing leadership on this very important issue by having a hearing on how to address greenhouse gas emissions from the electric power sector, as proposed in several pieces of legislation introduced by Senators Carper, Feinstein, Alexander and Sanders.

PG&E Corporation is an energy holding company headquartered in San Francisco, California and the parent company of Pacific Gas and Electric Company. Pacific Gas and Electric Company is California's largest utility, providing electric and natural gas service to more than 15 million people throughout northern and central California. PG&E is a recognized leader in energy efficiency and has among the cleanest electric power delivery mix of any utility in the country. And, today, I am pleased to announce that PG&E is formally launching a new program for our customers called ClimateSmart. ClimateSmart will allow those customers who choose to participate to make their energy use "climate neutral," by paying a small premium on their monthly bill to be invested in greenhouse gas reduction projects in California.

Our work on energy efficiency, support of clean generating technologies and ClimateSmart are just a few examples of the advanced energy solutions we provide to our customers. Through technology and innovation we allow our customers to meet their energy needs while providing unique opportunities for them to manage their energy use, reduce costs, promote new technologies and address climate change.

PG&E'S POSITION ON CLIMATE CHANGE

As the head of a major energy company—and also as an American and a great believer in our nation's unique place in the world—I believe the United States has a responsibility to be at the forefront of and be a leader in addressing global climate change.

The U.S. is among the largest emitters of greenhouse gases, both in terms of absolute emissions and on a per capita basis. And, based on our wealth and prosperity relative to other nations, it's clear that we have the ability to demonstrate leadership and make a difference.

The U.S. has a tremendous capacity for innovation and it is clear that we have the human capital to develop the solutions. By signaling, as a Nation, that we are serious about making progress on clean energy, we can stimulate investment and engage our best and brightest minds in this effort.

The longer we wait, the costlier the solutions will likely become. On the other hand, by acting now, we preserve valuable response options. We narrow the uncertainties. And we avoid the economic and social dislocation associated with having to make drastic changes later.

From PG&E's perspective, the risk of inaction on climate change is tremendous, while, if structured properly, a program to address climate change can create economic opportunity for us as a nation and elevate the U.S.'s leadership position in the world. The nation's energy infrastructure is aging and also must be expanded to meet a growing population and a more demanding economy. Hundreds of billions in new investments will be made. We could make the same investments we have been making for thirty years, or take the opportunity to make investments to sup-

port the economy as we want it to be, and as it will need to be, thirty years from now. These investments can enhance our energy security and advance technology, while achieving our climate change goals.

If we do not act now, the U.S. will miss the opportunity to become a technology leader, improving our competitiveness, while at the same time increasing the risks that dramatic changes in our climate will occur, stressing both our economy and citizens.

That is why, for more than a decade, PG&E has been actively looking for ways to address climate change that provide benefits to our customers and help advance technology. In order to effectively reduce greenhouse gas emissions to levels necessary to avoid dangerous climate change, we will need to fundamentally change the way we produce, deliver and consume energy in this country and throughout the world. We recognized this as a company and determined that it was our responsibility to lead and take action, as have others in our industry and industries throughout the economy. The actions by companies like ours have allowed us to advance technologies and understand the possibilities that currently exist, and also to understand what needs to be done to move forward. And, it is the investments made by our customers, and the customers of others in our industry, that have made this possible.

As climate change is a global issue, policies are needed to both maintain and accelerate these types of actions and investments and to provide a roadmap for transitioning to a low-carbon economy and the energy infrastructure to support it.

PG&E recommends the following principles to guide the development of climate policy that achieves these goals:

• *Mandatory greenhouse gas reductions are necessary.* Voluntary programs alone are insufficient and will not send the appropriate price signal to U.S. industry to make a measurable impact on global climate change. Only a mandatory, national reduction program is capable of stimulating sustained action and investment on the scale required to meaningfully reduce emissions and establish the U.S. as a leader in the response to global climate change.

• *Market-based programs minimize costs and maximize innovation.* Market-based strategies—such as cap-and-trade—provide the economic incentive and the flexibility to cut emissions in the most innovative, cost-effective ways. This approach is key to driving development of the next generation of clean, highly energy-efficient technologies and practices.

• *Long-term greenhouse gas targets provide a rational basis for action.* Addressing climate change will ultimately require stabilizing greenhouse gas concentrations in the atmosphere at a level that will avoid dangerous climate change. Setting ambitious, but achievable, targets now is important because it establishes a clear objective and sends the appropriate price signals from which incremental objectives and action plans can be created, as technologies emerge and scientific understanding progresses.

• *Broad-based participation leads to better, more cost-effective results.* Multi-sector participation creates efficiencies that will be essential to keeping costs low. A national program should eventually encompass all major sectors that emit greenhouse gases, with each sector responsible for its fair share of reductions. Sector-specific programs can, however, serve as a starting point for creating the infrastructure on which to base a broader, economy-wide program and strategy.

• *Energy efficiency must be a top priority.* Improving energy efficiency is one of the lowest cost options for managing growing energy demand, while eliminating greenhouse gas emissions. Policies and incentives should encourage and maximize improvements in energy efficiency throughout the economy. For example, utilities are empowered to aggressively pursue energy efficiency and demand response programs when regulators "decouple" the link between revenues and earnings by setting fixed revenue levels and eliminating the financial incentive to sell more energy.

• *Investment in low-and zero-emission electric generation and other technologies is critical.* Policies should lower barriers and create incentives for investment in renewable power, nuclear power, advanced coal technologies with carbon capture and storage, distributed generation, advanced transportation options, such as plug-in electric hybrid vehicles, and other low-and non-emitting technologies. Driving investment in these technologies, along with aggressive support for energy efficiency and demand response, will reduce greenhouse gas emissions, enhance and improve the efficiency and reliability of the nations' energy infrastructure, create economic opportunities for American business, reduce reliance on imported fossil fuels, and support overall U.S. energy independence and security.

• *Early action deserves to be rewarded—not penalized.* Policies must recognize and provide credit to responsible parties that have proactively cut emissions before being required to do so. Ignoring prior efforts sends a signal that stepping up, tak-

ing risks and taking responsibility is not something valued by policymakers. It also puts these parties at a competitive disadvantage, forces them and their customers to "pay twice" for emissions reductions, and discourages similarly responsible initiatives in the future.

• *Any climate program must be economically sustainable, achieve the ultimate environmental objectives of the program, and begin to address physical impact and adaptation issues.* Some economic sectors, geographic regions and income groups may be disproportionately impacted by both climate change impacts and mandatory greenhouse gas reductions. Any climate protection program needs to take account of these impacts and provide appropriate assistance to those impacted constituencies. At the same time, policies need to recognize that, ultimately, the majority of program costs will be born by energy consumers, and policies must therefore be structured to address this issue.

• *Near-term opportunities for cost-effective, verifiable greenhouse gas reductions should be pursued.* Policies should encourage greenhouse gas reductions, regardless of their geographic location or from where in the economy these greenhouse gas reduction opportunities originate. At the same time, a rigorous system must be developed to ensure the environmental credibility and integrity of these reductions. Taking this approach can help to encourage actions by other countries, spur technological innovation, reduce overall compliance costs and offer ancillary benefits.

• *Standardized emissions reporting is an essential first step and must form the basis of any mandatory program.* Developing consistent and coordinated greenhouse gas emission inventories, protocols for standard reporting and accounting methods for greenhouse gas emissions is fundamental to establishing a credible reduction program that is capable of tracking and verifying progress toward emissions goals and facilitating a tradable emissions credit system. PG&E was a Charter Member of the California Climate Action Registry, which is now working with 30 other State. to develop a consistent set of reporting standards and protocol. We believe that this effort can serve as a model for a national system and that any national system should leverage the work that the State. have already done.

DEVELOPING A RESPONSE

These principles guide our analysis of legislative proposals and policies and calibrate our participation in various coalitions. For example, PG&E is a founding member of both the Clean Energy Group, a coalition of environmentally progressive power companies supporting mandatory, market-based solutions to addressing climate change and air quality, and the U.S. Climate Action Partnership (USCAP), a coalition of leading businesses from a diverse range of industry sectors as well as leading environmental organizations. Together we support a mandatory, flexible, market-based approach to reducing greenhouse gas emissions.

In terms of legislation, PG&E has supported Senator Carper's Clean Air Planning Act of 2007 and Senator Feinstein's Electric Utility Cap and Trade Act of 2007. At the State level, PG&E was one of a handful of businesses to support Assembly Bill 32, the Global Warming Solutions Act, California's landmark greenhouse gas legislation. All of these legislative proposals recognize that market-based programs are needed to address climate change, greenhouse gas emission reductions can and must come from various sectors of the economy to allow for the most cost-effective reduction options, early actions should be recognized and accounted for, clean energy technologies and energy efficiency are key to addressing climate change, and a long-term emissions pathway is needed to allow for investment certainty and a long-term price signal.

With regard to the Clean Air Planning Act, one of the bills being discussed here today, PG&E also recognizes the importance for our industry of having long-term certainty with regard to emission reduction requirements for other major air emissions, such as sulfur dioxide, nitrogen oxide and mercury. Actions taken and investments made to reduce these emissions from power plants can have an impact on a facility's carbon dioxide emissions. Having a clear emissions reduction pathway for these pollutants, in addition to carbon dioxide, particularly in the next 10 to 15 years, will allow for our industry to make the most prudent and cost-effective investment choices.

Our industry is on the cusp of making more than $700 billion in investments to meet the future electric needs of this country between now and 2020. These are long-term investments, whose costs will ultimately be paid by electric consumers. It is imperative that our industry be given clear guidance and direction, as soon as possible, so that we make the right choices for the environment, for the economy and for our customers.

That is why we support the Clean Air Planning Act of 2007. We believe that taking the approach called for in this legislation will create clarity for business; create focus for a comprehensive electric power sector strategy; provide linkages to other sectors of the economy and the world; and allow us to begin to change the U.S. emissions trajectory today. This is particularly important given that the power sector accounts for approximately ⅓ of total U.S. greenhouse gas emissions.

I would also like to spend a little time addressing some of the key program design elements for reducing carbon dioxide provisions and their importance. These include the emissions trajectory, compliance flexibility mechanisms and allowance allocation approach. It is these provisions that I believe will most directly impact our sector's ability to address climate change cost-effectively, efficiently and accelerate the transition to the energy infrastructure needed to meet our greenhouse gas reduction responsibilities. For purposes of this testimony, I will focus on how the Clean Air Planning Act addresses these elements.

EMISSIONS TRAJECTORY

The Clean Air Planning Act provides an appropriate glide path for reducing electric sector greenhouse gas emissions by starting slowly, and then gradually ratcheting down the cap over several decades. This approach provides opportunity for technology solutions to develop, while ensuring a significant contribution from the electric sector toward a broader, economy-wide reduction goal. It also provides a long-term price signal, which will be vital for driving investment in low-carbon technologies.

Initially, we believe the caps proposed by the Clean Air Planning Act can be achieved with existing technologies and investments, including energy efficiency, renewable energy, greenhouse gas offsets and high efficiency coal and natural gas-fired generating technologies. Over time, advanced coal technologies with carbon capture and storage capability, next generation renewable technologies, like tidal and solar thermal, and advanced nuclear technologies will need to play a serious and greater role in America's energy future.

The European Union's short-term compliance periods—leaving industry guessing about their longer-term reduction obligations—is not a model to emulate. Businesses, particularly in our sector, need to understand what requirements will be for decades, as opposed to years, as some technologies, particularly advanced coal with carbon capture and storage and nuclear, have long lead times, entail project costs on the order of billions of dollars and are meant to serve customers for years to come. Again, we recommend a long-term reduction trajectory to guide investment decisions.

I would like to focus for a minute on energy efficiency as a near-term response option to climate change. Energy efficiency can and must play a key role in meeting the nation's energy needs. The recent energy legislation passed by the Senate recognized energy efficiency as a resource and asks State. to review existing regulatory policies to ensure that they do not impede achievement of this goal. In California, energy efficiency is the first resource we look at to meet our customer's electric demand. In fact, we meet half our demand growth (approximately 1 percent per year) through energy efficiency. Over the past 30 years, we have avoided the need to build approximately 24 large power plants to meet our customers' needs and have saved them money in the process.

Placing this type of "full court press" on energy efficiency nationally over the next 5 to 10 years could allow the Nation to offset the need to make the significant investments in conventional generating technologies that are contemplated, while low- and non-emitting generating technologies become more competitive and are tested and proven. This will help our sector to cost-effectively meet our customers' energy needs, slow and potentially stop the growth of emissions, maintain investment flexibility and reduce demand on natural gas—an important feedstock and energy source for many U.S. manufacturers.

PG&E's customers have seen tremendous benefit from our partnership with them on energy efficiency. For example, in partnership with Sun Microsystems, PG&E developed an incentive program for energy-efficient servers. PG&E also announced the first-of-its-kind utility financial incentive program for virtualization projects in data centers, which enable customers to consolidate IT workloads, using dramatically less energy. One major software firm, for example, was able to consolidate workloads that were running on 230 servers onto just 13, capturing tens of thousands of dollars in energy savings.

COMPLIANCE FLEXIBILITY

We all recognize the need to control the costs of achieving our greenhouse gas reduction goals, and the Clean Air Planning Act offers several cost control mechanisms that we think are vital to the success of a cap-and-trade program. These include greenhouse gas offsets, multi-year compliance periods, the banking of allowances and credit for early action.

Greenhouse gas offsets. High quality greenhouse gas offsets—which allow power companies to invest in reductions outside of our sector—reduce the costs of the program by providing a broader array of reduction opportunities, while stimulating innovative compliance solutions. For example, PG&E is partnering with dairy farms in California to produce pipeline quality "biogas" to serve our customers. This effort will not only reduce greenhouse gas emissions by offsetting fossil fuel use and capturing methane that would otherwise be released to the atmosphere, but it also diversifies our energy supply mix, provides additional economic opportunities to the farm sector and advances technology that can be deployed elsewhere in the U.S. and abroad.

Multi-year compliance periods. Cap-and-trade programs for conventional pollutants are typically based on annual compliance periods. At the end of each year, affected sources retire allowances for each ton of emissions they generated. However, because of the long-term nature of the climate change problem, multi-year compliance periods, like the 2-year compliance period proposed by the Clean Air Planning Act, are perfectly appropriate. This flexibility is particularly useful for the electric power sector because our emissions can vary significantly depending on weather and precipitation. For example, a dry year reduces hydroelectric capacity and increases our reliance on fossil-fired power plants, increasing carbon dioxide emissions in that year. Multi-year compliance periods can help manage this variability.

Banking. One of the most important aspects of the cap-and-trade regulatory approach is the ability to "bank" allowances for future years. By allowing companies to, in effect, "over-comply" and carry forward any excess allowances, banking greatly encourages compliance, slowing the accumulation of greenhouse gas emissions in the atmosphere. Given the long-life of greenhouse gases in the atmosphere and the cumulative effect, the more we can avoid releasing now and in the early years of a program, the more flexibility we will have in the future.

Credit for early action. Even before the program gets underway, early reduction credits can be used to encourage investments in low-carbon technologies. The Clean Air Planning Act creates a limited reserve of allowances to reward companies for their early reduction efforts. We think that this sends the right signal to industry to act now to begin to slow the growth of emissions.

ALLOWANCE ALLOCATION

The methodology used for distributing emissions allowances is perhaps the most challenging aspect of designing a cap-and-trade program. By capping electric sector greenhouse gas emissions, Congress will be establishing a new commodity—the emission allowance. These allowances will have tremendous value in the open market, on the order of billions of dollars annually, in aggregate, dwarfing any past emissions trading market. It's no surprise then that companies and other stakeholders have strong opinions about the most appropriate method for distributing these allowances.

Recognizing that there are divided opinions on this subject and multiple objectives to serve in allocating allowances, I offer the following principles, which guide PG&E's thinking on the distribution of allowances and which I believe are generally consistent with the recommendations of USCAP.[1]

- Create a smooth economic transition for those that are adversely impacted by the program, such as businesses and their employees that face intense, international competition.
- Use the allowances to accelerate the development and deployment of new technologies, including advanced coal, nuclear and renewable generating technologies and carbon capture and storage technologies.
- Avoid penalizing early actors and their customers.
- The customer at the end of the energy supply chain—like the households and businesses that we serve—will ultimately bear a substantial share the costs associ-

[1] USCAP does not endorse any particular allowance allocation methodology. The members of the group have a diversity of opinions on this issue. The allowance allocation language in the USCAP's recommendations provides a framework within which Congress can resolve this important question.

ated with the regulation of greenhouse gas emissions. The allocation system should recognize and compensate for these costs.

• Avoid creating unintended "windfalls" for companies by granting allowances whose value is far in excess of the costs of compliance or of mitigating costs for those company's customers.

We think there are several options for designing a cap-and-trade program to meet these objectives.

For example, the Clean Air Planning Act initially allocates—at no cost—a substantial share of the allowances to the electric power sector (82 percent). Only 18 percent of the allowances are auctioned initially. Assuming an average allowance price of $10 per ton, this translates to the free distribution of more than $20 billion in value in the first year of the program alone.

The bill gradually transitions to a full auction over the course of 25 years with the revenues dedicated to various initiatives, including assistance for displaced workers and disproportionately affected communities, low-interest loans, loan guarantees, grants, and other financial awards for clean coal technology development and deployment and energy efficiency research and development. The bill also establishes a special reserve of allowances to provide incentives for clean coal technology projects. These incentives will be critical as we transition to a lower carbon energy system that allows the U.S. to continue to use one of our most abundant energy resources—coal.

In terms of the allowances that are freely allocated to the electric power sector (the bulk of the allowances in the early years of the program), the Clean Air Planning Act proposes distributing the allowances based on a company's proportional share of electricity production or output, with the allocations updated each year to reflect a company's current production levels. This approach—known as an updating, output-based allocation—naturally adjusts to the changing dynamics of the industry. Retired units, no longer generating power, are phased out of the allocation, and new generating facilities are phased in to the system once they begin generating power. We think that this is a significant improvement over the approach used by the Clean Air Act's Acid Rain program.

Also, by distributing the allowances based on electricity output, a financial incentive is created for investment in power plant efficiency upgrades and you encourage investment in new energy technologies.

One issue that was not fully addressed in the Clean Air Planning Act, but an issue that is gaining increased attention as we unravel the lessons from the European cap-and-trade experience, is the treatment of allowances in regulated versus unregulated power markets. In Europe, and we would expect this to be true in unregulated power markets in the U.S. as well, power companies will reflect the cost of allowances in their wholesale power prices regardless of whether they initially received the allowances for free. Electricity customers pay more for electricity and power companies receive a valuable asset in the form of allowances.

In regulated power markets, a different set of issues emerges when a large share of the allowances are allocated at no cost to generating facilities and energy regulators claim the allowances for the benefit of the energy consumers within their jurisdiction. First, some State. import a significant share of their power and would never see the benefit of the allowances allocated to power plants outside of their borders. California, for example, imports 22 to 32 percent of its electricity supply and most power distribution companies, whether they are investor-owned or municipally owned utilities, purchase power from the wholesale markets on behalf of their customers. So while customers in State. that import a large share of their power supplies will face higher wholesale power prices, they see no benefit from the free distribution of allowances to out-of-State power plants. Again, this raises important equity concerns that should be factored into the allocation methodology.

The National Commission on Energy Policy, the California Market Advisory Committee and the Natural Resources Defense Council in separate reports have each outlined an alternative approach that we find compelling to avoid the inequities and the inefficiencies that stem from an Acid Rain-style allocation approach, while benefiting electricity consumers. Rather than allocating free allowances to power plants, allowances would be allocated to local electric distribution companies on behalf of their customers. Local distribution companies would in turn sell the allowances allocated to them to regulated sources, returning the proceeds to their customers through rebates, low income assistance programs, economic development rates or other programs that help to mitigate costs or reduce demand. In this way, you ensure that the value of the allowances flows to energy consumers who ultimately bear the costs of the program. This provides a more equitable and more rational basis for distributing the allowances, as compared to an Acid Rain-style, input-based allo-

cation. PG&E has expressed support for this concept in the context of California's AB 32 implementation process.

THE TIME IS NOW

Our country has an historic opportunity to change the way we produce and use energy in ways that will lower the threat of climate change and improve our environment. The optimist in me is certain that we're going to achieve this goal over the course of the next generation. But the realist in me knows that we can't take this outcome for granted. Achieving it will be a very substantial challenge. And that is why we are committed to being a pragmatic, responsible participant in this effort.

On behalf of PG&E, I want to thank you for the opportunity provided today. I appreciate the commitment of this Committee to addressing this critical issue and I pledge my cooperation and support as this Committee and Congress moves forward.

Thank you.

RESPONSES BY PETER A. DARBEE TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. As your testimony points out, California has been able to meet half its electricity demand growth through energy efficiency. What measures or tools have proven useful in encouraging home and business owners to become more energy efficiency?

Response. California has been a leader in energy efficiency for more than three decades, allowing the State to keep *per capita* electricity consumption flat—that is, no growth—over over the time period), while *per capita* electricity consumption for the United States during the same period has increased by approximately 50 percent. Over the next several years, California is poised to build on this success by meeting approximately half of its electricity demand growth through energy efficiency. PG&E expects to meet this aggressive goal and will do so through a variety of measures and programs, which are supported by established regulatory structures and other efforts.

The following summarizes what has helped California be successful to date, as well as what PG&E is doing to achieve these aggressive energy efficiency goals going forward:

• *A supportive regulatory structure and environment.*—Many rate designs create financial disincentives for utilities to promote energy efficiency. California's model of "decoupling" removes these disincentives: utility revenues and earnings are independent of actual energy sales. Decoupling eliminates the financial incentives that are found in some state regulatory schemes for selling ever-increasing amounts of energy (i.e., the financial incentives are "coupled" with growth in power sales). Under California's decoupling framework, the state's utilities collect no more and no less than the revenues necessary to run their business and provide a fair return to shareholders. If sales rise above these levels, the extra revenues go back to customers, rather than to the bottom line of the company; if sales fall below intended levels, utilities are assured they can recover the shortfall going forward. Energy efficiency goals can be achieved even more effectively if decoupling is combined with incentives that help motivate utilities to promote and embrace energy efficiency and put it en par with similar investment opportunities, such as building new generating facilities.

In addition to properly aligning incentives for utilities, California has recognized the need for long-term commitment to and has established a consistent regulatory environment for the development and support of leading energy efficiency efforts. For example, PG&E's current cycle for program development and investment is 3 years. By providing PG&E with a 3-year energy savings target and the authority to fund these efforts over this time period, PG&E is able to establish programs and measures, and engage with customers on some high-value efforts that have longer lead-times. We are also working on provisions for the next funding cycle that will allow us to work with customers who are designing new facilities many years in the future. By making commitments to enhanced energy efficiency early in the design process, customers can have assurance that the incentives will be available to them even though construction will be completed several years in the future. One example is the expected reconstruction of a significant number of California hospitals.

By having an established savings target and consistent level of funding over multiple years, we are also able to work with manufacturers and distributors of products and energy efficient equipment, because we can make multi-year commitments to support commercialization and deployment efforts.

And, finally, California has put significant emphasis on developing evaluation, monitoring and verification (EM&V) programs to track and account for these savings. Establishing transparent, consistent and understandable EM&V methodologies is critical for energy efficiency to gain broad acceptance by customers and shareholders, and those investing in energy efficiency projects.

• *Partnerships with other utilities, regulators, customers, and other stakeholders.*—California's success with energy efficiency is the result of a cooperative working environment at all levels. For example, PG&E has partnered with local governments to help them reduce energy usage, save money, achieve environmental goals and provide additional community benefits. One example is our partnership with Sonoma County, in which we helped to establish the Sonoma County Energy Watch program. Through this program, which is one of 20 throughout our service area, PG&E will work with county representatives to improve energy efficiency and reduce greenhouse gas emissions from residences, schools, colleges, retail stores, office buildings, the high-tech sector and agricultural interests. Some of the key activities include facilitating "building tune ups," supporting energy efficiency retrofits in wastewater and water treatment facilities, conducting outreach to realtors/home inspectors to use building/home inspections to identify energy saving opportunities, and conducting targeted energy audits, outreach, and training. Through this partnership, we project savings of approximately 7.6 million kilowatt-hours for the 2006–2008 timeframe.

• *Efficiency improvements to building codes and appliance standards.*—Approximately half of the energy savings achieved over the past three decades in California are the result of the States aggressive building codes and energy efficiency standards for end-use equipment and appliances. These codes and standards provide the foundation for all other energy efficiency efforts and serve as a platform from which new technologies, programs and practices are established. PG&E has dedicated employees that support the efforts of the California Energy Commission, the U.S. EPA's EnergyStar Program and others through our Codes and Standards Enhancement program. The program advocates the inclusion of energy-efficiency measures in state codes for buildings and appliances and conducts studies that assess the costs and benefits of the proposed changes.

• *Including manufacturers and distributors in efficiency efforts.*—PG&E works directly with manufacturers of energy efficient products and equipment as well as distributors to help develop and commercialize energy-efficient technologies. PG&E will use part of the nearly $1 billion we will spend to support our energy efficiency efforts through 2008 to "buy-down" the costs of these products and equipment prior to them reaching the mass market. For example, PG&E works with both the manufactures of compact-fluorescent lamps (CFLs) as well as the retail outlets, such as Costco Wholesale Corporation, that sell the product to reduce the price paid by the consumer at the time of purchase. This helps to simplify the process for the consumer and make these highly-efficient bulbs more competitive. As a result of these efforts, we expect more than 20 million CFLs to be purchased this year in our service area alone.

In addition to working to advance the market penetration of existing energy efficient products, PG&E operates an Emerging Technologies program to accelerate commercialization of new energy-efficient technologies. The program identifies promising technologies for PG&E to promote to our customers by screening and assessing newly-commercialized technologies, and identifying and establishing channels to deploy these new energy efficiency solutions. With a $3.7 million annual budget, PG&E's Emerging Technologies program is targeting more than 60 technologies, including light dimming fixtures for commercial building stairwells that go to full brightness when someone enters the stairwell, energy saving cooling systems for computer data centers and high-performance lighting for classrooms.

• *Creating targeted customer programs outreach and education efforts.*—PG&E has more than 900 programs and measures available to provide energy solutions to our customers. This allows us to create targeted energy solutions that meet our customers' needs and maximize energy saving opportunities. These programs are segmented by customer class and type and supported by professionals knowledgeable about the customer segment being targeted. Some examples of programs and measures include comprehensive energy audits for industrial customers, refrigerator recycling programs for residential customers to facilitate deployment of more energy efficient products, financial incentive programs for virtualization projects in data centers, air conditioner refrigerant charge and air flow checks for residential and small commercial customers in air-conditioning-intensive regions of our service area, and design assistance and incentives for refrigerated warehouses and other aspects of the agricultural and food processing sector.

In addition to these targeted programs, we work closely with the other utilities in California, state and federal agencies, energy efficiency and environmental groups, manufacturers and retailers, and other stakeholders to educate our customers about the environmental and cost-savings benefits of energy efficiency and the programs available to help customers. An aggressive education and outreach program is critical to overall success, as we must work closely with our customers and provide them with the necessary information so that they can make informed choices. We conduct these education and outreach efforts in multiple languages to ensure that all of our customers are able to participate fully and realize the benefits of these programs and measures.

Question 2. You recommend that companies that reduce carbon dioxide emissions before they are required to do so be given "early reduction credits." How can we be confident that these are actual reductions in advance of any legal requirements governing verification of reductions?

Response. PG&E believes that recognizing early action is an important principle for any environmental program so that industry is encouraged to be proactive in reducing its environmental impact. This is particularly true for climate change, where the challenge is to reduce the cumulative build-up of greenhouse gas emissions in the atmosphere over many decades. Therefore, actions prior to the start date of a program should be encouraged, as should actions taken before enactment of federal legislation.

At the same time, your question raises an important issue regarding the environmental integrity of early reduction credits. We believe that perhaps the most effective and efficient way to recognize early actions and ensure the integrity of such carbon reductions in the power sector is through the so-called allocation methodology. Allocating emission allowances based on actual carbon output (i.e., lbs. of carbon dioxide emitted per megawatt-hour (CO_2/MWh))—as opposed to allowances tied to levels of historic emissions or the fuel consumed—will inherently take into account the investments that have already been made by companies, and their electric power consumers, in lower-emitting technologies. Those companies with an emissions rate that is below the national average will essentially have excess credits to sell, while those with emissions rates above the national average will need to purchase credits. This is one method for recognizing early reduction investments and encouraging companies to continually make investments to reduce their carbon "footprint" prior to the start of a program. In contrast, if a company believes that it will receive a higher share of allowances if it defers making investments in lower emitting technologies, then it will continue to emit at current levels, or potentially increase its emissions levels, depending on the baseline year selected for determining the allowance allocation.

There are other mechanisms available as well, including creating a limited "set-aside pool" of allowances available for early reduction credits or limiting the distribution of credits to entities that have reported reductions under specific programs such as the California Climate Action Registry, EPA's Climate Leaders and other voluntary programs, or the 1605(6) reporting Program. Requiring such reductions to be verified through one of these established programs will help ensure that early reduction credits are distributed for actual reductions.

However, unlike using the allocation methodology for recognizing early carbon reductions, many of these programs are unlikely to capture investments made by electric power customers in things like energy efficiency and renewable generation technologies. California's energy consumers have paid for deploying these technologies and helped the state to achieve significant emissions reductions in the process. Many of these early actions would not be fully captured under these other methods and therefore must be captured in some other way to ensure that these customers do not "pay twice" for emission reductions.

Question 3. If utilities are given allowances for free, will utilities pass along the savings to consumers or will they increase the price of electricity to reflect the market value of the allowances?

Response. If allowances are given to utilities (or perhaps, more appropriately, generators of electric power) for free, their treatment will depend on whether the company is subject to cost-of-service regulation or whether the company is a competitive supplier. In competitive electricity markets, where electricity rates are set by marginal costs, the generators will generally pass on the cost of the allowances regardless of whether they were initially allocated for free and customers would experience electricity rate increases reflecting the market value of the allowances. In contrast, generators subject to cost-of-service regulation will generally not be able to reflect the value of the allowances in their customer rates because electricity regulators will not allow them to pass through the cost of the free allowances.

In response to these dynamics, PG&E and others have been considering an alternative emissions allowance allocation approach that would both preserve the carbon "price signal" needed to stimulate demand side responses, while at the same time helping consumers (i.e., the households and businesses that ultimately pay the cost of the program). This approach involves allocating allowances to local electricity distribution companies on behalf of their customers. Local electricity distribution companies would be required to sell the allowances allocated to them to regulated sources at a fair market-value, returning the proceeds to their customers through rebates, low-income assistance programs., or other programs that help to mitigate costs and reduce demand. In this way, the value of the allowances flows more directly to the energy consumers who will ultimately bear the costs of the program. This allocation approach provides a more rational and equitable basis for distributing allowances, as compared to an Acid Rain-style, input-based allocation system. As explained in my testimony before the Committee, PG&E has expressed support for this concept in the context of California's AB 32 implementation process.

Question 4. I understand the merits of your allocation preference, but I would like your response to the rationale of other approaches. For example, if power plants are given emission allowances that do not reflect how much carbon dioxide they emit, won't that make it harder for plants that run on coal or other fossil fuels to afford the emissions reductions they will need to achieve?

Response. An allocation approach that reduces the amount of allowances provided to fossil fuel-fired power plant—whether it is otherwise allocating allowances to clean or renewable energy facilities, or auctioning the allowances—may impact the profitability of a CO_2 emitting facility (simply because they would receive fewer valuable allowances), however this will not necessarily make it harder for these facilities to continue operating. Power plants are dispatched (or called upon to operate) based on their relative operating costs, with the lowest cost facilities dispatched first. Because coal is an inexpensive fuel source, CO_2, allowance prices would need to exceed $20 per ton before the operating costs of a coal-fired power plant would approach the costs of a natural gas-fired power Plant—a much lower carbon-emitting, but more expensive fuel option. In general, a coal-fired power plant will remain economic even if it were required to purchase 100 percent of its allowances.

We think this provides policymakers with the flexibility to use the distribution of emissions allowances to serve a broader range of public policy objectives, rather than simply allocating allowances for the economic benefit of coal-based generators and their shareholders. Several of these broader public policy objectives were outlined in my testimony, including the following:

- Create a smooth economic transition for those that are adversely impacted by the program, such as businesses, and their employees, that face intense, international competition.
- Use the allowances to accelerate the development and deployment of new technologies, including advanced coal, nuclear and renewable generating technologies and carbon capture and storage technologies.
- Avoid penalizing early actors and their customers.
- The customer at the end of the energy supply chain—like the households and businesses that we serve—will ultimately bear a substantial share the costs associated with the regulation of greenhouse gas emissions. The allocation system should recognize and compensate for these costs.
- Avoid creating unintended "windfalls" for companies by granting allowances whose value is far in excess of the costs of compliance or mitigating costs for those company's customers.

Many of these public policy objectives can be accomplished through a combination of the following: allocating allowances to local electricity distribution companies on behalf of their customers; allocating allowances to generators using an updating, output-based methodology; allocating allowances to states for use to support public purpose programs or to help disproportionately impacted communities or constituencies; and auctioning a portion of the allowances and using the proceeds to support various objectives, such as technology development and deployment, adaptation assistance, and/or support for low-income energy consumers.

Question 5. Can an allocation system both encourage the use of cleaner technologies and help coal-fired power plants reduce their carbon dioxide emissions?

Response. Yes. There are two basic mechanisms by which the allocation approach can encourage the use of cleaner technologies and help coal-fired power plants reduce their carbon dioxide emissions. First, allowances can be allocated to all forms of generation based on their proportional share of electricity output, including coal-fired power plants equipped with carbon capture and storage technology. By issuing allowances based on output, an incentive is created—much much like the way the

existing production tax credit works—that will encourage investment in new, higher efficiency generating technologies. Second, proceeds from the auction of emissions allocations—if that approach is selected—can be used to defray the costs of clean coal technologies through grants, loan guarantees, and other financial mechanisms.

RESPONSES BY PETER A. DARBEE TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. What business risks are associated with potential climate change legislation and have these risks been documented in your 10-K filings with the U.S. Securities and Exchange Commission (U.S. SEC) and appropriate disclosure to shareholders?

Response. PG&E Corporation's and Pacific Gas and Electric Company's joint 2006 Annual Report to Shareholders included a discussion of the potential operational and financial risks associated with climate change and with potential federal and state legislation to address climate change. Both the 2006 Annual Report to Shareholders and the joint 2006 Annual Report on Form 10-K included a discussion of Assembly Bill 32, California's landmark climate change legislation, and Senate bill 1368, which impacts long-term power purchase agreements in California, and the risk of increased compliance costs and electricity prices.

Question 2. If a cap-and-trade program such as the 2007 Bingaman-Specter bill and the 2007 McCain-Lieberman bill were implemented, what would be the gross costs imposed in your business operations? What would be the gross revenue? What would be the net cost/revenue?

Response. PG&E has not conducted a formal financial analysis of either the Bingaman-Specter bill or the Lieberman-McCain bill. We expect that it is likely that some provisions in these bills will be modified over the course of the legislative process, and that other legislative proposals on this subject are likely to be introduced and considered as well. In addition, several key aspects of the cited pending bills are not fully defined or left to the discretion of the administrative agencies to make determinations subject to notice and comment rulemakings. Therefore, providing a definitive assessment is not possible at this time.

Senator BOXER. Thank you so much, Mr. Darbee, from Pacific Gas and Electric. How many customers do you serve?

Mr. DARBEE. We serve about 15 million customers.

Senator BOXER. Thank you.

Our next speaker, we are going to right down, is Jason Grumet, executive director of the National Commission on Energy Policy.

STATEMENT OF JASON GRUMET, EXECUTIVE DIRECTOR, NATIONAL COMMISSION ON ENERGY POLICY

Mr. GRUMET. Madam Chairman, it is a pleasure to be here, Senator Inhofe and committee members, on behalf of the National Commission on Energy Policy.

The National Commission on Energy Policy, as you may know, is a professionally and ideologically diverse group of 21 leaders from environmental organizations, business groups, globally known scientists, labor leaders, former legislators and Government officials. We came together in 2002 with an aspiration that we could seek to develop consensus policy agreements that might help to forge a more constructive center in what we all know too well to be a rather polarized debate on energy policy.

On climate change, Madam Chairman, our Commission embraces the recent scientific descriptions offered by the IPCC. We believe that it is fundamentally imperative that the United States act urgently to reduce our own emissions and to lead the rest of the world with true resolve so that we can in fact achieve an equitable and effective global program that includes all major emitting nations, India, China, Brazil and down the line.

In April 2007, Madam Chairman, we strengthened a number of our recommendations and offered some specifics on allocation. We have provided those to the committee and we just recently completed some economic analyses of those recommendations, which we will provide today.

We fundamentally chose to maintain the basic architecture of our recommendations, which we think are critical to maintain the economic protection necessary to forge the bipartisan compromise that is going to be ultimately necessary to legislate on this issue.

I am going to focus the balance of my remarks on the issue of allocation. I would just like to note with some optimism that we believe there are three other architectural elements of climate change program that hold the key to bridging what has been such a contentious and divisive issue. I would like to note with greater optimism, Senators Lieberman and Warner, that I think they are the same issues that you both identified the other day, and we are very eager to work with you to try and build that consensus together.

First and foremost, our commission believes we must overcome this false choice between limits on emissions versus technology programs. We fundamentally have to have a program that balances both. We are going to have to move forward quickly with a price that is going to inspire innovation, but recognize that we can't set that price at $80 a ton at the outset without harming the economy.

What we can do is very thoughtfully and robustly direct incentives toward the key technologies, like carbon sequestration, like renewables, that will allow us to both advance those technologies quickly while protecting the overall economy and allowing time for a transition.

Second, and I think it is obvious from the opening statements today, it was obvious from our experience, we have to accept that reasonable, informed and well-intended people are going to continue to disagree about whether it is going to be cheap and easy or incredibly difficult and costly to reduce the carbon intensity of our economy. We have been suffering this my "modeler is smarter than your modeler" fight for about a decade without a lot of progress. It is an insoluble problem, because it is based on your projection of the future, how fast you think technology will progress.

It is on this basis that our commission has argued that we have to have cost certainty at the outset of this proposal. It is going to be controversial. We recognize that. We think there are different ways you can do it. At the end of the day, though, it can't depend on someone saying, trust me. We have to be able to say with absolute surety that the cost can't be worse than X.

Over time we believe that we will evolve and we will have more confidence and we will transition to an emissions-based certainty. We think that is key. Finally, we have to focus on international linkages. America must lead. But at the same time, we recognize, as has been said, that this is global warming, not American warming. There is going to have to be an interactive set of relationships between what the United States does and other countries do over time.

Turning to allocation, let me just start and save some time by basically embracing the principles that Peter Darbee articulated.

We think that they are essentially consistent with the commission. I would like to focus for a moment on what allocation is and what it isn't. Allocation of permits has dramatic effects on the distribution of burdens and the benefits of a greenhouse gas program. It does not affect the overall cost to society, and at most it has marginal effects on the emission performance. This is about how we split up the pie at the outset of an emissions trading system.

Second, contrary, I think, to popular expectation, the measure of the costs that a country or a sector bears is not a function of their emissions, their fossil fuel input or how many permits they have to buy. It is fundamentally a function of their ability to pass along increased fuel costs. Many sectors of the economy are quite good at that. The petroleum sector passes it along with great effect. The coal sector is going to have a little more trouble with that.

Our commission believes that the purpose of allocation should be to try to mitigate those near-term transitional costs so that we have an equitable distribution, encourage technology development, protect consumers and address the costs of adapting to climate change that is going to be unavoidable.

Bottom line, in my last 30 seconds, we believe to fully and fairly compensate everybody in the energy sector, you have to essentially at the outset of the program allocate about half of the permits at no cost. With that, it doesn't mean everyone gets 50 percent, some sectors more, some sectors less. But 50 percent is the most that we need to fully mitigate those near-term costs.

It should not be an allocation forever. We believe that over time there should be a gradual transition to a full and complete auction, and that with an effective approach and allocation identifying the balance of market signals, technology programs and addressing international issues, we hope this committee can bring forward an ecologically and economically responsible effort that could become law this Congress.

I thank you for your time.

[The prepared statement of Mr. Grumet follows:]

STATEMENT OF JASON GRUMET, EXECUTIVE DIRECTOR, NATIONAL COMMISSION ON ENERGY POLICY

Good morning Chairman Boxer and Members of the Committee. I am Jason Grumet, Executive Director of the National Commission on Energy Policy—a bipartisan group of energy experts that first came together in 2002 with the support of the Hewlett Foundation and several other private, philanthropic foundations. The Commission's ideologically and professionally diverse 21-member board includes recognized energy experts from business, government, academia, and the non-profit sector (see attachment). In December 2004, we issued a comprehensive set of consensus recommendations for U.S. energy policy, which included a proposal for a mandatory, market-based program to limit economy-wide U.S. greenhouse gas emissions.[1] More recently, in April of this year, the Commission published updated recommendations that called for strengthening several key parameters of our original climate-policy proposal.

The fact that we are here today, discussing the arcane issue of allowance allocation, shows how far the political debate on climate change has moved in the last few years. Increasingly, the real question for all parties to this debate is not whether we should act, but how. What program design will achieve meaningful results, prompt wider international cooperation, and set this nation on an economically responsible path to a lower carbon future? The proposals now under discussion by this

[1] The full report, titled Ending the Energy Stalemate, can be found at www.energycommission.org. The Commission's updated April 2007 recommendations are also available at the website.

Congress contain, in our view, many of the necessary elements of a sound solution. At the same time, we are under no illusions about the difficulty of building the consensus needed to pass legislation. And in that process, we expect few issues will prove more important than allocation. Before turning to this critical subject, however, I'd like to briefly outline the Commission's broader views concerning climate policy and the reasons for urgency in moving forward.

THE SCIENCE POINTS TO MANDATORY ACTION

Two years after the Commission released its original report, the scientific case for mandatory action to reduce greenhouse gas emissions is more urgent and more compelling than ever. Over the last several months, the United Nations Intergovernmental Panel on Climate Change (IPCC) has been releasing portions of its latest (fourth) assessment concerning the science, potential impacts, and mitigation options for global warming. The IPCC assessment, which represents the consensus view of hundreds of scientists around the world, tells us that evidence of global warming from the last 6 years of climate research is now "unequivocal." It points to multiple lines of evidence, from "observations of increases in global average air and ocean temperatures" to "widespread melting of snow and ice, and rising global mean sea level" and confirms that the current level of carbon dioxide (CO_2) in the atmosphere "exceeds by far the natural range over the last 650,000 years."[2]

This increase has already led to warming—11 of the last 12 years rank among the 12 hottest years on record. And because of the long-lived gases already in the atmosphere, this warming will continue. In fact, after reviewing the likely impacts of further, unchecked warming, the IPCC estimates the onset of many of the most serious consequences—from damage to coasts from floods and storms, to impacts on water supply, disease vectors, and large-scale risk of species extinction—at somewhere between a 2°C and 3°C increase in global mean temperature. To limit warming to this level, it is now clear, will require that we begin to achieve significant reductions in global emissions by mid-century. It's an enormous challenge to be sure, since current trends are going in the wrong direction. In fact, if nothing is done we can expect global emissions to increase by as much as 50 percent in just the next 25 years (by 2030). In that case, climate scientists estimate that twice as much warming will occur over the next two decades than if we had stabilized heat-trapping gases at 2000 levels.

So to sum up: it is clear that we must begin to face this challenge. It is also clear that voluntary action will not be enough. That has been the policy of the United States for the last decade or more. And while we've seen admirable initiatives from several large companies and while important progress has been made in advancing new technologies, we are still headed in the wrong direction: down a path of continued emissions growth. In fact, U.S. energy-related CO_2 emissions were 13 percent higher in 2005 than they were a decade earlier, in 1995, and 19 percent higher than they were in 1990. According to the Energy Information Administration (EIA), our nation's energy-related CO_2 emissions are likely to grow another 34 percent by 2030 if current trends continue.[3] At the same time, we know the costs of further delay in initiating reductions are likely to be substantial. The faster we can get started, the smaller the burden of future mitigation and adaptation efforts and the smaller the human suffering and long-term environmental damage.

ELEMENTS OF AN EFFECTIVE CLIMATE CHANGE POLICY

With the potential risks of climate change no longer in doubt, it is imperative that the United States engage this issue, act responsibly, and provide leadership. Ours is the world's largest economy and it accounts for 25 percent of global CO_2 emissions.[4] Without our participation and leadership, the rest of the world cannot effectively address what could be the most difficult and far-reaching environmental problem we have yet faced. The Commission believes that the U.S. can best provide lead-

[2] APCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom. This and other IPCC reports are available at http://www.ipcc.ch/.

[3] Based on reference case forecast in EIA's 2007 Annual Energy Outlook. Available at: http://www.eia.doe.gov/oiaf/aeo/aeoref—tab.html.

[4] Note that although carbon dioxide is the predominant greenhouse gas, there are other gases that contribute to climate change. These include methane, nitrous oxide, and some industrial fluorinated gases. These gases would all be covered in the Commission's climate proposal.

ership by adopting approaches that do not significantly harm our economy and that encourage other nations to take comparable action.

As I have already said, the first requirement of an effective policy is that it be mandatory. In a competitive market economy, where companies are expected to maximize shareholder value, it is unrealistic to expect them to invest significant resources absent a profit motive. As importantly, if the world's largest economy continues to rely on voluntary action alone it is very unlikely that countries like China, India, and Brazil will take serious action aimed at limiting their own rapidly growing emissions.

What are the critical components of a mandatory approach? First, we believe that the immediate goal should be to put in place a policy architecture or framework that can last many years and be adjusted as we learn more about the evolving science, economic impacts, technological developments, and actions of other nations. We must get started with a clear signal to investors, consumers, and other nations.

Second, a climate change program should be market-based and economy-wide. We are convinced that market-based approaches, like the landmark Acid Rain Program, are the most effective way to marshal the least cost emissions-reduction options and create powerful technology incentives. And although the focus of today's hearing is the power sector, we believe that a climate program should cover the entire economy. CO_2 emissions arise from fossil-fuel consumption throughout the economy; hence only an economy-wide program can deliver maximum emission reductions at the lowest possible cost. The Commission believes that the most efficient way to implement an economy-wide program is to make the point of regulation upstream (i.e., with fuel producers or processors).

Third, we continue to believe that cost certainty is critical to forging the political consensus needed to move forward without further delay. Debates about economic impact usually bog down in fruitless disagreements over whose economic model uses the right assumptions about technology change, fuel prices, and other factors. Different assumptions can produce wildly different estimates of the costs of reducing emissions. The safety valve feature in our proposal—which would make additional emissions allowances available for purchase from the government at a predetermined, but steadily escalating price—helps to cut through that debate by assuring that the per-ton cost of emissions reductions required under the program cannot rise above a known level.

The Commission recognizes that the "safety-valve" feature is highly controversial because it favors cost certainty over emissions certainty. But we continue to feel this tradeoff is justified in the interests of overcoming political gridlock and allaying the legitimate competitiveness concerns of U.S. workers and industry. At the same time, the Commission recognizes that the need for environmental certainty is likely to outweigh the need for cost certainty at some point in the future. Indeed, once there is greater international consensus about the policy commitments needed to address climate change it will likely be appropriate to transition away from the safety valve toward firm emission caps. Meanwhile, we are also aware that other legislative proposals provide alternative cost-containment mechanisms and welcome further debate and analysis to determine which approach best addresses the cost concerns that might otherwise stand in the way of timely action.

Fourth, the Commission believes that any successful national policy must place considerable emphasis on promoting wider international cooperation. By some accounts, China is now adding new coal capacity at the rate of one large power plant every week to 10 days and is set to surpass the United States in total carbon emissions in the next year or two.[5] We continue to believe that the United States should lead and that once the United States takes action, it is imperative that our major trade partners and other large emitters follow suit. We have therefore proposed that the United States (a) review its policy every 5 years in light of international and scientific developments, (b) explicitly link continued tightening of program goals and escalation of the safety valve to progress in other countries, and (c) signal its intent to work with other countries to forcefully address trade and competitiveness concerns if other major emitting nations fail to act within a reasonable timeframe.

Fifth, the Commission believes that market-based efforts to limit greenhouse gas emissions must be accompanied by a major technology push to develop and deploy the low-carbon alternatives that will allow us to meet our environmental objectives while maintaining secure, reliable, and affordable means of meeting our energy needs. We strongly believe that a combined strategy of market signals and robust technology incentives is the most effective and least costly way to achieve a meaningful shift from business-as-usual trends, while equitably sharing the burden of

[5] See http://select.nytimes.com/search/restricted/article?res=F50B12F83A5B0C748CDDA80994DE40 4482

emissions mitigation among shareholders and taxpayers. Our approach therefore calls for a complementary package of policies and public incentives to accelerate the development and early deployment of promising energy-efficiency and low-carbon-supply technologies. Incentives would be funded from revenues generated by an auction of emission allowances, thus avoiding additional burdens on the Federal Treasury. I will elaborate on this point later in my testimony.

Finally, the Commission continues to believe that solutions to climate change must be pursued in concert with other critical energy policy objectives such as improving America's energy security, reducing oil dependence, and ensuring that the nation's energy systems are adequate and reliable to meet future needs. Thus, our recommendations in 2004 and again in 2007 called for concerted efforts to improve vehicle fuel economy; promote cost-effective energy efficiency investments; develop promising renewable energy resources, including biofuels; diversify available supplies of conventional fuels, especially natural gas, in an environmentally responsible manner; address obstacles to nuclear power; develop the technologies needed to preserve a major role for coal, especially technologies for carbon capture and storage; and invest in critical energy infrastructure.

ALLOWANCE ALLOCATION

As I have already noted, the question of how government distributes allowances at the outset of an emissions trading program is likely to emerge as one of the most important and contentious issues in developing viable legislation. It is contentious precisely because allowances represent a valuable financial asset—one that could be worth, in aggregate, tens of billions of dollars under an economy-wide greenhouse gas trading program. How that asset gets divvied up obviously matters enormously to the many stakeholders in this debate.

In past emissions trading programs, notably the U.S. Acid Rain Program and more recently, the European Union Emission Trading Scheme, the great majority of allowances has been distributed for free to the entities that appeared most directly affected by regulation (this happened to be electric power generators in the Acid Rain Program and both power plants and other large industrial emitters in the European program.). The Commission has concluded, however, that these precedents do NOT provide a good model for allocating allowances under an economy-wide U.S. greenhouse gas trading program. Rather we recommend that roughly half of the total pool of available allowances be distributed for free to industry in the early years of program implementation, while reserving the remaining half of the allowance pool to be directed for public purposes. Over time, we believe the share of allowances distributed for free should diminish gradually and in a predictable manner in favor of a more complete auction that would make additional resources available for more productive and widely shared societal investments.

Economic analyses conducted by the Commission to explore the distribution of costs under its original program proposal suggest that this approach will provide adequate allowances to compensate major energy-related industries (including suppliers of primary fuels, the electric power sector, and energy-intensive manufacturers) for any short-term economic dislocations incurred in the transition to a lower-carbon economy. At the same time, it will reduce the potential for large windfall profits and generate substantial public resources to assist low-income consumers and to invest in low-carbon technologies and end-use efficiency.

The rationale for this approach is detailed in a recent White Paper on allowance allocation developed by Commission staff. The White Paper develops a number of crucial points that are important for understanding how allowance allocation does and does not affect the way an emissions trading program works. Indeed, it is worth repeating some of the key conclusions from that report's Executive Summary here:

(1) *Allocation affects the distribution of benefits and burdens among firms and industry sectors—it does not change program results or overall costs.* Under a trading program, using an allowance is always costly—even for a firm that got the allowance for free—because it means giving up an asset that could otherwise be sold in the marketplace. Thus the incentive to reduce emissions is the same for all firms, regardless of allocation. Since allowances have real monetary value, they can be used to compensate firms or consumers without changing how different entities respond to the policy or what measures are taken to reduce emissions going forward.

(2) *The sum value of allowances is not a measure of the program's cost to society.* The market value of allowances in circulation will far exceed the costs incurred by society to actually reduce emissions. This is simply because the number of tons being reduced or avoided is much smaller than the number of tons for which allowances are issued. Trade in allowances generates costs for allowance buyers, but

equal and offsetting gains for allowance sellers. It does not represent a cost to society.

(3) *The economic burden imposed on a particular firm or industry sector under a greenhouse gas trading program is not a direct function of its emissions or fossil-fuel throughput.* Rather, the burden depends on ability to pass through costs, available emission reduction opportunities, and other factors. Available analyses suggest that consumers and businesses at the end of the energy supply chain will bear the largest share of costs under a trading program, while primary producers or suppliers of fossil fuels (oil, coal, and natural gas) will bear a smaller share. Certain firms or industries, however, may encounter more difficulty than others in passing through costs and may bear a disproportionate burden as a result.

(4) *Because they do not bear most of the cost, allocating most allowances for free to energy producers creates the potential for large windfall profits.* Economic analysis suggests that energy companies can and will pass most program costs through to consumers and businesses at the end of the energy supply chain. Allocating a large share of free allowances to these firms would likely result in windfall profits. This occurred under the EU trading program and caused considerable political outcry.

(5) *Allocation provides an opportunity to advance equity and other broad societal interests without diminishing the price signal necessary to elicit cost-effective, economy-wide emissions reductions.* A trading program works by creating market incentives—effectively attaching a price to every ton of carbon emitted. Giving away allowances won't shield firms or consumers from this price signal (indeed, this would not even be desirable since the program will generate efficient outcomes only if all parties face the same incentive to reduce emissions). But allowances can be used for a variety of productive purposes: to compensate those who bear a disproportionate burden under the policy, to advance other public policy objectives (such as supporting energy R&D), or to provide broad societal benefits (for example, making it possible to cut taxes on income or investment).

Several important implications flow from these conclusions. One is that—because cost burdens vary across different sectors and industries—there should be no presumption that different sectors are entitled to equal shares of allowances, either in absolute terms or as a fraction of their emissions or fuel use. Thus, the recommendation that 50 percent of the total allowance pool be distributed for free to affected industry should not be misconstrued to imply that every sector is entitled to 50 percent of its emissions obligation in free allowances. Rather, an allocation guided by equity considerations would award some sectors significantly more than 50 percent because they face substantial un-recovered costs, while it would award other sectors that could pass through the great majority of their costs significantly less than 50 percent.

A second very important finding in the NCEP staff White Paper is that intra-sector allocation—that is, deciding how allowances should be distributed to individual firms from within the share dedicated to a particular sector under the broader allocation—may be as difficult and contentious in some cases as inter-sector allocation. A particular challenge for policymakers in this regard—and one that merits careful consideration—is allocation within the electric power sector. Equity considerations in this case are complicated by the various regulatory structures that govern the electric industry in different State. and regions. One concern is that program costs would be largely passed through to customers in competitive retail markets (allowing generators to "keep" most of the asset value of a free allocation), while companies operating in regulated markets could be required by regulators to use free allowances to offset price impacts to consumers. Since retail markets in the most coal-intensive regions tend to be regulated, this creates the potential for a perverse outcome in which consumers that rely on a more carbon-intensive generation mix see a weaker price signal than consumers that rely on a lower-carbon mix.

In response to these concerns, some have proposed allocating directly to electric distribution companies (and providing specific guidance to State regulators about the proper treatment of these allowances), rather than allocating directly to generators. In this way all electric sector allocations would come under the purview of economic regulators—State public utility commissions in the case of investor-owned utilities, and local boards in the case of publicly owned utilities and cooperatives. Proponents argue that these authorities are in the best position to sort out the equity implications of different allocation schemes, direct appropriate levels of compensation to adversely affected firms, and ensure that end-use customers, who bear the largest share of the program costs, receive an equitable share of the asset value associated with free allowances. Others have argued for a hybrid approach that would divide the utility sector's share of direct allowances between generation and distribution companies.

In addition, as mentioned above, allowances can be used to advance other public policy objectives such as providing incentives for carbon capture and storage (CCS). The Commission believes that CCS systems should be provided with deployment incentives that are at least equal to those currently available under EPAct05 for new nuclear power plants and (via the Federal production tax credit) for renewable energy resources. In particular, the Commission strongly supports the concept of awarding bonus allowances under a greenhouse-gas trading program for projects with CCS. The financial incentives generated by such provisions could substantially exceed any direct increase in public R&D spending on CCS.

In sum, allowance allocation is extremely important and can be complicated. But I don't want to leave the impression that it's too complicated. It is neither possible nor necessary to precisely estimate net cost burdens for different sectors, let alone individual firms. But available economic models do provide a tool for assessing the rough distribution of costs and tailoring allocation decisions accordingly so that the overall result is generally transparent and can be accepted as fair by most parties. The Commission is confident that the initial approach we have proposed—by combining a 50 percent free allocation with a 50 percent auction—strikes a reasonable balance between the interests of consumers and taxpayers and the legitimate cost concerns of some industry stakeholders. By providing adequate resources to compensate firms that lose under the policy without risking significant windfall profits and while also generating resources to assist in the transition to low-carbon technologies, we believe this approach will help to ensure the success of the overall policy and advance the prospects for reaching political consensus.

Clearly, important debates on allocation and other important aspects of climate-policy design lie ahead. In closing, I would like to re-iterate that the urgent imperative to act—and to act soon—must not get lost as these debates unfold in the months to come. Getting it right is important. But so is getting started.

Thank you for the opportunity to testify today. We hope that the suggestions we have put forward will be helpful, even as we recognize that ours is not the only approach and that there are many worthwhile ideas that the Committee will consider as it moves forward. The Commission and its staff will be happy to provide whatever assistance we can offer as you continue to engage these issues in the weeks and months ahead.

SUMMARY

The National Commission on Energy Policy is a diverse and bipartisan group of energy experts that first came together in 2002 and issued a comprehensive set of consensus recommendations for U.S. energy policy in December 2004. Those recommendations included a proposal for a mandatory, market-based, economy-wide program to reduce U.S. greenhouse gas emissions in a manner that is economically responsible and encourages action by our major trade partners. More recently, in April 2007, the Commission issued a set of updated recommendations that called for strengthening several aspects of our original climate proposal.

These updated recommendations reflect our conviction that the case for mandatory action to limit U.S. greenhouse gas emissions has become more compelling and more urgent than ever. In our view, the most effective approach would:

- Establish a policy architecture that is robust enough to be sustained for many years while retaining the flexibility to adjust over time as scientific, economic, and technological developments, as well as actions by other nations, warrant.
- Be market-based and economy-wide.
- Provide cost certainty as a means of forging the political consensus needed to move forward without further delay.
- Create compelling positive incentives for wider international cooperation by conditioning future U.S. efforts on comparable action by other nations.
- Include a major technology program to spur the development and deployment of affordable, low-carbon technologies as a means of reducing the costs associated with achieving emissions goals while simultaneously advancing energy-security objectives and ensuring U.S. competitiveness in future global markets for clean technologies.
- Fairly distribute the burden of regulation among major stakeholders—including consumers and taxpayers as well as energy-intensive industries—while maximizing benefits to society as a whole through a thoughtful approach to key design issues such as allocation.
- Place the compliance obligation at or near primary fuel producers or suppliers to reduce administrative complexity and the potential for emissions "leakage" while facilitating efficient pass-through of the carbon price-signal

Allocation—that is, how government distributes allowances at the outset of an emissions trading program—is a contentious issue and one that is especially important, for reasons both substantive and political, to the success of a mandatory policy. The Commission's current position on allocation is informed by several years of analysis and debate, the results of which are described in a Commission Staff White Paper. Our chief conclusions can be summed up as follows:

• Allocation should primarily be used to promote a more equitable distribution of cost burdens, recognizing that the overall burden imposed by regulation is likely to be small in the context of the economy as a whole and that allocation does not affect program incentives or outcomes.

• Compensating major energy-related industries (including suppliers of primary fuels, the electric power sector, and energy-intensive manufacturers) for any short-term economic dislocations incurred in the transition to a lower-carbon economy should require no more than roughly 50 percent of the total pool of allowances initially available on an economy-wide basis under a trading program.

• Remaining allowances should be used to generate funds for public purposes, such as mitigating impacts on low-income consumers and investing in low-carbon energy technologies and end-use efficiency.

• Over time, the share of allowances distributed at no cost should diminish in a predictable manner as part of a gradual transition to a more complete auction.

• Within the pool of allowances distributed for free to industry, inter-sector allocation decisions should be guided by the incidence of actual cost burdens. Because the ability to pass through costs varies across different industries, there should be no presumption that industry sectors are entitled to equal shares of allowances, either in absolute terms or as a fraction of their emissions or fuel use.

• Careful consideration will need to be given to intra-sector allocation within the electric utility industry where different regulatory structures create the potential for price distortions across regulated versus competitive markets. Policymakers should therefore explore a variety of allocation options within this sector that would assure equitable outcomes for consumers and companies in different parts of the country.

The Commission is well aware that reaching consensus on the issue of allocation will not be easy: the subject is inherently complex and many of the decisions involved are fundamentally distributional in nature, which makes them difficult to adjudicate in a manner that satisfies all parties. Nevertheless, few other nuts-and-bolts aspects of designing a greenhouse-gas trading program are likely to be more important to the ultimate goal of advancing meaningful and comprehensive climate policy in the United States.

RESPONSE BY JASON GRUMET TO AN ADDITIONAL QUESTION FROM SENATOR SANDERS

Question. Your organization has spent a lot of time modeling the impacts of the Commission's original and new recommendations, released this April. Based on your new recommendations, what happens to the traditional coal boom, meaning coal plants that do not capture carbon? Does it go away, shrink or do companies continue to build antiquated coal plants?

Response. To analyze the combined impact of the updated recommendations issued by the National Commission on Energy Policy in April 2007, the Commission used the National Energy Modeling System (NEMS), a detailed model of energy production and consumption used by the U.S. Energy Information Administration (EIA) to develop forecasts and assess policy options.[1]

Our analysis shows that if the Commission's April 2007 recommendations were implemented no new conventional coal generating capacity is built between 2012 and 2030. In addition, during that period nearly 38 thousand megawatts of conventional coal generating capacity is retired. The combination of the Commission's proposed CO_2 price signal and deployment incentives for carbon capture and storage (CCS)[2] result in approximately 81 thousand megawatts of new coal generating capacity with CCS during the period from 2012 to 2030.

These figures contrast with the EIA's "business as usual" forecast, which estimates that 58 thousand megawatts of new conventional coal generating capacity will be added between 2012 and 2030. During this same period 7 thousand megawatts of conventional coal generating capacity are expected to be retired, re-

[1] A detailed description of the NEMS model can be found at http://www.eia.doe.gov/oiaf/aeo/overview/index.html.

[2] To simulate the bonus allowance program for CCS recommended by the Commission, all advanced coal generation with CCS built by 2030 receives a 1.9 cent per kilowatt-hour production tax credit. As with the renewable production tax credit, plants receive the credit for the first 10 years of operation.

sulting in a net increase in conventional coal generating capacity of 51 thousand megawatts. The "business as usual" forecast does not report any new coal generating capacity that is equipped with CCS technology.

Senator BOXER. Thank you, sir.

Our next speaker is Lewis Hay, chairman and chief executive officer of FPL Group, Florida Power and Light.

STATEMENT OF LEWIS HAY III, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, FPL GROUP

Mr. HAY. Madam Chairman, Ranking Member Inhofe, members of the committee, thank you for the opportunity to be here today.

My company provides electric service to over 8 million people in Florida. We are also one of the top four generators of electricity in the country. Our generation fleet is one of the cleanest in the country and one of the lowest emitters of carbon dioxide. We are by far the largest wind energy producer and solar energy producer in the country.

If the rest of the industry were emitting carbon dioxide at the same rate as we do, U.S. carbon emissions would drop by 1.6 billion tons per year, or over 65 percent of our sector's emissions. This alone would allow our country to be below Kyoto standards. That is without any other industry taking any other action.

We are also ranked first in the Nation in energy conservation. In fact, if the rest of the industry had our conservation efforts, CO_2 emissions would be reduced by about 240 million tons per year, or nearly 10 percent of the emissions of the entire electric utility sector. These are just two examples of what is possible with today's technology.

Our exceptional environmental performance has not come without a cost, however. Our customers in Florida clearly pay more for electricity than they would if we had a higher percentage of coal in our fuel mix.

Let me summarize our views on global climate change. We believe man-made global climate change is real and requires prompt policy attention, but that it is not yet a crisis. We must take action, but the wrong actions can be worse than doing nothing at all. To be effective, any program must set a clear market price on carbon. It needs to apply throughout the economy. We need to protect export and import sensitive industries, or production will simply flee offshore. We need to recycle the dollars that consumers will pay in higher prices back to their pockets or we will do serious damage to the economy. Finally, we need to fund new technologies.

In our minds, the simplest, most effective way to do this is through a carbon fee. We are not alone in this view. Most economists, the *Los Angeles Times*, *The Washington Post*, *The Economist* magazine, former Federal Chairman Alan Greenspan and many others endorse the concept of a fee. A carbon fee is administratively simple; it can be implemented quickly across our economy; it is immune from market manipulation; it rewards those who have taken prior action; its costs are certain and, crucially, it provides us in the industry with clear price signals, which we need to make appropriate long-term capital decisions.

We suggest that the price starts out at a very modest level, such as $10 per ton of CO_2 emitted, and then rise predictably, something

like $2 per ton per year. To be effective, a carbon fee must be recycled, and we believe it should be recycled three ways. First, return the bulk of the money back to the consumers. Second, protect those industries that are genuinely exposed to direct competition from foreign firms located in countries without a carbon program. Third, fund research into carbon reduction capture and storage technologies as well as conservation and other low to no carbon power sources, such as nuclear and renewables.

Many people will tell you a fee is just a tax and a tax is politically infeasible. Senators, let me be quite clear: any action you take to constrain carbon will effectively impose a tax on our economy. With a fee, we have cost certainty. However, with unconstrained cap and tarde, we don't. There are important differences between a carbon fee and a tax. These differences are explained in my testimony.

However, if a fee really is politically infeasible, then the next best alternative is the right type of cap and trade program. But not all cap and trade programs are created equal. One simple example involves the allocation of free allowances. Allowances represent a very valuable financial asset worth between $70 billion and $300 billion per year. The specific method by which free allowances are allocated is very important and is likely to be highly politicized.

Consider two different ways of allocating allowances to electric generation sources. In the first, every megawatt hour produced receives the same number of allowances, while in the second, allowances are allocated based on historical emissions. The first approach rewards efficient, low-emitting generators, as they will have to buy fewer credits than inefficient, higher-emitting generators.

The second approach rewards those who have taken no action and who have old, inefficient and for the most part fully depreciated plants. Which would you rather reward, companies that have planned ahead and sought to anticipate policy trends and who have low emission profiles today, or firms that have sat back and done very little? We believe the answer is obvious.

This is just one of the practical issues with cap and trade. Close study of the problems encountered in the early days of the European carbon trading scheme have revealed many other problems, including the volatility of carbon prices, market manipulation, regressive impacts on the poor and windfall profits.

For every problem there is a proposed fix. But each fix makes it look more and more like a carbon fee. That said, our analysis suggests that the best cap and trade approach is to auction the majority of allowances, give away the remainder for a short period of time, and the free allowances should be allocated on an output basis, not the amount of BTUs consumed.

Most importantly, it is critical that we have a safety valve.

I see my time is up, so that pretty much summarizes our position.

[The prepared statement of Mr. Hay follows:]

STATEMENT OF LEWIS HAY III, CHAIRMAN AND CEO, FLORIDA POWER & LIGHT COMPANY AND FPL ENERGY

Madam Chairman, Members of the Committee, thank you for the opportunity to be here today. My name is Lew Hay, and I am the Chairman and CEO of FPL Group, the holding company for Florida Power & Light Company and FPL Energy.

Through Florida Power & Light. we provide electricity service to roughly half the State of Florida, the fourth largest State in the Nation, or over eight million people. Through FPL Energy we operate in competitive generation markets In roughly half the State. outside of Florida. Together, these businesses operate a fleet of over 35,000 megawatts of capacity. making us one of the top four generators in the country. Our generation fleet is one of the cleanest in the country and among the lowest emitters of carbon dioxide. FPL Energy is by far the largest wind energy producer in the country. We own and operate approximately one-third of all the wind capacity in the country, and our capacity exceeds that of the next eight largest players combined. No company anywhere on the globe has developed and built more wind capacity than we have. We are also the largest solar energy producer in this country and the operator of the two largest solar fields in the world. And we have experience with a number of other farms of renewable energy production. Thus, I think we can fairly claim to know a bit about renewable energy.

We also know a bit about conservation and energy efficiency. In Florida, with the support and leadership of the Florida Public Service Commission, we have been actively engaged with conservation and demand side management programs for over 25 years. In fact, according to the Department of Energy statistics, Florida Power & Light is first in the Nation in energy conservation programs among electric utilities. Energy efficiency is not something that has just occurred to us recently as the right thing to do. Over the years, our demand side management programs have enabled us to avoid building the equivalent of 11 major power plants and thus to avoid all the emissions that would otherwise have resulted. We have calculated that if the rest of the industry had conservation efforts roughly as effective as ours it would be as though the single largest emitter of CO_2 in the U.S. electric utility sector did not exist from an emissions standpoint. CO_2 emissions would be reduced by about 240 million tons per year, which is equivalent to 9.5 percent of the emissions of the entire electric utility sector.

We have had a track record of focusing on environmental issues for many years. and it has been an explicit part of our strategy to seek to build Into our future expectations our view of where future environmental constraints will take us. We have sought to look ahead and anticipate rather than to wait and react. Because of our past actions, our emissions profile today is among the best in the industry. To put this in perspective, we have calculated that tithe rest of the Industry were today operating at our emissions intensity for Carbon dioxide—that is emitting the same amount of carbon for every megawatt hour they produced as we do—the U.S. today would be under its Kyoto target for total carbon emissions—even without any contribution from other sectors. And we know we can do better. So can the rest of our industry. But to do better will require the right kind of public policy framework.

We have been able to combine exceptional environmental performance with strong financial performance. For 5 years in a row we have been named the most sustainable electric utility in the country by Innovest Strategic Value Advisors. We are one of 19 U.S. companies that Corporate Knights rated in the top 100 sustainable companies in the world. And just this year we were named by *Fortune* magazine as the most admired electric utility in that magazine's annual survey of our industry. We are proud of our accomplishments and our track record. However, our environmental performance has not come without a cost and I would be remiss if I did not point that out.

Today, although our retail rates are below industry averages, our customers in Florida clearly pay more for electricity than they would if we had a higher percentage of coal in our fuel mix. Conversely, the customers of many utilities elsewhere in the country are in our view paying prices that are attractively low only because the true cost of their environmental impact is not reflected in those prices. We tinny believe that the single most impatient step Congress can take is to ensure that as we move forward, the cost of emitting carbon into the atmosphere becomes fully reflected in the market prices of all products and services.

Major corporate carbon emitters, including electric generators, can reduce their carbon footprint by Improving their energy productivity, relying more on renewable forms of energy like wind, solar and geothermal, burning cleaner fuels and working with their customers to encourage more conservation and improve their efficiency (e.g., use more efficient air conditioners). But they have little incentive to do so because they are not required to pay for their carbon emissions or global warning's effects.

Turning to the specifics of how to deal with global climate change, we have dear views. I expect they will in some way challenge every member of this Committee. In brief, we believe anthropogenic (man-made) global climate change is real and requires prompt policy attention, but that it is not yet a crisis. We must take action, but the wrong actions can be worse than doing nothing at all. Getting the U.S. econ-

omy on a path to lower carbon intensity and ultimately reducing carbon emissions will got be cost free—but if done correctly it does not need to wreck the economy either. The devil is in the details.

To be effective, any program must

• Set a market price on carbon which will be reflected in the price of every good and service throughout the economy;

• Apply throughout the economy, not just for reasons of fairness but more Importantly for effectiveness. Carbon is pervasive throughout the economy and programs that focus on just one sector, such as our own, will not effectively address the problem;

• Protect import-and export-sensitive industries, otherwise production simply flee offshore to locations that do not price Carbon into their output and,

• Recycle the dolled that will be extracted from end consumers through higher prices back into their pockets, or we will do serious damage to the economy.

Our analysis has led us to conclude that the simplest, most effective way to do this Is through a carbon fee. As many of you know, this view is shared by numerous others who have analyzed the problem, including most economists. William Pizer, an economist for Resources for the Future and who has studied greenhouse gas controls for more than a decade, concludes that, "find that price mechanisms produce expected net gains five times higher than even the most favorably designed quantity target."[1] Editorials published in *The Economist,*[2] the *Los Angeles Times*[2] and *The Washington Post*[2] have all endorsed the use of a fee, as has former Federal Reserve Board Chairman, Alan Greenspan, and former Vice President, Al Gore. A carbon fee is administratively simple; it automatically becomes economy-wide; it is easy to recycle to consumers; and, crucially, it provides us in the industry with the price signals we need to make long term capital decisions—the very capital decisions that will ultimately determine whether or not we bring down our national emissions profile over time. We have suggested that the price start out at a modest level—say $10 per ton of CO_2 emitted—and rise predictably each year by, say, $2 per ton?[3]

Many people will tell you that a fee is just a tax, and a tax is politically infeasible. In fact, I'm sure you will hear the old witticism about waterfowl—if it quacks like a duck, etc. That is a good sound bite; but frankly, it's a bit silly. Senators, let me be quite dear-any action you take to constrain carbon will effectively impose a tax on our economy; that is a simple matter of economics. In our view, however, there are Important differences between a carbon fee and what most people think of when they think of a tax.

A tax is designed to raise revenue to fund common needs and social services; a carbon fee is designed to change relative prices and to be revenue neutral. Taxes are generally designed to be unavoidable. Companies can avoid paying a carbon fee by not emitting carbon—exactly the behavior we need to encourage. Moreover, if it is effective, in time a carbon fee will be self-extinguishing.

To be effective, a carbon fee must be recycled, and we believe it should be recycled three ways. First, the bulk of the fee should be returned to consumers directly, and the simplest way to do the is through a per capita allowance. Think of it as your personal allowance for your carbon footprint. Each year, every adult would receive a proportionate share in the proceeds of the aggregate fee, economically offsetting the typical emissions profile while preserving the pried signal that will discourage the use of carbon intensive products or production methods. Second, some of the fee needs to be reserved to protect those few industries that are genuinely exposed to direct competition from foreign firms that do not have an equivalent cost of carbon embedded in their cost structures. Third, a portion of the fee needs to be reserved for fundamental research into carbon reduction and elimination technologies, such as carbon capture and sequestration, without which in the long run we simply will not address the issue. ERR' estimates that in order to develop technologies necessary to address climate change in the electrical sector alone, RD&D funding will need to increase by roughly $1.3 billion per year over the next 25 years—or a total of $33 billion. I suspect the actual amount needed will be at least twice that amount. The balance among the three ways for recycling carbon fees back into the economy can be adjusted over time, with the allocations to R&D and industry protection diminishing as the global economy adjusts to a new State.

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[1] Pizer, William, "Choosing Price or Quantity Controls for Greenhouse Gases." Climate Issues Brief No. 17 (Washington, DC; Resources for the Future), July 1999. A copy of this paper is attached.

[2] Copies of these editorials are attached to our written testimony.

[3] These values can be adjusted upwards each year for general Inflation, in order to maintain the desired level of increasing real burden.

Finally, critics of a carbon fee will say it is not market based while cap and bade is. This is just not true—both approaches are market based. Under a cap and trade approach, volumes of CO_2, emissions are established and the market establishes a price, while under a carbon fee approach, the price for emitting carbon is established and market forces determine the corresponding volumes of CO_2 emissions. In both cases, market forces determine which specific forms of carbon reduction activities in what proportions are undertaken by private economic actors.

A fee is very different from a tax, but in one way it is similar It will require real political courage to implement. I believe our government has the courage to address this problem the right way. However, if a fee really is politically infeasible, then the next best alternative is the right type of cap and trade program. But Senators, I must caution you that not all cap-and-trade systems are created equal. In fact, there are tremendous differences across the array of cap and trade proposals that are being discussed. If you pursue cap-and-trade I urge you to become personally Involved In understanding the details of how it will work and how it will be administered. This is too important an issue for it to be delegated to an executive agency without considerable guidance from Congress. We support cap-and-trade proposals such as Senator Carpets and Senator Feinstein's, which have sought appropriately to address some of the practical issues of this approach.

Let me give you one simple but critical example of the practical issues you must address in cap-and-trade. Under a cap-and-trade approach, each year a fixed quantity of allowances are created-each allowance representing the right to emit a fixed amount of carbon dioxide or other greenhouse gas. Unless most of, if not all those allowances are auctioned off, which incidentally is an approach that we endorse, the specific method by which those allowances are allocated across industries and to firms or production sources within those industries becomes very important. Allowances represent a valuable financial asset. We estimate the total value of allowances per year to be between $70 billion and $300 billion—or between $2 trillion and $9 billion over the first 30 years of a carbon regulatory program—suggesting that the allocation process will be highly politicized and highly susceptible to rent seeking influence in Washington. The initial stages of the European carbon trading scheme show how significant the allocation question can be. It is widely agreed that allowances were over-allocated In some instances, leading to windfall profits for some market participants, particularly those participants who were the largest emitters of CO_2. Whatever approach is taken, you can be sure that someone will be unhappy, and In our society that is likely to mean litigation, and litigation is likely to sew down the pace at which real emission improvements are actually made.

Consider two different ways of allocating allowances to electric generation sources: In the first, every megawatt hour produced receives the same number of allowances, a so-called output-based approach; while In the second allowances are allocated based on fuel input where every BTU of enemy input receives the same number of allowances—a so-called input-based approach, Under the first, every generator has to reach the same goal, or pay the consequences; under the second, every generator has to improve by the same proportional amount or pay the consequences. The first rewards those who have already moved to become efficient, low emitters, since they will have to buy fewer allowances to reach the common goal; while the second rewards those who have taken no action and who have old. inefficient and, for the most part, fully depreciated plants. As you think about carbon policy proposals, Senators, I urge you to consider this issue. Which would you rather reward: companies that have planned ahead and sought to anticipate policy Vends and who have low emissions profiles today? Or firms that have sat back and taken advantage of low cost but high emissions technologies like traditional coal generation? We believe the answer should be obvious—you should not reward the worst emitters. But that is one of the many practical consequences that the exact form of a cap and trade program will have, and it is one that I urge you to think carefully about[4] I know you will follow your consciences; I hope my testimony will cause you to dig further into these practical issues.

The illustration I have just given you is but one of many practical issues with cap-and-trade, Close study of the problems encountered In the early days of the European carbon trading scheme reveal many others. These problems include:

• How to address differing regional growth rates. Non-updating allowance allocations, such as an input-based allocation based on historical BTU consumption, would

[1] In a recently issued white paper, Clean Air Watch estimates that with an input based approach, the top 10 carbon emitting electric usury companies would reap a windfall of a range from at least $4.5 to $9 billion per year (assuming allowance prices ranged from between $5 to $10 per ton).

impose large penalties on faster growing States, such as California, Arizona, Nevada and Florida,

• How to avoid unnecessary economic damage associated with highly volatile permit prices. Even under the highly praised SO_2, program, the price of SO_2 allowances has varied, on average, by more than 40 percent Per year and has increased over 80 percent per year over the past 3 years. Given CO_2's importance to the economy, this could have devastating impacts ranging from higher inflation, reduced consumer spending and reduced investments In green technology.

• How to prevent boarding of credits and other attempts to manipulate the market.

Each proposed "fix," such as including price floors and ceilings, adds complexity and possibly other unintended consequences, and, in effect, makes a cap and trade system work more and more like a carbon fee, albeit without the benefits that a carbon fee brings such as predictable pricing, fairness and administrative simplicity.

That said, we believe that market-based trading schemes can be made to work, but the right way to implement them is to auction the majority of allowances and give away the remainder for a short transition period. Our analysis has convinced us that it is neither necessary nor desirable to give away for free any large proportion of the total allowances created saga year. In most cases utilities and independent generators will recover the costs of purchasing allowances through charging higher prices. It is the end consumer who will ultimately bear the burden. An auction-based system, with the proceeds of the auction recycled direct to end consumers on a per capita basis, best protects against unintended windfalls for producers. To the extent that there are free allowances, they should be allocated on an output basis (per MWH) (with the possible exclusion of nuclear and renewable generation, which have already received plenty of government support). The proceeds of the auctions should be recycled back into the economy in the same three ways as I have described for a carbon fee. Even then, with a cap-and-trade approach you will face the difficult choice of deciding exactly how tight the caps should be each year. Too loose, and we don't make the progress we could make too tight and you surely will do serious damage to the economy. Unfortunately, as the Intergovernmental Panel on Climate Change's own reports acknowledge, no one today can tell you what those caps should be so you wit be left to guesswork This is another reason why we have concluded that a fee-based approach is superior. While there is still some guesswork involved, it is much easier to set a path for the future price of carbon than for the future volume of emissions reductions that will be manageable without major economic damage. And the future price of carbon—a so-called forward price curve-is the most crucial piece of information that all of us in business need to know in order to make the long-term investment decisions without which we will never succeed in bringing doom our national emissions profile. If a cap-and-trade approach is used, it is critical that a pre-determined ceiling price, or "safety valve," be included, in order to avoid the threat of significant economic disruption in the event of very volatile allowance pricing.

Senators, I know that there are some who do not believe that the science of climate change is conclusive, or that the consequences are certain. We agree. But we know enough to warrant taking action today. We know enough to know there is risk of severe consequences, and just as we buy insurance or wear seat belts, we need to address that risk But just as we don't give up all our income to purchase insurance, we need to be balanced in our approach to addressing that risk. A moderate carbon fee, escalating steadily and predictably, and recycled directly back into the economy, will have only a modest drag on the economy, but it will over time induce massive change in our carbon emissions profile especially when it is supported by adequate R&D. The same effect can be produced, though with greater complexity and less effectiveness, through a properly designed cap-and-trade system with a high percentage of allowances auctioned and a pre-determined safety valve built in. But a pearly designed scheme, or one that does not force a price on carbon throughout the economy, will not address the real environmental issue, and a will risk major economic dislocation.

Thank you for the opportunity to contribute to this critical public dialog.

ATTACHMENTS

"Doffing the Cap," *The Economist*, June 14, 2007.

Eilperin, Juliet and Mufson, Steven. "Tax on Carbon Emissions Gains Support; Industry and Experts Promote It as Alternative to Help Curb Greenhouse Gases," *The Washington Post* April 1, 2007.

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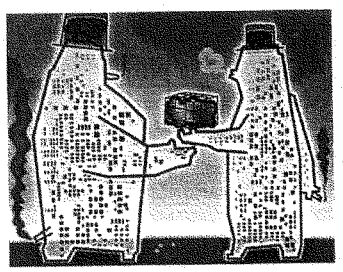
Doffing the cap

Jun 14th 2007
From The Economist print edition



Tradable emissions permits are a popular, but inferior, way to tackle global warming

THE pressure for political action on climate change has never looked stronger. Even George Bush has now joined the leaders of other rich countries in their quest to negotiate a successor regime to the Kyoto protocol, the treaty on curbing greenhouse gases that expires in 2012.

Too bad, then, that politicians seem set on a second-best route to a greener world. That is the path of cap-and-trade, where the quantity of emissions is limited (the cap) and the right to emit is distributed through a system of tradable permits. The original Kyoto treaty set up such a mechanism and its signatories are keen to expand it. The main market-based alternative—a carbon tax—has virtually no political support.

A pity, because most economists agree that carbon taxes are a better way to reduce greenhouse gases than cap-and-trade schemes. That is because taxes deal more efficiently than do permits with the uncertainty surrounding carbon control. In the neat world of economic theory, carbon reduction makes sense until the marginal cost of cutting carbon emissions is equal to the marginal benefit of cutting carbon emissions. If policymakers knew the exact shape of these cost and benefit curves, it would matter little whether they reached this optimal level by targeting the quantity of emissions (through a cap) or setting the price (through a tax).

But in the real world, politicians are fumbling in the dark. And that fumbling favours a tax. If policymakers set a carbon tax too low, too much carbon will be emitted. But since the environmental effect of greenhouse gases builds up over time, a temporary excess will make little difference to the overall path of global warming. Before much damage is done to the environment, the carbon tax can be raised.

Misjudging the number of permits, in contrast, could send permit prices either skywards or through the floor, with immediate, and costly, economic consequences. Worse, a fixed allotment of permits makes no adjustment for the business cycle (firms produce and pollute less during a recession).

Cap-and-trade schemes cause unnecessary economic damage because the price of permits can be volatile. Both big cap-and-trade schemes in existence today—Europe's Emissions-Trading Scheme for carbon and America's market for trading sulphur-dioxide permits (to reduce acid rain)— suggest this volatility can be acute. America has had tradable permits

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for SO_2 since the mid-1990s. Their price has varied, on average, by more than 40% a year. Given carbon's importance in the economy, similar fluctuations could significantly affect everything from inflation to consumer spending. Extreme price volatility might also deter people from investing in green technology.

Even without the volatility, some economists reckon that a cap-and-trade system produces fewer incentives than a carbon tax for climate-friendly innovation. A tax provides a clear price floor for carbon and hence a minimum return for any innovation. Under a cap-and-trade system, in contrast, an invention that reduced the cost of cutting carbon emissions could itself push down the price of permits, reducing investors' returns.

To avoid these pitfalls, some cap-and-trade advocates want to set price floors and ceilings within carbon-trading systems. One of the most prominent bills in America's Congress, for instance, includes a "safety valve". If the price of carbon rises beyond a threshold, the government will allocate an unlimited supply of permits at that price. Such reforms, in effect, make a cap-and-trade system work more like a carbon tax.

A third advantage of carbon taxes is that they raise revenue. Governments can use this cash to reduce other inefficient taxes, thereby cutting the economic costs of carbon abatement. Or they can use the money to compensate those, such as the poor, who are hit disproportionately hard by higher fuel costs.

The great green giveaway

Cap-and-trade schemes, in contrast, have traditionally given away permits, which leaves no room to reduce the economic costs of climate control by cutting taxes elsewhere. But here, too, change may be afoot. To mimic the advantage of a carbon tax, many cap-and-trade fans now want governments to auction at least a share of the permits.

All of which raises an important question. If cap-and-trade schemes are to be reformed so that they look more like carbon taxes, why are politicians so reluctant to impose carbon taxes in the first place? One reason is that their environmental benefits are harder to explain. It is intuitively easier to grasp how a carbon cap will slow global warming. Taxes are also more prone to ideological caricature, particularly in America, where many conservatives argue instinctively that all taxes are bad. Too many politicians pretend that carbon taxes will hurt consumers more than a cap-and-trade scheme, even though the cost of carbon permits will be passed on to consumers just as quickly as a tax.

But the biggest problem, at least politically, is that carbon taxes are transparent and simple, whereas cap-and-trade systems are complicated and conveniently opaque. Under a cap-and-trade scheme, governments can pay off politically powerful polluters (such as the coal industry) by giving them permits. Even more important, rich countries can pay poorer ones to cut their emissions without any cash changing hands between governments. Under a carbon tax such transfers must go through the government's budget. And that can be politically tricky. However sensible it sounds to an economist, American voters may be loth to see their tax dollars funding fat cheques for China. Add in these political arguments and the choice between a carbon tax and cap-and-trade becomes less obvious. Politicians are heading down the second-best path to combat climate change, but it may be the only one that leads anywhere.

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Tax on Carbon Emissions Gains Support; Industry and Experts Promote It as Alternative to Help Curb Greenhouse Gases

BYLINE: Juliet Eilperin and Steven Mufson; Washington Post Staff Writers

As lawmakers on Capitol Hill push for a cap-and-trade system to rein in the nation's greenhouse gas emissions, an unlikely alternative has emerged from an ideologically diverse group of economists and industry leaders: a carbon tax.

Most legislators view advocating any tax increase as tantamount to political suicide. But a coalition of academics and polluters now argues that a simple tax on each ton of emissions would offer a more efficient and less bureaucratic way of curbing carbon dioxide buildup, which scientists have linked to climate change.

"We want to do the least damage to the growth of GDP," said Michael Canes, a private consultant and former chief economist for the American Petroleum Institute, who led a Capitol Hill briefing on the subject in late February sponsored by the conservative George C. Marshall Institute. Between a cap system and a carbon tax, "a carbon tax will be the much more cost-effective way to go," he said, though he added that there are other ways to reduce emissions.

Robert J. Shapiro, a private consultant who was a Commerce Department official in the Clinton administration, agrees. A cap-and-trade system -- involving plant-by plant-measurements -- would be difficult to administer, he said, and would provide "incentives for cheating and evasion." And the revenue from a carbon tax could be used to reduce the deficit or finance offsetting cuts in payroll taxes or the alternative minimum tax.

A carbon tax offers certainty about the price of polluting, which appeals to many economists and businesses. William A. Pizer, a senior fellow at the centrist think tank Resources for the Future and a former senior economist for President Bush's Council of Economic Advisers, estimates that the benefit-to-cost ratio of a tax-based system would be five times that of a cap-and-trade system.

"You're going to pay one way or another, whether it's a tax or a permit program," Pizer said, adding that while a cap would provide more certainty on how much emissions would be cut, "the consequences of being uncertain about emissions over any short period of time just aren't that serious."

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Under a cap-and-trade system, the government would set an overall limit on emissions and allocate permits to emitters. If one plant reduces its emissions more quickly than another, it can sell its credits to the other emitter. A carbon tax would simply increase the cost of emitting each ton of carbon, which could then be passed on to consumers.

While Democrats have vowed to push through some sort of carbon dioxide control in this Congress, Bush has consistently opposed mandatory limits, so it remains unclear whether the United States will adopt any system before the next election.

Moreover, the fact that many economists back the tax approach is no guarantee that it will prevail over the five cap-and-trade plans already proposed in the Senate.

The complexity of the cap-and-trade system is part of its virtue for some politicians, since it may mask the system's impact on prices. Such a system also appeals to conservative lawmakers who like the idea of letting the market determine the price of carbon, while keeping revenue out of the hands of government. Some economists say it would channel capital to the most economically worthwhile projects first.

Environmentalists are split on a carbon tax. Fred Krupp, president of Environmental Defense, which is handing out baseball caps emblazoned with the slogan "Just Cap It" on Capitol Hill, called such a tax "an interesting distraction."

"It doesn't give us the guarantee the emissions will go down," he said.

But Carl Pope, executive director of the Sierra Club, said: "It will be more effective if people know that in year 'X' they will pay this much. Companies are highly motivated by costs." Moreover, he worries that rationing carbon allowances based on historical emissions would reward companies that spew out the most greenhouse gases now and did the least to limit them in the past.

Dan Becker, director of the Sierra Club's program on global warming, said the nation may need to adopt a carbon tax in several years but "we're not there yet."

Some industries that have historically opposed carbon limits embrace the idea of a tax because their sectors would not be singled out for regulation. "A poorly constructed cap-and-trade system can be as punitive as a regressive tax," said Scott Segal, an electric utilities lobbyist.

Red Cavaney, president of the American Petroleum Institute, told a National Press Club audience in February that his industry prefers that lawmakers explore a range of policy options before imposing a cap.

"A cap-and-trade system isn't necessarily the be-all and end-all," he said. "A carbon tax, everything, should be on the table from the beginning."

Few lawmakers, Democrat or Republican, have the stomach for a carbon tax, however. Some are still smarting from a vote in the early 1990s when President Bill Clinton persuaded the House to adopt a BTU tax -- a tax on the heat content of fuels -- only to abandon the effort in the Senate.

Democrats such as House Natural Resources Committee Chairman Nick J. Rahall II (W.Va.) say they have no desire to revisit the issue. "I'm not an advocate of a

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carbon tax," Rahall said. "That's going to be passed on; the consumer would end up paying for that."

Some analysts said former vice president Al Gore's endorsement of both alternatives in testimony before Congress last week was so politically unpalatable that it was a sign that he is not seriously thinking of running for president.

Only one House Democrat, Rep. Pete Stark (Calif.), has drafted a carbon tax proposal. Stark, who first proposed such a tax 16 years ago as a way to ease the nation's energy crunch, plans to introduce a bill in April that would levy a tax of $25 per ton of carbon released for five years.

"It's more efficient, more equitable, and it's less subject to gaming, I might add," Stark said, estimating that it would raise the cost of gasoline by 10 cents a gallon.

As Congress debates how to regulate greenhouse gases, however, several European officials have said it would be a mistake to choose anything but a market-based trading system that could be linked to the emerging carbon market in Europe.

"Political leaders in the United States need to make a decision, and make it quickly, whether they want to be left behind in a market that is going to evolve, or whether they want to get involved quickly," said Stephen Byers, a member of Britain's Parliament who helped establish the European Union's trading system. "Wall Street could become the world center of carbon trading."

And Stavros Dimas, the E.U. environment commissioner, speaking at a recent lunch hosted by the D.C.-based European Institute, called it ironic that the United States would question the cap-and-trade system, because U.S. negotiators essentially forced Europe to agree to such a system in the Kyoto Protocol negotiations in 1997.

"There was suspicion about market-based instruments," Dimas said. "In a way you did us a favor, because now we also are familiar with these market-based activities. It's functioning very well, actually."

"If we would go together into a world tax regime, that would be preferable," Jos Delbeke, the top E.U. official on climate change, said after a Senate Energy and Natural Resources Committee hearing Monday. "But practically speaking, it is not a likely way to go. Emissions trading is a very solid second best."

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Environmental Policy Outlook

Climate Change: Caps vs. Taxes

By Kenneth P. Green, Steven F. Hayward, and Kevin A. Hassett

As the Kyoto Protocol's 2012 expiration date draws near, a general theme dominates the global conversation: leadership and participation by the United States are critical to the success of whatever climate policy regime succeeds the Kyoto Protocol. Two general policy approaches stand out in the current discussion. The first is national and international greenhouse gas (GHG) emissions trading, often referred to as "cap-and-trade." Cap-and-trade is the most popular idea at present, with several bills circulating in Congress to begin a cap-and-trade program of some kind. The second idea is a program of carbon-centered tax reform—for example, the imposition of an excise tax based on the carbon emissions of energy sources (such as coal, oil, and gasoline), offset by reductions in other taxes. In this paper we will address the strengths and weaknesses of both ideas and the framework by which legislators should evaluate them.

The framing of a global climate regime presents a classic chicken-and-egg problem: the United States does not wish to enter into a regime of economically costly emission caps or taxes that would have the effect of driving industry and jobs to nations such as China and India that do not participate in such caps. China and India, however, are unlikely to enter into a restrictive regime unless the United States goes first, and even then, only so long as the policy regime does not threaten serious constriction of their economies. It is often assumed that if the United States goes first, developing nations will eventually follow, but this is by no means assured. Both China and India have repeatedly declared that they are not prepared to make even a delayed commitment at this time.

Given these policy uncertainties—and other uncertainties about the eventual impacts of climate change in terms of severity, distribution, and timing—there are two guideposts policymakers should keep in mind. The first is that the United States can only effectively impose a national regulatory regime (though such a regime could eventually be harmonized with international efforts). The second is that, given the current uncertainty, policy should conform as much as possible to a "no regrets" principle by which actions undertaken can be justified separately from their GHG emissions effects in the fullness of time, such that nonparticipation by developing nations will disadvantage the United States in the global marketplace as little as possible.

While the United States may wish to join with other nations in setting a post-Kyoto emissions goal, it should be wary of joining an international emissions-trading or other regulatory regime. One of the less-remarked-upon aspects of the Kyoto Protocol, and any prospective successor treaty on that same model, is that it represents an unprecedented kind of treaty obligation for the United States. Most treaties involve direct actions and policies of governments themselves, such as trade treaties that bind nations' tariff levels and affect the private sector of the economy only indirectly. Kyoto and its kin go beyond government policy to affect the private sector directly or require the

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government to control the private sector and the investment decisions of the private sector to an unprecedented degree. It is not governments that emit GHGs, after all. Between the asymmetries of legal and regulatory regimes across nations, the United States should think hard about the dilution of sovereignty that a binding GHG treaty represents, even if the United States agrees with the basic objective of reducing carbon emissions.

Problems with Emissions Trading for GHG

Some economists favor the idea of emissions trading for its elegance in achieving least-cost emissions reductions while avoiding the manifold difficulties of prescriptive "command-and-control" regulation from a centralized bureaucracy. But this is something of a false choice, as such regulation is a deeply troubled policy option. While trading may be superior to command-and-control, it is not necessarily superior to other alternatives, such as carbon-centered tax reform.

> While trading may be superior to command-and-control, it is not necessarily superior to other alternatives, such as carbon-centered tax reform.

There are a number of emissions-trading success stories that, upon inspection, suggest significant limitations to the applicability of emissions trading for GHG emissions. Enthusiasts for cap-and-trade point first to our sulfur dioxide (SO_2) trading experience under the 1990 Clean Air Act Amendments. It is claimed that the costs of SO_2 abatement through trading turned out to be dramatically lower than economists had forecast for a prescriptive regime, wherein the Environmental Protection Agency (EPA) would have mandated control technologies on individual coal-fired power plants. But a closer look shows this success to have been uneven. There has been significant volatility in emission permit prices, ranging from a low of $66 per ton in 1997 to $860 per ton in 2006, as the overall emissions cap has been tightened, with the price moving up and down as much as 43 percent in a year.[1] Over the last three years, SO_2 permit prices have risen 80 percent a year, despite the EPA's authority to auction additional permits as a "safety valve" to smooth out this severe price volatility.

Several other aspects of the SO_2-trading program are of doubtful applicability to GHGs. First, SO_2 trading was only applied to a single sector: initially, only 110 coal-fired power plants were included in the system, but it subsequently expanded to 445 plants. While coal-fired power plants account for roughly one third of U.S. carbon dioxide (CO_2) emissions and will therefore be central to a GHG cap-and-trade program, a comprehensive GHG emissions-trading program will have to apply across many sectors beyond electric utilities, vastly complicating a trading system.

Second, SO_2 and CO_2 are not comparable targets for emissions reduction. Reducing SO_2 emissions did not require any constraint on end-use energy production or consumption. Coal-fired power plants had many low-cost options to reduce SO_2 emissions without reducing electricity production. Some switched to low-sulfur coal (abetted in large part by railroad deregulation in the 1980s, which made transport of Western low-sulfur coal more economical than previously). The cost of "scrubbers"—industrial devices which capture SO_2 and sequester it—turned out to be lower than predicted. Other utilities emphasized more use of natural gas. The impact on ratepayers and consumers was modest.

CO_2 is different: it is the product of complete fuel combustion. There is no "low-CO_2 coal," and the equivalent of SO_2 scrubbers does not yet exist in economical form.[2] At the margin there is some opportunity for GHG emissions reductions through substitution—increased use of natural gas (which emits less CO_2 per unit of energy than coal) and possibly nuclear power—but the inescapable fact is that any serious reduction in CO_2 emissions will require a suppression of fuel combustion. This is going to mean lower energy consumption and higher prices, at least in the intermediate term.

Even though confined to a segment of a single sector of energy use, the SO_2 emissions-trading regime was far from simple. There were complicated allocation formulas to distribute the initial emissions permits. Despite the best efforts to create objective criteria, at the end of the day, the allocation of emission permits involves some arbitrary discretion. For political reasons there were special subsidies and extra allowances for the benefit of high-sulfur coal interests. Most trading in the early years took place between power plants within the same company.

Establishing allowances and accounting systems for GHG emissions across industries is going to be vastly more difficult and highly politicized. The forest products industry, for example, will reasonably want credits for creating carbon sinks in the trees it plants and

harvests, but the manufacturing sector that uses these wood products as a raw material will want credit for sequestering carbon. The difference will have to be split in some arbitrary manner that will surely introduce economic distortions in the marketplace. The auto industry will want credits for GHG innovations, while industries and businesses of all kinds will lobby for credits for reducing mobile source emissions from changes to their auto and truck fleets. There are going to be winners and losers in this allocation process. Multiply this problem across sectors and industries and it becomes evident that a GHG emissions-trading system is going to be highly complex and unwieldy, and too susceptible to rent-seeking influence in Washington. The problem of politically adjusting competing interests will be compounded on the international scale. The long-running diplomatic conflicts that can be observed over purported subsidies for aircraft (i.e., Boeing versus Airbus) and the European Union's agricultural subsidies and trade barriers are examples of the kinds of conflicts that will be endemic to any international emissions-trading scheme.

The favored solution to these problems is to over-allocate the number of initial permits both to ease the cost and to encourage the rapid start-up of a market for trades. This was the course the European Union took with its Emissions Trading System (ETS), and it has very nearly led to the collapse of the system. Because emissions permits were over-allocated, the price of emissions permits plummeted, and little—if any—emissions reductions have taken place because of the ETS. The over-allocation of initial permits merely postpones both emissions cuts and the economic pain involved. Economist Robert J. Shapiro notes:

> As a result of all of these factors and deficiencies, the ETS is failing to reduce European CO_2 emissions. . . . [T]he European Environmental Agency has projected that the EU is likely to achieve no more than one-quarter of its Kyoto-targeted reductions by 2012, and much of those "reductions" will simply reflect credits purchased from Russia or non-Annex-1 countries [developing countries], with no net environmental benefits.[3]

As economist William Nordhaus observes:

> We have preliminary indications that European trading prices for CO_2 are highly volatile, fluctuating in a band and [changing] +/- 50 percent over the last year. More extensive evidence comes from the history of the U.S. sulfur-emissions trading program. SO_2 trading prices have varied from a low of $70 per ton in 1996 to $1500 per ton in late 2005. SO_2 allowances have a monthly volatility of 10 percent and an annual volatility of 43 percent over the last decade.[4]

Nordhaus points out the ramifications of such volatility, observing that "[s]uch rapid fluctuations would be extremely undesirable, particularly for an input (carbon) whose aggregate costs might be as great as petroleum in the coming decades," and that "experience suggests that a regime of strict quantity limits might become extremely unpopular with market participants and economic policymakers if carbon price variability caused significant changes in inflation rates, energy prices, and import and export values."[5]

Nordhaus is not alone in this concern about price volatility. Shapiro similarly observes:

> Under a cap-and-trade program strict enough to affect climate change, this increased volatility in all energy prices will affect business investment and consumption, especially in major CO_2 producing economies such as the United States, Germany, Britain, China and other major developing countries.[6]

Additional pitfalls and dilemmas of emissions trading can be seen through a review of the spectacular trading failure of the RECLAIM (Regional Clean Air Incentives Market) emissions-trading program in Southern California. Launched in 1994 after three years of development, RECLAIM set in motion an emissions-trading program targeting SO_2 and nitrogen oxides (NO_x) emissions, and eventually hoped to expand to include volatile organic compound (VOC) emissions. All three types of emissions are important precursors to ozone formation in the greater Los Angeles air basin. RECLAIM, for the first time, offered swaps between stationary and mobile sources: stationary sources such as oil refineries could help reach their emissions reduction targets by purchasing old, high-polluting automobiles and trucks and taking them off the road—a cost-effective measure in a voluntary demonstration program. The South Coast Air Quality Management District (SCAQMD) estimated that SO_2 and NO_x would be reduced by fourteen and eighty tons per day, respectively, by the

year 2003, at half the cost of the usual prescriptive method of regulation.[7] There was great public support and enthusiasm for the program at the outset.

RECLAIM never came close to operating as predicted, and was substantially abandoned in 2001. Between 1994 and 1999, NO_x levels fell only 3 percent, compared to a 13 percent reduction in the five-year period before RECLAIM. There was extreme price volatility aggravated by California's electricity crisis of 2000. NO_x permit prices ranged from $1,000 to $4,000 per ton between 1994 and 1999, but soared to an average price of $45,000 per ton in 2000, with some individual trades over $100,000 per ton. Such high prices were not sustainable, and SCAQMD removed electric utilities from RECLAIM in 2001. SCAQMD also dropped its plan to expand RECLAIM to VOCs. Despite the hope that RECLAIM would be simple and transparent, there were serious allegations of fraud and market manipulation, followed by the inevitable lawsuits and criminal investigations.

One particular problem with RECLAIM that is likely to plague any international GHG emissions-trading regime is the lack of definite property rights to the emissions allowances the program creates. A cliché of the moment is that industry would like some clarity and certainty about any prospective GHG regulatory regime. A cap-and-trade program, however, cannot provide certainty precisely because emissions allowances are not accorded real property rights by law.[8] The government can change the rules at any time, making emissions allowances worthless. This is exactly what happened to electric utilities in Los Angeles: their allowances were terminated, and the utilities were subsequently required to install specified emissions-control technologies and to pay fines for excess emissions. In effect, some Los Angeles firms had to pay three times over for emissions reductions.

A GHG emissions-trading scheme on an international level will be even more vulnerable to these kinds of unpredictable outcomes. To the extent that a GHG emissions-trading program results in international cross-subsidization of the economies of trading partners, it is going to be politically unsustainable in the long run. An international emissions-trading program is also unlikely to survive noncompliance by some of its members.

There are two final, overriding reasons to be doubtful about global emissions trading. It is possible that the defects of previous emissions-trading programs could be overcome with more careful design and extended to an international level, though this would require an extraordinary feat of diplomacy and substantial refinements of international law. Even if such improvement could be accomplished, it would not provide assurance against the prospect that the cost of such a system might erode the competitiveness of the U.S. economy against developing nations that do not join the system.

If warming is either less pronounced than some current forecasts predict or if emissions reductions have limited effect in moderating future temperature rise . . . a severe global emissions-reduction policy through emissions trading could turn out to be the costliest public policy mistake in human history, with the costs vastly exceeding the benefits.

The second reason for skepticism about global emissions trading is that it fails the "no regrets" test. It is considered bad form nowadays to express doubt or skepticism about the scientific case for rapid and dangerous global warming in the twenty-first century. If warming is either less pronounced than some current forecasts predict or if emissions reductions have limited effect in moderating future temperature rise, however, a severe global emissions-reduction policy through emissions trading (on the order of a minimum 50 percent cut by 2050) could turn out to be the costliest public policy mistake in human history, with the costs vastly exceeding the benefits.

Could instituting a tax on the carbon emissions released by fuel use, as part of a revenue-neutral tax reform package, pass these two tests? We believe it could.

Advantages of a Revenue-Neutral, Carbon-Centered Tax Reform

Most economists believe a carbon tax (a tax on the quantity of CO_2 emitted when using energy) would be a superior policy alternative to an emissions-trading regime. In fact, the irony is that there is a broad consensus in favor of a carbon tax everywhere except on Capitol Hill, where the "T word" is anathema. Former vice president Al Gore supports the concept, as does James Connaughton, head of the White House Council on

Environmental Quality during the George W. Bush administration. Lester Brown of the Earth Policy Institute supports such an initiative, but so does Paul Anderson, the CEO of Duke Energy. Crossing the two disciplines most relevant to the discussion of climate policy—science and economics—both NASA scientist James Hansen and Harvard University economist N. Gregory Mankiw give the thumbs up to a carbon tax swap.[9]

There are many reasons for preferring a revenue-neutral carbon tax regime (in which taxes are placed on the carbon emissions of fuel use, with revenues used to reduce other taxes) to emissions trading. Among them are:

- **Effectiveness and Efficiency.** A revenue-neutral carbon tax shift is almost certain to reduce GHG emissions efficiently. As economist William Pizer observes, "Specifically, a carbon tax equal to the damage per ton of CO_2 will lead to exactly the right balance between the cost of reducing emissions and the resulting benefits of less global warming."[10] Despite the popular assumption that a cap-and-trade regime is more certain because it is a quantity control rather than a price control, such a scheme only works in very limited circumstances that do not apply to GHG control. The great potential for fraud attendant on such a system creates significant doubt about its effectiveness, as experience has shown in both theory and practice in the gyrations of the European ETS.

  The likelihood of effectiveness also cannot be said for regulations such as increased vehicle fuel economy standards. In fact, such regulations can have perverse effects that actually lead to increased emissions. By making vehicles more efficient, one reduces the cost of a unit of fuel, which would actually stimulate more driving, and, combined with increasing traffic congestion, could lead to an increase in GHG emissions rather than a decrease.

  As Harvard researchers Louis Kaplow and Steven Shavell point out, "The traditional view of economists has been that corrective taxes are superior to direct regulation of harmful externalities when the state's information about control costs is incomplete," which, in the case of carbon emissions reductions, it most definitely is.[11] And when it comes to quantity controls (as a cap-and-trade system would impose), Pizer found that

  > My own analysis of the two approaches [carbon taxes vs. emission trading] indicates that price-based greenhouse gas (GHG) controls are much more desirable than quantity targets, taking into account both the potential long-term damages of climate change, and the costs of GHG control. This can be argued on the basis of both theory and numerical simulations.

  Pizer found, in fact, that a carbon-pricing mechanism would produce expected net gains five times higher than even the best-designed quantity control (i.e., cap-and-trade) regime.[12]

- **Incentive Creation.** Putting a price on the carbon emissions attendant on fuel use would create numerous incentives to reduce the use of carbon-intensive energy. The increased costs of energy would flow through the economy, ultimately giving consumers incentives to reduce their use of electricity, transportation fuels, home heating oil, and so forth. Consumers, motivated by the tax, would have incentives to buy more efficient appliances, to buy and drive more efficient cars, and to better insulate their homes or construct them with more attention to energy conservation. A carbon tax would also create incentives for consumers to demand lower-carbon power sources from their local utilities. A carbon tax, as its cost flowed down the chains of production into consumer products, would lead manufacturers to become more efficient and consumers to economize in consumption. At all levels in the economy, a carbon tax would create a profit niche for environmental entrepreneurs to find ways to deliver lower-carbon energy at competitive prices. Finally, a carbon tax would also serve to level (somewhat) the playing field among solar power, wind power, nuclear power, and carbon-based fuels by internalizing the cost of carbon emission into the price of the various forms of energy.

- **Less Corruption.** Unlike carbon cap-and-trade initiatives, a carbon tax would create little incentive or opportunity for rent-seeking or cheating. As William Nordhaus explains:

  > A price approach gives less room for corruption because it does not create artificial scarcities, monopolies, or rents. There are no permits transferred to countries or leaders of countries, so they cannot be sold abroad for

> wine or guns. . . . In fact, a carbon tax would add absolutely nothing to the instruments that countries have today.[13]

Without the profit potential of amassing tradable carbon permits, industry groups would have less incentive to try to get credits for their favored but non-competitive energy sources. That is not to say that tax-based approaches are immune from corruption, for they certainly are not. If set too far down the chain of production or set unevenly among energy sources, carbon taxes could well lead to rent-seeking, political favoritism, economic distortions, and so on. Foreign governments might have an incentive to undermine a trading scheme by offering incentives to allow their manufacturers to avoid the cost of carbon trading. A tax on fuels proportionate to their carbon content, levied at the point of first sale, should be less susceptible to corruption, and by delivering revenue to the government rather than to private entities, should create incentives more aligned with the government's objective.

> A carbon tax, as its cost flowed down the chains of production into consumer products, would lead manufacturers to become more efficient and consumers to economize in consumption.

- **Elimination of Superfluous Regulations.** Because a carbon tax would cause carbon emissions to be reduced efficiently across the entire market, other measures that are less efficient—and sometimes even perverse in their impacts—could be eliminated. With the proper federal carbon tax in place, there would be no need for corporate average fuel economy standards, for example. California's emissions-trading scheme, likewise, would be superfluous, and its retention only harmful to the Golden State. As regulations impose significant costs and distort markets, the potential to displace a fairly broad swath of environmental regulations with a carbon tax offers benefits beyond GHG reductions.

- **Price-Stabilization.** As the experiences of the European ETS and California's RECLAIM show us, pollution-trading schemes can be easily gamed, resulting in significant price volatility for permits. Imagine one's energy bill jumping around as permits become more or less available due to small changes in economic conditions. A carbon tax would be predictable, and by raising the overall price of energy to include the tax, the portion of energy cost per unit that stems from fluctuation in market rates for fossil fuels shrinks as a percentage of the whole. That shrinkage makes the price of a given form of energy less susceptible to volatility every time there is a movement in the underlying production costs.

- **Adjustability and Certainty.** A carbon tax, if found to be too stringent, could be relaxed relatively easily over a time-frame, allowing for markets to react with certainty. If found too low to produce results, a carbon tax could easily be increased. In either event, such changes could be phased in over time, creating predictability and allowing an ongoing reassessment of effectiveness via observations about changes in the consumption of various forms of energy. A cap-and-trade system, by contrast, is more difficult to adjust because permits, whether one is the seller or the buyer, reflect significant monetary value. Permit traders would demand—and rightly so—compensation if what they purchased in good faith has been devalued by a governmental deflation of the new "carbon currency." In addition, sudden changes in economic conditions could lead to significant price volatility in a cap-and-trade program that would be less likely under a carbon-tax regime.

- **Preexisting Collection Mechanisms.** Whether at local, state, or federal levels, carbon taxes could be levied and collected through existing institutions with extensive experience in enforcing compliance, and through ready-made statutes to back up their actions. The same cannot be said for emissions-trading schemes that require the creation of new trading markets, complete with new regulations and institutions to define and enforce the value of credits.

- **Keeping Revenue In-Country.** Unlike an international cap-and-trade regime, carbon taxes—whether done domestically or as an internationally agreed-upon value—have the advantage of keeping tax payments within individual countries. This could strongly reduce the opposition to international action that has, until this point, had a strong

implication of wealth redistribution overlaid on the policy discussion.

This dynamic leads to a second reason why a carbon tax is a better fit for U.S. climate policy: it offers an international analogue to our federalist approach to public policy innovation within the United States. As we have seen, there is reason to doubt the long-run effectiveness and sustainability of the EU's emissions-trading program. If the United States adopts a carbon tax approach, we will be able to compare the effectiveness of tax versus emissions trading in short order.

- **Mitigation of General Economic Damages.** As energy is one of the three most important variable inputs to economic production (along with labor and capital), raising the cost of energy would undoubtedly result in significant economic harm. Using the revenues generated from a carbon tax to reduce other taxes on productivity (taxes on labor or capital) could mitigate the economic damage that would be produced by raising energy prices. The most likely candidates for a carbon tax tradeoff would be the corporate income tax (the U.S. rate is currently among the highest in the industrialized world) and payroll taxes, the latter of which would lower the cost of employment and help offset the possibly regressive effects of higher energy prices on lower-income households. But across-the-board income tax rate cuts and further cuts in the capital gains tax could also be considered.

  Few other approaches offer this potential. Regulatory approaches such as increasing vehicle efficiency standards do not because they mandate more expensive technologies and allow the costs to be passed on to consumers without offsets (unless they are subsidized), in which case it is the general taxpayer whose wallet shrinks. Emissions-trading would allow for this if one auctioned all initial permits and used the revenue to offset other taxes. The vast majority of trading systems, however, begin with the governing entity distributing free emission credits to companies based on historical emission patterns rather than having an open auction for permits that would produce such revenue streams. Without an auction, the revenues in a trading scheme accrue only to private companies that trade in carbon permits, while the companies buying permits would pass the cost on to consumers. International emissions-trading approaches such as Kyoto's clean development mechanism are worse still: the beneficiaries of the scheme are likely to be foreign governments or private entities that can reduce (or pretend to reduce) carbon emissions more efficiently, leaving Americans with higher energy prices and no revenue stream to offset the negative impacts on productivity.

Exploring the Parameters of Carbon-Centered Tax Reform

Published estimates of an initial optimal carbon tax on fuels are in the range of $10 to $20 per ton of CO_2 emitted (in 2005 dollars). Nordhaus, for example, estimates the optimal rate for a tax implemented in 2010 to be $16 per ton of carbon and rapidly rising over time.[14] We will focus primarily on a tax rate of $15 per ton of CO_2, while also providing enough information to allow a reader to consider the likely impact of a range of possible taxes.

- **Background on Emissions.** According to the U.S. Energy Information Administration, emissions of CO_2 in the United States in 2005 equaled 6,009 million metric tons (MMT) of CO_2, an increase of twenty MMT over 2004.[15] Emissions have grown at an annual rate of 1.2 percent between 1990 and 2005. Recently, the rate has slowed, with the average annual rate between 2000 and 2005 equaling 0.5 percent.

- **Price Impacts.** Table 1, on the following page, shows the price impacts of a $15 per ton CO_2 tax under the assumption that the tax is fully passed forward. The price shown for gasoline is not in addition to that on crude oil (i.e., it is not a double-tax). It is included to show how the price levied on crude oil would change the price of the refined product.[16] This provides a rough guide to the excise tax equivalent price impacts of a tax on CO_2. We can scale the tax rates to evaluate different carbon taxes. For example, a $10 per ton tax on CO_2 would raise the price of coal by $28.55 x 0.66 = $18.84.

  A $15 CO_2 tax would raise the price of gasoline by 14¢ per gallon. A similar calculation can be made for coal-fired electricity. Using the most recent data from EPA's Emissions & Generation Resource Integrated Database (eGRID), we calculate that the average emission rate for coal-fired power plants is 2,395 pounds of CO_2 per megawatt-hour (MWh) of electricity. A $15 per ton CO_2 tax would raise the price of coal-fired electricity by 1.63¢ per kilowatt-hour (kWh), or 20 percent at an average electricity price of 8.3¢ per kWh.

Table 2 shows the impact of a $15 per ton carbon tax on the price of major fuels used in electricity generation. Fuel prices are prices at which the carbon tax would likely be applied.[17] Not surprisingly, coal is most heavily impacted by a carbon tax, with coal's price rising by more than three-quarters with a tax of this magnitude.

- **Behavioral Responses and Revenue.** The higher energy prices in table 2 should bring about a reduction in the demand for carbon-intensive fuels. A full analysis of equilibrium changes in carbon emissions requires a Computational General Equilibrium (CGE) model, an exercise that is beyond the scope of this paper. We can, however, make a rough calculation using previously published results from CGE models. Here, we extrapolate results from the analysis of Bovenberg and Goulder of a $25 per ton tax on carbon.[18] Table 3 presents the price and output changes for fossil fuels following the imposition of the carbon tax in Bovenberg and Goulder's study. We compute the arc elasticity as the ratio of the percentage output change to price change.

These response elasticities are not price elasticities in the usual sense, since they are the outcome of the entire general equilibrium response to the tax. These responses, for example, include a shift in electricity production away from coal toward natural gas and oil.[19] They are also relatively short-run responses, on the order of three to five years following the phased-in introduction (over three years) of the carbon tax.

The elasticities from table 3 combined with the price increases in table 2 imply the reductions in fuel use and carbon emissions seen in table 4.

TABLE 1
PRICE IMPACTS OF A $15 CO_2 TAX

	Coal	Crude Oil	Natural Gas	Gasoline
Energy Unit	**Short Ton**	**Barrel**	**mcf**	**Gallon**
MT C/Quad Btu	25,980,000	20,300,000	14,470,000	19,340,000
Mt CO_2/Quad Btu	95,260,000	74,433,333	53,056,667	70,913,333
Btu/Energy Unit	19,980,000	5,800,000	1,027,000	124,167
Mt CO_2/Energy Unit	1.903	0.432	0.054	0.009
Tax/Energy Unit	$28.55	$6.48	$0.81	$0.14

SOURCES: Carbon content of fuels from www.eia.doe.gov/environment.html; energy content of fuels from U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Annual Energy Review 2005*, DOE/EIA-0384(2005), Washington, DC: EIA, 2006.

TABLE 2
SHORT-RUN PRICE EFFECTS OF A $15 CO_2 TAX

Energy Source	Unit	Price Per Unit ($)	Tax Per unit of Energy	Price Change (%)
Coal	short ton	$34.29	28.55	83.3
Crude Oil	barrel	$60.23	6.48	10.8
Natural Gas	million cubic feet	$8.53	0.82	9.6

SOURCE: Prices are 2006 averages as reported by Energy Information Administration (EIA). Coal statistics from EIA, "Receipts, Average Cost and Quality of Fossil Fuels," available at www.eia.doe.gov/cneaf/electricity/epm/table4_2.html; crude oil statistics from EIA, "Refiner Acquisition Cost of Crude Oil," available at http://tonto.eia.doe.gov/dnav/pet/pet_pri_rac2_dcu_nus_a.htm; and natural gas statistics from EIA, "Natural Gas Prices," available at http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm. Unit taxes computed from table 1.

NOTE: Tax is assumed to be fully passed forward.

TABLE 3
IMPLIED OUTPUT ELASTICITIES

	Price Change (%)	Output Change (%)	Output Elasticity
Coal Mining	54.50	-19.10	-0.350
Oil	13.20	-2.10	-0.159
Natural Gas	13.20	-2.10	-0.159

SOURCE: A. Lans Bovenberg and Lawrence Goulder, "Neutralizing the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?" in *Distributional and Behavioral Effects of Environmental Policy*, eds. Carlo Carraro and Gilbert E. Metcalf (Chicago: University of Chicago Press, 2000), table 2.2.

NOTE: Output elasticity is the ratio of the percent change in quantity demanded divided by the percent change in price, multiplied by negative one.

As table 4 shows, CO_2 emissions are reduced by 663 million metric tons, a decline of 11 percent. Most of the reduction in emissions comes from reduced coal use. A static estimate of CO_2 tax revenue (ignoring the behavioral response) suggests that a $15 tax would raise $90.1 billion per year in the near term.[20] Allowing for the emissions reductions calculated in table 4, the tax would raise $80.2 billion per year. Clearly, the tax would raise less money in future years as greater reductions in carbon emissions occurred through improvements in efficiency, fuel switching, or new technologies like carbon capture and sequestration.[21] The revenue estimate, however, does not factor in growth in demand for electricity nor the baseline growth in carbon emissions that would result in the absence of any carbon policy.

Applying this approach to different carbon tax rates gives the results for emissions reductions and tax revenues seen in table 5.

While these results are useful for providing a ballpark estimate of the impact of a carbon tax, more detailed modeling will be required to refine them further. Our estimates are broadly consistent with results from more detailed CGE modeling of U.S. carbon policies.[22]

TABLE 4
EMISSIONS REDUCTIONS FOR A $15 TAX

Energy Source	Output Change (%)	CO_2 Emissions (MMT)	Reduction in CO_2 Emissions (MMT)
Coal	−29.2	2,046	597.1
Crude Oil	−1.7	2,832	48.4
Natural Gas	−1.5	1,130	17.2
Total	N/A	6,009	662.8

SOURCE: Authors' calculations.

TABLE 5
VARYING THE TAX RATE

Tax Rate Per Ton ($)	Emissions Reductions (%)	Tax Revenue ($ billions, annual rate)
10	7.40	55.7
15	11.0	80.2
20	14.7	102.5
25	18.4	122.6

SOURCE: Authors' calculations.

TABLE 6
CARBON TAXES AS A SHARE OF OTHER TAXES

Tax Rate Per Ton ($)	Tax Revenue ($ billions)	Personal Income Tax (%)	Corporate IncomeTax (%)	Payroll Taxes (%)
10	55.7	6.0	20.0	7.0
15	80.2	8.6	28.8	10.1
20	102.5	11.1	36.8	12.9
25	122.6	13.2	44.1	15.4

SOURCE: Authors' calculations.

- **Potential Uses of Revenue.** Carbon tax revenues could be used for a number of purposes, such as lowering payroll and corporate income taxes, funding tax relief to low-income earners most affected by increased energy prices, or a combination of these. Table 6 reports the carbon tax revenue from table 5 as a percentage of various tax collections in 2005, as reported in the most recent administration budget submission.

A $15 per ton CO_2 tax raises enough revenue to reduce the corporate income tax by over one-quarter and income or payroll taxes by roughly 10 percent. In a policy brief for the Brookings Institution and the World Resources Institute, economist Gilbert Metcalf estimated that a rebate of the employer and employee payroll tax contribution on the first $3,660 of earnings per worker in 2003 would be sufficient to make the carbon tax both revenue- and distributionally neutral.[23]

Distributional neutrality may well impact the desirability and political feasibility of a carbon tax, but there are efficiency considerations as well. There is substantial literature on the "double dividend" that examines the economic conditions under which a

carbon tax can be paired with a reduction in other taxes in a manner that improves the overall efficiency of the economy. Where such a double dividend is available, a carbon tax swap would be desirable, even if the environmental benefit of reduced carbon emissions failed to be realized.

The concept of the double dividend stems from the observation that a tax on an environmental externality not only helps curb the externality (dividend 1), but also provides revenue with which other distorting taxes can be reduced, thereby providing efficiency gains (dividend 2).[24]

The double dividend comes in different levels.[25] The "weak" double dividend states that if one has an economically distorting tax, using environmental tax proceeds to lower it provides *greater efficiency gains* than returning the proceeds lump sum to those who pay the environmental tax. An intermediate form of the double dividend hypothesis is that there exists a distortionary tax, such that using environmental tax proceeds to lower this tax will *improve welfare*, setting aside environmental benefits.[26] A strong form claims that a welfare gain will occur when environmental proceeds replace those of the typical distorting tax.

> A tax swap would create economy-wide incentives for energy efficiency and lower-carbon energy, and by raising the price of energy, would also reduce energy use.

The weak double dividend is uncontroversial,[27] while the strong double dividend is somewhat more controversial.[28] Criticisms notwithstanding, logic suggests that the pursuit of a strong double dividend is desirable as a matter of public policy. To that end, it would seem much more desirable in terms of efficiency to pursue capital tax reduction as a revenue feedback than other choices, as the current treatment of capital in the tax code is quite far from the optimal tax of zero, and the efficiency gains from a reduction in a payroll tax would likely be minimal if labor is, as is generally accepted, supplied relatively inelastically.

It should be noted that cap-and-trade systems and carbon-tax systems can be designed so they are quite similar. If, for example, emissions are capped and permits are auctioned off, then one could, after observing the auction price, set a carbon tax that leads to a similar emissions and revenue outcome. Cap-and-trade systems, however, generally have been pursued as an alternative to revenue-raising taxes, and often allocate the permits according to some formula rather than through an auction. For the purposes of exposition, we compared a carbon tax to this latter form of the cap-and-trade system. One should remember that cap-and-trade proposals can be adjusted to raise revenues, and the revenues could then be used to pursue the double dividend. In that case, the relative merits of a carbon tax would be diminished.

Achieving a More Efficient System

A cap-and-trade approach to controlling GHG emissions would be highly problematic. A lack of international binding authority would render enforcement nearly impossible, while the incentives for cheating would be extremely high. The upfront costs of creating institutions to administer trading are significant and likely to produce entrenched bureaucracies that clamor for ever-tighter controls on carbon emissions. Permit holders will see value in further tightening of caps, but will resist efforts outside the cap-and-trade system that might devalue their new carbon currency. Higher energy costs resulting from trading would lead to economic slowdown, but as revenues would flow into for-profit coffers (domestically or internationally), revenues would be unavailable for offsetting either the economic slowdown or the impacts of higher energy prices on low-income earners.

A program of carbon-centered tax reform, by contrast, lacks most of the negative attributes of cap-and-trade, and could convey significant benefits unrelated to GHG reductions or avoidance of potential climate harms, making this a no-regrets policy. A tax swap would create economy-wide incentives for energy efficiency and lower-carbon energy, and by raising the price of energy would also reduce energy use. At the same time, revenues generated would allow the mitigation of the economic impact of higher energy prices, both on the general economy and on the lower-income earners who might be disproportionately affected by such a change. Carbon taxes would be more difficult to avoid, and existing institutions quite adept at tax collection could step up immediately. Revenues would remain in-country, removing international incentives for cheating or insincere participation in carbon-reduction programs. Most of these effects would remain beneficial even if science should

determine that reducing GHG emissions has only a negligible effect on mitigating global warming.

A modest carbon tax of $15 per ton of CO_2 emitted would result in an 11 percent decline in CO_2 emissions, while raising non–coal-based energy forms modestly. Coal-based energy prices would be affected more strongly, which is to be expected in any plan genuinely intended to reduce GHG emissions. A number of possible mechanisms are available to refund the revenues raised by this tax. On net, these tools could significantly reduce the economic costs of the tax and quite possibly provide economic benefits.

For these reasons, we conclude that if aggressive actions are to be taken to control GHG emissions, carbon-centered tax reform—not GHG emission trading—is the superior policy option.

AEI editorial associate Nicole Passan worked with Messrs. Green, Hayward, and Hassett to edit and produce this Environmental Policy Outlook.

Notes

1. United States Environmental Protection Agency (EPA), "Progress Reports," available at www.epa.gov/airmarkets/progress/progress-reports.html.

2. Sequestration projects currently appear to be not only very expensive, but they also reduce net power generation by as much as 20 percent, further aggravating the cost that will be passed along to consumers and rate payers.

3. 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," February 2007, 22, available at www.theamericanconsumer.org/Shapiro.pdf.

4. William Nordhaus, "Life after Kyoto: Alternative Approaches to Global Warming Policies" (NBER working paper no. W11889, December 2005), 15.

5. Ibid., 22.

6. 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."

7. RECLAIM covered 390 stationary sources of NOx and fourteen stationary sources of SO_2, which represented only 17 percent of total basin-wide NO_x emissions and 31 percent of basin-side SO_2 emissions.

8. The Clean Air Act forbids it, in fact. SCAQMD's RECLAIM regulations read: "An RTC [RECLAIM Trading Credit] shall not constitute a security or other form of property." Section 4 of the RECLAIM regulations reiterated this point: "Nothing in District rules shall be construed to limit the District's authority to condition, limit, suspend, or terminate any RTCs or the authorization to emit which is represented by a Facility Permit." (Cited in James L. Johnston, "Pollution Trading in La-La Land," *Regulation* [Fall 1991], available at www.cato.org/pubs/regulation/reg17n3-johnston.html.)

9. Carbon Tax Center, "Who Supports," available at http://carbontax.wrkng.net/who-supports/.

10. William Pizer, "Choosing Price or Quantity Controls for Greenhouse Gases," *Resources for the Future Climate Issues Brief* 17 (July 1999).

11. Louis Kaplow and Steven Shavell, "On the Superiority of Corrective Taxes to Quantity Regulation," *American Law and Economics Review* 4, no. 1 (2002).

12. William Pizer, "Choosing Price or Quantity Controls for Greenhouse Gases."

13. William Nordhaus, "Life after Kyoto: Alternative Approaches to Global Warming Policies," 15.

14. Ibid.

15. U.S. Department of Energy (DOE), Energy Information Administration (EIA), *Emissions of Greenhouse Gases in the United States 2005*, DOE/EIA-0573(2005), Washington, DC: DOE, 2006. Total GHG emissions equaled 7,147 million metric tons CO_2 equivalent using hundred-year global warming potentials. Note that a simple conversion of other GHGs (i.e., methane, nitrous oxides, HFCs, and PFCs) does not exist. The global warming potential depends on the time horizon. We focus on CO_2 only in this study, though, ideally, a carbon tax would also tax these non-CO_2 emissions.

16. This is a standard assumption borne out by CGE modeling. See, for example, A. Lans Bovenberg and Lawrence Goulder, "Neutralizing the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?" in *Distributional and Behavioral Effects of Environmental Policy*, eds. Carlo Carraro and Gilbert. E. Metcalf (Chicago: University of Chicago Press, 2000), 45–85.

17. We assume the tax on coal would be applied for electric utilities and major industrial coal users. Note that 91 percent of domestic and imported coal is consumed by electric utilities. (DOE, EIA, *Emissions of Greenhouse Gases in the United States 2005*.) The tax on crude oil is levied at refineries, and the tax on natural gas at the city gate.

18. A. Lans Bovenberg and Lawrence Goulder, "Neutralizing the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?"

19. Increased coal prices could also lead to increased demand for imported oil, an important policy consideration outside the scope of this paper.

20. Carbon taxes can be reported in either units of carbon or CO_2. To convert a tax rate per unit of carbon dioxide to a rate per unit of carbon, multiply the CO_2 rate by 44/12 (the mass difference between carbon and CO_2). Thus, a tax of $10 per ton of CO_2 is equivalent to a tax of $36.67 per ton of carbon.

21. The recent coal study by researchers at the Massachusetts Institute of Technology suggests that carbon capture and sequestration is cost competitive at a carbon price of $30 per ton of CO_2. See John Deutch and Ernest Moniz, *The Future of Coal* (Massachusetts Institute of Technology, 2007), available at http://web.mit.edu/coal/.

22. Sergey Paltsev et al., *Assessment of U.S. Cap-and-Trade Proposals*, report 146 (Cambridge, MA: MIT Joint Program on the Science and Policy of Global Change, 2007), available through http://mit.edu/globalchange/www/abstracts.html#top.

23. Gilbert Metcalf, *A Green Employment Tax Swap: Using a Carbon Tax to Finance Payroll Tax Relief* (Washington, DC: Brookings Institution–World Resources Institution, 2007).

24. Don Fullerton and Gilbert E. Metcalf, "Environmental Taxes and the Double Dividend Hypothesis: Did You Really Expect Something for Nothing?" *Chicago-Kent Law Review* 73, no. 1 (1998): 221–56.

25. See Lawrence H. Goulder, "Environmental Taxation and the 'Double Dividend': A Reader's Guide," *International Tax and Public Finance* 2 (1995): 157–83, for a thorough taxonomy of the various double dividends. Also see A. Lans Bovenberg and Lawrence Goulder, "Neutralizing the Adverse Industry Impacts of CO_2 Abatement Policies: What Does It Cost?"

26. The terminology of intermediate and strong double dividends is due to Goulder, "Environmental Taxation and the 'Double Dividend': A Reader's Guide."

27. Mustafa Babiker, Gilbert E. Metcalf, and John Reilly, "Tax Distortions and Global Climate Policy," *Journal of Environmental Economics and Management* 46 (2003): 269–87. Babiker et al. show that it is possible, however, to find taxes such that lump-sum replacement dominates, lowering a distortionary tax.

28. A. Lans Bovenberg and Ruud de Mooij, "Environmental Levies and Distortionary Taxation," *American Economic Review* 84, no. 4 (1994): 1085–89. See also Lawrence H. Goulder, "Environmental Taxation and the 'Double Dividend': A Reader's Guide."

Los Angeles Times
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From the Los Angeles Times

A WARMING WORLD

Time to tax carbon

A carbon tax is the best, cheapest and most efficient way to combat cataclysmic climate change.

May 28, 2007

IF YOU HAVE KIDS, take them to the beach. They should enjoy it while it lasts, because there's a chance that within their lifetimes California's beaches will vanish under the waves.

Global warming will redraw the maps of the world. The U.N.'s Intergovernmental Panel on Climate Change predicts that sea levels will rise 7 to 23 inches by the end of the century; as the water gets higher, the sandy beaches that make California a tourist magnet will be washed away. Beachfront real estate will end up underwater, cliffs will erode faster, sea walls will buckle and inlets will become bays. The water supply will be threatened as mountain snowfall turns to rain and the Sacramento-San Joaquin Delta faces contamination with saltwater. Droughts will likely become more common, as will the wildfires they breed.

Global warming is happening and will accelerate regardless of what we do today, but the scenarios of climatologists' nightmares can still be avoided. Though the cost will be high, it pales in comparison to the cost of doing nothing.

The proposed fixes for climate change are as numerous as its causes. Most only tinker at the edges of the problem, such as a California bill to phase out energy-inefficient lightbulbs. To produce the cuts in greenhouse gases needed to slow or stop global warming, the world will have to phase out the fossil fuels on which it relies for most of its power supply and transportation — especially the coal-burning power plants that account for about 32% of the annual emissions of carbon dioxide in the U.S. and that generate about half of our electricity. There are three basic methods of doing that, which are the subject of debate and legislation at every level of government.

Tax or trade?
The first is the simplest, and the least efficient: Just order the polluters to clean up. Unfortunately, that's the strategy favored by the Legislature, which last year ordered that greenhousegas emissions in California be cut by 25% by 2020 and is now coming up with ways to meet the goal through conservation and regulation.

The law isn't specific about how to achieve the reduction, opening the door for Gov. Arnold Schwarzenegger to pursue Method No. 2: a cap-and-trade system. Under this system, the government decides how many tons of a given greenhouse gas can be emitted statewide and passes out credits to the emitters. Polluters trade credits among themselves; those for whom it's relatively cheap to cut

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emissions sell credits to those for whom it's expensive. In the last year, Schwarzenegger has been traveling around the country and the world signing cap-and-trade deals.

The difference between these methods is that the Legislature wants to impose a cap without any trade. This "command and control" strategy is extremely punitive to some polluters, such as utilities that rely heavily on dirty, old coal plants. Many will find it impossible to meet the state goal, exposing them to harsh fines — the costs of which they'll pass on to their customers. Of all possible approaches, it would have the worst effect on the state economy.

Cap-and-trade isn't just less expensive, it has proved to be workable. In 1995, the federal government launched a cap-and-trade program for sulfur dioxide, the main ingredient in acid rain. The goal was to reduce emissions to half their 1980 levels by 2010, and the program is expected to reach it or fall just short. It has become a model worldwide, leading signatories to the Kyoto Protocol to pursue an international cap-and-trade system for greenhouse gases. Moreover, the carbon-trading concept has widespread political and business support — even such gargantuan polluters as Duke Energy, BP America and General Motors have joined a corporate coalition calling for a federal cap-and-trade program.

And yet for all its benefits, cap-and-trade still isn't the most effective or efficient approach. That distinction goes to Method No. 3: a carbon tax. While cap-and-trade creates opportunities for cheating, leads to unpredictable fluctuations in energy prices and does nothing to offset high power costs for consumers, carbon taxes can be structured to sidestep all those problems while providing a more reliable market incentive to produce clean-energy technology.

Europeans strike out

To understand the drawbacks of cap-and-trade, one has to look not only at the successful U.S. acid rain program but the failed European Emissions Trading Scheme, the first phase of which started in January 2005. European Union members each developed emissions goals, then passed out credits to polluters. Yet for a variety of reasons, the initial cap was set so high that the polluters fell under it without making any reductions at all. The Europeans are working to improve the scheme in the next phase, but their chances of success aren't good.

One reason is the power of lobbyists. In Europe, as in the U.S., special interests have a way of warping the political process so that, for example, a corporation generous with its campaign contributions might win an excessive number of credits. It's also very easy in many European countries to cheat; because there aren't strong agencies to monitor and verify emissions, companies or utilities can pretend they're cleaner than they are.

The latter problem might be avoided in the U.S. by beefing up the Environmental Protection Agency. But there's reason to suspect that many of the corporate interests pushing for a federal cap-and-trade program are hoping for a seat at the table when credits are passed out, and they will doubtless fudge numbers to maximize their credits; some companies stand to make a great deal of money under a trading system. Also hoping to profit, honestly or not, would be carbon traders. Large financial institutions would jump into the exchange to collect commissions on carbon trades, just as they do with crude oil and wheat. This presents opportunities for Enron-style market manipulation.

Cap-and-trade would also have a nasty effect on consumers' power bills. Say there's a very hot summer week in California. Utilities would have to shovel more coal to produce more juice, causing their emissions to rise sharply. To offset the carbon, they would have to buy more credits, and the heavy

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demand would cause credit prices to skyrocket. The utilities would then pass those costs on to their customers, meaning that power bills might vary sharply from one month to the next.

That kind of price volatility, which has been endemic to both the American and European cap-and-trade systems, doesn't just hurt consumers. It actually discourages innovation, because in times when power demand is low, power costs are low, and there is little incentive to come up with cleaner technologies. Entrepreneurs and venture capitalists prefer stable prices so they can calculate whether they can make enough money by building a solar-powered mousetrap to make up for the cost of producing it.

Carbon taxes avoid all that. A carbon tax simply imposes a tax for polluting based on the amount emitted, thus encouraging polluters to clean up and entrepreneurs to come up with alternatives. The tax is constant and predictable. It doesn't require the creation of a new energy trading market, and it can be collected by existing state and federal agencies. It's straightforward and much harder to manipulate by special interests than the politicized process of allocating carbon credits.

And it could be structured to be far less harmful to power consumers. While all the added costs under cap-and-trade go to companies, utilities and traders, the added costs under a carbon tax would go to the government — which could use the revenues to offset other taxes. So while consumers would pay more for energy, they might pay less income tax, or some other tax. That could greatly cushion the overall economic effect.

Taxes a tough sell

There is a growing consensus among economists around the world that a carbon tax is the best way to combat global warming, and there are prominent backers across the political spectrum, from N. Gregory Mankiw, former chairman of the Bush administration's Council on Economic Advisors, and former Federal Reserve Chairman Alan Greenspan to former Vice President Al Gore and Sierra Club head Carl Pope. Yet the political consensus is going in a very different direction. European leaders are pushing hard for the United States and other countries to join their failed carbon-trading scheme, and there are no fewer than five bills before Congress that would impose a federal cap-and-trade system. On the other side, there is just one lonely bill in the House, from Rep. Pete Stark (D-Fremont), to impose a carbon tax, and it's not expected to go far.

The obvious reason is that, for voters, taxes are radioactive, while carbon trading sounds like something that just affects utilities and big corporations. The many green politicians stumping for cap-and-trade seldom point out that such a system would result in higher and less predictable power bills. Ironically, even though a carbon tax could cost voters less, cap-and-trade is being sold as the more consumer-friendly approach.

A well-designed, well-monitored carbon-trading scheme could deeply reduce greenhouse gases with less economic damage than pure regulation. But it's not the best way, and it is so complex that it would probably take many years to iron out all the wrinkles. Voters might well embrace carbon taxes if political leaders were more honest about the comparative costs.

The world is under a deadline. Some scientists believe that once atmospheric carbon dioxide levels have doubled from the pre-industrial level, which may happen by mid-century if no action is taken, the damage may be irreversible.

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CHOOSING PRICE OR QUANTITY CONTROLS FOR GREENHOUSE GASES

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Choosing Price or Quantity Controls for Greenhouse Gases

William Pizer, Resources for the Future

I. Introduction

Much of the debate surrounding climate change has centered on verifying the threat of climate change and deciding the magnitude of an appropriate response. After years of negotiation, this effort led to the 1997 signing of the Kyoto Protocol, a binding commitment by industrialized countries to reduce their emissions of carbon dioxide to slightly below 1990 recorded levels. Without approving or disapproving of the response effort embodied in the Kyoto Protocol, I believe that an important element has been ignored. Namely, should we specify our response to climate change in terms of a quantitative target?

The appeal of a quantitative target is obvious. A commitment to a particular emissions level provides a straightforward measure of environmental progress as well as compliance. Commitment to an emissions tax, for example, offers neither a guarantee that emissions will be limited to a certain level nor an obvious way to measure a country's compliance (when other taxes and subsidies already exist). Yet, it is precisely this concern which points to an important observation.

Quantity targets guarantee a fixed level of emissions. Emission taxes guarantee a fixed financial incentive to reduce emissions. Both can be set at either aggressive or modest levels. Aside from the appeal of the known and verifiable emissions levels that quantity targets can ensure, might there be other important differences between price and quantity controls?

Economists would say yes. With uncertain outcomes and policies that are fixed for many years, it is important to carefully consider both the costs and benefits of alternate price and quantity controls in order to judge which is best. My own analysis of the two approaches indicates that price-based greenhouse gas (GHG) controls are much more desirable than quantity targets, taking into account both the potential long-term damages of climate change and the costs of GHG control. This can be argued on the basis of both theory and numerical simulations. Based on the latter, I find that price mechanisms produce expected net gains *five times higher* than even the most favorably designed quantity target.

To explain this conclusion, I first characterize the differences between price and quantity controls for GHGs. I then present both theoretical and empirical evidence that price-based controls are preferable to quantity targets based on these differences. Finally, I discuss how price controls can be implemented *without* a general carbon tax. This last point is particularly salient for the United States, where taxes are generally unpopular. The "safety valve," as it is often called, involves a cap-and-trade GHG system accompanied by a specified fee or penalty for emissions beyond the initial cap.

II. How do quantity- and price-based mechanisms work?

A quantity mechanism—usually referred to as a permit or cap-and-trade system—works by first requiring individuals to obtain a permit for each ton of carbon dioxide they emit, and then limiting the number of permits to a fixed level.[1] This permit requirement could be imposed on the individuals who actually release carbon dioxide into the atmosphere by burning coal, petroleum products, or natural gas. However, unlike emissions of conventional pollutants which depend on a variety of other factors, carbon dioxide emissions can be determined very accurately by the volume of fuel being used. Rather than requiring *users* of fossil fuels to obtain permits, we could therefore require *producers* to obtain the same permits. This has the advantage of involving far fewer individuals in the regulatory process, thereby reducing both monitoring and enforcement costs (see the papers by Carolyn Fischer, Suzi Kerr and Michael Toman in Further Readings). This type of system has been used with considerable success in the United States to regulate both sulfur dioxide and lead.

A key element in a permit system is that individuals are free to buy and sell existing permits in an effort to obtain the lowest cost of compliance for themselves, in turn leading to the lowest cost of compliance for society. In particular, when individuals observe a market price for permits, those that can reduce emissions more cheaply will do so in order to either sell excess permits or avoid having to buy additional ones. Similarly, those who face higher reduction costs will avoid reductions by either buying permits or keeping those they already possess. In this way, total emissions will exactly equal the number of permits while only the cheapest reductions are undertaken.

A price mechanism—usually referred to as a carbon tax or emissions fee—requires the payment of a fixed fee for every ton of CO_2 emitted. Like the permit system, this fee could be levied upstream on fossil fuel producers or downstream on fossil fuel consumers. Either way, we associate a positive cost with emissions of CO_2 and create a fixed monetary incentive to reduce emissions. Such price-based systems have been used in Europe to regulate a wide range of pollutants (although the focus is usually revenue generation rather than substantial emissions reductions).

Like a tradable permit system, price mechanisms are cost-effective. Only those emitters who can reduce emissions at a cost below the fixed fee or tax will choose to do so. Since only the cheapest reductions are undertaken, we are guaranteed that the resulting emission level is obtained at the lowest possible cost.

The important distinction between these two systems is how they adjust when costs change unexpectedly. A quantity or permit system adjusts by allowing the permit price to rise or fall while holding the emissions level constant. A price or tax system adjusts by allowing the level of total emissions to rise or fall while holding the price associated with

[1] Here and throughout this brief, we discuss policies designed to limit carbon dioxide emissions from fossil fuel sources. These emissions constitute the bulk of GHG emissions and are the general focus of most policy discussions. Regardless, the arguments made in this context apply equally well to the regulation of GHG emissions more broadly defined.

emissions constant. Ignoring uncertainty and assuming we know the costs of controlling CO_2, both policies can be used with the same results. Consider the following example:

Suppose we *know* that with a comprehensive domestic CO_2 trading system in place in the United States by the year 2010, a permit volume of 1.2 gigatons of carbon equivalent emissions (GtC) will lead to a $100 permit price per ton of carbon. (1998 US emissions of carbon from fossil fuels are estimated at 1.5 GtC.) In other words, faced with a price incentive of $100 per ton to reduce emissions, regulated firms in the United States will find ways to reduce emissions to 1.2 GtC. Therefore, the same outcome can be obtained by imposing a $100 per ton carbon tax.

III. Uncertainty about costs

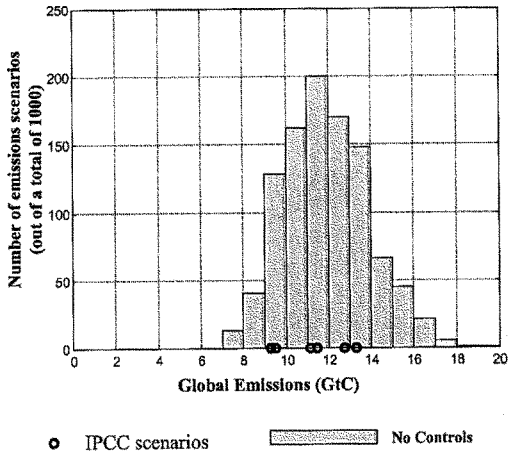
In reality, we have only a vague idea about the permit price that would occur with emissions of 1.2 GtC or any other emission target. There are three reasons why such costs are hard to pin down. First, little evidence exists concerning reduction costs. There are no recent examples of carbon reductions on a substantial scale from which to base estimates. In the 1970's, energy prices doubled and encouraged increased energy efficiency, but these events occurred both in a context of considerable uncertainty about the future and alongside many other confounding factors (such as increased environmental regulation). Alternatively, engineering studies provide a bottom up approach to estimating costs. However, comparisons of past engineering forecasts to actual implementation costs suggest that they are inaccurate at best (see work by Winston Harrington and Richard Morgenstern under Further Readings).

A second source of uncertainty arises because we need to forecast compliance costs in the *future*. This involves difficult predictions about the evolution of new technologies. Proponents of aggressive policy argue that reductions will be cheap as new low-carbon or carbon-free energy technologies become available. Proponents of more modest policies argue that these are unproven, pie-in-the-sky technologies that may never be practical.

Finally, it is impossible to know how uncontrolled emission levels will change in the future. That is, to achieve 1990 emission levels in 2010, it is unclear whether reductions of 5, 25 or even 50% will be necessary. The Intergovernmental Panel on Climate Change (IPCC), the international agency charged with studying climate change, gives a range of six possible global emission scenarios in the year 2010 that include a low of 9 GtC and a high of 13 GtC. My own simulations suggest a broader possible range, from 7 to 18 GtC.

The low end of both ranges reflects the possibility that population and economic growth may slow in the future and the energy intensity of production may fall. The high end reflects the opposite possibility, that growth is high and energy intensity rises. Figure 1 shows the distribution of uncontrolled emissions arising from my simulations of one thousand possible outcomes in 2010 alongside the six IPCC scenarios. (For details on the modeling, see paper by Pizer in Further Readings.)

Figure 1: Distribution of Emissions in 2010



In summary, there are two important reasons why we have only vague ideas about the cost of alternative emission targets. First, there is little historic evidence on costs. Second, as we examine policies ten or more years in the future, it is unclear how both baseline emissions and available technologies will change between now and then. From the preceding figure, global emissions could be anywhere from 7 to 18 GtC in 2010. The cost associated with a 8.5 GtC (1990 level) target will be uncertain both because the necessary reduction is uncertain—somewhere between zero and 10 GtC—and because even knowing the reduction level, costs are difficult to estimate.

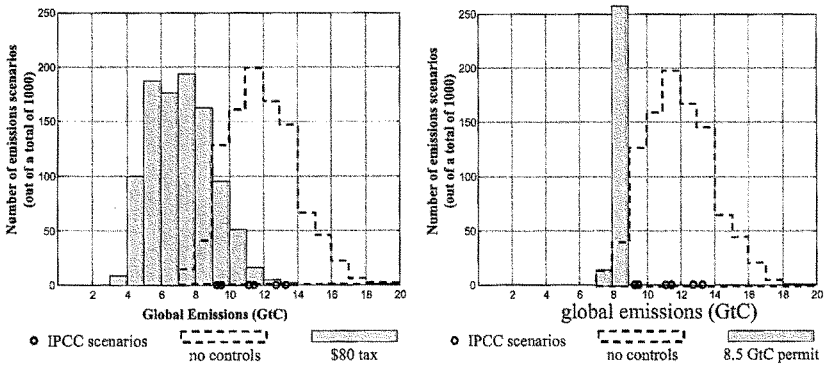
IV. Effects of price and quantity controls with cost uncertainty

When the cost of a particular emission target is uncertain, price and quantity controls will have distinctly different consequences for the actual level of emissions as well as the overall cost of a climate policy. Even if both policies are designed to deliver the same results under a best guess scenario, they will necessarily behave differently when control costs deviate from this best guess. These differences arise because a price policy provides a fixed $/ton incentive regardless of the emission level, while a quantity policy generates whatever incentive is necessary in order to strictly limit emissions to a specified level.

Figure 2 illustrates these differences by showing the emission consequences in 2010 associated with two policies that are roughly equivalent under a best-guess scenario: a quantity target of 8.5 GtC and a carbon tax of $80 per ton. Using the same one thousand emission scenarios shown in Figure 1, simulations are used to calculate the effect of these two policies for each outcome. With a carbon tax, the left panel indicates that emissions

are below 8.5 GtC in over 75% of the outcomes. In other words, on average the carbon tax achieves *more* reductions than a quantity target of 8.5 GtC. Sometimes, the reductions are much more: note that emissions may be as low as 3 GtC. Yet, the carbon tax fails to *guarantee* that emissions will always be below any particular threshold.

Figure 2: Effect of Price and Quantity Controls on Emissions in 2010

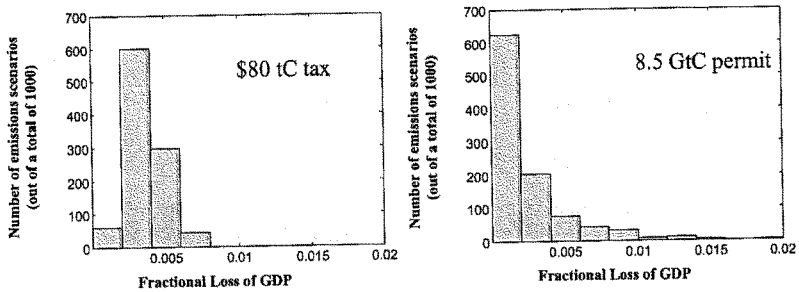


The quantity target, in contrast, never results in emission levels above 8.5 GtC. Since some emission outcomes in the absence of controls were rather high, on the order of 18 GtC, we would expect that the cost of this policy could be quite high. At the other extreme, the quantity policy could be costless if uncontrolled emissions are unexpectedly low.

This suggests that the cost associated with quantity controls will be high or low depending on future reduction costs as well as the future level of uncontrolled emissions. In contrast, price controls create a fixed incentive to reduce each ton of carbon dioxide regardless of the uncontrolled emission level. Therefore, costs under a carbon tax should fluctuate much less than costs under a quantity control.

With this distinction in mind, Figure 3 shows the estimated cost consequences of both policies. The range of costs associated with the quantity target is quite wide as we suspected. The estimates extend from zero to 2.2% of global gross domestic product (GDP). That is almost four times higher than the highest cost outcome under the carbon tax. In fact, the cost associated with emission reductions under a carbon tax are concentrated entirely in the range 0.2% to 0.6% of GDP. Since the carbon tax always applies the same per ton incentive to reduce emissions, the cost outcomes are more narrowly distributed than those occurring under a quantity target.

Figure 3: Distribution of 2010 Costs associated with Price and Quantity Controls



V. Choosing between price and quantity controls

So far the discussion has been limited to the different emission and cost consequences of alternative price and quantity controls. Choosing between them, as well as choosing the appropriate stringency of either policy, requires making judgments about climate change consequences as well as control costs. In order to help us understand when one policy instrument will likely be preferred to the other, it is useful to consider two extreme cases.

First, imagine that there is a known climate change *threshold*. When carbon dioxide emissions are below this threshold, the consequences are negligible. Above this threshold, however, damages are potentially catastrophic. For example, research suggests that the process by which carbon dioxide is absorbed at the surface of the oceans and circulated downward could change dramatically under certain circumstances (see article by Broecker listed in Further Readings). If we further believe that these changes will have severe consequences *and* we can identify a safe emission threshold for avoiding them, then quantity controls seem preferable. Quantity controls can be used to avoid crossing the threshold and, in this case, large expenditures in order to meet the target are justified by the dire consequences of missing it.

Now, imagine instead that every ton of carbon dioxide emitted causes the same incremental amount of damage. These damages might be very high or low, but the key is that each ton of emissions is just as bad as the next. Such a scenario is also plausible, as indicated by a survey of experts including both natural and social scientists who do research on global warming. Their beliefs suggest that the damage caused by each ton of emitted CO_2 may be quite high but that there is no threshold: damages are essentially proportional to emissions. Each additional ton is equally damaging, whether it is the first ton emitted or the last (Tim Roughgarden and Steven Schneider discuss this survey, originally conducted by William Nordhaus; see Further Readings for both references).

In this case, it makes sense to use a price instrument. Specifically, a carbon tax equal to the damage per ton of CO_2 will lead to exactly the right balance between the cost of

reducing emissions and the resulting benefits of less global warming. Every time a firm decides to emit CO_2, it will be confronted with an added financial burden equal to the resulting damage. This will lead to reduction efforts as well as investments in new technology that are commensurate with the alternative of climate change damage. In this scenario, little emphasis is placed on reaching a particular emission target because there is no obvious quantity target to choose. This argument applies even if we are uncertain about the magnitude of climate damage per unit of CO_2.

VI. Arguments for Price Policies

Given this characterization of circumstances under which alternative price and quantity mechanisms are preferred, we can now make the argument for price controls. This argument hinges on two basic points. The first point is that climate change consequences generally depend on the *stock* of greenhouse gases in the atmosphere, rather than annual emissions. Greenhouse gases emitted today may remain in the atmosphere for hundreds of years. It is not the level of annual emissions that matters for climate change, but rather the total amount of carbon dioxide and other greenhouse gases that have accumulated in the atmosphere. The second point is that while scientists continue to argue over a wide range of climate change consequences, few advocate an immediate halt to further emission. For example, the most aggressive stabilization target discussed by the IPCC is 450 ppm (roughly 1035 GtC), a level that we will not reach before 2030 even in the absence of emission controls (see the Technical Summary provided in the IPCC report listed in Further Readings).

If only the stock of atmospheric GHGs matters for climate change, and if experts agree that the stock will grow at least in the immediate future, there is virtually no rationale for quantity controls (for further discussion see my paper with Richard Newell in Further Readings). The fact that only the stock matters should first draw our attention away from short-term quantity controls for emissions and toward long-term quantity controls for the *stock*. It cannot matter whether a ton of CO_2 is emitted this year, next year or ten years in the future if all we care about is the total amount in the atmosphere. Taking the next step and presuming that the stock will grow over the next few decades, this suggests that there is some room to rearrange emissions over time and that a short-term quantity control on emissions is unnecessary.

Quantity controls derive their desirability from situations where strict limits are important, when dire consequences occur beyond a certain threshold. Such policies trade off lower expected costs in favor of strict control of emissions in all possible outcomes. However, under the assumption that it is acceptable to allow the stock of greenhouse gases to grow in the interim, there is no advantage to such strict control. We give up the flexible response of price controls without the benefit of an avoided catastrophe.

Even for those who believe the consequences of global warming will be dire and that current emission targets are not aggressive enough, price policies are still better. An aggressive policy designed to *eventually* stabilize the stock does not demand a strict limit on emissions before stabilization becomes necessary. Additional emissions this year are

no worse than emissions next year. Why not abate more when costs are low and less when costs are high—exactly the outcome under a price mechanism? When we eventually move closer to a point where the stock must be stabilized, a switch to quantity controls will be appropriate.

In addition to these theoretical arguments, one can also turn to integrated assessment models for support. To this end, I have constructed an integrated model of the world economy and climate based on the DICE model developed by William Nordhaus. In contrast to the DICE model, I simultaneously incorporate uncertainty about everything from growth in population and energy efficiency to the cost of emission reductions, to the sensitivity of the environment to atmospheric CO_2 and the damages arising from global warming.

The results of these simulations indicate the price-based mechanisms can generate overall economic gains (expected benefits minus expected costs) that are *five times higher* than even the most prudent quantity-based mechanism. These results are robust. Even allowing for catastrophic damages beyond three degrees centigrade of warming, price mechanisms continue to perform better. This robustness can be explained in two ways. First, the catastrophe, if it exists, lies in the future. Before we reach that point, it is desirable to have some flexibility in emission reductions. Specifically, one will want to delay those reductions if the costs are unexpectedly high in the short run, provided those reductions can be obtained more cheaply in the future but before the catastrophe.

Second, unlike the earlier, stylized description where climate consequences depend directly on CO_2 concentrations, in this model damages instead depend on temperature change. In reality, damages probably depend on an even more complex climatic response. Either way, the link between CO_2 emissions, concentrations, temperature change and other climatic effects are not precisely known. Therefore, a quantity control on *emissions* is not equivalent a quantity control on *climate change*. Both price and quantity controls will lead to uncertain climate consequences. Therefore the advantage of the quantity control—namely its ability to avoid with certainty the threat of climate catastrophe—is substantially weakened.

VII. Combined price and quantity mechanisms

Even if a carbon tax is preferable to a cap-and-trade approach in terms of social costs and benefits, this policy obviously faces steep political opposition in the United States. Businesses oppose carbon taxes because of the transfer of revenue to the government. Under a permit system there is a hope that some, if not all, permits would be given away for free. Environmental groups oppose carbon taxes for an entirely different reason: they are unsatisfied with the prospect that a carbon tax, unlike a permit system, fails to guarantee a particular emission level. Such antagonism from both sides of the debate makes it unlikely that a carbon tax will become part of the US response to the Kyoto protocol.

However, the advantages of a carbon tax can be achieved without the baggage accompanying an actual tax. In particular, a combined mechanism—often referred to as a hybrid or "safety-valve"—can obtain the economic advantages of a tax while preserving at least some of the political advantages of a permit system (other concerns about the revenue aspects of different policies have been discussed by Ian Parry; see Further Readings).

In such a scheme, the government first distributes a fixed number of tradable permits either freely, by auction, or both. The government then provides additional permits to anyone willing to pay a fixed ceiling or "trigger" price. The initial distribution of permits allows the government the flexibility to give away a portion of the right to emit CO_2, thereby satisfying concerns of businesses about government revenue increases. The sale of additional permits at a fixed price then gives the permit system the same compliance flexibility associated with a carbon tax.

With a combined price/quantity mechanism, it will be necessary to consider how both the trigger price and the quantity target should evolve over time. One possibility is to raise the trigger price over time in order to *guarantee* that the quantity target is eventually reached. A second possibility is to carefully choose future trigger prices as a measure of how much we are willing to pay to limit climate change. As we learn more about the costs of future emission reductions, however, this distinction between price and quantity controls will diminish. That is, once uncertainty about future compliance costs is reduced through experience, price and quantity controls can be used to obtain similar cost and emission outcomes.

Operationally, there are potential problems when this safety valve is used in conjunction with international emissions trading, as the Kyoto Protocol allows. In general, there would be a need for either harmonization of the trigger price across countries, or restrictions on the sale of permits from those countries with low trigger prices. Otherwise, there would be an incentive for countries with a low trigger price to simply print and export permits to countries with higher permit prices. This would not only effectively create low trigger prices everywhere, it would also create large international capital flows to the governments of countries with the low trigger prices.

Instead of harmonizing trigger prices, we could alternately set the trigger price low enough to avoid the need for international GHG trades. This may be a desirable end in light of concerns about the indirect economic consequences of large volumes of international GHG trade flows (this point has been made by Warwick McKibbin and Peter Wilcoxen; see Further Readings).

Finally, if we find it desirable to raise the trigger price rapidly, it will be necessary to limit the possibility that permits can be purchased now and held for long periods of time. Otherwise, there will be a strong incentive to buy large volumes of cheap permits now in order to sell them at high prices in the future. This problem is easily addressed by assigning an expiration date for permits as they are issued, for perhaps one or two years in the future.

VIII. Building domestic and international support for a price-based approach

While the safety valve approach is potentially appealing to businesses concerned about the uncertainty surrounding future permit prices, environmental groups will be wary of giving up the commitment to a fixed emission target. Such a commitment is already an integral part of the Kyoto Protocol. Ultimately, however, a strict target policy may lack political credibility and viability. Although a low trigger price would clearly rankle environmentalists as an undesirable loosening of the commitment to reduce emissions, a higher trigger price could allay those fears while still providing insurance against high costs.

Perhaps more controversial than the concept of a safety valve is the fact that a hybrid policy requires setting a trigger price. It extends the debate over targets and timetables to include, based on the trigger price, perceived benefits. Business interests will undoubtedly seek a low trigger price and environmental groups a high trigger price. I believe this is desirable. The debate will focus on the source of disagreement between different groups: namely, the value placed on reduced emissions. Rather than leaning on rhetoric that casts reduction commitments as either the source of the next global recession (according to businesses) or the costless ushering in of a new age of cheaper and more energy efficient living (according to environmentalists), it will be necessary to decide how much we are realistically willing to spend in order to deal with the problem.

While seemingly provocative in its challenge of the core concept of targets and timetables embedded in the Kyoto protocol, some form of the safety valve idea is already part of many countries' notion of their Kyoto commitments. European countries who are likely to implement carbon taxes must have some view as to how they will handle target violations if their tax proposals fail to sufficiently reduce emissions before the end of the first commitment period. Other countries who are considering either a quantity or command-and-control approach likewise must envision a way out if their actual costs begin to surpass their political will to reduce emissions.

Among the many "implicit safety valve" possibilities, one could imagine a more flexible interpretation of existing provisions, such as the Clean Development Mechanism or the use of carbon sinks. Alternatively, Article 27 specifies that parties can withdraw from the Protocol by giving notice one year in advance. A country that foresaw difficulty in meeting its target in the first commitment period could serve notice that it wishes to withdraw before the commitment period ends.

Implicitly, therefore, flexibility in meeting current commitments already exists. Countries can choose to massage their commitments using existing provisions, violate their targets and risk penalties (which have yet to be defined) or simply withdraw. In these cases, however, the outcome and consequence are unclear. The advantage of a price mechanism is that it makes the safety valve concept *explicit* and *transparent*. Establishing a price trigger for additional emissions allows countries, and in turn private economic decision-makers, to approach their reduction commitments with greater

certainty about the future. This not only improves the credibility of the Protocol but also its prospects for future success in reducing GHG emissions.

IX. Conclusions

The considerable uncertainty surrounding the cost of international GHG emission targets means that price- and quantity-based policy instruments cannot be viewed as alternative mechanisms for obtaining the same outcome. Price mechanisms will lead to uncertain emission consequences and quantity mechanisms will lead to uncertain cost consequences. Economic theory as well as numerical simulations indicate that the price approach is preferable for GHG control, generating five times the net expected benefit associated with even the most prudent quantity control. The essence of this result is that a rigid quantity target over the next decade is indefensible at high costs when the stock of GHGs is allowed to increase over the same horizon.

Importantly, a price mechanism need not take the form of carbon tax. The key feature of the price policy is its ability to relax the stringency of the target if control costs turn out to be higher than expected. Such a feature can be implemented in conjunction with a quantity-based mechanism as a "safety valve." A quantity target is still set but with the understanding that additional emissions (beyond the target) will be permitted only if the regulated entities are willing to pay an agreed upon trigger price.

This approach can improve the credibility of the Protocol and its prospects for successful GHG emission reductions. This last point is particularly relevant for ongoing climate negotiations. Should the emission incentives and consequences remain ambiguous and uncertain, or should they be made explicit and transparent? Specifying a price at which additional, above-target emissions rights can be purchased provides such a transparent incentive. The current approach does not. While ambiguity may prove to be the easier negotiating route, it may also be a disincentive for true action.

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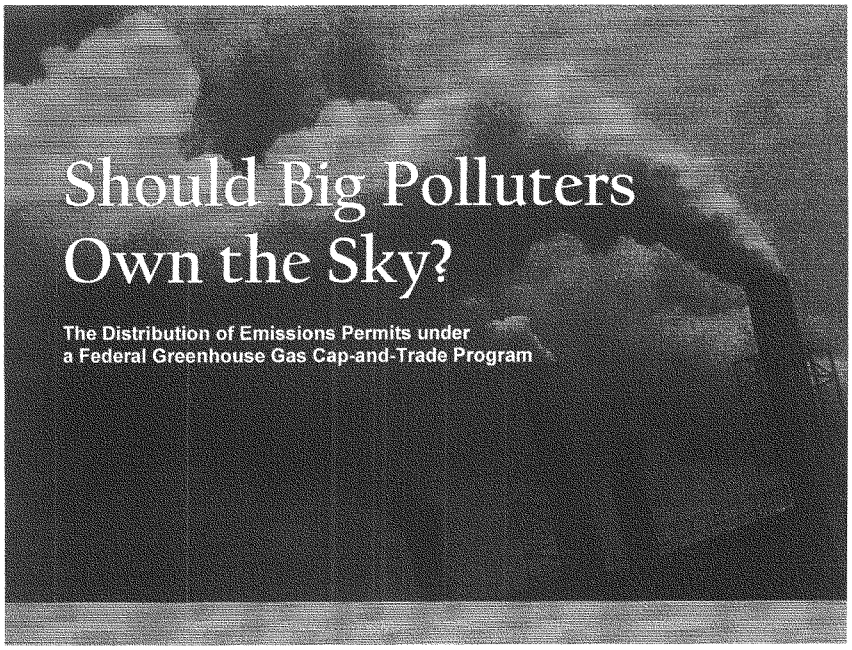

Clean Air Watch

With a foreword by Larry J. Schweiger,
President and CEO, National Wildlife Federation

June 2007

Foreword

Who owns my grandson's future?

That question has haunted me since Thadius was born almost three years ago.

Without urgent action, global warming will, in Thadius's lifetime, visit catastrophic damage upon human communities and unfathomable harm upon the natural world. Few political leaders fully understand that we have precious little time before the planet reaches a tipping point that will trigger untamable, runaway global warming. We need to reclaim our right, and our responsibility, to protect our children from the irreversible changes we stand poised to unleash.

America emits 25 million pounds of global warming pollution into the atmosphere every minute. About 85 percent of this pollution comes from power plants, industrial sources, and the transportation fuels produced by oil companies.

Major corporate carbon emitters could reduce their carbon footprint by improving their energy productivity and by relying more on renewable forms of energy like wind, solar, geothermal and biofuels. But they have little incentive to do so, because they are not required to pay for their carbon emissions or for global warming's effects. After all, when millions of acres of drought-plagued forests and grasslands burn, nobody sends them a bill. When storm surges from rising sea levels flood neighborhoods, nobody sends them a bill. When wildlife and the natural environment that sustains it perish because of shifting climate zones, nobody sends them a bill.

Instead, that bill goes to my grandson and to my children, who will see these effects in their lifetimes.

It's time these companies started getting the bill. We need a pragmatic, market-based plan that attaches a price to carbon emissions. The price must be one that compels corporate polluters promptly to start cutting global warming pollution by at least two percent every year, and by a total of 80% within 40 years, a rate of reduction that scientist predict would allow us to avoid the most catastrophic effects of climate change.

An aggressive, scientifically based cap-and-trade program could achieve such reductions. Fortunately, dozens of responsible companies are expressing support for such a program.

But a cap-and-trade program that does not require companies to pay for carbon permits, and instead gives them away for free in perpetuity, would be fundamentally unjust. No-cost licenses to pollute would deprive the public of the resources and revenues with which to aid the economic transition to a low-pollution world, and with which to address the impacts of global warming. Consider the following:

- Low income American families, which are the least responsible for generating global warming pollution, bear the brunt of climate change's effects. We need carbon credit revenues to help address their needs. For example, implementing a system of incentives for

home weatherization would lower families' heating and cooling bills while shrinking their carbon footprint, as could subsidies to offset the sometimes high costs of purchasing energy-efficient appliances.

- Hundreds of millions of the world's poor, who live in nations unable to respond adequately to a rapidly changing planet, are already suffering from the spread of disease, floods from rising sea levels, drought, and dwindling supplies of clean water. Even if we stopped polluting altogether tomorrow to head off the worst impacts of global warming, the pollution we have already pumped into the atmosphere would perpetuate these effects. We have a moral responsibility to financially aid developing nations contending with climate change.

- Building a clean energy economy will create thousands of new jobs and require American workers dependent on the fossil fuel economy to transition into different jobs. We need to be ready to support this transition through job training and other programs that bridge the divide.

- The survival of wildlife species, and the continuation of America's cherished conservation heritage, will depend on investing in a host of mitigation, restoration and management strategies to help wildlife survive a warming planet.

Any fair and effective federal carbon emissions reduction plan will consider all of these interests. The resources to address these needs will be held in public trust by Congress, on behalf of my grandson and all of us.

We are the stewards of our children's future. Let's make sure our voices are heard.

Larry J. Schweiger
President and CEO
National Wildlife Federation

Should Big Polluters Own the Sky?

Executive Summary

As Congress debates the issue of global warming, one key issue involves how emission credits or "allowances" should be distributed under a cap-and-trade system. Simply giving allowances away to polluting companies – as Congress did with the Clean Air Act's acid rain program – could amount to a multi-billion dollar windfall for the nation's biggest polluters, not to mention a virtual monopoly on the combustion of fossil fuels for incumbent utilities. At stake is billions of dollars – the 10 most polluting electric power companies could collectively be awarded $9 billion in allowances annually. The largest emitter of global warming pollution, AEP, could receive ten times the value of its SO_2 allocations under the Acid Rain Program. At the same time, low-income residents could be harmed by a system that simply hands over these windfall profits to private companies.

It seems unconscionable to reward the biggest polluters in this fashion. Why should the polluters profit from the legacy of damage they have caused? Do we really want them to own the sky?

The emissions from the power companies advocating for an approach that would guarantee these windfall profits have released pollution in the past fifty years that still remains in the atmosphere. Giving allowances for free to these polluting companies does not require them to pay for any of the potential consequences caused by their legacy of pollution including sea level rise, increased natural disasters, increased competition for water resources, and adverse health impacts from higher temperatures.

A more thoughtful approach would embody the "polluter pays" principle used in other federal statutes, including the Superfund toxic dump cleanup law with the revenues used to benefit electricity consumers – those who ultimately pay the cost of reducing CO_2 emissions. Rather than giving away these emissions rights, companies should be obligated to purchase allowances. Revenues could be invested in energy efficiency and renewable energy, help for low-income residents, worker transition assistance, protecting wildlife and other socially desirable goals.

Those who pollute the most should pay the most.

Introduction

At least ten bills have been introduced to date in the 110th Congress aimed at cutting global warming pollutants from power plants and other large industrial sources. The majority of the proposals would rely on a "cap-and-trade" regulatory system much like the program established under the Clean Air Act to address acid rain pollution.

The most critical feature of any cap-and-trade program is the stringency of the emissions cap and the timetable for ratcheting down the cap. The cap determines the total quantity of pollution that can be released to the atmosphere by regulated facilities. In the current climate change debate, many stakeholders advocate significant emission reductions – up to 25 percent below current levels by 2020 and 60 to 80 percent below current levels by 2050.

Another critical feature is the method by which the cap – in the form of allowances (each allowance entitles the holder to release 1 ton of pollution to the atmosphere) – is distributed among the power plant operators that need them to run their facilities. The basic options are to sell the allowances to industry (through an auction) or to give them away for free. Not surprisingly, many within industry advocate free allocations. Economists, however, warn of the "windfall profits" that companies would enjoy if allowances are given away for free and strongly recommend an auction approach as a more equitable approach.[1] According to the Congressional Budget Office most of the costs associated with a cap-and-trade program would be borne by consumers, and the price increases, for electricity and gasoline, for example, would be regressive because lower-income households devote a larger fraction of their household income to purchasing energy.[2] By auctioning allowances, rather than simply giving them away, the government generates revenue that can be used to offset these costs and to serve a broader public purpose (e.g., offsetting taxes, consumer rebates, protecting wildlife or technology research and development).

To evaluate the implications of freely distributing allowances to industry, this paper estimates the projected value of a free CO_2 allowance allocation under an electric utility sector cap-and-trade program. For illustrative purposes, this paper focuses on the top ten highest emitting companies in the electric utility sector; companies that generally advocate a free allocation approach.[3]

The top ten highest emitting companies in the U.S. account for approximately 29 percent of total annual U.S. electricity generation, 35 percent of CO_2 emissions, 34 percent of total annual NO_x emissions, 44 percent of SO_2 emissions, and 39 percent of mercury emissions from the electricity sector in the U.S. (See Appendix A for a list of the top ten CO_2 emitting electric utility companies and their contribution to electric sector emissions.) Collectively, the top ten emitting

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[1] *See, e.g.*, Lawerence H. Goulder, *Mitigating the Adverse Impacts of CO2 Abatement Policies on Energy-Intensive Industries*, Resources for the Future (March 2002), *available at* http://www.rff.org/rff/documents/rff-dp-02-22.pdf; Dallas Burtraw et al., *The Effect on Asset Values of the Allocation of Carbon Dioxide Emission Allowances*, Resources for the Future, (March 2002), *available at* http://www.rff.org/Documents/RFF-DP-02-15.pdf.

[2] Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions* (April 25, 2007), *available at* http://www.cbo.gov/ftpdocs/80xx/doc8027/04-25-Cap_Trade.pdf.

[3] *See, e.g.*, Response from Dennis Welch, American Electric Power, to Sens. Domenici and Bingaman's White Paper on Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System (February 2006). In its response, AEP explained that "AEP believes strongly that a high percentage of the allowances (e.g., 95%-100%) should be allocated without cost to electric generators based on their pro rata share of historical greenhouse gas emissions."

electric utilities emit over 900 million tons of CO_2 per year. In fact, these ten companies collectively emit more CO_2 on an annual basis than the emissions included in the European Emissions Trading Scheme in the countries of Germany, United Kingdom, and Poland combined.

Overview of Allowance Allocation Issues

How emission allowances are initially distributed has a direct effect on consumer energy costs and on the relative profitability of different types of producers.[4] Ultimately, however, the decision as to how to distribute allowances is political.

Allowance allocations are one of the most contentious decisions in designing a cap-and-trade program, and the issue is shaping up to be a significant point of debate in Congress given the sheer quantity and financial value associated with the allowances in a CO_2 cap-and-trade program. The question is contentious precisely because allowances represent a valuable financial asset.[5] As Senators Pete Domenici and Jeff Bingaman, then Chairman and Ranking Member of the Senate Energy and Natural Resources Committee, explained in a joint letter summarizing the common themes that emerged from their Committee's April 2006 climate change conference: "Allowances should not be allocated solely to regulated entities because such entities do not solely bear the costs of the emissions trading program." The same point is made by the bi-partisan National Commission on Energy Policy: "The economic burden imposed on a particular firm or industry sector under a greenhouse gas trading program is not a direct function of its emissions or fossil-fuel throughput....Available analyses suggest that consumers and businesses at the end of the energy supply chain will bear the largest share of costs under a trading program."[6]

The Financial Value of Allowances

The financial value of the allowances under a future CO_2 cap-and-trade program would very likely dwarf previous cap-and-trade programs – reaching many billions of dollars.

While the actual value of emission allowances in a CO_2 cap-and-trade program would depend on several factors, including, for example, the stringency of the cap and the possibility of offsets, the existing literature and range of CO_2 policies now being debated suggests that the value of emission allowances might total between $50 billion and $300 billion per year (in 2007 dollars) by 2020.[7]

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[4] Dallas Burtraw, et al., *CO_2 Allowance Allocation in the Regional Greenhouse Gas Initiative and the Effect on Electricity Investors*, Resource for the Future (Dec. 2005) *available at* http://www.rff.org/Documents/RFF-DP-05-55.pdf.

[5] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System* (March 2007), *available at* http://www.energycommission.org/files/contentFiles/Allocating_Allowances_in_a_Greenhouse_Gas_Trading_System_45f71a5fb536b.pdf.

[6] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System*.

[7] Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions*. The sum value of allowances, however, is not a true measure of the program's cost to society because allowances are an asset of the allowance seller. Rather the cost is equal to the cost of the actual mitigation measures undertaken. (National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System*). For example, under the original National Commission on Energy Policy (NCEP)

To provide context for these large values, consider that the Maryland General Assembly adopted a $30.0 billion budget for fiscal 2008, the New Jersey 2008 proposed state budget is $33.3 billion, and Texas's state budget for 2007 was approximately $75 billion.

The Acid Rain Program - Is it a Model to Follow?

Many electric utility sector companies advocate giving virtually all of the allowances away free of charge to the highest emitting facilities, much like was done under the existing Acid Rain Program, a near 100-percent allocation based on emissions or fuel consumption – with a small percent reserved for annual auctions.[8]

This free allocation approach has proved to be very valuable for electric utilities, especially major emitters of SO_2. For example, in the first ten years of the Acid Rain program (1995-2005), the financial value of the SO_2 allowances allocated to American Electric Power (AEP) – the largest U.S. electricity generator (35,600 MW capacity), the largest consumer of coal in the Western Hemisphere, and the largest emitter of SO_2 in the electricity sector – totaled at least $1.6 billion.[9]

This type of analysis demonstrating the financial contribution that the federal government made to industry under the Acid Rain Program is further supported by the recent experience under the European Union (EU) CO_2 trading program. Under the EU program, most of the countries in the EU opted to allocate all available allowances for free to affected industries. This approach has become extremely controversial within the EU as evidence has emerged that the electric power producers passed on the cost of compliance with the emission limits to the consumers and realized windfall profits as a result of the free allocations.[10]

The Potential for Windfall Profits

Public interest advocates and environmental groups also argue that regardless of whether allowances are provided for free or are sold through an auction, companies will charge customers the same based on the opportunity cost of the allowances.[11] In other words, in order to comply with the CO_2 emissions limit, companies will increase the price of electricity sold to consumers. This price increase generates revenues *and* under a free allocation system, the company would also receive a new asset, the allowances, that the company can then sell on the market. Thus, a

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proposal, the market value of allowances in circulation in the early years of the program would total $30 to $40 billion annually, while the costs incurred by society to actually reduce emissions would be much less (on the order of $4 billion per year).

[8] The SO_2 cap and trade program under the Acid Rain Program initially distributed allowances free of charge to each affected power plant unit based on its heat input during a historical base period (1985–1987), multiplied by an emissions rate calculated such that aggregated emissions equal the target emissions cap. A small portion (2.8 percent) of allowances were withheld from the market and auctioned, with revenues from the auction returned to industry.

[9] See Appendix B for the methodology utilized to estimate the financial value of the SO_2 allowances given to AEP for the first ten years of the Acid Rain Program.

[10] Eric Heymann, *EU Emission Trading: Allocation Battles Intensifying*, Deutsche Bank Research (March 6, 2007), *available at* http://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000207573.pdf ("Power generation companies reap hefty windfall profits.").

[11] *See, e.g.*, Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions*; Environmental Defense, *Toward a Fair and Effective Climate Policy for the United States*, response to the U.S. House of Representatives Committee on Energy and Commerce and Subcommittee on Energy and Air Quality (March 19, 2007); Natural Resources Defense Council, Response to the U.S. House of Representatives Committee on Energy and Commerce and Subcommittee on Energy and Air Quality (March 19, 2007).

free allocation system can create two additional revenue sources – the higher priced electricity and the allowances.[12] This system creates a windfall for affected sources, and as discussed above, this situation has borne out in the European CO_2 trading program. Moreover, a recent Congressional Budget Office analysis explains that price increases would disproportionately affect people at the bottom of the income scale.[13] According to the report, a free allocation would increase producers' profits without lessening consumers' costs. This damming assessment of the concept of free allocations should give our Congressional leaders pause before opting for this approach.

Electric power companies operating in traditional regulated power markets assert that they are required to return the value of any allocation to the ratepayer in full and, therefore, oppose the auctioning of allowances. However, these same companies sell power into competitive power markets earning windfall profits, and a perverse outcome can result from the treatment of these allowances. Price increases in regulated power markets may be smaller relative to the increases in unregulated markets. More significantly though, as described below, this argument by the regulated companies runs counter to our society's basic principle that a polluter should pay for any pollution it has released.

The Polluter Pays Principle

Public advocates and environmental groups advocate a larger role for auctioning allowances under a future CO_2 cap-and-trade program citing the precedents created by other environmental programs such as Superfund and the Resource Conservation and Recovery Act (RCRA) under which the polluter pays. For example, under the Superfund program, EPA has the legal authority to: (i) conduct the cleanup and seek recovery from responsible parties, (ii) enter into settlement agreements with the responsible parties, or (iii) compel the responsible parties to conduct a cleanup or pay for the cleanup. Regardless of EPA's use of its authority, the key underlying principle is that responsible parties are joint and severally liable for restitution of any response costs incurred by the government or a private party as a result of a release of hazardous substances. As a result, between 1980 and 2000, the estimated value of private party settlements with EPA is $18 billion.[14] In 2005, based on the polluter pays principle, EPA secured private party funding commitments of more than $1.1 billion.[15] Similarly, RCRA requires the generators, transporters, and treatment, storage, and disposal facilities to comply with RCRA, which can involve remedial action by those responsible for the pollution. Advocates of auctioning CO_2 allowances contend that a CO_2 program should be no different.

Allowances are a public good and should not be given away for free. Instead, polluting companies should be required to purchase the allowances. The revenue from the sale of the allowances could then be utilized for public benefits – including energy efficiency and renewable energy investments, worker transition, habitat preservation, and adaptation to the impacts of

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[12] *See, e.g.*, Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions*; Dallas Burtraw, et. al., *Lessons for a Cap-and-Trade Program* in *Managing Greenhouse Gas Emissions in California*, The California Climate Change Center at UC Berkeley (2006) *available at* http://calclimate.berkeley.edu/5_Cap_and_Trade.pdf.

[13] Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions* (April 25, 2007).

[14] Environmental Protection Agency, *Superfund: 20 Years of Protecting Human Health and the Environment* (December 11, 2000) *available at* http://www.epa.gov/superfund/action/20years/20yrpt1.pdf.

[15] Environmental Protection Agency, *Superfund National Accomplishments Summary Fiscal Year 2005, as of November 22, 2005, available at* http://www.epa.gov/superfund/action/process/numbers05.htm.

climate change (e.g., constructing sea walls). In other words, the polluters would pay for the costs resulting from and made necessary by the CO_2 pollution.

The Acid Rain Allocation Approach Applied to CO_2

As noted above, most of the cost of a CO_2 cap would ultimately be borne by consumers. Giving away nearly all of the allowances to affected energy producers would mean that the value of the allowances received under a CO_2 cap would greatly exceed any cost the companies might bear.[16]

The financial give away would be enormous if the Acid Rain Program approach were used for the allowance allocation in a CO_2 cap-and-trade program. For example, the value of the allowances provided to the top ten emitting electric utility companies would conservatively range from at least $4.5 billion to $9 billion per year (assuming allowance prices ranging from $5-$10/ton). The table below summarizes this information using 2004 emissions and shows that a free allocation system would provide the greatest subsidy to the highest polluting companies.

Table 1: Top Ten CO_2 Emitting Utilities and Annual Value of a Free Allocation

Company[17]	CO_2 (tons/year)	$5/ton	$10/ton
AEP	163,934,554	$819,672,772	$1,639,345,543
Southern	148,647,755	$743,238,776	$1,486,477,553
Duke	113,602,312	$568,011,562	$1,136,023,125
Tennessee Valley Authority	103,602,929	$518,014,644	$1,036,029,288
Xcel	69,809,043	$349,045,216	$ 698,090,431
Ameren	69,029,540	$345,147,698	$690,295,396
Dominion	62,071,888	$310,359,438	$620,718,875
Edison International	61,810,500	$309,052,499	$618,104,997
Progress Energy	58,930,512	$294,652,560	$589,305,121
TXU	54,946,087	$274,730,437	$549,460,875
Totals	906,385,120	$4,531,925,602	$9,063,851,203

Source: Ceres, Natural Resource Defense Council, and Public Service Enterprise Group, *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States – 2004,* (April 2006) (available at: http://www.nrdc.org/air/pollution/benchmarking/2004/benchmark2004.pdf and http://www.nrdc.org/air/pollution/benchmarking/default.asp).

Thus, over the first ten years of the program, the value of the allowances AEP would receive would range from $8.2 billion to $16 billion dollars – ten times the value of the SO_2 allowances it received during the first ten years of the Acid Rain Program.

Conclusion - A Different Approach

There is growing recognition that giving CO_2 allowances away for free leads to windfall profits for companies. As mentioned above, in contrast to a free allocation of CO_2 allowances, other major environmental programs are based on the *polluter pays principle* – those entities that

[16] Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions.*
[17] Additional information regarding each company is provided in Appendix C.

create the pollution must pay for any required cleanup. No other environmental program, allows a company to profit from releasing the most pollution.

Auctioning emission allowances could raise sizable revenues that lawmakers could use for various purposes, some of which could lower the cap's overall cost to the economy. For example, policymakers could require that proceeds from an auction be used to decrease the budget deficit, which would strengthen the economy. Proceeds could also be used to reduce taxes on labor, capital, or personal income that could be affected by a CO_2 cap.[18] Depending on the stringency of the cap and the type of tax cut, such an approach could reduce the economy wide cost by roughly 50 percent, or perhaps substantially more, some researchers suggest.[19] Revenues can also be used to achieve other aims such as research, development, and deployment of new low carbon technologies, which could help reduce the growth of CO_2 emissions and increase energy efficiency, or could support adaptation and transitional programs to help workers and low-income households transition into a carbon constrained economy.

Another option being debated as a means to avoid the potential windfalls is allocating allowances to state regulated electric distribution companies (and providing explicit guidance to state regulators about the proper treatment of those allowances), rather than allocating directly to electricity generators.[20] This method would cause all electric sector allocations to "come under the purview of economic regulators—state public utility commissions in the case of investor-owned utilities and local boards in the case of publicly owned utilities and cooperatives."[21] Distribution companies would sell the allowances they are allocated to regulated sources (e.g., power plants), and return the revenues to their customers. Advocates for this alternative explain that "these authorities are in the best position to sort out the equity implications of different allocation schemes, direct appropriate levels of compensation to adversely affected firms, and ensure that end-use customers, who bear the largest share of program costs, receive an equitable share of the asset value associated with free allowances."[22]

Regardless of how the revenues are allocated, any CO_2 cap-and-trade program should not perpetuate the system of effectively allowing the most polluting companies to significantly profit from the pollution they have generated. Other significant environmental statutes are based on the equitable principle that the polluter should pay for any cleanup for which it is responsible. Any climate change legislation should be no different. A CO_2 cap-and-trade program can create benefits for society. A CO_2 program must not create windfall profits for the polluting companies, and distributing allowances free of cost to industry would only ensure such an inequitable result.

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[18] Congressional Budget Office, *Trade-Offs in Allocating Allowances for CO_2 Emissions.*
[19] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System.*
[20] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System.*
[21] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System.*
[22] National Commission on Energy Policy, *Allocating Allowances in a Greenhouse Gas Trading System.*

Appendix A – Top Ten CO_2 Emitting Electric Utilities in the U.S.

Top Ten CO_2 Emitting Electricity Sector Companies in the U.S. (2004 data)

Company	Total (MWh)	NO_x (tons)	SO_2 (tons)	CO_2 (tons)	Hg (lbs)
AEP	190,358,346	318,783	963,838	163,934,554	7,498
Southern	186,294,694	216,824	886,735	148,647,755	7,821
Duke	168,010,605	190,722	873,574	113,602,312	3,973
Tennessee Valley Authority	157,556,843	199,801	492,605	103,602,929	3,360
Xcel	81,283,493	124,237	157,324	69,809,043	2,183
Ameren	74,954,742	67,553	318,461	69,029,540	2,943
Dominion	105,971,331	107,670	225,452	62,071,888	2,062
Edison International	78,170,023	93,760	271,764	61,810,500	2,837
Progress Energy	93,252,779	105,052	351,276	58,930,512	1,907
TXU	67,922,206	43,812	241,010	54,946,087	4,607
TOTALS	1,203,775,062	1,468,214	4,782,039	906,385,120	39,191
ELECTRIC SECTOR TOTAL	3,810,555,000	4,143,000	10,309,000	2,456,934,000	96,000
PERCENTAGE SHARE	32%	35%	46%	37%	41%

Source: Ceres, Natural Resource Defense Council, and Public Service Enterprise Group, *Benchmarking Air Emissions of the 100 Largest Electric Power Producers in the United States – 2004,* (April 2006) (available at: http://www.nrdc.org/air/pollution/benchmarking/2004/benchmark2004.pdf and http://www.nrdc.org/air/pollution/benchmarking/default.asp#).

Appendix B- AEP SO_2 Allowance Analysis

This write up provides the initial SO_2 allowance allocations and their financial value for American Electric Power Company (AEP).

Methodology

Step 1 – Identification of AEP Electric Generating Facilities

The 2006 Benchmarking Report (2004 data year) electric generation facility ownership breakdown was utilized to identify AEP wholly and jointly owned electric generating facilities.

Step 2 – Query the EPA Data and Maps Query Tool[23]

Using the list of AEP facilities obtained from the Benchmarking Report, EPA's Allowance Query Wizard was used to determine the facility allocations for Phase 1 (1995-1999); Phase 2a (2000-2009) and Phase 2b (2010- and beyond).

Step 3 – Utilize Average SO2 Allowance Values to Calculate Allowance Value

Using EPA data for historical average SO2 allowance prices (1995-2004) and broker reported values for 2005, the financial value of the allowances allocated to AEP were then estimated.

[23] See http://cfpub.epa.gov/gdm/index.cfm?fuseaction=iss.isshome.

Appendix C – Corporate Information Regarding the Top Ten CO_2 Emitting Electricity Sector Companies in the U.S.

1. AEP

AEP owns and operates about 80 generating stations in the United States, with a capacity of more than 36,000 megawatts. AEP's utility units operate as AEP Ohio, AEP Texas, Appalachian Power (in Virginia, West Virginia), AEP Appalachian Power (in Tennessee), Indiana Michigan Power, Kentucky Power, Public Service Company of Oklahoma, and Southwestern Electric Power Company (in Arkansas, Louisiana and east Texas). AEP's headquarters are in Columbus, Ohio.

2. Southern

Southern owns and operates four electric utilities, with a generating capacity of more than 41,000 megawatts. Southern operates Alabama Power, Georgia Power, Gulf Power, and Mississippi Power. Other major subsidiaries and business units include Southern Nuclear.

3. Duke

Duke has a generating capacity of 37,000 megawatts and owns and operates regulated (franchised) and unregulated (wholesale) power plants in North America (North Carolina, South Carolina, Ohio, Indiana and Kentucky) and Latin America. Duke Energy Generation Services (formerly Cinergy Solutions) is the owner and operator of power generation solutions utilizing natural gas and various solid fuels, and currently owns and operates over 6,500 megawatts. Duke Energy's U.S. portfolio includes approximately 8,100 megawatts of wholesale electric generation primarily in the Midwest.

4. Tennessee Valley Authority

The Tennessee Valley Authority is a federal corporation and its system includes three nuclear, 11 fossil, 29 hydroelectric, six combustion-turbine, and one pumped-storage plant.

5. Xcel

Xcel has regulated operations in 8 Western and Midwestern states and its plants have a generating capacity of over 15,000 megawatts. Its principal non-regulated subsidiaries include, Eloigne Company and Quixx Corporation. Xcel's regulated operating companies include: Northern States Power Company Minnesota, Northern States Power Company Wisconsin Public Service Company of Colorado, and Southwestern Public Service Company. Its service company is Xcel Energy Services Inc.

6. Ameren

Ameren Corporation is the parent of AmerenCILCO, based in Peoria, Ill; AmerenCIPS, based in Springfield, Ill.; AmerenIP, based in Decatur, Ill.; and AmerenUE, based in St. Louis, Mo. Additional subsidiaries also include: AmerenEnergy, AmerenEnergy Resources, the holding company for non-rate-regulated generation, development, marketing and fuels services companies (AmerenEnergy Generating Company, AmerenEnergy Development, AmerenEnergy Medina Valley Cogen, LLC, AmerenEnergy Marketing and AmerenEnergy Fuels & Services), AmerenEnergy Resource Generating, and Ameren Services.

7. Dominion

Dominion's asset portfolio consists of about 26,300 megawatts of power generation. Its electric generating companies include: Dominion North Carolina Power and Dominion Virginia Power. Other subsidiaries also include: Dominion East Ohio, Dominion Hope, Dominion Peoples, Dominion Cove Point LNG, LP, Dominion Clearinghouse, Dominion Exploration and Production, Dominion Gathering-Producer Services, Dominion Generation, Dominion Greenbrier, Dominion Retail, Dominion Technical Solutions, Inc., and Dominion Transmission.

8. Edison International

Edison International operates in regulated and non-regulated markets with a power generation portfolio of approximately 14,000 megawatts. Headquartered in Rosemead, California, Edison International is the parent company of a regulated electric utility, Southern California Edison (SCE) and Edison Mission Energy (EME).

9. Progress Energy

Progress Energy, headquartered in Raleigh, N.C., has more than 23,000 megawatts of generation capacity. Its subsidiaries include Progress Fuels Corporation and Progress Energy Ventures.

10. TXU

TXU Corp. manages a portfolio of energy businesses primarily in Texas. TXU Power has over 18,300 MW of generation in Texas and TXU's other businesses include TXU Energy, TXU Wholesale, and Oncor Electric Delivery.

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ISSUE BRIEF

This document is based on research performed by FPL Group in collaboration with The Brattle Group.

U.S. CLIMATE POLICY: PRICING CARBON

PRESERVING THE ENVIRONMENT PROTECTING THE ECONOMY

This paper is based on research performed by FPL Group in collaboration with The Brattle Group, an independent economic consulting firm. That research involved in-depth empirical analyses of potential CO_2 policy approaches and their impacts on emissions, the economy, and our energy system, with special attention to the electric industry. The Appendix contains an overview of those analyses and results. Additional detail on our research can be found in an accompanying technical paper by The Brattle Group, available at www.brattle.com/publications.

FPL GROUP

ISSUE BRIEF

This document is based on research performed by FPL Group in collaboration with The Brattle Group.

U.S. CLIMATE POLICY: PRICING CARBON PRESERVING THE ENVIRONMENT-PROTECTING THE ECONOMY

EXECUTIVE SUMMARY

Sufficient evidence of human-induced climate change exists today to warrant global and national action to limit and reduce the introduction into the atmosphere of greenhouse gases (GHGs), particularly carbon dioxide (CO_2). We believe it is prudent for the U.S. Congress to take immediate steps to set the U.S. on a path to lower CO_2 emissions rather than continue the current "business as usual" approach. While the existing theoretical and empirical data do not warrant an emergency "crash reduction" approach, they do support establishing and maintaining a glide slope to constrain the aggregate output of greenhouse gases.

We believe that the most effective GHG policy will price carbon emissions throughout the economy and do so in a predictable fashion.[1] By internalizing the cost of carbon into the overall cost of all goods and services throughout the economy, the proper incentives and economic signals to reduce emissions will be created, without also introducing unnecessary economic burdens or distortions. If properly implemented, such a policy need result in little loss of overall economic output. However, we note that current CO_2 policy discussions often fail to acknowledge that the effectiveness of the policy (measured ultimately by the aggregate economic cost of achieving a given level of CO_2 emissions reduction) depends crucially on exactly how the price is determined and the policy implemented. Our analysis supports the conclusion that a market-based, economy-wide program that directly places a price on carbon emissions has the best prospect of achieving sensible environmental goals and maintaining economic growth.

Many of the proposed programs that employ a pure cap and trade approach risk causing substantial harm to the economy. Moreover, most cap and trade proposals include the allocation of some level of free allowances, virtually guaranteeing a "feeding frenzy" among companies jockeying for position to obtain the maximum number of allowances they can. The administrative challenges of implementing a pure cap and trade program in a fair and rational way are likely insurmountable.[2] Furthermore, the science of climate change does not permit the determination of a single level of emissions – or a single path to a steady state level of emissions – that will produce the best result for humanity, thus taking away the principle attraction of cap and trade, which is that the precise amount of emission reductions are in principle known.

A primary conclusion of our research is that directly imposing a price on CO_2 emissions that predictably, steadily and gradually escalates over time offers substantial practical advantages: (i) it supports the long-term capital deployment that will be needed to address emissions by avoiding the volatility in future CO_2 prices that is inherent in a cap and trade approach; (ii) it creates the right long-term signals and incentives to support environmental goals while avoiding immediate large distortions and frictional costs in the economy; and (iii) it allows the economy time and opportunity to find the most efficient ways of adapting to rising CO_2 prices. Even as it does this, a properly structured fee will also automatically generate the resources that will be needed to: (i) support funding for the increased levels of basic R&D which will be needed to expeditiously develop new CO_2 abatement and control technologies; (ii) provide transitional assistance for economically disadvantaged end consumers; and (iii) preserve the competitive position of U.S.-based companies that compete in markets open to foreign competition that is not bearing an equivalent burden of CO_2 reduction ("leveling the playing field").

The program should be:

- Mandatory;
- Market-based;
- Economy-wide, applied upstream;
- Phased in gradually with a predictable, long-term CO_2 price trajectory;
- Free of large transitional protections; and
- Revenue neutral, returning revenues to the economy.

Our research suggests that a CO_2 price that starts at about $10/ton and increases at an annual rate of roughly $2/ton should be substantial enough to influence investment and consumption decisions, thereby reducing emissions, encouraging conservation, promoting efficiency, and stimulating technology and innovation, but not so great as to burden the economy unnecessarily.

We conclude that the goals of emissions reductions are met best with a directly imposed CO_2 price or fee. However, we also suggest that a modified cap and trade program which incorporates a price ceiling and floor and auctions all of the allowances, while more complex and less attractive than the direct fee approach, could offer similar benefits, providing confidence in long-term greenhouse gas reductions and price stability to protect the economy.

DIMENSIONS OF A CO_2 POLICY

The goals of a CO_2 policy should be to effectively reduce long-term CO_2 emissions, with minimum economic disruption and cost, in a way that is administratively efficient. Our research indicates that the following features are important to achieving these goals.

1) Mandatory

A voluntary program – one that neither imposes cost for CO_2 emissions nor rewards reductions – will give no incentives to change investment or consumption behaviors to reduce emissions, even among those otherwise willing to support a CO_2 control policy. The policy would be ultimately ineffective, and would prolong the current policy ambiguity and continue to complicate infrastructure planning.

2) Market-based

Market-based policies seek to capture the dynamics of the marketplace. There is general agreement that placing a price on CO_2 creates the incentive to reduce emissions efficiently.[3] The two fundamental market-based approaches to controlling emissions are: regulate quantity or regulate price. Both approaches put a price on CO_2: regulating quantity does so indirectly and imprecisely, the price approach does so directly and definitively.

A cap-based policy is a quantity approach. The allowed CO_2 quantity is set administratively, and applied to industry, to company and even to facility, based on target environmental goals and an estimated economic cost. A market for allowances then determines the price that is consistent with that quantity. Under a price approach, a fee sets the CO_2 price administratively at a level expected to induce emission reductions. The level of the fee is based on the expected cost of emissions avoidance, thus ensuring that it has "teeth." The market then determines the exact CO_2 emissions quantity that is consistent with that price. Both approaches can be effective. The quantity approach has been used in the past in the U.S. for controlling emissions of air pollutants. However, because of the particular characteristics of global climate change and the associated uncertainties in the science, the quantity approach is less attractive for addressing CO_2 reduction. As we explain, a pure quantity approach presents significant administrative complications and inefficiencies. A fee can be a simpler and ultimately more effective way to achieve the desired results.

3) Economy-wide

The use of energy from fossil fuels permeates the entire economy. There is no easy way to achieve the desired CO_2 reductions from any individual sector, as our analyses confirm. Sensible policy should spread the burden across all sources of CO_2 to achieve reductions as equitably and efficiently as possible.

Quite apart from being unfair, singling out one or several sectors of the economy for CO_2 control would be less effective than including all sectors of the economy. It would be inefficient and could not achieve as large a reduction. Applying a price to CO_2 throughout the economy provides an unbiased stimulus to all sectors to find cost-effective ways of reducing emissions. Since a ton of CO_2 emissions from one sector of the economy or one geographical region is no less a contributor to climate change than any other, this approach helps ensure the maximum reduction in emissions for the least economic impact.

As one of the nation's largest and most visible CO_2 emitters, the electric generation industry continues to be a prominent target of CO_2 policy. Until recently, it was widely assumed that the electric industry could provide substantial near-term CO_2 reductions relatively easily, largely by substituting natural gas for coal to fuel power plants. Recent large increases in the price of natural gas have fundamentally changed energy markets and rendered that expectation obsolete. Today and for the foreseeable future, large-scale CO_2 emissions reductions from the electric generating sector will require very substantial capital investments. The electric industry accounts for about 40 percent of U.S. CO_2 emissions. It would be inefficient and needlessly expensive to try to obtain all the desired reductions from this 40 percent without addressing the remaining 60 percent of emissions. The uncontrolled emissions of other sectors would continue to grow, and there could be uneconomic substitution of other fuels or processes for electricity, possibly even increasing CO_2 emissions overall and certainly offsetting some portion of the reductions obtained in the electric sector.

4) Upstream

A CO_2 price on the carbon content of fossil fuels should be applied at an "upstream" point where fossil fuels enter the economy. This would facilitate an economy-wide program and simplify administration. Just about 2,000 sources – coal mines and preparation plants, oil refineries and importers, natural gas pipelines and processing plants – would cover virtually all fossil fuels consumed in the U.S., applying the price only once to each unit of fuel.[4] The price of all fossil fuels would rise in proportion to their carbon content (combustion releases virtually all the carbon into the atmosphere as CO_2). Because CO_2 costs would be included in fuel prices, the price of all downstream goods would rise in proportion to the use of carbon-intensive fossil fuels in their manufacture and distribution.

It is important, however, to avoid raising the cost of fossil fuel uses that do not emit CO_2, such as the capture and permanent storage of CO_2 and petrochemicals used to make plastics. To that end, mechanisms such as credits, rebates or exemptions should be implemented for non-emitting uses.

5) Phased in

Introducing a CO_2 price into the economy and gradually increasing the price in pre-determined, measured increments balances two primary objectives: avoiding near-term economic disruption, and immediately influencing new investment and technology development toward low-carbon solutions.

While some might advocate a high initial CO_2 price to force near-term reductions, such an abrupt approach is inadvisable. It would likely shock the economy, necessitate short-term activities that cost more than longer-term solutions for the same reductions, and might impede needed investments in long-term research and solutions. It would invite companies, industries or regions to seek exceptions, undermining the program's goals. And the economic cost would risk political backlash from consumers – facing suddenly higher prices for energy and other goods, they would have had neither the time nor opportunity to change their energy use habits. In short, an abrupt policy would be unnecessarily costly, less effective and potentially self-defeating. In contrast, phasing in a CO_2 price will give all sectors of the economy both the time to react and advance awareness of how to react. Moreover, a high initial price is not warranted by the science of climate change. Everything we know about this subject shows that it is the long-term accumulation of CO_2 and other GHGs in the atmosphere that drive climate

change effects. As the latest report of the IPCC demonstrates, the expected path of GHG concentrations for the next twenty or thirty years is insensitive to policy changes today. What matters is placing the global economy on a path towards substantial and sustained reductions over a long period of time.

The foreknowledge that CO_2 prices ultimately will reach a high level, but in a predictable way, will strongly encourage R&D and investment in carbon-abating technologies and projects. This would likely lead to greater long-run reductions, at lower cost.

6) Stable and predictable

A policy that creates a steadily escalating CO_2 price will offer stability and predictability to consumers, producers, regulators and investors alike. This will both protect the economy and encourage emission-reducing research and investment. Having a predictable escalating price that soon reaches levels where efficiency and low carbon technologies are economic will encourage long-term investment in those technologies.

If CO_2 emissions are fixed under a strict quantity-based policy, the price will be inherently uncertain and volatile, and potentially quite high.[5] Today, there are few if any technologies operating at commercial scale that can remove CO_2 from existing processes, and recent natural gas price increases make it very expensive to substitute lower-carbon gas for coal. If a fixed quantity cap were nonetheless enforced, the cost and price of CO_2 could skyrocket. The risk of a sharp price increase would be costly for existing CO_2-intensive processes, while the possibility that CO_2 price might drop precipitously later on would discourage long-term investments in emission-reducing technologies.

The risk of high or volatile CO_2 costs under a strict quantity-based policy would adversely affect utilities and their customers, in particular. Recent swings in the CO_2 price in Europe's Emissions Trading Scheme (a cap and trade program) have been substantial – even larger than the total variable cost of coal-fired power (see Appendix). Utilities, their customers and regulators will want to avoid this level of cost and price fluctuation, and the utility's resource planning would be much more effective if this uncertainty could be avoided.

7) Transitional protection

Transition protection should be limited and sparingly applied. It is important to retain the integrity of the CO_2 price signal; diluting the price signal for some segments of the economy would defeat the purpose of the program. By and large, a policy that puts a price on CO_2 will not require free allocations of allowances or other protection to indemnify producers. In a competitive industry, allocations will safeguard neither production nor jobs. Most energy producers, utilities, and energy-intensive industries will be forced to and will be able to incorporate most of their CO_2 costs into the price of their products, as our analyses have confirmed for electricity producers. The fact that end consumers will bear the economic burden makes it crucial that the overall system be structured for maximum economic efficiency – it will matter greatly to consumers that every ton of CO_2 that can be avoided at $10/ton is eliminated before tackling the emissions that will cost $20/ton to eliminate.

In the case of regulated utilities, a free allocation of allowances could compromise the program, artificially shielding some customers from CO_2 costs. This "protection" would eliminate one of the primary means for reducing CO_2 in the near-term – enlisting consumers to embrace conservation and efficiency to reduce demand and utilize energy more efficiently.

For unregulated producers, free allocations risk over-compensating producers for increased costs that may be passed through to customers via higher product prices, creating large and unfair windfalls that would rightly anger customers and politicians. Because the true incidence of CO_2 costs is very complex, allocations would virtually assure that the burdens would fall unevenly on the economy. (See Appendix.) Such windfalls are occurring now under Europe's cap and trade program because of its overly generous allowance allocations.

There is one clear exception to the general rule that the incidence of the CO_2 cost should be uniform. To the extent that not all countries impose comparable burdens on their economies, U.S.-based companies that compete against companies whose cost structures are not equivalently burdened should receive relief. This can be achieved by a variety of mechanisms, such as a rebate system analogous to those used by countries that impose value-added taxes. For products entering the U.S. from countries that do not include CO_2 costs in their exports, an equivalent CO_2 tariff could be imposed thus avoiding discrimination against American goods.

8) Revenue neutrality

If properly structured, and with continued technological development, a policy that employs a steadily rising CO_2 fee will eventually be largely self-extinguishing: in time, it will be more economic to eliminate CO_2 than to pay the fee. Thus, the revenue stream from the fee will be transitional – rising initially as the burden is imposed, and then eventually stabilizing and tailing away as CO_2 emissions are reduced. Similarly, the economic burden imposed is largely transitional. Over the long term, the economic cost of reducing CO_2 emissions is primarily driven by the costs of shifting the economy to a new equilibrium. Thus, the costs of adapting to lower CO_2 emissions profiles will be transitional – rising as the burden is imposed, and then eventually tailing away.

Because of this, it is crucial that a policy that prices CO_2 into the economy directly be revenue neutral: the revenue generated by the fee must be reinjected into the economy in a fashion that addresses the transitional economic costs (but that does not simply nullify the incentive imposed by adding the marginal cost of CO_2 into producers' and consumers' decision-making).

There are three important ways in which the revenue generated by a CO_2 fee should be used to support transition. First, in order to make the transition to a low or zero carbon-emitting economy as rapid as possible, revenues should be dedicated to leveraging CO_2 abatement by funding research, development and deployment and, possibly, financing investment in key low-carbon technologies. Second, since higher energy prices tend to be regressive, mechanisms to offset the effect on lower-income consumers must be developed. Third, as noted above, it will also be appropriate to use some of the revenues to offset any remaining negative impacts on particularly vulnerable industries – but only to the extent that they face genuine competition from entities whose cost structures do not properly reflect an equivalent cost of CO_2.

A PRICE FOR CO_2

Our research shows that a CO_2 price beginning at $10/ton of CO_2 and increasing by $2/ton each year would be both effective and manageable. In ten years, this CO_2 price would reach $30/ton, decreasing electric sector emissions by about 20 percent from what they would otherwise be, with further reductions continuing thereafter. (This estimate does not include the effect of technological substitution of low or zero-carbon generation in place of high-carbon conventional generators. Such substitution is likely to provide additional reductions, particularly in the longer term.) While this CO_2 price would achieve some early emission reductions, most importantly, it will alter investment and behavior patterns over decades to ensure substantial ongoing reductions well into the future. This is crucial – to effectively address climate change requires eliminating the large majority of current CO_2 emissions from the entire economy in the very long term. It is much less important to meet particular short-term emission targets; as the most recent IPCC report demonstrates, no realistic short-term policy change will have a meaningful impact on the short-term path of climate change.

Our analyses show that CO_2 prices at these levels are manageable for the electric industry, even for coal-based utilities. The current utility business model remains viable without substantial free allocations of allowances or other protections. In fact, large allocations are likely to be counterproductive, since they would unfairly insulate select groups of consumers from the CO_2 cost and inhibit energy efficiency and conservation, while potentially creating windfalls for the allowance recipients.

The proposed level of CO_2 price would also be manageable for other energy sectors. An initial $10/ton CO_2 price would increase energy costs across the board. (Of course, this would be the result of any CO_2 pricing program, including cap and trade.) Home heating costs would increase by about $3 per month for the average residential natural gas household, or $5 per month for oil-heated households. Gasoline prices would rise by about 10 cents per gallon. Electricity prices would increase by about 0.5 cent to one cent per kWh, roughly 10% of average retail rates. These increases are within the range of recent commodity price volatility, and further increases would be phased in gradually over a number of years. These energy price impacts can be made more tolerable if they are offset by the return of some portion of program revenues to consumers, which will provide meaningful assistance to lower income consumers without affecting incentives to conserve at the margin.

While the proper starting level and escalation rate of a CO_2 price can and certainly will be debated, we believe these are the right program attributes and approximately the right CO_2 price trajectory to strike the necessary balance between attaining early and sustained emission reductions while avoiding undue economic risk and harm.

While we focus on U.S. policy, we recognize that it is crucial to gain international cooperation in reducing emissions. A promising approach is to place an equivalent tariff on imports from countries lacking a carbon policy, and rebate the tariff on exports to such countries. A U.S. policy like this will send a clear signal from the world's largest consuming nation that a comparable CO_2 policy is required for doing business with the U.S., and may serve as a catalyst for broader international programs. Another key benefit is that it will preserve American jobs and competitiveness, because it avoids "offshoring" carbon-intensive industries.

IMPLEMENTATION

A CO_2 Fee

Both the fee approach suggested here, and cap-and-trade proposals more commonly promoted, have the potential to be effective.[6] Both harness market forces to bring about changes in our energy infrastructure and behavior and reduce CO_2 emissions. Nevertheless, our analyses show clear advantages to the fee approach for addressing the specific issues associated with global climate change. A CO_2 fee that increases predictably provides a foreseeable and certain CO_2 price, offering consumers and industry alike greater stability in energy prices. It avoids the uncertainty and price volatility of allowance prices under cap-and-trade, where fixing the quantity actually forces the price to fluctuate. In fact, a CO_2 fee eliminates CO_2 price uncertainty, further encouraging low-carbon technologies and offering greater economic protection.

A CO_2 fee puts the United States on an economically sustainable path to long-term CO_2 reductions. To a greater extent than a cap, the fee's predictability will encourage long-term investment in efficiency and low-carbon energy technologies. A fee could induce more CO_2 reductions than expected if carbon-reducing solutions were to become economic more quickly, while a cap gives no incentive to reduce emissions below the cap. The consistent escalation of the fee ensures that it will soon reach levels that promote CO_2 reductions, increasing the likelihood of actually achieving desired reductions, with only modest uncertainty as to the precise timing.

This fee proposal does not offer a way for producers to simply buy their way out of reducing CO_2. A persistently low fee might do that, but the increasing fee proposed here quickly reaches a level that gives strong incentives for CO_2 reduction. It would be clear from the outset that the fee would reach $30/ton of CO_2 in ten years. At about this level it is widely believed that large-scale low-and zero-carbon technologies, such as CO_2 sequestration and perhaps nuclear generation, would become economically viable. In fact, over the long term the program should be largely self-extinguishing, since the costs will eventually rise to levels that make it more economic to avoid the emission of essentially all man-made CO_2 than to pay the fee.

The price stability of a fee also protects the economy. An initial fee of $10/ton limits near-term economic disruption and gives producers and consumers years to anticipate and adapt to the higher CO_2 prices to come. This allows for efficient use and the ultimate re-deployment of existing capital stock, whereas an arbitrary volume target risks making large portions of the nation's capital investment obsolete, imposing significant, unnecessary economic burdens, while simultaneously missing relatively inexpensive reductions of CO_2 that consumers could make through conservation. As shown above, the impacts on fossil fuel prices in the near term will be manageable.

Not a tax?

While the fee approach offers significant economic and practical benefits, it will surely be subject to the political disadvantage of being characterized as a tax. That it is very different from a tax will not stop the critics from mischaracterizing it, nor from ignoring the fact that a pure cap and trade program, which will likely impose higher costs than a fee, is administratively cumbersome and is less effective. If the costs for CO_2 control and reduction are to be imposed on the American economy, care should be taken that this burden be imposed fairly, is the least costly, most efficient and most effective to achieve meaningful reductions.

Taxes by their nature are designed to raise revenue to fund government activities. Taxes are politically unpopular particularly when applied to broad, desirable economic activities (e.g., earning income or making profits) and because they are intentionally difficult to avoid. A CO_2 fee shares neither of these characteristics. First, over the long term a CO_2 fee is highly avoidable – in fact the fundamental long-term goal of the program is to prompt consumers and producers to avoid the fee by reducing and ultimately eliminating most CO_2 emitting activities. Second, the fee is not intended or structured to support general government activities, and in fact to be effective it must be excluded from the government's sources of general revenue. Revenue-neutrality, a key feature of the policy, ensures that the revenues are recycled directly into the economy in ways that mitigate the short-term transitional economic burdens of shifting the economy to a new, low CO_2 emissions path. Over the longer term, as noted above, the program should be essentially self-extinguishing.

Modified Cap and Trade?

Most CO_2 policies, whether existing or new programs (e.g., the EU ETS, California's Global Warming Solutions Act, the Regional Greenhouse Gas Initiative in the Northeast) or legislative proposals, rely on a cap and trade structure. The cap and trade approach establishes a total emissions cap and distributes a corresponding quantity of emission allowances, usually by free allocation, but sometimes by auction. Allowances are freely tradable, establishing a market price for the right to emit CO_2. The cap and trade mechanism has been very successful in reducing SO_2 in the U.S., which explains much of its popularity as an environmental policy mechanism. However, a cap and trade system, at least as typically structured, would not be well suited to control CO_2 emissions, for several reasons. A strict quantity cap can result in high and/or volatile CO_2 prices, creating risk for the economy and potentially discouraging needed investment in low-carbon alternatives. Pure cap and trade usually involves large free allocations of allowances, which are unnecessary in the case of CO_2, as noted earlier, and can create large windfalls. Free allocations protect emitters from reducing their emissions; they also discourage efficiency and conservation, which provide some of the best opportunities for near-term CO_2 reductions. And most cap and trade systems are applied to a small number of major sources, rather than economy-wide. Any cap and trade system for CO_2 will be enormously complex to administer and will surely set off a "feeding frenzy" among affected entities scrambling to protect their existing economic positions or better their future positions.

Nevertheless, it is possible to structure a cap and trade program to mitigate, though not eliminate, these problems, and it will be very important to do so if a cap-based policy is favored. First, a price ceiling and floor should be used to bound the extremes of CO_2 price and limit price volatility. This combines price and quantity mechanisms, allowing the price to fluctuate with market conditions within limits, and offers most of the advantages of CO_2 price stability. A price ceiling, sometimes called a "safety valve," would prevent the CO_2 price from exceeding a given level by creating additional allowances (essentially relaxing the quantity cap) if necessary to keep the price from getting too high. This protects the economy and limits the financial exposure of businesses, consumers and existing infrastructure. Similarly, a price floor prevents the price from falling too low, ensuring an attractive market for low-carbon technologies, encouraging their development and deployment.

A price ceiling and floor that brackets the desired carbon fee trajectory, with both floor and ceiling increasing gradually and predictably over time, would allow a CO_2 cap program to set a market price that both protects the economy and encourages no or low-carbon investment. The allowable "band" of CO_2 price between the floor and ceiling should be narrow enough to maintain the benefits of a reasonably predictable price but broad enough to encourage secondary trading within the band and forestall efforts to routinely relax the ceiling or floor.

Again, our research has shown that utilities do not need large allocations. A cap and trade program without large free allocations should auction the allowances. Auction revenues should be employed as with the carbon fee approach.

Whether implemented through a properly structured cap and trade program, or through a CO_2 fee, a policy that creates an escalating CO_2 price, starting from a meaningful level and increasing predictably, will have substantial advantages for both the environment and the economy over the cap and trade approaches currently under discussion.

CONCLUSION

To effectively control GHG emissions, a CO_2 control policy must persuade producers and consumers to produce and use less CO_2. It is generally understood by economists and others that placing a price on CO_2 will induce consumers to demand products and services that produce less CO_2 and require providers to manufacture products and generate energy with lower CO_2 emissions.

The way that a CO_2 price is implemented, however, is crucial. The initial introduction of a CO_2 price must be at a level that does not unnecessarily burden or disrupt the economy and which increases gradually to allow the economy to absorb the price without disruption or dislocation and to permit both consumers and producers sufficient time and opportunity to adjust to the new and higher price of CO_2. The escalation of the price must be predictable and aggressive enough to provide secure long-term price signals that will encourage and support the large, long-term capital deployments that will be needed if the economy is to move over time to a new, low CO_2 emissions profile.

Our analyses show that instituting a CO_2 fee with a gradually escalating price will provide an appropriate price signal to producers and consumers to reduce emissions. For industrial firms with long-planning horizons, it will provide critical stability and predictability; among producers and consumers it will encourage efficiency and conservation; for the new technologies needed to reduce CO_2 emissions, it will provide resources to support research and development and deployment. While a CO_2 fee is the most effective and efficient policy, it may be possible to modify a cap and trade program to produce roughly similar benefits, albeit not as readily or as efficiently, by incorporating a price ceiling and floor and by auctioning allowances.

Most important is to:

a) Promptly introduce a program that will begin a steady and sustainable reduction in U.S. CO_2 emissions;
b) Use market forces to reward lower carbon production and consumption;
c) Promote the research, development and deployment of low-carbon technologies
d) Encourage sensible long-term capital investment decisions through certain and stable prices for CO_2.

Our market economy has great difficulty assigning a current price to the long-term cost of CO_2 emissions. Congress can and should intervene in the economy solely to the extent of assigning a price profile to CO_2. It is less important that this price profile be the economically "optimal" one than that it begin at moderate but meaningful levels and then escalate predictably over a long period of time. Then, markets, consumers and producers can respond to this strong price signal and bring the substantial benefits of American ingenuity, market discipline and entrepreneurial creativity to controlling CO_2. The most efficient and effective way for Congress to intervene is with a carbon fee. Because a CO_2 fee is the least-cost, highest-benefit alternative, it merits discussion and consideration along with other GHG control proposals.

The policy considerations and the empirical evidence and analysis presented in this paper support a fee approach to controlling CO_2. We hope that this paper will stimulate broad discussion of these ideas and facilitate timely and sensible policy action to address CO_2 emissions and climate change

Notes:

1. This discussion focuses on CO_2, but of course the policy should also be extended to cover other greenhouse gases such as nitrous oxide and methane.
2. See 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, The American Consumer Institute, February 2007, at www.theamericanconsumer.org.
3. See, e.g., Phil Izzo, "Is It Time for a New Tax on Energy?" *The Wall Street Journal*, February 9, 2007.
4. See Tim Hargrave, U.S. Carbon Emissions Trading: Description of an Upstream Approach, Center for Clean Air Policy, Washington, DC, 1998.
5. See William D. Nordhaus, After Kyoto: Alternative Mechanisms to Control Global Warming, Yale University, December 9, 2005.
6. See CBO Issue Brief: Limiting Carbon Dioxide Emissions: Prices Versus Caps, Congressional Budget Office, March 15, 2005.

APPENDIX

This Appendix summarizes a number of the important analytic findings and resulting policy conclusions from joint research by FPL Group and The Brattle Group. A more thorough discussion of the methods used in those analyses and the technical details of these issues can be found in an accompanying technical paper by The Brattle Group, available at www.brattle.com/publications.

A. Effects on the Economy, Consumers and Other Industries

A.1 A modest but gradually escalating CO_2 price would entail a manageable burden on the economy as a whole.

Based on current U.S. greenhouse gas emissions of almost 7 billion tons (CO_2 equivalents), a CO_2 price of $10/ton corresponds to direct annual revenues of about $70 billion. This is a large amount in absolute terms, but a manageable share of the economy – about 0.5% of GDP – and the bulk of the revenues would be returned directly to the economy. A $10/ton CO_2 price would increase the cost of home heating by about $3 per month for the average residential natural gas household, or $5 per month for oil-heated households, while the price of gasoline would rise by 10¢ per gallon. Electricity prices would increase by 0.5-1¢/kWh. These increases are within the range of recent commodity price volatility, and further increases would be phased in gradually over a number of years.

A.2 Much of the CO_2 price effect will be reflected in goods and services.

Direct consumer energy usage in the U.S. accounts for less than half of total CO_2 output; most energy is consumed indirectly in the energy content of goods and services. Residential electric consumption accounts for only about 15% of total CO_2 emissions. This means that much of the CO_2 cost will appear indirectly in higher prices of other goods and services, rather than primarily through the increased cost of fuels and electricity. Lower income consumers are hit harder by rising energy costs; thus they will be affected disproportionately by a CO_2 control policy, whatever its form.

The consumer impact of this policy is one strong reason to insist that the program be revenue-neutral to government. Revenues collected should not be used to fund general government operations. Addressing the impact on low income consumers should be an integral part of the overall CO_2 reduction policy.

A.3 Some compensation may be needed to protect energy-intensive industries subject to import competition when the CO_2 price becomes high, unless foreign countries (particularly developing nations) adopt similar CO_2 policies.

A domestic price for CO_2 may raise the production costs of energy-intensive domestic industries, such as primary metals, chemicals and paper, impairing their ability to compete in domestic and foreign markets with international producers that do not face CO_2 costs. Higher CO_2 prices could push production of energy-intensive goods offshore to countries without comparable CO_2 policies, inducing needless economic harm while frustrating the intent of the CO_2 policy. Protections for some vulnerable industries may be warranted, but direct allocations of allowances are unlikely to have the desired effect. One environmentally and economically promising approach to address these problems would be to use "border tax adjustments" (BTA), where the additional costs of a domestic CO_2 price would be rebated to an exporting manufacturer, while a tariff comparable to the CO_2 price would be imposed on imported products, to the extent they are not already subject to comparable CO_2 controls. It is often acceptable under trade agreements to make certain types of border tax adjustments to counteract the effect of differences in domestic and foreign taxation. The advantages of border tax adjustments would need to be weighed against the administrative burden involved, as well as potential trade impacts.

A.4 A cap and trade program risks substantial CO_2 price uncertainty and volatility, absent mechanisms to limit the extremes of CO_2 price.

The European experience with cap and trade since the start of the Emissions Trading Scheme (EU ETS) in 2005 has shown that CO_2 prices under allowance trading can be quite volatile, as shown in Figure 1. ETS CO_2 prices started initially around €7/ton and increased to a high of nearly €30/ton. After several months of relative stability in the €20-25/ton range, the CO_2 price increased for a time and then collapsed within a few days to around €11/ton in early May 2006. After a temporary and partial rebound, it has subsequently fallen to under €1/ton. This fall is widely attributed to the allocation of excess allowances.

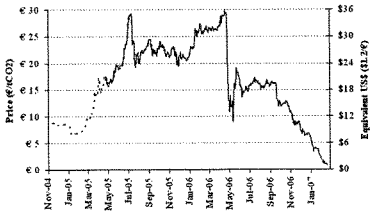

Figure 1: European CO_2 prices have shown marked volatility.

This level of CO_2 price volatility can make planning quite difficult. For a typical efficient coal plant, a variation in CO_2 price of €15/ton ($19/ton at the current exchange rate) corresponds to a change of about $19/MWh in operating costs. This is as large as the cost of fuel for many plants. Even for an efficient gas-fired combined cycle plant, this change in CO_2 price affects operating costs by $8/MWh. A price ceiling and floor will give greater confidence in CO_2 price, protecting the economy from very high prices and encouraging carbon-reducing investments by preventing very low prices. A fee-based policy could eliminate CO_2 price uncertainty altogether.

B. Analysis of Electric Industry impacts

The CO_2 price trajectory proposed here would not be disruptive to the electric industry, but it would catalyze structural changes quite soon. The industry's basic business model would remain intact, with existing assets retaining most of their value and with no abrupt, intolerable, or unmitigatable impacts on customers. A gradually escalating CO_2 price would give the necessary incentive and the time for conservation and carbon-abating technologies to be substituted for existing infrastructure, without threat to system reliability. This phased approach avoids the risk of quickly making a large portion of the generation base uneconomic in the early years of the program, while still ensuring that the technological transition will begin promptly.

B.1 The electric industry cannot provide substantial low-cost reductions in CO_2 emissions in the near future.

Substantial and rapid CO_2 reductions from the electric industry could have been reasonably expected in the mid-1990s, when the price of natural gas was below $3/MMBtu and new natural gas combined cycle plants were far cheaper to build and operate than coal plants. In such circumstances, the imposition of a moderate CO_2 price would have eliminated a great deal of CO_2 emissions simply through fuel switching – dispatching existing and new gas-fired plants more, and coal plants less. But with current gas prices at well over twice the levels of the 1990s, coal-fired generation is now substantially more economic than natural gas. Even a $30/ton CO_2 price (which would be reached in ten years at the proposed escalation rate) would not make gas more economic than efficient, existing coal-fired generators. As Figure 2 shows, with natural gas at $3, a small CO_2 price ($0-5/ton) would have made an efficient gas-fired combined cycle plant more economical than many coal plants. With gas around $7 now, a CO_2 price of $35-55/ton is needed to induce substantial fuel switching. Simulation modeling of the Eastern Interconnection confirms that the CO_2 price would need to get to around $30/ton to begin to induce substantial fuel switching at current gas prices; this would cause electric sector CO_2 reductions of about 8%.

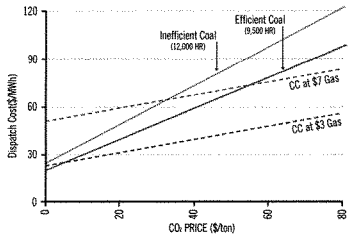

Figure 2: With high gas prices, a CO_2 price of $30/ton or more is needed to make existing gas-fired power plants more economic to operate than coal-fired plants.

B.2 Pricing carbon will raise the average cost and market price of electricity, but the attendant increases in customer bills will not be unmanageable – particularly if offset by end-use efficiency and conservation.

In most of the U.S., coal and natural gas-fired plants make up the majority of the total generation and an even a greater percentage of the generation on the margin, i.e., determining prices in competitive wholesale markets. As a result, the average and marginal cost of power – i.e., regulated cost-based rates and competitive market-based prices – are affected comparably by CO_2 prices, rising roughly $5-10/MWh in response to a $10/ton CO_2 price, as illustrated in Figures 3 and 4. Regions with the larger absolute and percentage increases tend to be those where rates are lower than average presently, due to the dominance of relatively inexpensive coal-fired generation. These estimated cost and price increases include only the direct effects of fuel switching, and not indirect changes like demand response, which partially mitigate the cost and price effects. A policy that phases in a CO_2 price to reach $30/ton over 10 years translates to an annual increase of about 0.2¢/kWh (2.5% of the current average retail price) or less – certainly not insignificant, but moderate compared to recent rate increases that have been driven by higher fuel costs. Cost and price increases are an expected and intended effect of a CO_2 control policy. The policy's goal should be to discourage activities that emit CO_2 and to encourage the development and substitution of technologies that emit less carbon.

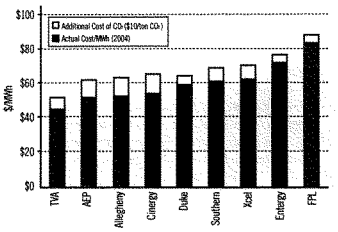

Figure 3: The average cost of power increases by $5-10/MWh with $10/ton CO_2 (selected utilities shown).

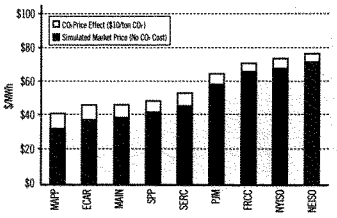

Figure 4: Competitive market prices also increase by $5-10/MWh under $10/ton CO_2 (simulated regional results).

B.3 Since there is limited potential for fuel-switching, most near-term CO_2 reduction in the electric sector must come from reducing demand and in the longer term, substituting lower-carbon technologies.

Significant conservation is likely to occur in response to progressive CO_2 price increases. A CO_2 price of $30/ton in ten years would reduce electric demand by 5-10%, leading to an 11% cut in electric sector CO_2 emissions. This is in addition to the 8% reduction expected from fuel switching. Still more reductions would come in the longer term from the adoption of less carbon-intensive technologies for generation additions. If a phased-in CO_2 policy like the one considered here is implemented, gas-fired capacity would again be competitive with traditional coal-fired capacity for generation expansion, and very low-carbon technologies such as nuclear and integrated gasification combined cycle with carbon capture and sequestration would hopefully become economic for future generations of capacity expansion. Phasing in the CO_2 price will mean smaller emission reductions initially, of course, but potentially greater reductions in the longer term as the CO_2 price continues to rise. As low carbon technologies become available, they will begin to penetrate the generation fleet, ultimately replacing traditional coal-fired plants for capacity expansion. Coal technologies will dramatically improve, given a clear economic signal of what that will be worth. (See, e.g., Future Carbon Regulations and Current Investments in Alternative Coal-Fired Power Plant Designs, R. Sekar, et al., Report No. 129, MIT Joint Program on the Science and Policy of Global Change, Dec 2005.)

B.4 Traditional coal-fired generators remain cost-effective for many years, even with a strong CO_2 control policy.

Current high natural gas prices have made coal plants very profitable, and traditional coal-fired generation will continue to be a significant part of the U.S. electricity supply mix for some time to come, even under a strong CO_2 policy. Our analysis shows that almost all existing coal capacity would remain viable until CO_2 prices get quite high, many years into the future under a phased-in program. At that point, older and less efficient coal-fired plants will start to be phased out as higher CO_2 costs make them uneconomical, but the newest and most efficient coal plants will continue to be viable. For plants operating in deregulated markets, imposing a CO_2 price would cause wholesale electricity prices to increase to levels that will partially (often almost entirely) compensate for the increase in coal plants' operating costs. Coal plants under cost-based regulation would still be economic to operate and would thus recover their costs in rates. The continued viability of the coal fleet also means that the proposed phased-in CO_2 price would not threaten system reliability, as it would only slowly encourage the retirement of the least-efficient coal plants.

B.5 A CO_2 control policy does not create a need for financial indemnification of utilities (e.g., via free allocation of allowances).

The electric industry is not vulnerable to competition from imports that are exempt from CO_2 costs, nor are there ready substitutes for most electricity uses. The financial performance of regulated cost-of-service utilities is mostly protected from CO_2 price increases, since regulators would generally pass additional costs through to customers in increased rates and utilities would have time to partially mitigate their exposure under a phased-in program. Figure 3 above showed that operating cost increases would be about $5-10/MWh in response to a $10/ton CO_2 price. Market simulation of the Eastern Interconnect indicates that competitive market prices increase about the same amount (Figure 4 above), so that in a fully deregulated market generators would, on average, also recover their increased costs. This is not uniformly true; some generators who are more CO_2-intensive than their regional market would fare less well if they are not under cost-recovery regulation.

Figure 5 shows the simulated effect of a $10/ton CO_2 price on the gross margins of generators in the Eastern Interconnect (revenues minus total variable costs, with no demand response), assuming that all operate in competitive generation markets. As expected, the potential competitive financial effect is closely correlated with a generator's overall CO_2 intensity, though also depends on relative CO_2 intensity compared with price-setting generation in the region. A key result is that for even the worst affected generators, to offset their potential losses would require free allocations equal to less than 30% of their total emissions, and more than half the generators would actually benefit without any free allocations. Thus, large free allocations are not necessary to protect generators' financial health, and would create unnecessary financial windfalls. The European experience has shown that large allocations, which were made under the EU ETS, lead to large windfalls for producers. For example, the UK regulator estimated that the windfall to UK generators alone could cause a wealth transfer of as much as £19 billion over the eight years encompassing Phases 1 and 2 of the EU ETS (this estimate was based on a CO_2 price of €25/ton; it would be lower at the current price, but still substantial). See "Our Energy Challenge": OFGEM's Response, Office of Gas and Electricity Markets, May 2006.

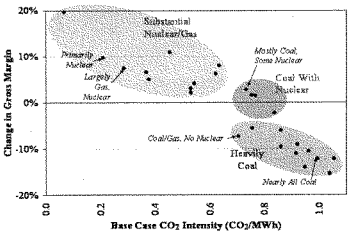

Figure 5: Effect of CO_2 price on generator margins (if all were deregulated) is closely related to carbon intensity. (Simulated results for Eastern Interconnect generation fleets; no free allocations.)

Understandably, some regulated utilities may desire allowance allocations in order to protect their customers, rather than for themselves directly. While some consumer protections are certainly warranted (especially for lower-income customers), electric utilities are not well placed to provide such protection, for several reasons. First, in an economy-wide program where electricity is responsible for a small fraction of total consumer impacts (residential electricity accounts for only 15% of total CO_2), it will be difficult or impossible to achieve fair and equitable protection for consumers via their electricity suppliers. Second, this is further complicated by the fact that some consumers are served by regulated, vertically integrated utilities, and others get their power from deregulated generators. It would be difficult to make allowance allocations to generators (or even to distribution companies) that would translate to equitable protection for all consumers. Finally, it is important that electricity consumers, like consumers of other energy forms, see the effect of CO_2 price, to preserve incentives for cost-effective conservation and efficiency measures that will contribute to emission reductions. Other, broader forms of consumer protection – e.g., the return of program revenues directly to consumers – would offset the income loss due to higher energy prices while preserving the price signal. There is a strong role for utilities in this regard, with energy conservation and technology adoption programs funded by CO_2 policy revenues.

RESPONSES BY LEWIS HAY III, TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. You advocate a carbon fee as the simplest, most effective way to reduce carbon emissions. How can we be sure that a fee will achieve the needed level of emission reductions? Couldn't companies just decide to pay to pollute?

Response. Unfortunately, no program design will guarantee a certain result, not even a cap and trade. A cap can be missed—there's absolutely nothing to guarantee that it won't be—and in fact, the European experience suggests that this is quite possible. Although it may seem as though a cap gives certainty, we believe this is an illusion. Clearly, there is no certainty if the cap and trade system includes a safety valve. Furthermore, from a pragmatic perspective, there is simply no way a future Congress will not provide relief (in the form of deferrals or re-set targets) if it turns out that the expected levels of CO_2 reduction cannot be achieved at reasonable cost. This is exemplified in the recent proposal by Senators Landrieu, Graham, Lincoln and Warner in which they propose a Carbon Market Efficiency Board. Unfortunately, with a cap, the way this will come about is through a rapid, intense run-up in the price of allowances, with potentially devastating economic effects and little time for industry to anticipate and react, leading to a political reaction in the face of economic distress. In contrast, with a fee, if the originally set path of future costs does not appear to be generating enough CO_2 reduction, the future fee path can be gently and progressively ratcheted up—but always with direct observation over the level of economic hardship imposed by pricing carbon directly.

In addition, we believe this question contains a false premise. We do not know today what the "needed" level of emissions reduction is. In other words, we do not know the exact relationship between atmospheric CO_2 concentrations and global temperature. Currently, there is insufficient scientific evidence to determine this (as the most recent IPCC report explicitly acknowledges). Until more work can be done and the uncertainty narrowed, the issue is less scientific than economic. Global climate change presents the risk of future severe economic damage and addressing it will require some degree of economic sacrifice. Exactly what the tradeoff should be is not yet a matter of science but rather a policy judgment.

This may seem to be a problem, but we believe it is actually a "silver lining" from a policy perspective. Because climate change is a result of the long-term accumulation of greenhouse gases and since CO_2 remains in the atmosphere for many years, it doesn't matter greatly whether we meet a particular annual emissions target in 1 year or the next. This is especially true in the short-term. What is important is that we accomplish long-term goals by setting the economy on a new path toward lower carbon intensity and that we do so without inflicting major economic damage. Setting volume caps (or targets, as they really are) gives us the illusion of certainty, but it does not provide certainty. In contrast, a fee, as long as it is not arbitrarily shifted over the short term (which it does not need to be), provides a much greater measure of predictability to individuals and firms trying to make decisions about long-lived assets. Thus, it is far more likely to elicit major behavioral change based on sound investment decisionmaking.

The entire question of whether it is better to attempt to control price or volume has been extensively studied. One of the best analysts, we believe, is Billy Pizer of RFF, who argues that price controls induce behavioral changes that can achieve results five times higher than quantity targets. A carbon fee can be implemented gradually, thus avoiding any economic disruption. That said, since the fee continues to escalate and can be anticipated, there's a point when the fee will become too expensive to pay. This is the point at which emitting carbon becomes economically impracticable, and is also the point at which the fee becomes anachronistic, or self extinguishing.

Advocates of cap and trade argue that the economic models are sufficiently robust, that they "know" the impact on our economy of various caps and the likely resultant CO_2 price. While we have our doubts about the precision of such models, especially in regard to site impacts, if the relationship between carbon limits and carbon prices is that well understood, then the impact on CO_2 emissions levels should be the same regardless of whether a price is set or a certain level of carbon emissions is set. In other words, if these advocates are correct about the accuracy of their models, they should be pleased with a fee and be very confident with the end result. If, however, the converse is true—and they are wrong about their models—then we will have played Russian roulette with our economy by setting a hard cap.

All programs to control carbon will have both costs and uncertainties. No program will provide absolute certainty over either price or volume. The best program will, however, reduce the uncertainties as much as possible. Both cap and trade and a fee provide uncertain results, but since the fee provides a higher degree of predict-

ability to guide consumers and producers in their immediate economic decisions, the fee is obviously preferred.

Question 2. How would we know how much to charge for a carbon fee? Could we be sure it would stimulate the investments needed to spur essential technological developments?

Response. The most important issue when setting the price for carbon is the balance between the need for technological investment to bring long-term emissions reductions and the need to avoid economic disruption. Emissions reduction is a long-term problem that will take many decades to solve. Thus, if we start with a reasonable and steadily increasing price, a fee is going to attain a level whereby investments and, subsequently, behavioral changes, are imminent. At some level—a level that will in due course, though not immediately, become knowable to businesses, industries, and innovators—it will simply become too expensive to emit carbon into the atmosphere. Prior to this, investments will be made and changes will result. Unfortunately, the same cannot be said for a cap and trade since it doesn't set a floor—or guaranteed cost for carbon—and consequently doesn't ensure a specified or certain level for returns on investment. As such, not only is behavior modification not certain, neither is technological advancement. In other words, setting a floor is just as important as setting a ceiling.

In practical terms, a degree of judgment is required in setting the price path, since it is desirable not to have to change this with any frequency. With carbon, the critical challenge is to estimate what the cost of future technology with zero net emissions may be and then to set the target price at that level in the timeframe when those future technologies are expected to be broadly available. For example, if we believe that there is a reasonable probability that carbon capture and sequestration could be feasible at commercial scale for a cost of $50 per ton by about 2030, then the price path should be set to reach $50 per ton about 2030. It should start out at modest levels, and it should rise predictably and progressively. That is why we have proposed starting at $10 per ton, which will send a clear price signal but will not be massively economically disruptive, and escalate at $2 per ton (all values in 2007 dollars, i.e., the actual nominal prices will be increased for inflation).

Such a price profile, if understood and believed, will absolutely spur technological development, just as it will spur behavioral change. This is particularly true if one believes that the cost to society of reducing greenhouse gases will be modest. Importantly, a reasonable and progressive price profile will give all economic actors time to respond. Investors and consumers will both be able to judge what actions to take, and the prospect of earning a predictable return for every ton of carbon that a new technology or change in behavior might avoid would be an extremely powerful inducement. We know from centuries of experience that there is no more powerful incentive to large-scale behavioral change than economics.

A cap and trade, on the other hand, almost entirely ignores the economics, focusing instead on forcing a political solution to an economic problem. The proponents of certain cap and trade programs often point to various economic models as bases for their position, but even if these proponents have confidence in the models that support their conclusions, they should certainly understand that they can apply the same conclusions to a fee and support a much more economically efficient means of arriving at the same result! The politically convenient support for cap and trade programs is, as *The Economist* notes, quite frankly "a pity, because most economists agree that carbon taxes are a better way to reduce greenhouse gases than cap-and-trade schemes. That is because taxes deal more efficiently than do permits with the uncertainty surrounding carbon control. In the neat world of economic theory, carbon reduction makes sense until the marginal cost of cutting carbon emissions is equal to the marginal benefit of cutting carbon emissions. If policymakers knew the exact shape of these cost and benefit curves, it would matter little whether they reached this optimal level by targeting the quantity of emissions (through a cap) or setting the price (through a tax)" ["Doffing the Cap," *The Economist*, 14 June 2007]. In other words, if we knew either the marginal benefit or the marginal cost, then we'd be entirely indifferent to the policy solution. But, since we know neither the benefit nor the cost—every model, to this point, is at best a rough approximation—then we should be obligated to take the path that provides cost certainty. This seemingly simple fact is ignored by politicians because, as that same Economist article notes, a fee is prone to "ideological caricature." Economists, like Alan Greenspan, Paul Volcker, Robert Shapiro, and William Pizer understand that the solution shouldn't be political, but should be efficient and certain and thus all support a carbon fee. For their part, entrepreneurs, industrialists and markets respond best to price signals. If there is a price on carbon, you can bet safely that they will respond

with new, lower cost technologies, which in turn helps the overall economy and spurs the carbon-free paradigm that any program should aspire to.

While the exact price profile of the fee is less important than its general shape, it is very important that we not err too much to one side or the other. For example, if we set the price at $50 in the first year or two it will make little difference to the speed with which necessary new technologies can be developed and commercialized, but it will exact a huge economic cost. This is the great danger with a cap and trade system—it will be very easy to inadvertently set a cap that cannot practically be met within a particular timeframe. The consequence will be that allowance prices will skyrocket unpredictably, but too late to induce additional action, and the only possible response will be to relax the caps. By then, however, the economic damage will have been done.

It is worth noting that a modern, free enterprise economy like our own can adapt very well to moderate, predictable changes in relative prices without significant loss of net output. It cannot adapt nearly so well to short, sharp shocks (for example, the oil shocks of the 1970s). A fee system provides predictable, moderately changing prices, allowing the economy gradually to adapt to a new, lower carbon intensity state. A cap approach runs the risk of inadvertently inducing unanticipated and unnecessary economic shocks.

At its most basic form, a carbon fee creates a supply curve. This is key to stimulating the kind of behavioral changes and investment decisions that will ultimately abate carbon emissions. Generation technologies cost hundreds of millions of dollars, and in some cases—nuclear, for example—billions of dollars. And, the decisions and technologies last a long time. Long-term investment decisions require price certainty for justification, not economic models.

Question 3. How would you recommend recycling some of the proceeds from a carbon fee or auction back to consumers?

Response. It's important to remember that the point of a carbon fee or auction is not to raise treasury revenue, but to modify behavior and reduce carbon emissions. It should be, in effect, revenue neutral, with all proceeds recycled directly back into the economy.

The proceeds should be employed in three ways:

1. *To abrogate the inherent regressivity of a carbon cost and its consequent impact on energy costs, the bulk of the fee should be returned to consumers directly through a per capita allowance, a de facto personal allowance for carbon.* To this end, each year, every adult would receive a proportionate share in the proceeds of the aggregate fee, economically offsetting the typical emissions profile while preserving the price signal that will discourage the use of carbon intensive products or production methods. While other methods are possible, it is crucial that the return to consumers be independent of their carbon footprint, otherwise the price signal effect will be lost. Thus, for example, if credits were given to electric load serving entities, there is a high likelihood that state-level utility regulation would pass these through to consumers based on their kilowatt-hour consumption. This would nullify the desired price signal. Overall, we believe a simple per capita allowance makes most sense. To reflect the inherent efficiencies of families, we suggest that dependent children receive a partial allowance (one-third or one-half of the adult allowance).

2. *Some portion of the resultant proceeds needs to be reserved to protect those few industries that are genuinely exposed to direct competition from foreign firms that do not have an equivalent cost of carbon embedded in their pricing structures.* Similarly, U.S.-based industries and firms that export to non-carbon controlled countries that are negatively impacted also merit protection.

3. *A portion of the fee needs to be reserved for fundamental research into carbon reduction and elimination technologies, such as carbon capture and sequestration.* Without these technologies, we simply will not be capable of adequately addressing carbon abatement. EPRI estimates that in order to develop technologies necessary to address climate change in the electrical sector alone, RD&D funding will need to increase by roughly $1.3 billion per year over the next 25 years—or a total of $33 billion. We believe the actual amount needed will be at least twice that amount.

The balance among the three ways for recycling carbon fees back into the economy can be adjusted over time, with the allocations to R&D and industry protection diminishing as the global economy adjusts to the new paradigm. We believe that the vast majority of the dollars should go directly to consumers.

Question 4. How can we encourage utilities to encourage energy efficiency on the part of their customers?

Response. While energy efficiency isn't the only solution, it's clearly an important part of the solution. And, importantly, as a country—and, in particular, as an indus-

try—we've only scratched the surface. There's an enormous potential for more energy efficiency measures to be implemented. For example:

1. *Do what Florida does.* As a first step, you need look no further than to the best of what has already been done. We don't build new generation until we've proven that we've exhausted all economical conservation and efficiency measures. Consequently, FPL is first in the Nation in conservation (our peak demand is just 2 percent of America's peak demand, but we've implemented 13 percent of the country's energy efficiency and 6 percent of the load management). If the rest of the nation's utilities adopted our efficiency standards, it would avoid completely the same about of carbon emitted by the nation's largest electric utility emitter.

2. *Create economic incentives to do more.* Utilities can play a big role, but they need an incentive to reduce their existing sales and source of profits.

3. *Support infrastructure investments and new rate structures.* Smart meters and time of day pricing will clearly make energy delivery and use more efficient. Such effectual structures, coupled with smarter end-use appliances will drive behavioral changes and efficiency.

4. *Ensure that the cost of CO_2 is fully reflected in the rates that customers are paying.* To this point, a carbon fee is the clearest and most efficient means to ensure that the price of carbon is reflected in the costs of goods and services. Importantly, because they would actually hide the cost of carbon, free allowances in a cap and trade scheme would have the opposite effect and would actually undermine efforts to encourage drive efficiency and behavioral changes.

5. *Implement programs to educate consumers and create awareness.*

Despite our best efforts, energy efficiency is not always top of mind for our customers. Many times the most efficient alternative is not selected because the customer simply doesn't have the information to make an informed decision. Raising public awareness on conservation is very costly; education on the best alternatives increases that cost even more. Over the last 25 years FPL has worked hard to raise the awareness level of energy efficiency and has accomplished an industry-leading level of success, but meeting the reduction targets that are contemplated in most carbon reduction measures would require a Herculean effort. To even begin to accomplish such an effort would require proactive awareness campaigns from all levels of government, a modest but consistent level of funding, and a concerted public/private partnership. A small portion of the proceeds of a carbon fee could be dedicated to this role.

Once customers are made aware, the increased incremental cost of an energy efficient alternative must then be overcome. Today, utilities provide incentives to customers that install energy efficient measures. However, such incentives often pale in comparison to the differential cost of the more efficient measure. We need a regulatory mechanism that allows for larger incentives to help cover the cost of the measure. The gap between the cost of an energy intensive end point and the cost of an efficient device must be narrowed significantly to make a difference. Once again, this is one of the virtues of a fee: it translates immediately and directly into a price signal and will automatically make any existing potential conservation measure inherently more attractive—and in a predictable fashion.

Question 5. If utilities are given emission allowances for free, will utilities pass along the savings to consumers or will they increase the price of electricity to reflect the market value of the allowances?

Response. We think there is a very real risk that with any allowance program in which there are free allocations there will be misappropriations. Free allowances are inherently problematic. There are, quite simply, too many things that can go wrong to make them worthwhile.

While we cannot know for sure exactly what will happen, we can make reasonable assessments. In deregulated markets, generators are unlikely to pass along any net savings to consumers. Prices are set by the market, and the market price will likely increase by the marginal producers' incremental cost of CO_2 compliance. Other generators will benefit from this to the extent that their cost of CO_2 compliance is less than that of the marginal producer. If they receive free allowances, they will keep this difference as well.

In traditional, regulated markets, the amount of savings customers will realize, and how they will realize it, will be a function of each utility's State public service commission. It is hard to predict how each PSC will act. Some will likely require a pass through to customers based on their electricity consumption. We view this as a significant problem, because it will nullify the price signal that is crucial to send to customers if they are to be encouraged to change their behavior and become more energy efficient. Other PSC's might implement different pass-through mechanisms, with unpredictable results.

Of course, it is possible that some utilities will try to convince their PSC's that they have to pay twice to deal with carbon: first by paying for CO_2 allowances and second by building new low (or no) carbon generation; and as such they should be allowed to sell their allowances and keep the proceeds to help recover their costs. We have heard this argument used by some generators. It is, however, quite without merit. They may choose to pay the cost of carbon for each megawatt hour either of two ways: by purchasing an allowance, or by creating new, clean generation. But they will never have to pay twice for the same megawatt hour.

Since free allowances are inherently problematical and somewhat unpredictable in their distributional effects, we believe they should be avoided. Clearly, however, if there are any free allowances they should be distributed based on efficiency—thus, rewarding the very behavior a climate bill would purport to encourage. Some companies and sectors argue that allowances should be distributed based on historic pollution. We find this unjustifiable for two major reasons: (1) our customers pay more already because they've already made investments in clean, efficient generation (i.e., this penalizes those who are efficient and/or who took early action) and (2) Florida is a rapidly growing State that would be essentially be penalized for growth under an input, or historic, scheme. Customers of low-cost traditional coal generation enjoy substantially lower rates than customers of cleaner, more efficient generation. There's an obvious correlation between carbon emissions and cost. Even after adding the cost of allowances, coal customers will still pay less. It makes no sense to subsidize lower rates and higher emissions on the backs on consumers who pay higher rates but have lower emissions. Further, there's no logic whatsoever in looking at historic emissions. It doesn't solve the problem and doesn't encourage technological innovation. Certain regions of the country could meet a mandated reduction simply because their population is declining and thus their energy consumption and resultant emissions are declining. Consequently, they would have no incentive to make investments in new, more efficient technologies. On the other hand, certain regions—such as the Southeast and Southwest—would be punished for simply growing in population.

Since allowances have value and thus create a cost for carbon, it is logical to assume that all electric rates will increase. It follows that if some allowances are free, then some consumers will end up essentially paying more for electricity while the utilities are held harmless. Of course, if there's an over-allocation of allowances, then those entities can actually sell the allowances and make a profit, while charging the increased market for electricity. This scenario is especially convoluted in deregulated markets where a clearing price is set—likely at an elevated level—and the states' Public Service Commissions have less control over the process. To this point, in Germany both E.ON and RWE have been charged with doing exactly this, selling electricity to their customers at market price and selling free allowances for profit, in effect double charging their customers.

Even if this does not happen, however, there is a perverse effect from free allocation of allowances. If the value of the allowances is passed through to consumers as a reduction in the price of a kilowatt hour of energy, then the consumer promptly loses the price signal that we need to send if the large reductions in carbon intensity that are possible through end user efficiency and conservation are actually to be achieved! Either way there is a problem.

These problems are inherent in the approach of free allocations. They are avoided if we choose a carbon fee with per capita recycling. Regulated utilities will pass on their costs directly, while the wholesale price of electricity will rise in de-regulated markets, so end-use consumers will see the right price signals and will have appropriate incentives to conserve and be efficient, but because the vast bulk of the dollars will be recycled directly into consumers' pockets the economy will not be hurt significantly. Again, the superiority of the fee approach is clear.

If a cap and trade system is used, allowances should be auctioned, with the proceeds recycled as we have discussed for the fee approach.

RESPONSES BY LEWIS HAY III, TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. What business risks are associated with potential climate change legislation and have these risks been documented in your 10–K filings with the U.S. Securities and Exchange Commission and appropriate disclosures to shareholders?

Response. The business risks associated with climate change legislation generally fall into three categories.

1. *Climate change legislation can result in higher operating costs that may not be recovered in prices paid by customers.* This is particularly a possibility for generation units in competitive markets, but it could also happen for regulated generation.

2. *Climate change legislation can mean higher capital expenditures resulting from the investments necessary to comply with the new rules* (e.g., improvements to plant efficiency, CO_2 capture and storage technology). Again, these costs may or may not be recoverable in rates.

3. *Climate change legislation can render current generation assets obsolete and, therefore, create the risk of unrecoverable, or stranded, capital costs.* Further, current generation assets might have their output materially reduced, which would likewise create the risk of unrecoverable, or stranded, capital costs.

We believe that we have made the appropriate disclosures to investors in Part 1, Item 1A: Risk Factors of our 2006 10–K filings. The commensurate excerpt from this section is noted below.

> "FPL Group and FPL are subject to extensive Federal, State and local environmental statutes as well as the effect of changes in or additions to applicable statutes, rules and regulations relating to air quality, water quality, climate change, waste management, wildlife mortality, natural resources and health and safety that could, among other things, restrict or limit the output of certain facilities or the use of certain fuels required for the production of electricity and/or require additional pollution control equipment and otherwise increase costs. There are significant capital, operating and other costs associated with compliance with these environmental statutes, rules and regulations, and those costs could be even more significant in the future."

In addition to the risk factors section above, which is designed to provide investors a high level view of the broad array of risks to which the business is exposed, FPL Group also includes discussion of environmental matters in Part 1, Item 1: Business. An excerpt from this section specific to climate change is noted below.

"Climate Change—As a participant in President Bush's Climate Leader Program to reduce greenhouse gas intensity in the United States by 18 percent by 2012, FPL Group has inventoried its greenhouse gas emission rates and has committed to a 2008 reduction target of 18 percent below a 2001 baseline emission rate measured in pounds per megawatt-hour. FPL Group believes that the planned operation of its generating portfolio, along with its current efficiency initiatives, greenhouse gas management efforts and increased use of renewable energy, will allow it to achieve this target. In addition, FPL Group has joined the U.S. Climate Action Partnership, an alliance made up of a diverse group of U.S.-based businesses and environmental organizations, which in early 2007 issued a set of principles and recommendations to address global climate change and the reduction of greenhouse gas emissions.

The U.S. Congress is considering several legislative proposals that would establish new mandatory regulatory requirements and reduction targets for greenhouse gases. Based on the most current reference data available from government sources, FPL Group is among the lowest emitters of greenhouse gases measured by its rate of emissions to generation in pounds per megawatt-hour. However, these legislative proposals have differing methods of implementation and the impact on FPL's and FPL Energy's generating units and/or the financial impact (either positive or negative) to FPL Group and FPL could be material, depending on the eventual structure of any legislation enacted and specific implementation rules adopted."

For a full list and description of all of the risk factors impacting our business, please see our full 10–K filing which can be accessed via the Internet at *www.FPLGroup.com.*

In addition to this formal documentation, our regular communications with investors frequently include discussion of the specific topic of climate change, which is increasingly of interest to many investors. Because the range of alternatives for addressing climate change is so wide, at this stage it is impossible to provide specific guidance on the impact that legislation might have. As the above excerpt notes, the impact on FPL Group could be materially positive or negative, depending upon the specifics of the program, if any, eventually adopted.

Question 2. If a cap-and-trade program such as the 2007 Bingaman-Specter bill and the 2007 Lieberman-McCain bill were implemented, what would be the gross costs imposed in your business operations? What would be the gross revenue? What would be the net cost/revenue?

Response. It is impossible to provide specific answers to these questions, as the results depend both on presently unspecified but important details of how these proposals might be implemented and on how markets in different parts of the country react. Generally speaking, we can say that we would incur significant costs to purchase needed allowances, and these costs would likely be higher with the Lieberman-McCain bill over time, because of its more aggressive emissions targets, but we have no way of estimating how much these costs would be. Similarly, we have no way at present of knowing whether or to what extent any of the FPL Group

companies might receive allocations of allowances, and even if they did, what the value might be. Finally, we have no way of knowing how much the price of electricity would rise in markets in different regions of the country in response to the additional cost of required purchases of allowances.

All these uncertainties, which are very large, emphasize some of the reasons we believe a carbon fee is the best way to address climate change. Not only are there inherent uncertainties, but in a cap-and-trade regime these uncertainties will be reflected in volatility of carbon prices. This greatly complicates, and likely delays, investment decisionmaking, and it is only through long-lived investments, involving huge amounts of capital, that we will eventually be able to address the problem of climate change.

For all these reasons, we believe a fee is superior to cap-and-trade. We don't support or advocate for the passage of either the Bingaman-Specter bill or the Lieberman-McCain bill. We do believe that climate change is a real long-term threat to our economic welfare and we do believe it warrants action in the near term. But we share Senator Inhofe's concern that poorly implemented legislation risks inflicting economic damage without helping the longer term environmental issue. Like Senator Inhofe, we believe that significant scientific uncertainty remains and that some of the more extreme scenarios painted by climate change alarmists simply aren't supported by the evidence. A prudent middle ground is warranted, in our view.

A carbon fee that starts at a moderate level and escalates progressively and predictably, as I discussed in my testimony, can address the real concern with climate change without inflicting economic damage. It is worth noting that a modern, free enterprise economy like our own can adapt very well to moderate, predictable changes in relative prices without significant loss of net output. It cannot adapt nearly so well to short, sharp shocks (for example, the oil shocks of the 1970s). A fee system provides predictable, moderately changing prices, allowing the economy gradually to adapt to a new, lower carbon intensity state. A cap approach runs the risk of inadvertently inducing unanticipated and unnecessary economic shocks.

Senator BOXER. Thank you very much, sir.

Our next speaker is David Hawkins, director, Climate Center, Natural Resources Defense Council. Welcome.

STATEMENT OF DAVID G. HAWKINS, DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Mr. HAWKINS. Thank you very much, thank you for inviting NRDC to testify today. It is gratifying that the committee is meeting to discuss how to develop protective climate legislation, not whether.

I would like to just touch on four questions. First, what emissions targets do we need? In my view, and in the view of the scientific community, to have a 50–50 chance of preventing really calamitous changes in the climate, we need to cut global emissions by the year 2050 by about 50 percent. Now, since developing countries' emissions are going to grow somewhat before they start to turn down, that implies that industrialized countries, including the United States, really need to be planning for cuts in emissions from today's levels by about 80 percent by the year 2050.

To reach such levels by 2050, we have to have interim reductions that get us well along the way. We think that reductions of about 40 percent by 2030 are going to be needed in order to make the 80 percent by 2050 achievable. Now, for the electric power sector, this suggests cuts on the order of those in Senator Sanders' bill, S. 1201, which is about 35 percent below today's levels in the year 2025.

The second question is, are reductions of that magnitude achievable? Yes, they are. In the power sector, in particular, we have largely untapped potential in efficiency and renewables, and in the ability to deploy CO_2 capture and geologic disposal.

A recent study of the potential of just efficiency and renewables alone based on DOE laboratory reports and other sources indicates that power sector CO_2 reductions of about 37 to 50 percent from today's levels by the year 2030 are achievable.

The next question is one that has been touched on by the previous witnesses; how to distribute emission allowances. NRDC believes that the optimal approach here is to recognize that permission to emit pollutants is a public resource. Allowances should be held in trust for the public and distributed in ways that will produce public benefits. This can be done through an auction, as Mr. Hay just described, with the revenue disbursed according to statutory formula and criteria, or it can be done by distributing allowances directly for certain uses, according to the same formula and criteria.

In either approach, the legislation should provide for a public trustee to administer the statutory program. The resources should not go to the Treasury.

The overarching goals of any allowance allocation program, in addition, obviously, to reaching the emission reductions, should be, one, to keep the cost of the program as low as possible for residential and other customers by encouraging investment in end-use efficiency and by avoiding wealth transfers from consumers to upstream entities; to encourage deployment of technologies needed to significantly reduce emissions in key sectors, such as mainstreaming carbon capture and disposal in the electric sector, retooling the auto industry to produce hybrids and other low-emitting vehicles, and accelerating the deployment of sustainable, low-carbon motor fuels and renewable energy.

How to prevent high costs, the last topic. The best measure to control costs, in our view, is broad availability for trading to achieve compliance under the cap. Now, some are advocating that the emission reduction program should be called off or suspended if the compliance price exceeds a congressionally set price ceiling. This so-called safety valve concept would allow emissions to increase above permitted levels and thus would undermine the purpose of the law, which is to set us on a course to achieve predictable reductions in emissions over the next several decades.

A price ceiling would also undermine innovation by creating a risk that investments in low-emitting technologies might be worth a lot less if they came in with initial costs even slightly above the price ceiling. For these reasons, we strongly oppose the price ceiling approach. We believe that banking of emission reductions allows firms to hedge against possible high-cost periods and combined with trading for compliance, should provide adequate protection against price spikes.

If Congress does consider additional cost control provisions, they should be designed to not undercut the required emission reductions and the market mechanisms that drive those reductions. One approach that should be considered is authorization to borrow allowances from future years and repay them with interest. Together, banking and borrowing can stabilize long-term costs and eliminate the risk of price spikes while preserving the environmental integrity of the long-term caps on emissions.

That concludes my testimony. Thank you.

[The prepared statement of Mr. Hawkins follows:]

STATEMENT OF DAVID G. HAWKINS, DIRECTOR, CLIMATE CENTER, NATURAL RESOURCES DEFENSE COUNCIL

Mr. Chairman and members of the Committee, thank you for providing the Natural Resources Defense Council (NRDC) the opportunity to present its views on Global Warming Issues in the Power Plant Sector. NRDC is a national, non-profit organization of scientists, lawyers, and environmental specialists, dedicated to protecting public health and the environment. Founded in 1970, NRDC serves more than 1.2 million members and supporters from offices in New York, Washington, Los Angeles, San Francisco, Chicago and Beijing.

NRDC strongly supports enactment of legislation to achieve major reductions in global warming emissions from the key emitting sectors in the U.S. economy. NRDC is a member of the U.S. Climate Action Partnership, which has urged Congress to enact such legislation. Electricity production is a critical feature of our economy and addressing global warming emissions from this sector and others is essential if we are to avoid the worst damages from a radically disrupted climate system.

Electricity has brought us an unequalled quality of life and a thriving economy but it continues to be produced in ways that also bring us large and unnecessary harm to human health and to the environment. The electric generating sector remains the largest single polluting activity in the United States. Electric generators are responsible for two-thirds of America's sulfur dioxide pollution, nearly one-third of its nitrogen oxides, forty percent of carbon dioxide and more than one-third of remaining mercury emissions.

Together these "four horsemen" of power plant pollution cause tens of thousands of premature deaths each year and hundreds of thousands of respiratory illness cases. They also kill lakes and threaten forests, contaminate fish, and fill the skies over national parks with haze. Carbon dioxide from the electric generating industry traps heat in the atmosphere, leading to disruption of the climate that we all depend on to maintain life as we know it on this planet.

If these words strike any of you as familiar, it is because they are the opening paragraphs from my testimony to this Committee on the same subject in 2001. I decided to repeat them here as a reminder that all of us have failed in the past to address this issue with the urgency that is warranted. NRDC is gratified that, in recent months, the sense of urgency has increased in America and we applaud this Committee for its efforts to move forward with greater dispatch.

Legislation that is effective in achieving emissions from all major emitting activities in the U.S. is essential but this hearing focusing on the electric sector is helpful in illuminating a number of issues that are relevant both to the electric sector and to other industries that would be included in multi-sector legislation.

THE IMPORTANCE OF THE POWER SECTOR

Several factors make it critical to address the electric power sector in any global warming bill. First, there is the sheer size of power's contribution to global warming emissions: in the U.S. electric power emits about 40 per cent of our total carbon dioxide (CO_2) emissions and the global share is similar. Once emitted, this CO_2 pollution load remains in the atmosphere for centuries. Half of the CO_2 emitted during World War I remains in the atmosphere today. A second feature of the power sector is the very long life of power generation plants. Some power plants built at the start of World War II are still operating and plants built in the last couple of decades will likely operate for 60 to 80 years. A third feature is that we do not today possess low-cost commercially demonstrated systems for removing CO_2 from our existing fossil power station designs. That may change and might even change rapidly but we cannot ignore the risk that new power plants built today might operate for decades without meaningful reductions in their CO_2 emissions if they are not designed with the need for carbon management in mind.

These facts put a premium on prompt adoption of legislation that will cause electric sector investments to be made in a manner that favors low CO_2 options. Our dependence on coal to generate power, both in the U.S. and globally, makes this challenge even greater. The very attribute of coal that has made it so attractive—its abundance—magnifies the problem we face and requires us to act now, not a decade from now. Until now, coal's abundance has been an economic boon. But today, coal's abundance, absent corrective action, is more bane than boon.

Since the dawn of the industrial age, human use of coal has released about 150 billion metric tons of carbon into the atmosphere—about half the total carbon emissions due to fossil fuel use in human history. But that contribution is the tip of the carbon iceberg. Another 4 trillion metric tons of carbon are contained in the remain-

ing global coal resources. That is a carbon pool nearly seven times greater than the amount in our pre-industrial atmosphere. Using that coal without capturing and disposing of its carbon means a climate catastrophe.

And the die is being cast for that catastrophe today, not decades from now. Decisions being made today in corporate board rooms, government ministries, and congressional hearing rooms are determining how the next coal-fired power plants will be designed and operated. Power plant investments are enormous in scale, more than $1 billion per plant, and plants built today will operate for most of this century. The International Energy Agency (IEA) forecasts that more than $5 trillion will be spent globally on new power plants in the next 25 years. Under IEA's forecasts, over 1800 gigawatts (GW) of new coal plants will be built between now and 2030—capacity equivalent to 3,000 large coal plants, or an average of ten new coal plants every month for the next quarter century. This new capacity amounts to 1.5 times the total of all the coal plants operating in the world today.

The astounding fact is that under IEA's forecast, 7 out of every 10 coal plants that will be operating in 2030 don't exist today. That fact presents a huge opportunity—many of these coal plants will not need to be built if we invest more in efficiency; additional numbers of these coal plants can be replaced with clean, renewable alternative power sources; and for the remainder, we can build them to capture their CO_2, instead of building them the way our grandfathers built them.

If we decide to do it, the world could build and operate new coal plants so that their CO_2 is returned to the ground rather than polluting the atmosphere. But we are losing that opportunity with every month of delay—10 coal plants were built the old-fashioned way last month somewhere in the world and 10 more old-style plants will be built this month, and the next and the next. Worse still, with current policies in place, none of the 3,000 new plants projected by IEA are likely to capture their CO_2.

Each new coal plant that is built carries with it a huge stream of CO_2 emissions that will likely flow for the life of the plant—60 years or more. Suggestions that such plants might be equipped with CO_2 capture devices later in life might come true but there is little reason to count on it. While commercial technologies exist for pre-combustion capture from gasification-based power plants, most new plants are not using gasification designs and the few that are, are not incorporating capture systems. Installing capture equipment at these new plants after the fact is implausible for traditional coal plant designs and expensive for gasification processes.

If all 3,000 of the next wave of coal plants are built with no CO_2 controls, their lifetime emissions will impose an enormous pollution lien on our children and grandchildren. Over a projected 60-year life these plants would likely emit 750 billion tons of CO_2, a total, from just 25 years of investment decisions, that is 30 percent greater than the total CO_2 emissions from all previous human use of coal.

WHAT EMISSION TARGETS DO WE NEED?

A central question that faces drafters of all environmental legislation is what should the targets be? Because of the long life of greenhouse gases, especially CO_2, in the atmosphere, the long life of energy producing investments and buildings that use energy and the rapid growth in the global economy, we need to design legislation that will set a path that brings emissions down starting soon and persisting over decades in a predictable fashion.

As detailed more fully in Appendix 1 of my statement, to have better than even odds of avoiding truly catastrophic disruption of earth's climate, the United States and other industrial nations need to adopt a declining emissions cap that starts reducing emissions soon and reaches 80 percent below current emission levels by 2050, and developing countries need to promptly reduce their emissions growth and follow suit with similar reductions later in the century.

As discussed in Appendix 1, if national emission reductions start soon, we can stay on a prudent climate protection path with an annual emission reduction rate that gradually ramps up to 3.2 percent per year. But if we delay a serious start by, for example, 20 years and allow continued emission growth at nearly the business-as-usual rate, the annual emission reduction rate required to stay on this path jumps to 8.2 percent per year (see Figure 1 in Appendix 1). In short, a slow start forces a crash finish.

Some analysts argue that delay is cheaper because we will develop breakthrough technologies in the interim. But that outcome is implausible for three reasons.

• First, delay dramatically increases the emission reduction rate required later. Cutting emissions by more than 8 percent per year would require deploying ad-

vanced low-emission technologies several times faster than conventional technologies have been deployed over recent decades.[1]

• Second, without meaningful near-term market signals, there will be little incentive for the private sector to direct significant R&D resources toward developing the breakthrough technologies. Hope will rest entirely on the Federal R&D program, which now is far too small to yield the required results.

• Third, without different market signals, a new generation of conventional power plants, vehicles, and other infrastructure will be built during the next two decades. Our children and grandchildren will then have to bear the costs of prematurely retiring an even bigger stock of highly emitting capital than exists today. Even with a substantial discount rate, it is virtually impossible that delaying emission reductions will be cheaper than starting now.

Given the power sector's large contribution to annual and cumulative CO_2 emissions, it will be necessary to achieve large reductions in total power sector emissions if we are to achieve reductions in total emissions on the order of 80 percent by 2050. That said, it is worth noting that the question of where reductions must be achieved is not necessarily identical to the question of how emission reduction costs are best distributed in our society. However, legislation that proposes targets for particular sectors, such as Senator Sanders' bill, S. 1201, which contains targets for the power sector, should specify targets that are sufficiently ambitious to be consistent with where total U.S. emissions need to go. S. 1201 would cap power sector emissions at current (2006) levels in 2011, with emissions declining to approximately 10 percent below current levels by 2015, approximately 25 percent below current levels by 2020, and approximately 35 percent below current levels by 2025.

Are reductions like these achievable? Yes, they are. A robust portfolio of energy efficiency, major expansion of renewable generating resources and deployment of CO_2 capture and geologic disposal (CCD) at fossil generating plants can achieve these targets in our view. Some would add increased reliance on nuclear energy to this mix, although the recent Keystone Center report on this subject suggests that high cost of new nuclear power plants, their lengthy construction period, the current dependence on large Federal subsidies and incentives to stimulate private investment in the sector, unresolved waste management and disposal issues, and a massive requirement to replace the current installed base of nuclear plants before 2050, will all make it difficult for nuclear to make a significantly greater contribution to carbon reductions than is already being contributed by today's fleet of nuclear power plants.[2]

We also believe these reductions are affordable. For example, NRDC and colleagues at Princeton estimate that all of the new coal plant capacity forecast to come on line in the U.S. between 2012 and 2020 could be equipped with CO_2 capture and disposal systems at a cost equal to a 2 percent increase in average retail electricity rates in 2020.

For a strategic sector like power generation, NRDC believes that it is important to combine the driver of broad cap and trade permit program that delivers economic and planning signals to all players with well-designed performance requirements to accelerate the use of low carbon generating technologies. Both S. 1201 and S. 309, an economy-wide measure sponsored by Senator Sanders and 17 other Senators, contain provisions for a minimum emission performance standard, "birthday" provisions to assure that aging plants cleanup or be replaced, and a low-carbon generation requirement. These provisions all would stimulate deployment of CO_2 capture and disposal systems faster than would occur in a cap and trade program alone. NRDC believes that U.S. leadership in this area is an important business opportunity and is essential to shape investment decisions in fast-growing developing countries that plan to use substantial amounts of coal.

DISTRIBUTING ALLOWANCES

Another issue of great interest to the power sector and of even greater public policy importance concerns how pollution allowances are allocated or distributed under

[1] Hawkins, D. "Policies to Promote Carbon-less Energy Systems" Proceedings of the 7th International Conference on Greenhouse Gas Control. Technologies (GHGT7). September 5–9, 2004, Vancouver, Canada.

[2] Notwithstanding their low-carbon advantages, the complete cradle-to-grave fuel cycles for nuclear and coal-or natural gas-fired plants with carbon capture have other serious non-carbon environmental drawbacks that make them inherently less sustainable than increased efficiency and wind, solar, geothermal, combined heat and power, and industrial waste-heat cogeneration options. So our energy strategy should prioritize large-scale deployment of these carbon-displacing options, with fossil energy with CCD and nuclear competing under a cap to supply the remainder of our future electricity requirements.

a cap and trade program. NRDC believes pollution allowances are a public trust. They represent permission to use the limited capacity of the atmosphere, which belongs to all of us, to dispose of global warming pollution. This limited carrying capacity is not a private resource owned by historical emitters.

Emissions allowances will be worth tens of billions of dollars per year, and their value will increase over the first decades of the program as the pollution cap declines. Providing more than a small fraction of the allowances for free to pollution sources would give their shareholders an enormous and undeserved financial windfall.

For these reasons, NRDC opposes grandfathering of emissions allowances to firms based on historical emissions, heat input, fuel sales, or other factors. Grandfathering the allowances would generate huge windfalls and transfers of wealth. Economists at the Congressional Budget Office, Resources for the Future (RFF) and other institutions have determined that grandfathering all emissions allowances would give the recipient companies an asset worth seven times the costs that they could not pass on to energy consumers.

Stanford University and RFF economist Larry Goulder has shown that in an economy-wide upstream cap and trade program, it would require only 13 percent of the allowances to cover the costs that fossil-fuel providers would not be able to pass on to consumers.[3] Dallas Burtraw and RFF colleagues have shown similar results for a cap and trade program on electricity generators.[4] The Congressional Budget Office has reached the same conclusion.[5] In the United Kingdom, the Government has determined that free allocation of allowances to electric generators has resulted in windfall profits of over $500 billion.[6]

To avoid these windfalls, allowances should be held in trust for the public and distributed in ways that will produce public benefits. This can be done through an auction, with the revenue dispersed according to legislated formulae and criteria, or by distributing the allowances themselves according to the same formulae and criteria. In either approach, the legislation should provide for a public trustee to administer the allowances.

The overarching goals should be (1) to keep the cost of the program as low as possible for residential, commercial and industrial consumers (especially low-income consumers), by encouraging investment in end-use energy efficiency measures and by avoiding wealth transfers from consumers to upstream entities, and (2) to encourage deployment of the technologies needed to significantly reduce emissions in key sectors (e.g., mainstreaming carbon capture and disposal in the electric sector; retooling the auto industry to produce hybrids and other low-emitting vehicles; accelerating deployment of sustainable low-carbon motor fuels and renewable electricity).

NRDC believes the allowance resources should be used for four broad objectives (elaborated in Appendix 2):

(1) To reduce overall costs for individual and business consumers (especially low-income consumers) through energy efficiency investments (50 percent).

(2) To accelerate deployment of the "big change" technologies that we will need to cut emissions in key sectors (25 percent).

(3) To provide transition assistance to impacted workers and heavily affected firms, and adaptation assistance to communities, farmers, wildlife managers (20 percent).

(4) To encourage carbon reductions outside the cap, and early reductions, while preserving the cap (5 percent).

To the extent that any emission allowances are allocated to the electricity industry, rather than auctioned, NRDC recommends that distribution companies receive these allowances rather than generators. The problem with allocating allowances to generators is rooted in equity concerns: about 40 percent of U.S. generation sells its output at market prices into various largely unregulated wholesale markets, while the rest remains subject to diverse forms of cost-of-service price regulation.[7] Impacts of allocations on consumers and shareholders will vary widely and State regulators will not be able to respond to real or perceived inequities. Generators can be ex-

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[3] Morgenstern et al., "The Distributional Impacts of Carbon Mitigation Policies," Issue Brief 02–03 (Resources for the Future, Feb. 2002), http://www.rff.org/Documents/RFF–IB–02–03.pdf.

[4] Morgenstern et al., supra.

[5] See e.g., Terry Dinan, "Shifting the Cost Burden of a Carbon Cap-and-Trade Program," (Congressional Budget Office, July 2003); CBO, "Issues in the Design of a Cap-and-Trade Program for Carbon Emissions," (Nov. 25, 2003).

[6] House of Commons, Environmental Audit Committee, "The International Problem of Climate Change: UK Leadership in the G8 and EU," p. 17 (Mar. 16, 2005).

[7] This is the estimate of the Electric Power Supply Association, which represents competitive power suppliers.

pected to pass through the increased price of carbon regulation in their wholesale prices, and also to keep the proceeds from the sale of allowances allocated to them initially. Consumers obviously will see the price signal, but not the benefits from the allowance allocation. The problem has already surfaced in European markets, leading United Kingdom authorities to conclude that initial allocation to electric generators serving competitive markets resulted in large windfall profits.[8]

Electricity distribution companies, by contrast, provide service under continuous price regulation from either State commissions (for investor-owned utilities, accounting for about three-fourths of retail sales) or local boards (for publicly owned utilities and cooperatives, which serve the rest of the nation). The regulators can ensure that the value of these allowances is used for designated public purposes, including energy efficiency programs and rate adjustments.

Congress would have a wide range of options in making allocations, ranging from the carbon content of electricity delivered by distribution companies to the volumes of electricity delivered (with numerous intermediate compromise possibilities). Utilities that distribute mostly coal-fired electricity are likely to advocate an emissions-based formula on the grounds that they will see the largest increase in electricity costs as a result of the CO_2 emissions cap. Utilities that distribute mostly low-emission resources are likely to advocate a formula based on electricity sales on the grounds that their customers are already paying higher prices for a cleaner generation portfolio.

Whether or not the allocations should be updated over time is an independent question. A phaseout of any free allocations to the private sector diminishes the case for updating in general (the more rapid the phaseout the less need to update the free allocation). Any allocation based on carbon content should definitely not be updated because that would create a perverse incentive to increase emissions in order to obtain a larger allocation, raising the overall cost of achieving the emission cap (or increasing actual emissions if a safety valve is in effect). There is a better argument for updating a sales-based formula as a matter of equity between high-growth and low-growth areas. Such an approach would need to include an adjustment for independently verified energy efficiency to ensure that updating does not create a disincentive for additional energy efficiency improvements.

The simplest approach would be to allocate based on electricity sales during the same historical period used for allocating to other sectors. If Congress decides to allocate (in part or in whole) based on historical emissions, however, calculating the carbon content of those electricity sales is certainly feasible and should not be seen as an obstacle to allocating to distribution companies. As long as the allocation is to distribution companies (to avoid windfall profits) and is not updated in a way that creates perverse incentives (to avoid raising costs or emissions) then the specific allocation formula is a matter of regional equity and an appropriate subject for negotiations during the legislative process.

ADDRESSING CONCERNS ABOUT UNEXPECTED COSTS

Defects of the safety valve. While the cap-and-trade model has worked well for acid rain control, some observers are pushing for a "safety valve" as a safeguard against permit costs exceeding a predetermined level.

The fundamental problem with the safety valve is that it breaks the cap without ever making up for the excess emissions. Simply put, the cap doesn't decline as needed or, worse, keeps growing. A better approach to cost-control is possible.

"Safety valve" is actually a misleading name. In boiler design, the role of a safety valve is to allow pressures to build within the vessel to working levels, well above atmospheric pressure. A safety valve's function is to open in the rare occasion when the boiler is pressured beyond its safe operating range, to keep it from exploding. In the life of a well-run boiler, the safety valve may never open.

Imagine, however, a boiler designed with a valve set to open just slightly above normal atmospheric pressure. The valve would always be open, and the boiler would never accomplish any useful work.

That is the problem with the safety valve design in two other proposals advanced by Senator Bingaman and by Representatives Udall and Petri. The valve is set at such a low level that it could be open more than it is closed.

A safety valve also would prevent U.S. participation in international trading systems. The market price of CO_2 in the European Union's emissions trading scheme, for example, has already exceeded the U.S. safety valve price proposed in the Bingaman and Udall-Petri proposals. If trading were allowed between the EU and the

[8] House of Commons, Environmental Audit Committee, "The International Problem of Climate Change: U.K. Leadership in the G8 and EU," p. 17 (Mar. 16, 2005).

U.S., a major distortion would occur. European firms (acting directly or through brokers) would seek to purchase U.S. lower-priced allowances. Their demand would almost immediately drive the U.S. allowance price to the safety valve level, triggering the "printing" of more American allowances. European demand for newly minted U.S. safety valve allowances would continue until the EU price dropped to the same level. The net result would be to flood the world market with far more allowances—and far less emission reduction—than anticipated even under the National Commission on Energy Policy recommendations.

Much like other forms of trade barriers, a safety valve distorts the free flow of allowances in an international trading system. A safety valve distorts trade in the same way as when a country fixes the price of its currency and avoids letting its currency find its appropriate exchange rate based on market forces.

A new approach: borrowing. NRDC has proposed a new approach to controlling unexpected costs. In our estimation, the greatest fear of many in industry is that short-run costs will fluctuate unexpectedly, much as natural gas prices have spiked in recent years. Setting a long-term declining emissions cap opens the door to an innovative way to avoid short-term cost volatility: Firms could be allowed to borrow emissions allowances from future years, using them early in times of unexpected cost pressure, and paying them back when short-term spikes recede.

Current legislative proposals already allow firms to make reductions in advance when prices are lower than expected and bank allowances for future use. Borrowing would open the opposite possibility.

Absent borrowing, firms can comply only with current or banked allowances. Allowance prices thus reflect the current marginal cost of compliance, and that price can spike in response to short-term conditions (e.g., a delay in bringing on a new technology, or a surge in economic activity). Borrowing would let firms use emissions allowances from future years, stabilizing prices against unexpected short-term fluctuations. The long-term cap will be maintained, because borrowed allowances will be repaid, with interest, by releasing fewer emissions later when the short-run pressures are relieved. Together, banking and borrowing can stabilize long-term costs and eliminate the risk of price spikes while preserving the environmental integrity of the long-term caps.

The combination of a long-term emissions pathway and borrowing has a clear advantage over the safety valve because it does not break the cap and permanently allow excess emissions. (Proposals allowing unlimited "offsets"—credits for emission reductions not covered by the cap—also have the potential to break the cap if credits are awarded for actions taking place anyway, a problem endemic to past offset programs.)

Legislation to permit borrowing will need to include certain safeguards. First, there needs to be an interest payment pegged to be slightly higher than commercial lending rates in order to discourage businesses from treating allowance-borrowing as a no-interest alternative to regular financing. Second, there need to be appropriate mechanisms to secure repayment and guard against defaults. One option is to limit borrowing to 5 years in advance, with the option to borrow again if repayments are completed. A second option is to require that borrowers be bonded or otherwise secured against defaults.

In summary, it is urgent that we develop and adopt legislation in this Congress that will put the United States on a predictable and manageable path toward greatly reduced global warming emissions. Such a path is completely compatible with a growing economy. Indeed, failure to address global warming now will expose our economy to threats of an unprecedented magnitude as our country and the rest of the world attempt to deal with an unraveling of the hospitable climate that has allowed civilizations to flourish over the past 20 millennia. We know how to design legislation that works for the electric power sector and for the economy as a whole. It is time to begin.

Mr. Chairman and members of the Committee, this concludes my testimony. I am happy to answer any questions you may have.

Appendix 1

Emission Reductions Needed to Prevent Dangerous Climate Disruption

The recent Intergovernmental Panel on Climate Change (IPCC) report states a new degree of the scientific certainty that global warming is happening now and is human-caused. The IPCC assessment highlights how an increase in global temperatures is already affecting climate worldwide and will have far reaching effects on sea levels, ice cover at the poles, heat waves, floods, and droughts. Here are some of the IPCC's key findings:

- The earth will warm by an additional 4-11 degrees Fahrenheit during the 21st Century if energy production is fossil fuel intensive (best estimate 7 degrees).
- The earth will warm by an addition 3-8 degrees Fahrenheit during the 21st Century if emissions follow a mid-range business-as-usual forecast (best estimate 5 degrees).
- The Arctic Ocean could largely be devoid of sea ice during summer later in the century.
- The ocean will continue to become more acidic due to carbon dioxide emissions. Ocean pH has already decreased by 0.1 units and will decline by an additional 0.14 to 0.35 units if emissions are not curtailed.
- The IPCC projects that sea levels will rise by 7 to 23 inches during the 21st Century, but this estimate assumes no acceleration of ice flow in Greenland or Antarctica and does not fully account for some positive feedback processes, such as the release of additional CO_2 from tundra soils as the planet warms. A new study published in *Science* on January 19th projects that sea levels will rise by 20 to 55 inches this century based on recent observations.[1] This study was published after the deadline for consideration by the IPCC.
- The Stern Review of the economics of climate change, conducted for the UK government, "estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more."[2]

At this point, some warming and some impacts are unavoidable, but there is a world of difference between 1 degree and 7 degrees.

Congress needs to enact comprehensive emission limits that will steadily reduce global warming pollution. We still have an opportunity to fix this problem, but only if we act before it's too late.

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[1] Rahmstorf, S. 2007. "A Semi-Empirical Approach to Projecting Future Sea-Level Rise." *Science* 315:368-370.

[2] N. Stern, *et al.*, *The Economics of Climate Change*, p. xv (Cambridge University Press, New York, 2007).

- **There is a growing consensus that allowing more than a 2 degree Fahrenheit increase above today's global average temperature would have clearly dangerous consequences.**[3]

- **To retain even a 50-50 chance that average temperatures more than another 2 degrees Fahrenheit in this century, heat-trapping gas and aerosol concentrations need to be stabilized below 450 ppm CO_2-equivalent.**[4]

- **We can stay below 450 ppm CO_2-equivalent if the United States and other industrial nations adopt a declining emissions cap that starts reducing emissions soon and reaches 80 percent below current emission levels by 2050, and if developing countries promptly reduce their emissions growth and follow suit with similar reductions later in the century.**

Because heat-trapping emissions are cumulative, delaying the decision to reduce emissions will only worsen the problem and make the task of solving it much harder. This is illustrated in the two hypothetical emission reduction scenarios for the U.S. presented below. Either scenario, in concert with comparable action by other nations, is aimed at avoiding atmospheric concentrations higher than 450 ppm CO_2-equivalent. But the two scenarios have vastly different economic implications.

If national emission reductions start soon, we can stay on the 450 ppm path with an annual emission reduction rate that gradually ramps up to 3.2% per year. But if we delay a serious start by, for example, 20 years and allow continued emission growth at nearly the business-as-usual rate, the annual emission reduction rate required to stay on this path jumps to 8.2% per year (see Figure 1). In short, a slow start forces a crash finish.

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[3] Three sources are particular instructive on the dangers inherent in exceeding a 2 degree Celsius (3.6 degree Fahrenheit) increase over pre-industrial levels, which is equivalent to a 2 degree Fahrenheit increase over today's levels:

- Schellnhuber, H., W. Cramer, N. Nakicenovic, T. Wigley, and G. Yohe, eds. *Avoiding Dangerous Climate Change* (Cambridge University Press, New York, 2006).

- J. Hansen *et al.*, Proceedings of the National Academy of Sciences, **103**:14288 (2006).

- R. Warren, *"Solving" Climate Change: Mitigation Targets and the Earth's Climate System,"* presentation to the Center for Clean Air Policy's Climate Policy Initiative Dialogue Meeting, Feb. 13, 2007. Dr. Warren is at the Tyndall Centre for Climate Change Research, University of East Anglia. A copy of Dr. Warren's presentation is attached.

[4] M. Meinshausen "What Does a 2 C Target Mean for Greenhouse Gas Concentrations? A Brief Analysis Based on Multi-Gas Emission Pathways and Several Climate Sensitivity Uncertainty Estimates." in H. Schellnhuber, et al., eds. *Avoiding Dangerous Climate Change* (Cambridge University Press, New York, 2006).

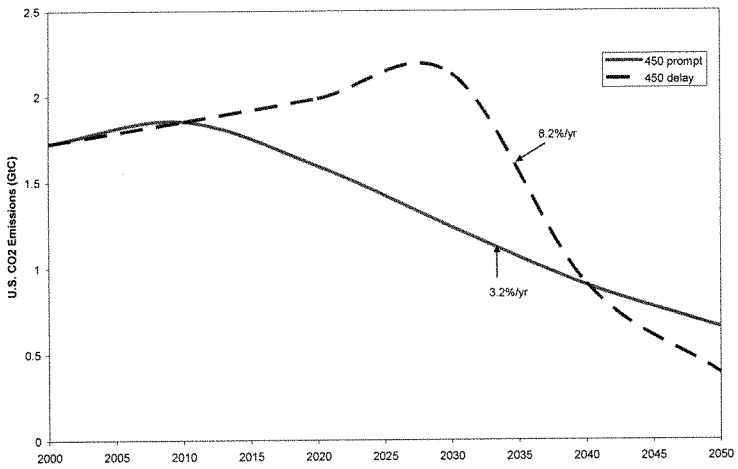

Figure 1: Prompt start and delay pathways consistent with stabilizing heat-trapping gases at 450 ppm CO_2-equivalent. Global emissions 2000-2100 are 480 GtC from Meinshausen's S450Ce scenario (*see* fn. 2, above). The U.S. share of global emissions is assumed to decline from 25% to 5% linearly between 2000 and 2100. This results in an emissions budget for the U.S. of 84 GtC in the 21st Century. In the prompt start case emissions decline by 1.5%/yr from 2010 to 2020, 2.5%/yr from 2020 to 2030 and 3.2%/yr thereafter. The delay case assumes that emissions grow by 0.7%/yr from 2010 to 2030, a reduction of 0.5%/yr compared to the Energy Information Administration forecast;[5] emissions must decline by 8.2%/yr thereafter to limit cumulative 21st Century emissions to 84 GtC. Cumulative emissions 2000-2050 are 68 GtC in the prompt start scenario and 79 GtC in the slow start scenario.

Some analysts argue that delay is cheaper because we will develop breakthrough technologies in the interim. But that outcome is implausible for three reasons.

- First, delay dramatically increases the emission reduction rate required later. Cutting emissions by more than 8 percent per year would require deploying advanced low-emission technologies several times faster than conventional technologies have been deployed over recent decades.[6]

- Second, without meaningful near-term market signals, there will be little incentive for the private sector to direct significant R&D resources toward developing the breakthrough technologies. Hope will rest entirely on the federal R&D program, which now is far too small to yield the required results.

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[5] Reference case from U.S. Department of Energy, Annual Energy Outlook 2006 with Projections to 2030, Report # DOE/EIA-0383(2006).

[6] Hawkins, D. "Policies to Promote Carbon-less Energy Systems" *Proceedings of the 7th International Conference on Greenhouse Gas Control. Technologies (GHGT7).* September 5-9, 2004, Vancouver, Canada.

- Third, without different market signals, a new generation of conventional power plants, vehicles, and other infrastructure will be built during the next two decades. Our children and grandchildren will then have to bear the costs of prematurely retiring an even bigger stock of highly-emitting capital than exists today. Even with a substantial discount rate, it is virtually impossible that delaying emission reductions will be cheaper than starting now.

The Stern Review concludes: "The costs of stabilising the climate are significant but manageable; delay would be dangerous and much more costly." Where the impacts of unabated climate change could cost 5%, or even 20% of world GDP, the Stern review concludes that achieving a declining cap ultimately reaching an 80% reduction below current emission levels "is a major challenge, but sustained long-term action can achieve it at costs that are low in comparison to the risks of inaction."[7]

Stern estimates the cost of achieving stabilisation between 500 and 550 ppm CO_2 equivalent at "around 1% of global GDP, if we start to take strong action now."[8] Achieving the more demanding target of 450 ppm is still within our reach. Its costs would still compare favorably to the prospect of climate change impacts costing us 5-20% of world GDP.

Thus the "slow start" scenario has shortcomings from both the environmental and business perspectives. From the climate protection standpoint, it risks locking us into dangerous CO_2 concentrations. From the business standpoint, it provides neither economic nor political certainty, and it leads to higher costs later.

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[7] Stern Report, *supra* note 2, at p. xvi.

[8] *Id.*

Appendix 2

Using Allowance Resources for Public Benefits

NRDC advocates legislation that would provide four broad public benefit uses for allowances.

(1) 50% of allowances to support cost-saving energy efficiency investments

NRDC proposes that *at least half* of total allowances should be allocated for the benefit of energy consumers, primarily to facilitate investments in using energy more efficiently.

These investments will help reduce overall energy demand without any sacrifice in the quality of energy services. They will tangibly reduce consumers' energy bills and they will substantially reduce the overall cost of a cap-and-trade program.

Despite these clear balance-sheet advantages, individual consumers under-invest in end-use efficiency, resulting in higher energy costs and higher emissions. Energy efficiency programs have a proven track record of overcoming the market barriers that cause this under-investment. Allowances should be used to fund such programs on a much larger scale nationwide than ever before.

Energy efficiency programs supported by allowance allocations should be aimed at both businesses and individual users of energy, with an emphasis on low-income individuals. These programs should promote efficiency in electricity and natural gas use, and in transportation.

Electricity and natural gas. An analysis conducted for the northeast states' Regional Greenhouse Gas Initiative (RGGI) indicates that increasing end-use efficiency is the most effective way to reduce the impact of a carbon cap on electricity rates.[1] Indeed, this analysis demonstrated that by using the proceeds of an allowance auction to promote efficiency, the states could reduce power sector carbon dioxide emissions by 10% from current levels and at the same time save average customers over $100 per year on their energy bills.[2]

A study by the American Council for an Energy Efficiency Economy demonstrated even more dramatic results in the natural gas sector – increasing energy efficiency by 5% could reduce natural gas prices by 20%.[3] Since natural gas-fired electricity generation is at the margin in many regions, increasing the efficiency of natural gas use in non-electric applications will reduce the impact of a carbon cap on both gas prices and electricity rates.

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[1] ICF Consulting "RGGI Electricity Sector Modeling Results, Updated Reference, RGGI Package and Sensitivities," September 21, 2005, available at http://www.rggi.org/docs/ipm_modeling_results_9_21_05.ppt; Economic Development Research Group, "Economic Impacts of RGGI Under Proposed SWG Package Scenarios," September 21, 2005 available at http://www.rggi.org/docs/remi_stakeholder_presentation_11_17_05-final.ppt#492,1,.

[2] Economic Development Research Group, "Economic Impacts of RGGI Under Proposed SWG Package Scenarios," September 21, 2005.

[3] Elliott, Neal R, Anna Monis Shipley, Steve Nadel and Elizabeth Brown, "Impacts of Energy Efficiency and Renewable Energy on Natural Gas Markets," American Council for an Energy Efficient Economy, September 12, 2003.

Transportation. The California Air Resources Board and the National Academy of Sciences have demonstrated the same effect in the motor vehicle sector: Standards to limit global warming emissions or raise fuel economy can provide consumers a net savings through lower fuel and maintenance costs that more than offset higher costs for new vehicles. Improving the efficiency of the vehicle fleet will also help moderate gasoline prices by reducing overall gasoline demand.

Yet there are significant market barriers here too that stand in the way of reaping the full potential benefit of more efficient transportation. To help overcome these barriers, NRDC proposes to use allowances to fund much larger consumer purchase incentives for low-emitting vehicles than government has ever before provided. (These consumer incentives would dovetail with manufacturer retooling incentives.) There are many ways such incentives could be delivered to consumers, and we welcome to discuss these options in greater detail.

(2) 25% of allowances for "big change" technology incentives

In order to prevent dangerous global warming it is essential to start making reductions in heat-trapping pollution now and to get on a path toward reducing emissions by 80 percent by mid-century. To accomplish this at reasonable cost, many analyses demonstrate the need for rapid deployment of clean and low-emitting energy technologies in key sectors – especially electricity and transportation, which together make up more than two-thirds of U.S. global warming emissions. Although not an exclusive list, the prime candidate "big change" technologies include:

- Drive-train and related technologies (including hybrid gas-electric engines) in the auto industry;
- Carbon capture and disposal (CCD) in the electric sector; and
- Renewable electricity and sustainable low-carbon fuels for transportation.

But we face a serious dilemma. We need to start rapid deployment of these "big change" technologies *now* in order to hold down the long-term costs of sharply cutting U.S. emissions, yet it is generally agreed that the initial price signals from feasible cap-and-trade programs will not be sufficient alone to jump-start that deployment. The allowance distribution formula can solve this problem, by incentivizing firms to invest in rapid deployment of these key technologies.

For example, CCD deployment requires about $2 billion/yr in investment on a levelized cost basis. A University of Michigan study for NCEP estimates that capital investments of $153 million are required for capacity to produce 200,000 hybrids per year (not including engineering costs).[4] This report shows the long-term cost savings, through job retention, of providing incentives to automotive manufacturers and suppliers to re-tool their existing plants to make in the United States hybrid and advanced diesel engines and components that would otherwise be produced offshore.

[4] "Fuel-Saving Technologies and Facility Conversion: Costs, Benefits and Incentives," Office for the Study of Automotive Transportation, University of Michigan, November 2004.

Funds on this scale for these and other technologies will not be found through tax incentives or appropriations. The allowance distribution formula can solve this problem, by incentivizing firms to invest in rapid deployment of these key technologies.

NRDC proposes to dedicate at least 25 percent of total allowances to incentivize technology deployment and R&D. Although not an exclusive list, the prime candidate "big change" technologies include:

- *Retooling the automobile.* A wide range of improved drive-train technologies, including hybrid gas-electric engines, clean diesels, batteries, fuel cells, and related technologies, are available to dramatically reduce global warming pollution from passenger vehicles and, by extension, many other segments of the transportation sector.

  Incentivizing domestic production of these technologies would assist domestic auto companies in becoming more competitive. An allowance allocation to automakers (and suppliers), coupled with steadily improving performance standards for lower global warming emissions or higher fuel economy would help incentivize and smooth the transition to building advanced, clean technologies. Similarly, allowances could be used to support consumer incentives to purchase clean vehicles at many time the scale of today's tax breaks for hybrids.

- *Carbon capture and disposal (CCD) in the electric sector.* All the components of a comprehensive CCD system rely on proven technologies. CCD is essential if coal is to maintain a vibrant market under a long-term declining cap. Large-scale implementation of CCD in this country would open the door to its application in China and India as well – a key to sustaining development in those nations without unacceptable carbon emissions.

  Despite these factors, investment in CCD is currently limited by two factors. First, many electric generators that see the attractiveness of this technology are waiting for others to undertake the first projects. Second, beyond initial applications associated with enhanced oil recovery, there is a cost differential (compared to conventional coal plants) that is unlikely to be covered by initial allowance prices.

  During this period, incentives in the form of allowance allocations can accelerate the deployment of CCD in meaningful numbers. As indicated above, these incentives should be coupled with an emissions performance standard – e.g., a low-carbon emissions standard for coal-based energy. All coal-based electric generation technologies should be allowed to compete as long as they meet a common CCD performance standard.

- *Renewable electricity and sustainable low-carbon fuels.* A third "big change" technology is renewable energy, both in motor fuels and electricity production. The deployment of cellulosic biofuels has great potential as a replacement for petroleum-derived fuels. Allowance allocations could help mainstream construction of plants to convert cellulosic materials into both transportation fuels and electricity, and could help farmers accelerate the supply of cellulosic feedstocks. In addition to reducing global warming pollution, an allowance allocation for this purpose would help achieve the president's objective of ending our oil addiction. It would also help the farm sector adjust to agricultural subsidy reforms.

Other renewable energy resources, such as wind and solar, should also be supported by allowances. Wind power is competitive in many markets but still suffers from the on-again-off-again nature of the production tax credit, which inhibits the large scale investment in wind that is needed for it to achieve its potential. A more stable funding incentive would markedly increase wind generation's penetration.

- *RD&D.* A portion of these technology-advancement allowances – perhaps five percent of total allowances – should be dedicated to RD&D into breakthrough technologies that are not yet ready for broad deployment assistance. This amount would be sufficient to reverse the dangerous decline in RD&D budgets that has occurred over the past decade and a half. A high priority should be given to joint ventures with the private sector putting up half of the research funds. This will help assure that the research is well targeted. In order to replenish the funding for further RD&D, the statute should provide that the publicly chartered entity will receive an equal share in the patent rights for successful technologies developed with these public funds.

It is important to note that most of the allowances distributed in this way would go without cost to the same industries that typically seek other forms of "free" allocation, but they would go in proportion to those industries' investments in cleaner vehicles and other low-emitting technologies. Distributing allowances this way is far preferable, for example, to allocating allowances on the basis of historical emissions or energy usage.[5] But there is no reason to limit support for clean energy investments to incumbents only. Rather, Congress should ensure the allowance value is available to *any* firm – incumbent or new entrant – that can efficiently and effectively carry out investments in energy efficiency and clean energy technology.

NRDC supports implementing these incentives by allocation formulas written into the statute, or partly by allocating allowances to a publicly chartered entity such as the Climate Change Credit Corporation proposed under the Climate Stewardship Act. Under a long-term declining cap, these technology incentives would have a much larger and more stable long-term source of funding than will come from the authorizations and tax incentives in the Energy Policy Act of 2005. Furthermore, these incentives could be accomplished without any budgetary impact.

(3) <u>20% of allowances for transition and adaptation assistance</u>

NRDC supports allocating 20 percent of allowances for a range of transition and adaptation assistance purposes.

A substantial fraction of allowances should be made available to assist workers and communities that are disproportionately impacted by mitigation measures (e.g., coal-miners and coal-mining communities). We support assistance for communities heavily affected by climate impacts, such as Gulf Coast wetland restoration and Alaskan village relocation. Adaptation resources should also be provided to help manage climate change impacts on fish and wildlife and the ecosystems on which they depend. NRDC does not pretend to be expert in the best mechanisms for

[5] If granted free allowances on a historical basis – or on any basis unlinked to making these investments – there is no guarantee that the firms will use allowance value for those purposes. They may distribute the allowance value to shareholders, or invest in other ventures deemed more profitable than retooling to reduce emissions.

delivering this assistance, but we are eager to work with labor and with leaders of affected communities.

Some have proposed that transition assistance is also needed for energy-intensive industries. We note that energy-intensive electricity and gas consumers would benefit from investments in energy efficiency under part (1) of our proposal. Energy intensive industries could also benefit from allocations made to support big-change technologies under part (2) of our proposal.

As discussed above, NRDC does not support grandfathering allowances to firms that supply or consume highly polluting fuels. Such an allocation would not protect workers in these firms, as it is sometimes claimed, because a grandfathered allocation would allow an energy-intensive firm to shut down its U.S. plants in order to shift production abroad and sell its unused allowances to other sources. Legitimate concerns about the competitiveness of firms that produce internationally-traded energy intensive products should be addressed by other means, such as border tax adjustments or allowance allocations tied to U.S. *employment*. If, however, Congress believes such firms merit some grandfathering of allowances for transitional reasons, this should be tightly limited as discussed above to avoid over-compensation and windfalls.

(4) 5% of allowances to encourage reductions outside the cap, and early reductions, while preserving the cap

NRDC supports setting aside 5 percent of total allowances to encourage emission reduction and sequestration activities by sources that are not covered by the cap, and for early reduction activities. Example activities outside the cap could include soil carbon sequestration by farmers and methane capture at small landfills not covered by EPA regulations.

NRDC strongly supports using a set aside of allowances from within the cap for this purpose rather than to create additional "offset" allowances based on these activities. Establishing appropriate emissions baselines for non-covered sources is an inherently uncertain exercise because it is impossible to observe the emissions that would occur from these sources in the absence of the program. Using allowances from within the cap is a good way to create incentives for beneficial activities without risking the environmental integrity of the emissions cap.

As for early reductions, NRDC does not support giving allowances for "reduction" reports under DOE's 1605(b) program. First, early emission reductions are their own reward because they position firms to comply with the cap at the lowest possible cost. Careful review of the emission "reductions" reported under the 1605(b) program shows that most of the reported activities, such as increased output at existing nuclear power plants, were simply business-as-usual actions, and thus deserve no rewards now.[6]

If some early reduction credit is nonetheless warranted, then like the treatment of offsets proposed above, the incentive for early action should come out of this fraction of the allowances.

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[6] See http://www.nrdc.org/globalwarming/finandatory.asp

Senator BOXER. Thank you very much, Mr. Hawkins.

Our next speaker is Jim Rogers, chairman, president and CEO of Duke Energy. Welcome, sir.

STATEMENT OF JAMES E. ROGERS, CHAIRMAN, PRESIDENT AND CEO, DUKE ENERGY CORPORATION

Mr. ROGERS. Thank you. Madam Chair Boxer, Ranking Member Inhofe and members of the committee, I want to thank you all for inviting me here to share my views on how we can work together to slow, stop and reverse the country's greenhouse gas emissions.

One of my first jobs after law school was as a consumer advocate in Kentucky. I challenged the increases proposed by utility companies in the 1970s. Today, I am here as an advocate for Duke Energy's 4 million electricity customers in five States in the Midwest and the Carolinas. These customers rely upon coal-fired generation for 70 percent of their electricity.

I am also here to advocate for the tens of millions of electric customers in the 25 States where more than 50 percent of the electricity is generated using coal. You can see the chart over there, in the green are the 25 States where more than 50 percent of the electricity comes from coal.

To address climate change, we must have a bridge. I want to underscore that, a bridge, to a low-carbon economy. To cross that bridge, I have advocated for many years that we need an economy-wide cap and trade program for CO_2. A cap and trade program with an appropriate allocation of allowances will protect consumers as we develop technologies to reduce carbon dioxide emissions.

In 1990, Congress provided a similar bridge when it passed the Clean Air Amendments, legislation that has dramatically reduced SO_2 emissions. This bridge has been a transition mechanism of allowance allocations. As CEO of a legacy Duke Company in Indiana in 1989, I advocated for SO_2 cap and trade legislation. I can tell you from first-hand experience, it is delivering extraordinary results. By 2010, Duke Energy and its predecessor companies will have invested $5 billion to retrofit our plants, to reduce SOX and NOX by more than 70 percent, and all of this is done at a lower cost than we were predicting in 1990.

During this period, we were given permission to emit SO_2 from our existing generation fleet. This allowed us to use these plants to produce electricity while advanced emissions technology was developed and installed. As demand grew over the years, we purchased allowances to serve our customers.

Also over time, as our allowances were reduced, we purchased additional allowances. While customers bore the cost of buying these allowances and paying for the SO_2 retrofits, the cap and trade program protected them, and importantly, protected them from major rate shock and unnecessary economic harm.

Some have suggested that CO_2 allowances should be auctioned, you have heard that here today. But an auction approach would unfairly and disproportionately harm regions that depend on coal, especially the 25 States in the Midwest, Southeast and Great Plains, forcing customers from these regions to bear the cost of buying allowances for existing plants, while at the same time bearing the cost of retrofitting and replacing existing plants would re-

sult in a double hit, paying twice for the bridge. Also, it would be counterproductive to the long-term goals of climate change legislation.

Additionally, it is unfair to allocate allowances based on megawatt output, as some suggested even here today. This would give permits to power plants such as nuclear or hydro that have no CO_2 emissions. These plants were conceived and built decades ago, long before anyone raised carbon concerns.

Duke Energy is the third largest coal generator. We are the fourth largest nuclear generator. We are planning to build two nuclear units. From our perspective, there is simply no economic justification to give allowances to nuclear and hydro plants that will not incur any cost to comply with the program. Doing so would be like giving these companies a printing press to make money at the expense of other regions of our country. There is no justification for such a windfall.

It is also important for us to acknowledge that if we are not serious about building more nuclear generation in this country that we are not serious about climate change. Nuclear energy has a demonstrated safety record. It is efficient, economical and the basic technology is available today. There is no way that we can realistically obtain significant levels of carbon reduction and achieve our country's future economic goals without expanding its use.

Climate change is one of the most important issues of our time. Getting it right for our customers and your constituents will be a marathon, not a spring. But Chair Boxer, let me, if I may, tell you how I judge my decisions. I am judged quarterly by investors and annually. But I apply the grandchildren's test, particularly on important issues about environment, important issues about supplying and balancing these competing needs. Because when I apply the grandchildren's test, the grandchildren's test to me is this. My hope is, and I have seven grandchildren, when my grandchildren look back and they are my age, at the decisions I made about the environment, I want them to say, my granddaddy's decision is still a good decision, even today.

So I think as we work our way through this, applying that test is important. Because we are ready to cross the bridge. We need to go to work now and we do not need to delay, the sooner, the better. Thank you very much.

[The prepared statement of Mr. Rogers follows:]

STATEMENT OF JAMES E. ROGERS, CHAIRMAN, PRESIDENT AND CEO, DUKE ENERGY CORPORATION

Chairwoman Boxer, Ranking Member Inhofe and members of the Committee. Thank you for inviting me to share my thoughts with you this morning on how we as a nation should address the issue of global climate change. I believe this can be done with appropriate design of a comprehensive, long-term program that caps emissions, provides the right cost-control tools and supports the development, demonstration and deployment of new technologies. Both cost containment and technology development are critical if Congress is to craft and enact a workable climate change protection act.

For today's discussion, I want to focus on four very important aspects of a climate change policy—allowance allocations in a cap and trade program, carbon capture and sequestration, energy efficiency and, last, nuclear power generation. But before I get into the specifics, I believe there are some core principles we must keep in mind as we move forward on climate change legislation:

1. *Flexibility.* Legislation should recognize the successes of past environmental programs by enacting a cap that features flexibility through the inclusion of a tradable allowance market. But Congress must also recognize the need to contain costs—especially to those living in areas of the country that rely on coal. Congress should not penalize past fuel choices.

2. *Broad Coverage.* The program should apply economy-wide, resisting the urge to focus solely on the electric sector. A broad program is the most cost-effective approach and will set the country on a course of greenhouse-gas emission reductions. Programs that focus on only one sector will fail to reach emission reduction goals.

3. *Cost Containment.* Because a cap-and-trade program for greenhouse gas emissions will impact all sectors of the economy, we believe that, in order to alleviate concerns over implementation costs, the program should contain provisions that create an escalating allowance price cap or that cap the allowance price for a period of time.

4. *Meaningful reductions that track technology development.* It is important to start a cap now, and to gradually reduce that cap so that technologies have time to develop and deploy. Recognizing that it is difficult to set a course for 50 years or more, Congress should mandate periodic reviews to ensure that projected technology development and the cap trajectory are in sync.

5. *Customer Impacts.* Replacing our energy infrastructure will take time and money. We did not build it overnight, and we will not replace it overnight. Consumers should not be penalized for fuel choices that were made 40-plus years ago. Areas of the country facing the largest increases in electricity rates due to climate change policy also represent the nation's industrial heartland. How allowances are allocated will directly impact the cost of electricity and the prices these consumers pay. We must get that right.

6. *Technology Innovation.* The program must actively support the development and deployment of low-carbon baseload generation technologies (including coal with carbon capture and sequestration). Widespread availability and deployment of such technologies will be key to managing GHG emissions in the power sector without disrupting the economy. This will require substantial near-term Federal financial support—the carbon price signal will not by itself be able to drive the needed technology revolution quickly enough.

7. *Nuclear Expansion.* Climate change policy must address and remove barriers associated with nuclear energy production. We cannot meet our greenhouse gas reduction goals without expanding the role of nuclear in this country's energy mix.

8. *Diversity in energy supply.* Congress must recognize that no single energy source will address the climate change challenge and at the same time meet growing demand. We will need all five fuels—nuclear, coal, natural gas, renewables and the "fifth fuel," energy efficiency. We will need to use existing technologies as well as develop new ones on all fronts.

DUKE ENERGY'S ROLE IN THE DEBATE

Duke Energy Corporation is one of the nation's largest generators of electricity. We serve nearly 4 million customers in North Carolina, South Carolina, Indiana, Ohio and Kentucky. Duke Energy has approximately 37,000 megawatts of generating capacity in the U.S., about half of that in coal-fired power plants. More importantly, in 2006 Duke Energy produced nearly 150 million megawatts-hours of electricity, 71 percent from our coal plants and 27 percent from our three nuclear plants in the Carolinas.

I am often asked why, as the CEO of the third-largest consumer of coal in the U.S., I am so outspoken on the need to address climate change through legislation. For several years now, I have been talking about the need to regulate greenhouse gas emissions. In my judgment, the science, as expressed by the Intergovernmental Panel on Climate Change and the National Academy of Science, is persuasive, and the call to action is compelling. This call to action led Duke Energy to join nearly two dozen other leading companies and environmental organizations to form the United States Climate Action Partnership (USCAP). The members of USCAP are united in calling on the government to enact Federal legislation to limit greenhouse gas emissions, and we have developed a set of high-level recommendations for the design of such legislation.[1]

As the leader of an electric utility, my first obligation is to make sure that the lights come on when our customers flip a switch. And I don't mean to sound glib with that statement. Electric production and delivery require a complex network of power generation, transmission and distribution capability. Until we develop ad-

[1] United States Climate Action Partnership, "A Call to Action" (January 2007).

vanced storage technology we must generate electricity the instant it is required—constantly and simultaneously matching supply with demand. In addition, this discussion of climate policy is occurring as we are beginning a new building cycle, as well as investing significant dollars in controlling sulfur dioxide, nitrogen oxides and mercury emissions.

We are facing significant capital decisions based on increased energy demand, along with rising prices, environmental challenges and a national yearning for energy independence. There is no "silver bullet" that will address all of those concerns. It is our responsibility as electric utilities to balance four criteria in meeting our customers' needs—to provide them with energy that is available, affordable, reliable and clean.

In striking that balance, it is critical that we understand the environmental expectations of those who regulate us. In short, we ask that Congress replace uncertainty with clarity, and carefully consider the needs of the environment, the economy and growing customer demand in crafting climate change policy. In the electricity sector, where capital investments are large and long-lived, clear signals on the approach to climate change are critical.

With the recent Supreme Court decision on climate, which makes the future of U.S. climate regulation even murkier, the need for certainty through congressional action is more critical than it was just a few months ago. And I believe that providing that clarity, particularly in recognition of the immense capital costs associated with changing out our current fleet of power plants to become a less carbon-intense society, is one of the most important tasks that Congress will tackle in the months ahead.

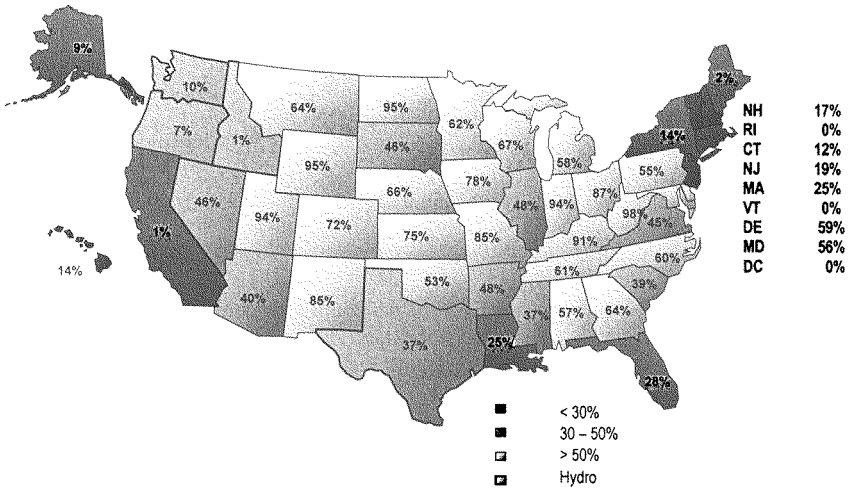
I believe the best way to accomplish that critical task is (1) to control greenhouse gas emissions through an economy-wide, market-based cap-and-trade program that utilizes a safety-valve price mechanism, (2) to support the development, demonstration and deployment of new technologies that will enable us to reduce greenhouse gas emissions over the long term, and (3) to remove barriers to the deployment of zero-emission nuclear energy. For our discussion today, I would like to emphasize a few specific items—an allowance allocation approach, carbon capture and sequestration challenges, energy efficiency incentives and the removal of barriers associated with nuclear power.

ALLOWANCE ALLOCATIONS: A FAIR, EFFECTIVE AND TESTED APPROACH

The more than 1,500 pulverized coal units in the U.S. today provide just under 336 gigawatts of generating capacity to consumers in 47 states. As reflected in the chart below, many states are highly dependent on coal generation, and the consumers in those states will bear the largest costs of climate change regulation. More than 50 percent of the electricity in 25 States comes from coal generation.

Percent of Total Generation from Coal (2005)

National Average: Coal Share of Total Generation = 50%



Source: Energy Information Administration, November 2006.

Congress must recognize that this fuel mix cannot change overnight. Coal is the most abundant energy resource in this country, and historical decisions have led us to power half of our country with this natural resource. We will have to transition gradually to a less carbon-intensive economy, and consumers in these states should not be disproportionately impacted as we move forward.

Therefore, it is essential that Congress put forward a clear trajectory that allows companies time to invest and build. That means companies must be able to change out their current fleets in a timeframe that does not stretch capital expenditures to a point where Wall Street reacts by increasing capital costs and downgrading companies. In addition, customers must have time to absorb those huge capital expenditures. Even though utilities build power plants and depreciate them over a 30-year period, the massive transformation that climate change legislation will require will mean an impact on rates in the near and long term.

Much of the climate debate is centering on how an allowance to emit carbon dioxide will be allocated to companies. Under a cap-and trade program, for every ton of carbon that is emitted there must be an allowance surrendered. While the design of an allowance allocation system can be complex, we have the benefit of experience with the effective process that Congress put in place for the electric sector under the Clean Air Act Amendments of 1990. In fact, many of the members of this committee played an important role in that landmark legislation.[2] This successful approach provided for the granting of allowances based on the amount of emissions or heat input in a historical period. Some refer to this as an "input" based approach where the allocation of allowances is based on the average fuel-adjusted heat-input (or emissions) in a recent historical period.

Two primary issues have emerged regarding allowance allocations. Some have taken the position that all or most allowances should be auctioned rather than granted. Some also argue that the allowances for the electric power industry should be allocated based on the amount of energy or megawatt—hours being produced rather than the amount of emissions or heat input. This is referred to as an "out-

[2] More recently, EPA adopted a similar yet improved approach for allocating NOx allowances in the Clean Air InterState Rule and for allocating mercury allowances in the Clean Air Mercury Rule.

put" based approach. Both the significant auction[3] and output approaches are contrary to the methods Congress and the EPA have successfully used in the past to reduce emissions, and both should be avoided in climate change legislation.

I would like to take a moment to remind the Committee what allowances stood for when they were first adopted by Congress in 1990. Title IV, Section 403 (f) of the Clean Air Act Amendments of 1990 stated that "an allowance allocated under this title is a limited authorization to emit sulfur dioxide in accordance with the provisions of this title. Such allowance does not constitute a property right." The Act makes it very clear that an allowance represents an emission. It does not represent cash for hedge funds or nuclear owners or investment bankers to play with. It is a method for tracking emissions and transferring permits when a company is able to more economically reduce emissions at one plant than at another.

According to recent testimony by career EPA staffer Brian McLean, Director of the Office of Atmospheric Programs, Office of Air and Radiation, before the House Energy and Commerce Committee, Subcommittee on Energy and Air Quality, March 29, 2007, "Emissions cap and trading is an alternative to traditional regulation and credit trading, not simply a trading feature added to existing regulation . . . . Individual source control requirements are not specified but each source must surrender allowances for compliance equal to its actual emissions." Mr. McLean goes on to point out how effective the program has been both in its simplicity, and in controlling costs of the program. He notes that the program resulted in earlier emission reductions than required and reduced compliance costs by more than two-thirds of initial EPA and industry estimates. And, finally, he points out that the method of distributing allowances is critical to the distribution of economic impacts and is therefore an important design feature. Putting a price on allowances directly increases compliance costs and the economic impact on consumers.

Again, several members of this committee played an important role in 1990 Clean Air Act landmark legislation and I ask you and the rest of the Committee to think about the important steps you took to reach an agreement to make historic reductions in air emissions. You have that same responsibility before you today. The way in which you design legislation will directly affect consumers and businesses in this country. I caution you to resist the call of those who would make this equally historic environmental legislation significantly more expensive than it has to be.

AN AUCTION APPROACH REMOVES THE BRIDGE TO THE FUTURE

Any allocation approach should be viewed as a transitional program. It is simply a bridge to the point in time at which we can de-carbonize our economy. Keep in mind—our electric power system has been more than a century in the making—and we won't revamp it in a decade. But over time, advanced new technology will be the key to virtually de-carbonizing our country's energy system. As we approach that point, the granting of allowances can be phased out.

An auction approach takes away the bridge. It would disproportionately and unfairly burden those regions that are most dependent on coal—the Midwest, Southeast and Great Plains states. Forcing customers in the 25 States that currently depend on coal-fired generation for most of their electricity to bear the cost of buying allowances, while at the same time bearing the cost of replacing the existing carbon intense generation with lower carbon alternatives, would result in a double hit to those customers. That double hit simply is not equitable, and there is no reason to penalize those customers while rewarding hedge funds and others who would like to have a new commodity to play with. It serves no environmental purpose and that was never the purpose of emission permits in the first place.[4]

Using my company as an example may help to clarify the issue. Duke Energy's customers depend on coal-fired generation for most of their electricity. Those plants were built decades ago, long before anyone raised carbon concerns. A carbon cap that becomes more stringent over time will require us to reduce the amount of carbon our plants emit. That will require us to build new, low-and non-emitting plants, and install carbon capture and sequestration technologies. Our customers will bear the burden of the cost to de-carbonize our generation fleet. And, because our current fleet is more carbon-intensive than those found in some other regions of the country, the costs to build and install this equipment will be proportionately higher than in areas that are less dependent on coal. Until new technology becomes available and new plants can be built, we have to run our coal plants to meet the needs of our

[3] Under the Clean Air Act, approximately 3 percent of the allowances were auctioned, primarily to assure liquidity of the emissions market.

[4] Thus, one of the key USCAP recommendations is that a significant portion of allowances should be initially distributed free to economic sectors particularly disadvantaged by the price effects of a cap. USCAP, "Call to Action," at p. 8.

customers. To run those plants, we will need allowances. Again, requiring our customers to pay disproportionately higher fleet modernization costs, and at the same time pay the cost of allowances until the fleet can be de-carbonized, is an unfair double punch.[5] The rate shock to customers and the disproportionate damage to the economies in the 25 States that depend on coal are neither reasonable nor equitable.

AN EMISSIONS-BASED ALLOCATION APPROACH IS FAIR AND EFFECTIVE

Allocating allowances using an average fuel-adjusted heat-input approach mitigates rate hikes and other associated costs that otherwise would be felt by the customers in states heavily dependent on coal. But it is important to note that this approach would not totally block the policy price signal from reaching the customer, as is sometimes claimed. Rather, it dampens the rate impacts—rates will still increase owing to the fact that: (1) allowance prices will increase over time, (2) generators will change the order in which they dispatch their plants in response to market forces, and (3) generators will make very large investments in new low-and non-emitting plants, which show up in electricity prices one way or another.

Some suggest that a better approach is to allocate allowances on a total energy output basis (based on megawatt-hours produced). Allocating allowances on an output basis would do two things. First, it would provide firms which have significant non-emitting generation (nuclear and renewable) with a windfall gain. We understand this, because we own and operate a sizable nuclear fleet in the Carolinas. These assets will already be advantaged in the market under a cap-and-trade program, with no compliance obligation; they need no allocation. Second, it would take allowances away from coal-fired generation that would incur the greatest compliance cost, ultimately impacting the customers who depend on that coal generation. This would place a disproportionate share of the program's costs on states that are more heavily dependent on coal.

Suggestions that output-based allocations will encourage the deployment of non-emitting generation are without merit and miss the point of the allocations. What we're talking about here is the generation on the ground—existing assets that serve our nation's electric needs, powered by fuels and technologies that made the most economic sense at the time in accordance with our State regulations, and which cannot be shut down and replaced overnight. As in the Clean Air Act, which used an input-based approach, all new entrants must purchase allowances if they want to build plants that emit.

Accordingly, under both input-and output-based approaches, market forces and the cost of carbon apply equally to all new generation decisions. In the future, new technologies will be deployed because the changed regulatory environment and a rising carbon price signal will make them the most economic choices, regardless of how Congress allocates allowances to existing units.

In any event, we believe that Congress should make the decisions on allowance allocations and spell out the details in legislation, rather than leave those critical policy decisions to the discretion of an administrative agency. The allocation of allowances will have critical, multi-billion-dollar impacts on the distribution of compliance costs associated with a cap-and-trade program.

ENCOURAGING AND FUNDING INNOVATION

As the door opens to what will become a carbon-constrained economy, we face a clear challenge. No technological solutions are available today to scrub carbon out of the flue gas or to generate large amounts of emission-free electricity from coal. Promising new technologies are being researched and developed, but right now no reliable technology is available that we can add to the back or front end of our coal plants to eliminate carbon dioxide emissions.

This has two implications for the nation's climate policy. First, before such technologies are widely available, a cap-and-trade program must be carefully calibrated so that allowance prices are high enough to pull technology off the shelf, but not so high as to be onerous. This requires careful attention to the trajectory of the emissions cap and safety valve—and a clear ability to adjust the trajectory of each, in response to technology developments.

Second, the prospect of future CO_2 allowance prices is not, by itself, a sufficient driver for developing technology quickly enough, and thus an affirmative technology policy must be part of the larger climate change policy. One of the principal rec-

[5] The effect on customers of companies smaller than Duke Energy could be even worse. If Congress makes the decision to charge companies for the right to operate their current fleets of power plants, you will be greatly reducing the capital available to de-carbonize their fleets. For smaller companies, you may be removing that capability all together.

ommendations of USCAP is that a climate change program should couple a carbon price with a targeted set of policies to promote development and deployment of low-carbon technologies.[6] For carbon capture and sequestration, this means the development of a substantial and reliable source of funding for large-scale demonstration of technologies. I encourage Congress to closely review the long-term funding programs that help promote the development of IGCC, oxyfuel combustion and other advanced-coal technologies. You should look for research programs that can be combined and where efficiencies can be gained, as well as creative ways to further reduce risk taken on by utilities that are using new or emerging technologies.

CARBON CAPTURE

Much work remains to develop the technologies for carbon capture, a technology still in its infancy when applied to utility operations. Ninety percent carbon capture, for instance, installed at a 600-megawatt IGCC plant, would consume about 13 percent of the net power output; installed at a 550-megawatt pulverized coal plant, it would consume approximately 30 percent of the net power output. Clearly, considerable work lies ahead to reduce those power requirements.

As importantly, we need as strong a commitment to develop technology that can capture carbon from our large fleet of already-existing coal plants. There are more than 1,500 pulverized coal units in 47 states. Most of these plants are not yet near the end of their useful lives. Clearly, retrofit technologies must be developed to mitigate carbon emissions from these facilities. We cannot ignore these plants as we build the next generation of shiny new plants using advanced technologies. In my view, it is risky to place your bets on just one technology, which is why I believe we need to develop carbon capture technologies to keep these plants operating.

CARBON SEQUESTRATION

Carbon capture and storage (CCS) for coal-fired power plants is a critical technology if we are to achieve our environmental goals while continuing to use our abundant domestic coal resources. CCS captures the CO_2 from the power plant and channels it underground for permanent storage in deep geological formations. However, this storage capacity is not available everywhere and, contrary to some statements I've seen recently, the technology itself is not fully developed and ready for deployment.

We believe CCS ultimately will prove to be one of the least-cost ways to reduce CO_2, and we are actively involved in projects to advance the research. Duke Energy is hosting a small-scale Phase II sequestration demonstration project at its East Bend power plant in Kentucky, which will involve injection of CO_2 into deep saline reservoirs in the area, between 3,000 and 4,000 feet below the surface. If the site is determined to be suitable, about 10,000 tons of CO_2 would be injected in 2008. The sequestration will be subject to monitoring, measurement and verification.

Duke Energy's commitment to CCS also includes membership in three DOE-funded carbon sequestration regional partnerships (the Midwest Regional Carbon Sequestration Partnership, the Midwest Geological Sequestration Consortium and the Southeast Regional Carbon Partnership) which are collecting, sharing and assessing data. DOE's National Energy Technology Laboratory (NETL) manages a number of regional sequestration consortia, creating a nationwide network to help identify the best technologies, regulations and infrastructure needed for carbon capture and storage. These partnerships will support multiple small-scale projects that will provide invaluable information on siting, monitoring, evaluation and public acceptability of carbon sequestration.

Expanded Federal financial support will be necessary to continue the process of demonstrating geologic sequestration. USCAP has advocated that Congress fund at least three full-scale CO_2 injection demonstration projects, each at a scale equivalent to the CO_2 emissions produced by a large coal-fired power plant.[7] The MIT Future of Coal study calls for three to five demonstration projects at a projected cost of $500 million to $1 billion over 8 years.[8]

In addition to proving the technology and geology for sequestration, a number of critical regulatory and legal issues will need to be resolved. As USCAP has stated,

[6] USCAP, "Call to Action" at p. 7 ("[A]n effective climate change program must include policies to promote significant research, development and deployment of hyper-efficient end use technologies, low-or zero-GHG emitting technologies, and cost-effective carbon capture and storage, which will be particularly important in the deployment of advanced coal technologies."); see also p. 9.

[7] USCAP, "Call to Action," at p. 9.

[8] Massachusetts Institute of Technology, "The Future of Coal: an Interdisciplinary MIT Study," (2007), at pp. 53–54, 97.

"Congress should require the EPA to promulgate regulations promptly to permit long-term geologic sequestration of carbon dioxide from stationary sources."[9] In addition to developing an appropriate regulatory system that will specify the ground rules for sequestration projects and enhance public acceptability, Congress should also provide appropriate protections against costly litigation and liability claims. The potential for significant liability claims and litigation defense costs, even when facility operators comply with all regulatory requirements, will be a significant damper on the commercial development of sequestration facilities. Given the speed with which we will need to put sequestration capacity into operation, we cannot simply wait to see if the common law in each State develops in a way that acceptably moderates these liability and litigation risks. Instead, I expect that the legal and liability issues must be settled before any company will feel comfortable moving forward with a large-scale CCS project.

Finally, despite all the seeming activity described above, CCS development needs a much greater sense of urgency if we are truly to respond to the climate problem. To paraphrase an MIT economist who has looked at this problem—if CCS doesn't work, we are in big, big trouble. I would characterize the current focus on CCS as something of a hobby. It should be an obsession, and receive a great deal more attention and resources.

ENERGY EFFICIENCY

While the deployment of carbon capture and sequestration technologies and the buildout of new nuclear generation will take several years, we have other opportunities to reduce our carbon emissions in the short term. One of those opportunities is to revisit the way we as a nation think about and use energy.

Electric utilities have the expertise, the infrastructure, the customer relationships—and a responsibility as well—to make efficiency a significant part of the energy mix. We call it our "fifth fuel" —as important as coal, nuclear, natural gas and renewables in meeting our customers' energy needs.

Energy-saving programs can range from simple onsite energy audits, to the use of sophisticated technologies to monitor and control customers' own energy use.

The key for the success of these programs is to compensate utilities for meeting demand—whether we do that by producing electricity, or conserving it. As the fifth fuel, we believe energy efficiency should be treated like any other type of production.

Most State regulatory regimes include inherent disincentives for energy efficiency efforts. Some regulatory innovations, such as decoupling, are aimed at taking away disincentives, rather than creating incentives. We're working to change that paradigm, by encouraging our regulators to allow utilities to earn a return on their investments in saving watts, just as they would for generating watts. This new paradigm would give us an incentive to fully develop all economically sound energy efficiency programs.

Taking variable costs such as fuel and emission costs into account, the energy efficiency model we are proposing produces a triple win—for customers, for companies and for the environment.

Last month we took the first step at Duke Energy. We filed our energy efficiency plan with the North Carolina Utilities Commission. This proposal is designed to help our customers conserve energy and reduce their power bills, without sacrificing comfort or convenience. New energy efficiency technologies are available now to help us do just that.

While State public service commissions must take the lead, Congress can encourage the states to review their ratemaking policies as they relate to energy efficiency. I encourage you to include such considerations in any climate or "pre-climate" legislation.

NUCLEAR

It is imperative that we have multiple options for reducing greenhouse gas emissions. Energy efficiency plays a role and the importance of developing new technologies to capture and sequester carbon cannot be underestimated. However, there is no way this country will meet long-term emission reduction goals without nuclear power.

Expansion of our nuclear power generation will be critical to meeting our long-term emission reduction goals as well as maintaining our country's diverse energy supply mix. Today, 104 reactors produce 20 percent of U.S. electricity, and nuclear energy represents nearly three-quarters of all non-emitting electric generation. In

[9] Id. MIT's Future of Coal report makes similar recommendations. MIT, "The Future of Coal," at p. 98.

the Carolinas, nuclear energy provided 47 percent of the electricity to Duke Energy's customers in 2006. By using nuclear energy instead of coal for a portion of our generation, Duke Energy has avoided the release of an estimated 1.1 billion tons of CO_2 since our three nuclear stations entered service.

In its recently issued report on strategies for addressing global warming, the Intergovernmental Panel on Climate Change emphasized that nuclear power is "an effective [greenhouse gas] mitigation option."[10] The IPCC further determined that, to the extent that new nuclear plants could displace existing and planned fossil fuel-fired plants, "net CO_2 emissions could be lowered significantly."[11]

It is vitally important that we keep our existing nuclear power fleet running, while adding new nuclear capacity. Accordingly, the Federal Government needs to meet its commitments and obligations, work to remove barriers toward expansion of nuclear power, and help build continued public confidence in nuclear energy and the management of nuclear waste.

To make this possible, we need new energy policies in the nuclear power area.[12] Building new nuclear power assets involves major capital commitments. With every new nuclear power plant, however, the public gains a substantial amount of new, affordable, carbon-free power. Therefore, I would call on the government to follow through on establishing and implementing a workable loan guarantee program, as authorized in the Energy Policy Act of 2005, in order to lower the capital costs of bringing new nuclear generation on line.

New capital is not enough, however. We need to have a sound, stable, and certain regulatory environment for nuclear power. Most importantly, we need a system for handling used fuel and nuclear waste, one that we all can feel confident and secure about. This means:

• *Establishing a credible management and governance structure that will be responsible and accountable for management of used fuel and high-level waste.* The Federal Government has missed one milestone after another, including its obligation to begin accepting used fuel by 1998. This has resulted in deterioration in the public's confidence in our ability to manage used fuel. We need a management and governance structure, modeled on private-sector principles, to strengthen accountability and to provide program management continuity.

• *Ensuring that there is adequate funding and resources to implement this structure, and providing for independent oversight of the collection and expenditures of funds.* To date, over $28 billion has been committed to the Nuclear Waste Fund, with Duke Energy's customers contributing over $1.2 billion of this amount. The status quo, where these moneys continue to be collected, yet are used for other than their intended purposes, does not enhance public confidence in the government's ability to manage this program or these funds.

• *Authorizing the consideration of all feasible options for management of used fuel, including fuel recycling as an alternative to direct disposal or a companion strategy.* When used fuel is discharged from a reactor, it still contains a significant amount of recoverable energy value. Used-fuel recycling is not a new concept or technology—it is used by many countries including France and Japan as a means of recovering and reusing the remaining fissile content. Recycling needs to be further considered for the U.S. nuclear fuel cycle.

• *Providing statutory direction on the application of the National Environmental Policy Act (NEPA) as it applies to the licensing of new nuclear plants.* A NEPA review of environmental impacts of a potential terrorist attack on a nuclear power facility offers no benefit to such a facility's security—already fully addressed by NRC requirements—or the NRC's consideration of environmental concerns, as NRC regulations already require the agency and licensees to consider the environmental impacts of events that could result in releases of nuclear material or radiation. Clarification and reinforcement of the roles of the various Federal agencies (NRC, Office of Homeland Security, etc.) in the assessment of and preparations against potential terrorist attacks is needed to ensure individual licensing proceedings for nuclear facilities are not protracted over this issue.

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[10] Intergovernmental Panel on Climate Change, Working Group III Report: "Mitigation of Climate Change" (May 2007) (pre-copy edit version), available at *http://www.mnp.nl/ipcc/pages—media/AR4-chapters.html*, at p. 26.

[11] Id., at p. 66.

[12] The need for nuclear energy policies to promote greenhouse-gas emissions mitigation was also a conclusion of a major multidisciplinary study undertaken by MIT. See at MIT, "The Future of Nuclear Power: an Interdisciplinary MIT Study," (2003), at p. 88 ("Our position is that the prospect of global climate change from greenhouse gas emissions and the adverse consequences that flow from these emissions is the principal justification for government support of the nuclear energy option.")

Duke Energy believes that nuclear power is an indispensable resource for a clean energy future. Indeed, our company is moving forward with a major new investment in nuclear generation in South Carolina. However, it will take a credible and stable regulatory environment to make it possible for this country to achieve its low-carbon potential with new nuclear generation.

COMPREHENSIVE SOLUTIONS NEEDED

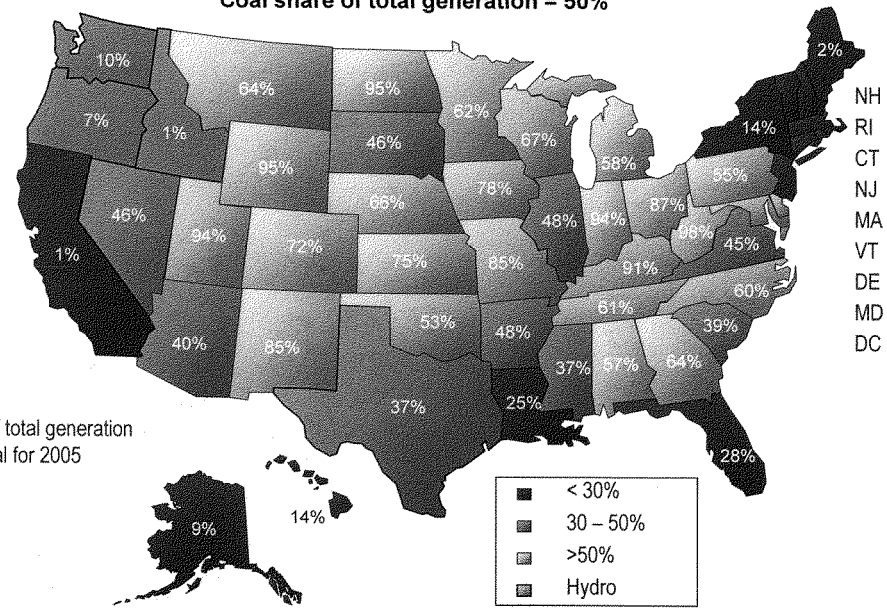
In preparing our company to operate successfully under carbon caps, we have come to realize that there is no one-size-fits-all approach to reducing greenhouse gas emissions. It will take a suite of actions to lighten our nation's carbon footprint. As I've often said, "there is no silver bullet—just silver buckshot." Our industry will need to invest in coal with carbon capture and sequestration, nuclear, renewables and energy efficiency to tackle the climate challenge effectively and economically.

I am confident that Congress can structure climate legislation in a way that protects our economy, allows continued use of abundant domestic energy resources and leaves a better environment for our grandchildren. That legislation can and should be structured in a manner that promotes innovation, encourages investment in new and emerging technologies, and fairly distributes the costs.

I am encouraged that this Committee has begun a thorough examination of this critical issue. I thank you for the opportunity to share my views, and I look forward to working with you.

Coal Plays a Vital Role in Electric Generation

National average:
Coal share of total generation = 50%



NH	17%
RI	0%
CT	12%
NJ	19%
MA	25%
VT	0%
DE	59%
MD	56%
DC	0%

% = percent of total generation from coal for 2005

Source: Energy Information Administration, November 2006.

RESPONSES BY JAMES E. ROGERS TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. You believe that economy-wide regulation is essential to effectively tackling our global warming problem. Can a power sector-only bill be a piece of a larger regulatory regime?

Response. An economy wide cap and trade program that includes all the emission sources under the same cap is the best solution because it is the most inclusive—meaning, it covers the emissions from the entire economy and ensures that all emissions "see" a single price signal created by the program. Some of these emissions cost very little to reduce, so their inclusion in a single program helps lower the overall cost of reducing emissions. In addition, establishing multiple programs to reduce emissions adds to the administrative complexity and cost to achieve overall reduction goals. A single program is administratively more efficient.

A power sector only approach covers only a little more than a third of U.S. greenhouse gas emissions, so additional programs and systems will have to be put in place to control the other two-thirds of the emissions adding unnecessary costs to consumer products. In addition, if some sectors are not covered under an overall program and have less restrictive requirements, consumers would be incentivized to move away from the decarbonizing electric sector to the higher emitting sources that are not covered under the cap and trade program. Such a result would defeat both the environmental goals and the cost-effectiveness Congress seeks.

Question 2. You recommend that global warming legislation set a cap on the price of allowances so that companies could simply buy allowances when the cost of making reductions became "too high." How could we sure that the price cap was set at the right level to spur the technological developments needed to significantly reduce greenhouse gas emissions?

Response. In reality, it isn't only about costs, but costs and price volatility. A price cap is an essential element to control the cost impacts while the energy sector transforms to lower emitting technologies. Providing compliance cost certainty protects against the risk of high costs and/or price volatility rendering the program unacceptable to the American public. The levels of an economy-wide emissions cap and safety valve price must be calibrated to the expected demonstration and commercial viability and availability of Carbon Capture and Storage and advanced nuclear technologies. Setting the emission reduction path on a slow, stop and reverse trajectory while using a safety valve price guards against unacceptably high rate shocks or high price volatility (swings between high and low prices) on consumers.

Allowance markets are often volatile, moving sometimes rapidly from high to low prices. These fluctuations make it much more difficult to time the expenditures of large sums of capital, which, in turn, acts as a disincentive to more rapid deployment of new technologies. A strong, consistent and predictably increasing CO_2 price will do two things: First, it will protect customers from unforeseen energy price shocks, particularly in the early years of the program when many low-carbon technologies, including carbon capture and storage have yet to be demonstrated at a utility-scale. And second, it can arrest the volatility that not only adds uncertainty to the consumers' energy choices and costs but also discourages the technology development and deployment you seek.

Also, concern remains that tackling climate legislation for the first time will result in costs rising very quickly and causing severe economic hardship. And, because many consumers reside in the industrial heartland of our country—the fear is compounded by the fact that consumers will be hit by rising electric costs and the flight of large industrials to overseas markets that are not burdened by climate regulations. One mechanism to help curb those fears is to place a cap on costs. As the emissions cap declines, industries will be looking for methods of changing out old technology for newer lower emitting technologies, but allowing that change to happen on a trajectory that the economy can absorb is of utmost importance. A mechanism that recognizes when that trajectory is following an economically unforgiving upward curve is something that will be necessary to help those Members concerned about cost controls be more comfortable with climate legislation. In addition, unlike with the Clean Air Act where technology to remove the regulated pollutants was available; no specific carbon dioxide removal technology exists today. If that technology does not become available as the cap declines, then protections must be in place to deal with that possibility.

Question 3. I understand the merits of your allocation preference, but I would like your response to the rationale for other approaches. For example, if emission allowances are allocated largely based on power plants' current carbon dioxide emissions, doesn't that reward the power sector's highest emitters—coal fired power plants—and penalize those utilities that have invested in cleaner technologies?

Response. Emissions control programs have never been and shouldn't in the future be a matter of rewarding or punishing anyone. Carbon dioxide emissions are currently unregulated and the goal of climate legislation should simply be to reduce those emissions over a period of time that is doable and that does not hurt consumers.

As I stated in my testimony, as many as 25 States for historical reasons and the availability of local resources, use coal to produce the majority of their energy. While the goal of climate legislation is to move the country toward lower emitting sources, that can't happen overnight. These regions still have a large amount of heavy manufacturing (which tends to be more energy intensive than other sectors).

The method of distributing allowances will be critical to the distribution of the economic impacts of climate change legislation. Consumers in states that are highly dependent upon coal will bear the largest cost of climate change legislation. Providing allowances to non-emitting generation and a disproportionately large allocation to natural gas generation will simply increase the costs that consumers in these coal-dependent states must bear. Coal units can't be turned off tomorrow. They'll need to continue to operate for many years until new lower and non-emitting generation technologies can take their place. A fair allocation of allowances must be provided to help transition the affected regions to lower emitting generation technologies over time without imposing on them an unreasonable and unfair economic burden.

An input-based allocation approach is simple and economically the fairest way to allocate allowances for both generators and consumers. It allocates allowances to each emitting source based on their recent CO_2 emissions (i.e. their compliance burden.) It doesn't give allowances to non-emitting generation facilities that do not need them (as would occur with an output-based allocation approach) and it doesn't give a disproportionately large allocation to natural gas generation as would also occur under an output-based approach. Allocating allowances to non-emitting generation would result in a windfall for these sources at the expense of coal-fired generation and its customers. And given that combined-cycle natural gas generation on average emits about 60 percent less CO_2 per mwh than coal, it doesn't make economic sense to give allowances to each type of generation at the same rate, as would occur with an output-based approach. An emissions-based approach is similar to the approach used by EPA in several electric sector cap-and-trade programs and it is the approach best suited to moderating the impacts of regulation on electricity users.

Question 4. If utilities are given emissions allowances for free, will utilities pass along the savings to consumer or will they increase the prices of electricity to reflect the market value of the allowances?

Response. For power companies like Duke—which serves millions of customers with electricity generated substantially from coal-fired power plants—the most reliable approach for moderating electricity price impacts is to allocate allowances at no cost within the electric sector to fossil-fueled generation on the basis of historical emissions. Whether an allowance allocated at no cost is sold in the market or used to cover emissions, the value of that allowance to regulated generators will flow directly to the electricity customers, mitigating some of the costs that consumers would otherwise have to bear. Such an approach will not shield customers from higher electricity prices completely, but will act to dampen price increases, spreading out the impacts over several years as opposed to impacting customers hard in the first year of the program.

Past history is the judge. Allowances to emit were awarded to the emitting facilities. Those allowances were turned in at the end of the year and matched the cap. The awarding of allowances simply protects consumers in coal dependent states from the huge price spikes that would occur if companies had to purchase all the allowances needed to continue operating existing plants, while also having to invest in new technologies. In fact, most companies would have a very difficult time from a capital perspective being able to invest in new technologies if they had to purchase the right to run their existing generation.

Duke Energy recognizes that the plan we support for allocating allowances within the electric sector is not necessarily applicable for generators located in deregulated electricity markets. Prices in deregulated markets would increase regardless of the allocation level to generators because the price is set by the bid of the next least costly plant needed to operate to meet demand. In these markets, such an allocation may indeed result in windfall profits while providing no benefit to consumers. Duke is working on a companion allocation methodology that may be appropriate for these markets that we would be happy to discuss.

RESPONSES BY JAMES E. ROGERS TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. What business risks are associated with potential climate change legislation and have these risks been documented in your 10–K filings with the U.S. Securities and Exchange Commission and appropriate disclosures to shareholders?

Response. The business risks to Duke Energy Corporation of potential climate change legislation clearly depend on the specifics of the legislation itself. Broadly, Duke Energy Corporation is subject to numerous environmental laws and regulations and compliance with these environmental laws and regulations, and potential additional laws and regulations, can require significant expenditures. Legislation associated with the regulation of greenhouse gas emissions could result in the creation of additional costs in the form of taxes or emission allowances.

Duke Energy has provided such disclosure to shareholders in the Duke Energy Corporation Form 10–K filing for the year ended December 31, 2006. See "Risk Factors" at page 30 and "Management's Discussion and Analysis of Financial Condition and Results of Operations" at page 83.

Question 2. If a cap-and-trade program such as the 2007 Bingaman-Spector (sic) bill and the 2007 Lieberman-McCain bill were implemented, what would be the gross costs imposed in your business operations? What would be the gross revenue? What would be the net cost/revenue?

Response. The economic impacts of any greenhouse gas cap-and-trade policy on Duke Energy will depend on numerous factors, including the design features of the cap-and-trade program, the changes in fuel prices and electricity prices that result from implementation of the program, the demand response to higher electricity prices, the availability and cost of new lower and zero emitting generation technologies, and the regulatory treatment of costs resulting from the program. The design features of a cap-and-trade program that will have the greatest impact on costs include the level at which the cap is set, the method(s) used to distribute allowances, whether the policy includes a safety valve, and if so, the level at which it is set.

With all these factors and the uncertainty of how the design features will be drafted, if included at all, it is not possible to calculate a meaningful estimate of cost, etc. This illustrates how critical it is that the design features be drafted in a responsible manner and a greenhouse gas cap-and-trade policy provide for a large allowance allocation and include a safety valve on the price of allowances. These two policy tools will have a tremendous impact on controlling program costs, and ultimately the cost to consumers.

Senator BOXER. Thank you so much, sir, for your eloquent testimony.

Just because Senator Inhofe was asking, this is the plan that we are going to follow today. I want to get through as many as I can before the votes start, so we will just keep going and I think once we get down to the floor, we might want to stay there for a few minutes to see what is happening. What we will do is we will get as many speakers as we can in. We will take a break, we will go to the floor. We will return within 15 to 30 minutes of our departure time. So if you can talk among yourselves and maybe bond and come up with a great plan for Senators Warner and Lieberman.

[Laughter.]

Senator INHOFE. Madam Chairman, I think it might be worth making sure our panel knows what we are voting on, because it is the immigration vote. Obviously, we are not going to miss it.

Senator BOXER. Right. We are not. The vote is supposed to be now, but it could slip.

Let's just move ahead. Mr. Tom Donohue, we are very pleased to have you here, CEO and President of the U.S. Chamber of Commerce. Welcome.

STATEMENT OF THOMAS J. DONOHUE, PRESIDENT AND CEO, U.S. CHAMBER OF COMMERCE

Mr. DONOHUE. Thank you, Madam Chairman. I am very pleased to be here.

As you and the members of the committee know, the Chamber has been very engaged with the members of this committee and with members of the House and Senate on the critical energy and environmental questions facing our country. We are working hard to preserve the best features of the bipartisan Energy Policy Act of 2005, which if fully implemented will help address many of the concerns we share about the security, diversity and cleanness of America's energy supply.

In addition, you noted we have recently formed the Institute for 21st Century Energy, led by General Jim Jones, who will lead a bipartisan, inclusive effort to shape a thoroughly rational, long-term approach to energy acquisition, efficiency, infrastructure and the management of global warming. The Institute's first product has been made available to you today. I hope you will put my comments at the end of the record. You ought to take it home and share it with your children, it is really interesting, the myths and realities of American energy.

Achieving energy security while also reducing carbon emissions is one of the most critical challenges of our time. The Congress and indeed the entire Nation is engaged in a difficult balancing act between meeting our growing needs and protecting the environment. The Chamber is deeply concerned with the Congress' ability to balance these two goals. Failure to strike the right balance can result in lost jobs, increase electricity prices and the migration of industries to foreign nations.

As much as we would like to believe that there is a silver bullet, we think it is going to take a whole lot of movement in the right direction to deal with the facts and not the myths. The fact is that our energy needs will continue to grow, no matter what we do. Even with the efficiency gains that have been discussed, and there is more that we can do, we must find a way to secure the fuel and power we need for a growing country, while also protecting the environment and addressing the risk of climate change.

Now, today's witnesses, many of whom are members of the Chamber and have a view on what we should think, have offered specifics and will offer other specifics to address these challenges. You may have noticed that their proposals are not all the same.

What is clear to me, however, and to the Chamber, is that as the Congress considers such policy options as cap and trade or carbon taxes or other approaches, we need all the facts, all the experience and a real serious consideration of the unintended results. We look forward to participating in that debate. We need to study these options carefully and we need to know where we are going before we go there. I would be glad to elaborate some more on that in the questions.

Although our members may have differing views, they come together on a serious of principles I think they all agree on. They first believe that whatever we do must preserve American jobs and international competitiveness of U.S. industries. They believe that to be international in scope and encompassing developing nations,

any plan has to look at China and India and others. The Chairman knows that 30 percent, or almost that much of the pollution in her own State comes from those countries.

We need to promote the development and the global deployment of greenhouse gas reduction technologies, and we might even make a buck on it. We need to reduce barriers to the development of climate-friendly energy sources and we need to promote energy conservation and efficiency. If we follow that list of requirements, we are going to make better judgments in our companies, in our Congress and in our country.

Now, I will as time allows, just quickly say that climate legislation, we have to deal with it, but we need to keep a lot of people working. I would also say that any climate legislation has go to be international. If we sit around and just do it here, the idea suggested that we would reduce our emissions by 80 percent is a great idea. If somebody has that silver bullet, I would like to see it.

Third, the Chamber believes that all climate change legislation has to promote the accelerated development of technology that is going to help us reduce climate problems from the traditional fuels that we are going to be using in this country until our grandchildren are sitting here. We absolutely believe that whatever we do, that we have to make it affordable, diverse and secure and I believe your point, Jim, that if you don't believe in nuclear energy after everything we know about its safety, then you are not serious about serious climate change.

I have run that very quickly to my schedule, I know you have yours. I look forward to our discussion. Thank you, Madam Chairman.

[The prepared statement of Mr. Donohue follows:]

STATEMENT OF THOMAS J. DONOHUE, PRESIDENT AND CEO, U.S. CHAMBER OF COMMERCE

Good morning, Chairman Boxer, Ranking Member Inhofe, and members of the Committee on Environment and Public Works. My name is Thomas J. Donohue and I am President and Chief Executive Officer of the U.S. Chamber of Commerce. The Chamber is the world's largest business federation, representing more than three million businesses and organizations of every size, sector, and region. On behalf of the Chamber and its members, I thank you for the opportunity to testify here today.

You have asked me to come before the Committee today to discuss global climate change proposals and their relation to the power plant sector. The Committee should be commended for exploring the impact of the numerous legislative proposals on power plants. If Congress follows through with legislation, but does not carefully consider the impact provisions such as mandatory emissions caps, carbon capture and sequestration, and mandatory renewable portfolio standards will have on industry, the Chamber believes the economic consequences could be severe.

The 110th Congress is performing a balancing act, striving to preserve energy security while also limiting energy use and the fuels to be used for the purpose of addressing climate change. On one hand, Congress seeks to place serious limits on energy exploration, but, on the other, continues to push for energy independence and carbon-constraining climate change legislation. The Chamber is very concerned with Congress' perceived ability to balance these two goals. If energy independence is what we truly want, we can certainly achieve it; we have more than enough energy sources (ranging from coal and oil shale to wind and photovoltaic) that, when used in conjunction with one another, can make the country energy independent, but not any time soon and perhaps not even in this century.[1] However, when we add caveats to how that energy independence must be achieved—such as legislation that reduces greenhouse gas emissions without also funding technology, or with a federally

[1] Edmonds, J.A., et al., Global Energy Technology Strategy: Addressing Climate Change (May 2007), available at http://www.pnl.gov/gtsp/docs/gtsp—2007—final.pdf.

mandated renewable portfolio standard (RPS), or by limiting oil and gas exploration on Federal lands and in the Outer Continental Shelf—the balancing act will give way to one extreme or the other.

What Congress must continue to recognize, as it crafts this legislation, is that electricity is the "juice" that runs our country. And this country will depend on the sustainability of the "juicers"—coal, natural gas, petroleum, nuclear, and hydropower, to name a few—for the foreseeable future. We simply cannot flip a switch and power our country exclusively on renewable energy sources. (Even if we could—and we cannot—we need energy corridors to move that electricity from rural areas to urban regions, and Congress is taking steps to shut down these corridors as well.) By promoting renewables at the expense of other energy sources, Congress is picking winners and losers—and the losers will be the power plants that generate the electricity to run this great nation.

As you know, many of this country's power companies are members of the Chamber. In fact, several companies joining me today on this panel (Duke Energy, Florida Power & Light, Murray Energy, and Pacific Gas & Electric) are Chamber members, and each has a different view for addressing global climate legislatively. Some advocate for cap-and-trade, RPS, or more nuclear. Others want an international, voluntary program, such as the Asia-Pacific Partnership. For this reason, I believe the best place to begin my discussion of how to address climate change is with the five core principles the Chamber utilizes to evaluate any proposed climate change solution. The Chamber measures all proposed climate change legislation against the following standards:

Does the legislation. . .

1. Preserve American jobs and the competitiveness of U.S. industry;
2. Provide an international, economy-wide solution, including developing nations;
3. Promote accelerated development and deployment of greenhouse gas reduction technology;
4. Reduce barriers to the development of climate-friendly energy sources; and
5. Promote energy conservation and efficiency.

I urge you to view my testimony today as a valuable resource. The Chamber and its members have already had the internal debate on climate change, and our five core principles are largely the result of that discussion. The Chamber has not endorsed one specific solution or one specific piece of legislation, but over the years has supported legislation that funds research, development and deployment of technology, and that promotes energy efficiency.

Let's not turn our backs on the energy companies that made America great. Instead, let us work with those companies to develop the technology to make their energy—indeed, all energy—clean, efficient, and affordable. Only then will we be able to solve the global climate challenge.

I. PRESERVE AMERICAN JOBS AND INTERNATIONAL COMPETITIVENESS OF U.S. INDUSTRY

Any climate change solution, no matter what it is, must preserve American jobs and the competitiveness of American industry. Even areas served by large power companies (who arguably would be able to afford either the technology or the extra credits necessary to stay in business) would feel the strain, both from increased costs of doing business and other regions' inabilities to keep up. A 2005 analysis done by CRA International found that, for legislation aimed at reducing greenhouse gas emissions to 2000 levels by 2010, and continuing at that rate until 2020, the cost to business and society would be substantial while the effects of climate change would not be reduced.[2] Specifically, CRA found that such legislation would cost the average household $450 to $720 per year until 2010, rising to $490 to $810 until 2020. The U.S. would lose 550,000 to 840,000 jobs by 2010, and 793,000 to over 1.3 million jobs by 2020.[3] Coal production would decline by 22 to 42 percent, electricity generation by 7 to 14 percent, and oil refining by 6 to 13 percent.[4]

These negative effects are within the realm of possibility when considering industry's inability to meet the aggressive targets set by many of the climate change bills currently before the Senate. Assessment of U.S. Cap-and-Trade Proposals, a study recently performed by energy experts at the Massachusetts Institute of Technology, analyzed three scenarios, which roughly mirrored the targets sought in bills intro-

[2] CRA International, "Costs to the Nation under Proposed Federal Cap and Trade Legislation to Limit Greenhouse Gas Emissions," June 21, 2005, available at http://www.accf.org/pdf/statestudies2/US–2005 percent206–21–05.pdf.

[3] *Id.*

[4] *Id.*

duced by Senators Bingaman, McCain-Lieberman, and Sanders-Boxer, respectively.[5] The forecasted increases in electricity prices found by the MIT panel are simply staggering: from 2015 to 2050, Senator Bingaman's bill will increase prices by 31 to 59 percent with nuclear in the mix, 34–66 percent without; the McCain-Lieberman targets will increase prices by 51 to 59 percent with nuclear, 51 to 75 percent without; and the Sanders-Boxer bill will raise prices by 56 to 59 percent with nuclear, and 60 to 78 percent without.[6] Faced with such rising energy costs, it would be no surprise to see many heavily energy-dependent industries migrate overseas and take American jobs along with them. The chemical industry has already done so.[7]

II. MUST BE ECONOMY-WIDE, INTERNATIONAL IN SCOPE, AND MUST INCLUDE DEVELOPING NATIONS

Any climate change program must be long-term, international, and economy-wide. Domestic emissions constraints, without corresponding long-term cutbacks in greenhouse gas emissions from nations such as China and India, will not only fail to make the required impact on levels of greenhouse gases in the atmosphere, but could also irreparably harm our country's ability to compete in the global market.

As the Task Force on Hemispheric Transport of Air Pollution (HTAP) made clear just last week, emissions measured in American cities do not always originate within American borders.[8] Climate change legislation must therefore target the citizens and businesses of all nations, not simply domestic power plants and fossil fuel producers. If not, the effects on the U.S. economy, consumer prices and jobs could be disastrous.

Similarly, any long-term climate change action plan absolutely must include developing nations such as China and India. Chinese emissions are projected to increase 119 percent and Indian emissions 131 percent between 2004 and 2030.[9] Unless developing nations are engaged, domestic emissions controls would penalize domestic businesses that attempt to compete in the world market while non-participating developing nations continue to get a free ride.

The good news is, we have a mechanism to accomplish an international, economy-wide solution that has brought developing nations—even China and India—to the table: the Asia-Pacific Partnership for Clean Development (APP). The bad news is, APP is not receiving the time, attention, or funding it needs to accomplish its goals. APP is still in its relative infancy, and needs both (a) time to develop and demonstrate climate-friendly technology, and (b) increased funding from the World Bank and the International Monetary Fund.

The United States is not holding up its end of the bargain with respect to APP and technology development and deployment. The Energy Policy Act of 2005 (EPAct), which contains more than 60 provisions requiring the U.S. Government to engage with the private sector and develop innovative climate and energy technologies, is embarrassingly under-funded. To make matters worse, several bills in Congress attempt to repeal and/or de-fund those EPAct provisions that have begun to make a difference.

President Bush recently announced plans for an international summit at which the 10 to 15 nations responsible for approximately 85 percent of the world's global emissions will begin a dialog on the best way to reduce those emissions responsibly. As Council on Environmental Quality Chairman Jim Connaughton recently stated, any near-term domestic efficiency gains will be overwhelmed by the rise of coal-based power generation in China, India, South Africa, Mexico, Central and Eastern Europe, and Russia.[10] Those countries will continue to use coal because they are trying to advance their economies, trying to lift people out of poverty, trying to provide clean water, and trying to use energy to run air pollution controls. And energy is necessary for all of that. The purpose of President Bush's proposed summit is to find a shared technology-development pathway, to bring the cost of these expensive

[5] Paltsev, S., et al., Assessment of U.S. Cap-and-Trade Proposals, Apr. 1, 2007, available at http://web.mit.edu/globalchange/www/MITJPSPGC—Rpt146.pdf.

[6] *Id.*

[7] Greg Schneider, Chemical Industry in Crisis: Natural Gas Prices Are Up, Factories Are Closing, And Jobs Are Vanishing, WASH. POST, Mar. 17, 2004, at E01.

[8] Task Force on Hemispheric Transport of Air Pollution, 2007 Interim Report (June 2007), available at http://www.htap.org/activities/2007—interim—report/reading/TF%20HTAP%202007%20Exec%20Sum%20070612.pdf.

[9] International Energy Agency, World Energy Outlook 2006, available at http://www.iea.org/textbase/weo/index.htm.

[10] Press Briefing by Senior Administration Officials on the President's Trip to Europe and the G8 Summit, Radisson Hotel, Rostock, Germany, June 6, 2007; available at http://www.whitehouse.gov/news/releases/2007/06/20070606–5.html.

technologies down so that they will be used by China, India and other developing nations.[11]

III. PROMOTE ACCELERATED DEVELOPMENT AND DEPLOYMENT OF GREENHOUSE GAS REDUCTION TECHNOLOGY

The development and deployment of affordable, widely available climate-friendly technology is crucial to preserving jobs while controlling emissions. Carbon capture and sequestration, next-generation nuclear power, and other cutting-edge technologies must be researched, developed, demonstrated and deployed. Without widespread availability of these and other technologies, the power plant sector may not be able to continue producing power to meet local and regional demands while also satisfying aggressive carbon emissions caps.

Although some of these technologies exist, they are by no means cost-effective or commercially viable. Current emissions control technologies are too expensive for all businesses to utilize under their respective business models.[12] Larger businesses can arguably afford the high cost of this technology while continuing to turn a profit, but small and mid-sized businesses cannot.

Similarly, new technologies are far from simple to deploy. Siting, permitting, insurance coverage, and liability exposure concerns will remain major roadblocks, as will high costs for materials, labor, and construction expertise. The overall costs of wind, nuclear, and liquefied natural gas regasification facilities continue to increase due to rising costs of materials.

Carbon capture and sequestration technology is perhaps the best example of our ongoing technological struggle. The Future of Coal, a report released in March 2007 by a consortium of faculty and energy experts at MIT, found that, even with a high price on carbon (due to a legislative or regulatory cap or tax), coal, the leading source of carbon-dioxide emissions from electricity generation, will continue to be a major source of electricity due to its sheer abundance and an increasing worldwide demand for energy.[13] However, the report criticizes current efforts by the U.S. Department of Energy (DOE) to research carbon capture and sequestration, and calls for a $5 billion, 10-year program to research, develop and (most importantly) demonstrate on a realistic scale the technology necessary to capture and store carbon dioxide from coal-fired power plants.[14] The MIT report also cites additional hurdles, such as (1) coal gasification limitations, (2) near-prohibitive costs of retrofitting existing coal plants to capture and sequester carbon, and (3) DOE's failure to determine system costs through the FutureGen project.

The MIT study concludes that coal demand is not going anywhere, yet we are now facing imminent legislation that will constrain coal power plants' abilities to meet this growing demand while failing to provide an adequate technological alternative. It is for this reason that, if Congress does anything, it must absolutely provide comprehensive research and development incentives to stimulate technological innovation. Without such incentives, emissions controls will likely fail.

IV. REDUCE BARRIERS TO THE DEVELOPMENT OF CLIMATE-FRIENDLY ENERGY SOURCES

If Congress is truly determined to (a) cap greenhouse gas emissions and reduce those levels over time, (b) require mandatory renewables from every state, and (c) attempt to achieve some level of energy independence, it must remove all barriers to the development of clean, climate-friendly energy sources. It must stop creating barriers to "national interest" transmission corridors recently designated by DOE. And it must not only provide incentives for so-called "renewables" such as wind, solar and geothermal, but also clean energy sources such as coal, hydropower, nuclear power, biofuels, and clean-burning natural gas. If the true policy goal is to encourage energy production, there is no legitimate reason why innovative energy technology producers are left standing at the door as they get ready for the marketplace. Congress must be pragmatic about its energy strategy, and any legislation should be technology-neutral so that Congress avoids picking technology winners and losers.

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[11] *Id.*

[12] Paltsev, S., et al., Assessment of U.S. Cap-and-Trade Proposals, Apr. 1, 2007, available at http://web.mit.edu/globalchange/www/MITJPSPGC—Rpt146.pdf.

[13] Deutch, J., and Moniz, E., The Future of Coal: An Interdisciplinary MIT Study, March 14, 2007, available at http://web.mit.edu/coal.

[14] *Id.*

V. PROMOTE ENERGY CONSERVATION AND EFFICIENCY

The amount of energy required to produce a dollar's worth of goods and services in the U.S. economy fell by more than 50 percent between 1949 and 2004, as a result of improvements in energy efficiency, structural shifts in industry, and other related factors.[15] From 1980 to 2004, industrial delivered energy use per dollar of industrial value of shipments declined by an average of 1.6 percent annually.[16] According to the Energy Information Administration, although energy use generally increases as the economy grows, continuing improvement in the energy efficiency of the U.S. economy and a shift to less energy-intensive activities are projected to keep the rate of energy consumption growth lower than the GDP growth rate.[17]

Chevron began tracking energy use across all operations in 1992, and reports that since beginning company-wide efforts, energy efficiency has been increased by 24 percent.[18] Since the 1992 inception of the Environmental Protection Agency's Energy Star program, Eastman Kodak Company has reduced its use of energy by more than 15 percent.[19] 3M has improved its worldwide energy efficiency by 29 percent since 1998.[20] United Technologies Corporation improved its worldwide normalized energy consumption performance by 39 percent from 2002 to 2006.[21] These are but a few examples of how business and industry are seeking out and taking advantage of energy efficiency opportunities; there are thousands of other companies doing the same.

Energy efficiency makes good business sense: such practices, where cost-effective, often afford sizable reductions in operating costs. The flip side to this argument, however, is that companies are typically reluctant to implement cost-ineffective energy efficiency measures.[22] Historically, lawmakers have used policy instruments to ensure cost recovery for such cost-ineffective measures. This is the absolute wrong way to promote energy efficiency. The market should decide which energy efficiency technologies are winners and losers, not politicians. Governmental intervention should only be considered as a last resort, following careful examination of all long-term benefits and drawbacks.

This country's energy goals will be met only by a commitment to technology innovation and to all types of available energy sources. Power plants, the industrial lifeblood of our country, must not be unnecessarily constrained by climate change legislation without first being afforded the technology necessary to meet those controls. Just like the American public itself, diversity of domestic energy production is vital to continued economic prosperity. If you ignore this truth, you will be turning out the lights on our country's economic future—literally.

Thank you for the opportunity to testify today. I look forward to answering any questions you may have.

RESPONSES BY THOMAS J. DONOHUE TO ADDITIONAL QUESTIONS FROM SENATOR BOXER

Question 1. You emphasize the importance of developing climate-friendly technologies. Haven't we seen that regulation can spur technological development by giving businesses a reason to find low-cost ways of reducing pollution?

Response. In terms of greenhouse gas regulation specifically, we have seen quite the opposite. The European Emissions Trading Scheme (ETS), and the flawed regulation behind it, has resulted in permit prices so low that technological innovation costs significantly more than it does to purchase credits to cover increased emis-

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[15] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, "Highlights of Energy Intensity Trends—Total Energy," available at *http://intensityindicators.pnl.gov/total—highlights.stm.*

[16] Energy Information Administration, *Annual Energy Outlook 2007,* at 79, available at *http://www.eia.doe.gov/oiaf/aeo/index.html.*

[17] *Id.*

[18] Chevron Corporation, "Energy Efficiency and Conservation," available at http://www.chevron.com/social—responsibility/energy—conservation/.

[19] ENERGY STAR Awards for Sustained Excellence and Corporate Commitment, 2005, available at http://www.energystar.gov/index.cfm?c=pt—awards.pt—es—winners—2005.

[20] 3M Corporation, "Improving Energy Efficiency," available at http://solutions.3m.com/wps/portal/3M/en—US/global/sustainability/s/performance-indicators/environment/energy-efficiency/.

[21] United Technologies Corporation, 2006 Corporate Responsibility Report, at 4, available at http://www.utc.com/responsibility—reports/2006/2006—utc—corporate—responsibility.pdf.

[22] The exception to this rule might be businesses that act as "first movers," such as those seeking to gain technological expertise or establish primacy in intellectual property rights on energy efficiency technology.

sions. The ETS, in essence, has actually reduced incentives for companies to limit their emissions. First among many culprits for this outcome is the allocation system used by ETS. As would be the case in the United States, each participating nation in the ETS cap-and-trade system was forced to choose winners and losers through the allocation process. Participating ETS nations chose to over-allocate credits to its regulated entities, which led to reduced permit prices, increased emissions, and virtually no technological innovation.

American technological prowess is evident from the fact that we have made even greater gains than the Europeans without a mandatory emissions trading scheme like ETS. In 1980, the United States consumed approximately 19,000 Btu per dollar of gross domestic product (GDP); today, that figure is at 8,000 Btu per dollar of GDP.[1] What these numbers show is that, over the last 30 years, businesses have gotten two-thirds of their energy needs from technology-based efficiency gains. The will of business to "do good" is very strong, but with rising population and a growing economy, Congress should be providing incentives to these businesses to develop even more technology instead of punishing them. Regardless of regulation in place, business will always have one very large reason to continue to develop climate-friendly technologies: competition from other businesses.

Global climate change is not simply a domestic issue, and the main problem with regulation to address the problem of climate change—at least the type of domestic greenhouse gas regulation pondered by this Committee—is its narrow scope. Domestic greenhouse gas regulation will not affect emissions from developing nations, and without the participation of these nations, global greenhouse gas levels will not change.[2] A recent study by Dr. Leon Clarke at Pacific Northwest National Laboratory, entitled "CO_2 Stabilization in a Heterogeneous World," demonstrates that failure to secure participation from all nations—both developed and developing—will cause extreme price fluctuations in the price of carbon and will greatly reduce our ability to achieve overall global emissions targets.[3] Any solution to climate change must be international in order to succeed.

Question 2. If companies aren't required to reduce global warming pollution, can we really expect enough of them to do so on their own, particularly if their competitors aren't following suit?

Response. As Dr. Clarke's research demonstrates, for global greenhouse gas emissions levels to be affected in any meaningful way, international participation is required.[4] There is a significant distinction to be made here: reductions in absolute greenhouse gas emissions are not the same as reductions in greenhouse gas concentrations. While it is certainly conceivable to reduce our country's absolute greenhouse gas emissions (i.e., X tons of carbon), local emissions reductions alone will do virtually nothing to impact global greenhouse gas emissions concentrations. Therefore, failure to secure international participation, for even ten years, could significantly limit the effectiveness of global greenhouse gas reductions.

We must deal with reality: China and India have already stated that they will not agree to mandatory greenhouse gas emissions caps[5] Forced to deal with the world as it is, the best way to bring these countries into the fold is not through regulation aimed only at limiting domestic emissions. Rather, we need to engage these nations through the mechanisms that continue to work, such as the Asia-Pacific Partnership for Clean Development (APP) and the President's recently-announced 15-nation summit.

Question 3. So far, our Nation's refusal to adopt mandatory limits on our greenhouse gas emissions has not persuaded developing nations to agree to such limits. What do you think is the best way to persuade large emitters like China and India to reduce their global warming pollution?

Response. The Chamber respectfully disagrees with your assumption that our nation's refusal to adopt mandatory greenhouse gas limits has somehow caused developing nations to refuse such limits. These countries have routinely refused to implement mandatory emissions controls, and nothing the United States has done (or will do) will persuade these rapidly-developing nations that mandatory controls make economic sense. the reason is simple: the governments of China and India are bur-

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[1] "International Total Primary Energy Consumption and Energy Intensity," Energy Information Administration, available at *http://www.eia.doe.gov/emeu/international/energyconsumption.html.*

[2] See, e.g., Clarke, L., "CO_2 Stabilization in a Heterogeneous World," (July 13, 2007); available at http://www.uschamber.com/issues/index/environment/climate—change.htm.

[3] *Id.*

[4] *Id.*

[5] "Poor nations vow to do 'fair share' on climate," Reuters News Service, June 8, 2007; available at *http://www.reuters.com/article/worldNews/idUSL08814796200706 08.*

dened with rapid economic development for billions of inhabitants, and they do not see an economically feasible way to reduce emissions without impeding their ability to provide for their citizens. As we stated in the Chamber's response to Question 2 above, the best course is to engage these nations through existing partnerships, such as APP and the President's 15-nation summit.

Question 4. Has the Chamber considered the costs of global warming to its members? Aren't many of its members already being affected by rising insurance prices that reflect the increased risk of extreme weather events that are associated with global warming?

Response. The Chamber's member companies have many lines of insurance (e.g., D&O, E&O, commercial general liability, workers' compensation) whose premiums are unaffected by weather patterns. Only a small portion of most companies' insurance portfolios—commercial property, and, where applicable, builder's risk—is even remotely affected by the weather.

At the risk of answering a question with another question, we ask whether the Committee has evaluated the impact of international border pollution on its decision whether to regulate greenhouse gases in the United States without also securing international participation. The recent report by the Task Force on Hemispheric Transport of Air Pollution, a joint research group organized by the United States and the European Union under the purview of the United Nations Economic Committee for Europe, indicates that emissions emanating from China, India and other nations do not simply disappear into the atmosphere; instead, wind carries those emissions to the United States, where domestic air quality levels are impacted.[6] As a result of the global economy, many of the Chamber's members operate not just in the United States but throughout the world. If the United States is over-regulated, those businesses could view such regulation as an incentive to move their operations to a developing nation (such as China or India) where emissions regulation is more permissive and less costly. The emissions generated in those countries will then be carried over to the United States as a result of international border pollution. It is certainly foreseeable that over-regulation in our country, without cooperation from all other nations, will lead to higher pollution levels in the United States and more lost jobs.

RESPONSES BY THOMAS J. DONOHUE TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. Can you elaborate why you think rising energy costs will harm businesses?

Response. All cost increases affect the competitiveness of an industry; rising energy costs are no exception. The impact will be felt both directly and indirectly. Direct costs will be, quite simply, the fact that increased costs to manufacture equipment, produce goods, and maintain an office will further limit profits. Indirect costs will come in the form of business migration: the primary goal of a business is to make money, and if it is significantly easier to do so in another country, the business will move.

Dr. Clarke's report provides a good illustration of the impact U.S.-only climate change regulation will have on energy costs, and, therefore, American competitiveness. Should the United States impose limitations on itself while its competitors operate without carbon constraints, the costs to stabilize CO_2 levels globally skyrocket.[7] Businesses will migrate to new locations with little to no emissions controls (such as China or India) and greenhouse gases produced at those locations will carry back over to the U.S., forcing even more businesses to leave and making our nation even less competitive in the global market.

Question 2. Can you tell us about the impacts on businesses if we pass cap-and-trade legislation and do not have the technology necessary to meet the targets?

Response. This is a perfect example of the conflict highlighted in the Chamber's written testimony to the Committee. The United States depends on fossil fuels for energy production, and will continue to do so for the foreseeable future. In fact, energy demands continue to rise. Policymakers preach goals of "energy independence" and "energy security," yet repeatedly impose limitations on the country's ability to

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[6] Task Force on Hemispheric Transport of Air Pollution, 2007 Interim Report (June 2007), available at *http://www.htap.org/activities/2007—interim—report/reading/TF%20HTAP%202007%20Exec%20Sum%20070612.pdf*

[7] Clark, L., "CO_2 Stabilization in a Heterogeneous World," (July 13, 2007); available at *http://www.uschamber.com/issues/index/environment/climate—change.htm.*

meet these objectives by: (a) taking steps to limit oil and gas exploration; (b) rolling back transmission and other provisions contained in the Energy Policy Act of 2005 (EPAct); and (c) refusing to site new nuclear power plants, permit Yucca Mountain, and reopen spent fuel reprocessing.

This conflict is typified by the government's repeated failure to implement technology provisions mandated by EPAct. EPAct contains more than 60 provisions that specifically address new energy production and efficiency technologies. The Chamber has done extensive research on the status of these 60 provisions, and found an embarrassing number of them to be un-funded, underfunded, or simply not implemented at all. If the goal is to develop new technologies—and to own the intellectual property from these technologies—Congress should be focusing its efforts on funding and implementing EPAct, not "reinventing the wheel" on energy policy.

Question 3. How does the Supreme Court's ruling in *Massachusetts* v. *EPA* affect your view of climate change? Should EPA be regulating greenhouse gases under the Clean Air Act?

Response. The Chamber is hesitant to speculate as to the scope of the Supreme Court's ruling in *Massachusetts* v. *EPA*—the Chamber is a trade federation, not a law review—but suggests that more guidance may be necessary to fully interpret the scope of EPA's authority to regulate greenhouse gases under the Clean Air Act. However, regulation undertaken by EPA on its own motion poses many of the same problems as legislation currently introduced in Congress: none of these regimes adequately address the problem of international participation. The Task Force on Hemispheric Transport of Air Pollution has found that emissions from China, India and Southeast Asia substantially affect background air quality levels in the United States. Without a truly international climate change solution, as domestic regulation tightens greenhouse gas levels over time, emissions from those developing nations will continue to increase. It is certainly possible, if not probable, that large numbers of states will be penalized for substantial emissions emanating from outside their borders.

Senator BOXER. Thank you, sir, for your contribution to this debate.

Our next speaker is Marlo Lewis, a senior fellow at the Competitive Enterprise Institute.

Welcome, sir.

STATEMENT OF MARLO LEWIS, SENIOR FELLOW, COMPETITIVE ENTERPRISE INSTITUTE

Mr. LEWIS. Thank you, Chairman Boxer and members of the committee, for inviting me to testify today.

Jonah Goldberg, the columnist, notes that the Earth warmed about 0.7 °C in the 20th century, while global GDP increased by some 1800 percent. For the sake of argument, says Goldberg, let's agree that all of the warming was anthropogenic, the result of economic activity. Let's further stipulate that the warming produced no benefits, only harms. That is still an amazing bargain, Goldberg remarks. Average life expectancies doubled in the 20th century. The human population nearly quadrupled. Yet per capita food supplies increased. Literacy, medicine, leisure and even in many respects the environment hugely improved, at least in the prosperous west.

This suggests a thought experiment. Suppose you had the power to travel back in time and impose carbon caps on previous generations. How much growth would you be willing to sacrifice to avoid how many tenths of a degree of warming? Would humanity be better off today if the 20th century had half as much warming but also a half or a third or even a quarter less growth? I doubt anyone on this committee would say yes. A poorer planet would also be a hungrier, sicker planet. Many of us might not even be alive.

How much future growth are you willing to sacrifice to mitigate global warming? That is not an idle question. Some people believe we are smart enough now to measurably cool the planet without chilling the economy. But Europe is having a tough time meeting its Kyoto commitments and Kyoto would have no detectable impact on global warming.

Three of the main climate bills introduced in the Senate this year would require CO_2 emissions cuts of about 60 percent by 2050. Yet the Energy Information Administration projects that in 2030, U.S. emissions will be about 33 percent above year 2000 levels. I submit that nobody knows how to meet the targets in those bills without severe cuts in either economic growth or population growth.

But won't the bill's carbon penalties make deep emission reductions achievable by spurring technological change? I doubt it. Europe has been taxing gasoline for decades at rates that translate into carbon penalties of $200 to $300 per ton of CO_2. Where in Europe is the miracle fuel to replace petroleum? Where are all the zero emission vehicles? EU transport sector CO_2 emissions in 2004 were 26 percent higher than in 1990.

The Energy Information Administration analyzed the market impacts of a relatively modest $7 per ton CO_2 emission cap in the Bingaman-Spector legislation. The proposed cap decreases projected investment in coal generation by more than half.

However, it does not make carbon capture and storage economical. Would a bigger regulatory hammer do the trick? No. It would just drive more investment out of coal generation.

Regulatory climate strategies put the policy cart before the technology horse. Not until markets are capable of producing vast quantities of affordable energy without emissions would it be reasonable for Congress to consider mandatory emission cuts.

Policy makers concerned about global warming should do three things, CEI believes. First, encourage worldwide R&D investment in non-carbon emitting technologies. This should be the focus of post-Kyoto diplomacy. Second, eliminate tax and other political barriers to innovation and capital stock turnover. Third, for a fraction of Kyoto's cost, target international assistance on those threats to human health and welfare where we know how to do a lot of good for each dollar invested. This could not only save millions of lives today, it could also help developing countries become wealthier and less vulnerable to climate-related risks.

Thank you again for the opportunity to present my views. I would be happy to try and answer your questions.

[The prepared statement of Mr. Lewis follows:]

Testimony before the United States Senate
Committee on Environment and Public Works
Honorable Barbara Boxer, Chairman

On global warming issues in the power plant sector

By Marlo Lewis
Senior Fellow, Competitive Enterprise Institute
Before the Senate Committee on Environment and Public Works

Washington, D.C.
June 28, 2007

Thank you, Chairman Boxer and members of this committee for inviting me to testify today on global warming issues in the power plant sector.

I offer the following points for your consideration as the committee deliberates on global warming policy.

I. Global warming policy is not risk free.

There is a tendency in the global warming debate to see peril and risk only in mankind's enhancement of the greenhouse effect and to view global warming policy as risk free. However, there are risks on both sides of the ledger.

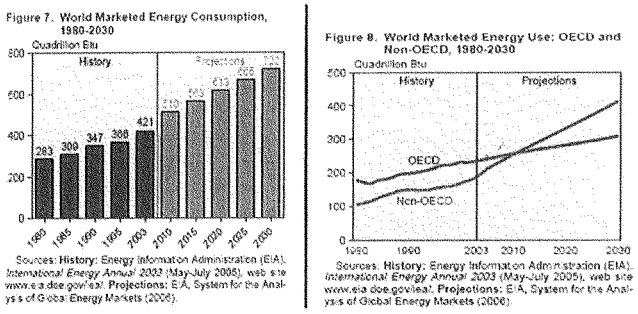
A thought experiment suggested by columnist Jonah Goldberg spotlights the often-neglected risks of global warming policy.[1] Goldberg writes:

> Earth got about 0.7 degrees Celsius warmer in the 20th century while it increased its GDP by 1,800 percent, by one estimate. How much of that 0.7 degrees can be laid at the feet of that 1,800 percent is unknowable, but let's stipulate that all of the warming was the result of our prosperity and that this warming is in fact indisputably bad (which is hardly obvious). That's still an amazing bargain. Life expectancies in the United States increased from about 47 years to about 77 years. Literacy, medicine, leisure and even, in many respects, the environment have improved mightily over the course of the 20th century, at least in the prosperous West.

To this list of achievements we might add the near quadrupling of the human population combined with substantial long-term increases in global per capita food supply.

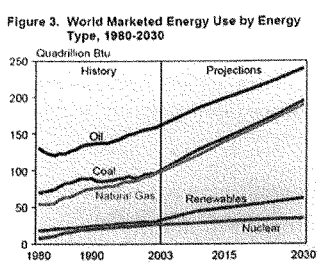
Here's the thought experiment. Suppose we had the power to impose carbon caps or taxes on previous generations. Assuming, again, that all global warming in the 20th century was due to economic activity, how much global growth would you be willing to sacrifice to avoid how many tenths of a degree of global warming? Would we be better off today if the 20th century had half as much warming but also half as much growth? I doubt anyone on this committee would answer "yes." Had there been only half as much growth, millions of our brethren today would not even exist, and the lives of millions more would be nasty, poor, and short.

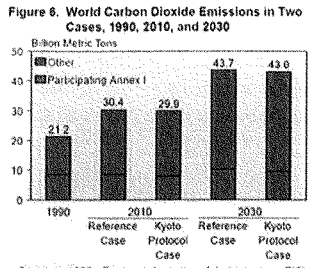
This should make us a bit circumspect when evaluating cap-and-trade proposals and other global warming initiatives. Global warming policy has a high *potential* to restrict future growth, because ours remains very much a fossil-energy-dependent civilization. In fact, demand for fossil energy worldwide is increasing. The Energy Information Administration (EIA) projects a 71 percent increase in global energy consumption between 2003 and 2030, with three quarters of the increase occurring in developing countries.[2]



World energy consumption is projected to grow 71% from 2003 to 2030, with three-quarters of the growth in developing countries. Source: EIA

Most of the increase in energy demand will be met by fossil fuels, with the result that in 2030, fossil fuels are projected to supply about 86 percent of world energy consumption—roughly the same percentage as in 2003.[3] As a consequence, and notwithstanding Kyoto, CO_2 emissions worldwide are projected to rise from 21.2 billion metric tons in 1990 to 29.9 billion in 2010 and 43 billion in 2030.[4]





Kyoto notwithstanding, fossil energy consumption and CO2 emissions increase substantially. Source: EIA

You have probably heard that China is building new coal-fired power plants at the rate of one every week to 10 days.[5] In late 2004, the *Christian Science Monitor* (CSM) reported that three countries—the United States, China, and India—are planning to build nearly 850 new coal plants, "which would pump up to five times as much carbon dioxide into the atmosphere as the Kyoto Protocol aims to reduce."[6] These new plants, the CSM article concluded, would "bury" Kyoto:

> By 2012, the plants in three key countries—China, India, and the United States—are expected to emit as much as an extra 2.7 billion tons of carbon dioxide, according to a Monitor analysis of power-plant construction data. In contrast, Kyoto countries by that year are supposed to have cut their CO_2 emissions by some 483 million tons.

Other countries are also building new coal plants:

> With natural gas prices expected to continue rising, 58 other nations have 340 new coal-fired plants in various stages of development. They are expected to go online in a decade or so. Malaysia, Japan, Indonesia, Thailand, and Turkey are all planning significant new coal-fired power additions. Germany also plans to build eight coal plants with 6,000 megawatts capacity.

A more recent article reports that Germany—yes, Kyoto-loving Germany—may build 26 new coal-fired power plants.[7] Last week *Planet Ark* reported that demand for thermal coal in Russia is expected to triple by 2020, with coal-based generation doubling its share of Russian power production from about 20 percent to 38-40 percent.[8]

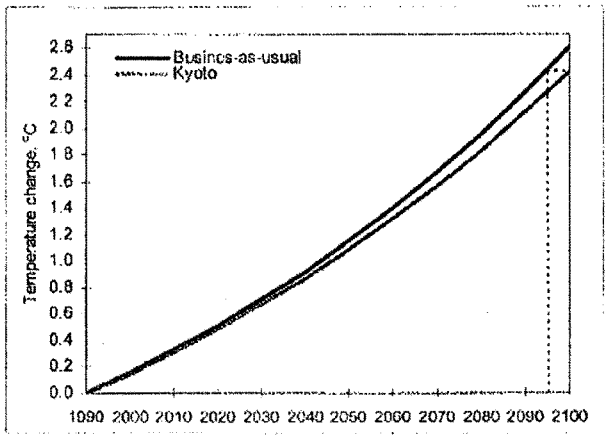
The conclusion I draw from these facts is that the economics of fossil energy in general, and coal-based power in particular, remain highly favorable compared to the alternatives.

How then could governments significantly restrict fossil energy use, especially coal-based power, and not adversely affect the health and welfare of millions?

II. Regulatory strategies like the Kyoto Protocol can achieve only inconsequential reductions in global warming and, thus, are all economic pain for no environmental gain.

Let's grant for the sake of argument that global warming is a serious problem.[9] Are regulatory strategies like the Kyoto Protocol a smart way to deal with it?

Based on favorable scientific assumptions, the Kyoto treaty would avert only 0.07°C of global warming by 2050.[10] That's too small an amount for scientists to detect. Put somewhat differently, Kyoto would postpone the arrival of a 2.6°C warming by five years—from 2095 to 2100. See the Figure below.



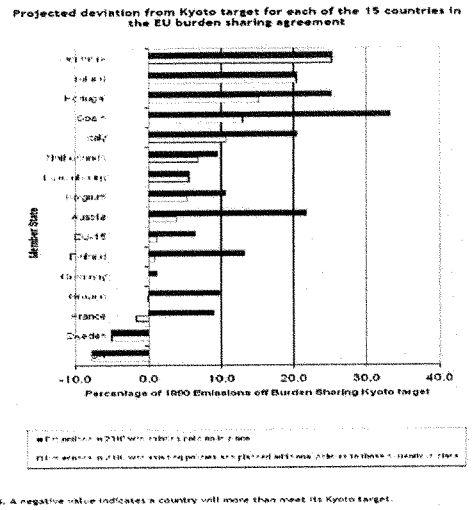
Kyoto postpones the arrival of a 2.6°C warming by five years; Source: Lomborg (2007)[11]

Similarly, Kyoto would avert only 1 cm of sea-level rise by 2050 and 2.5 cm by 2100.[12] It would have no measurable effect on hurricane strength, even if global warming makes hurricanes stronger, and none on malaria-related mortality, even if global warming increases the population at risk of exposure to malaria.[13]

However, although Kyoto would provide no discernible climate protection, it would cost the U.S. economy tens to hundreds of billions of dollars in higher energy prices, lost jobs, and lower GDP.[14]

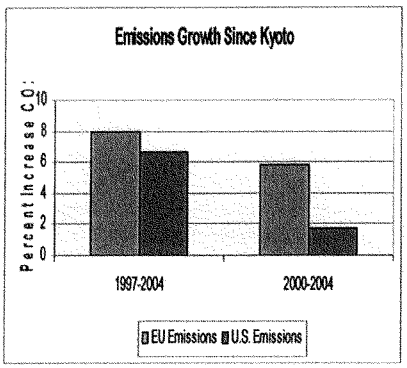
Kyoto advocates might respond that the treaty is only a "first step." But even the first step is economically onerous. Most of the EU-15 countries are not on track to meet their

Kyoto targets,[15] even though European compliance is facilitated by the dubious advantages of low economic growth and low population growth. See the Figure below.



Source: Institute for Public Policy Research, Traffic Lights Report (Dec. 27, 2005)

Ironically, although the European Union ratified Kyoto and the United States did not, EU emissions have increased more rapidly than U.S. emissions since 1997, the year Kyoto was negotiated, and since 2000.



U.S. and EU emissions growth since Kyoto; Source: EIA data[16]

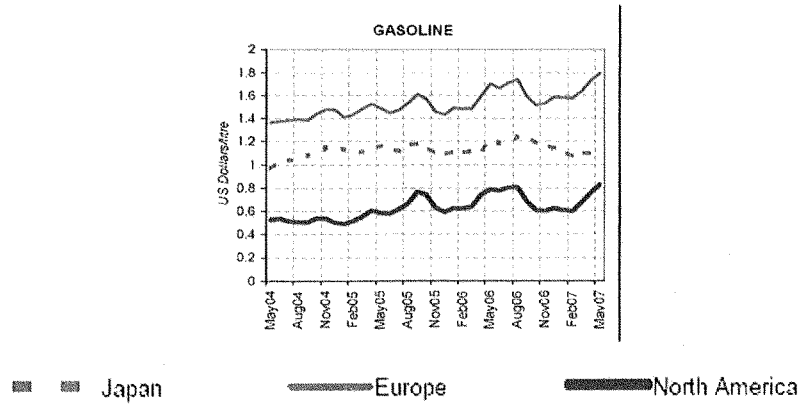
Japan and Canada are similarly failing to achieve their Kyoto targets.[17] At the end of 2005, Japan's emissions were 8.1 percent above 1990 levels. Canada's in 2004 were 26.6 percent higher than 1990 levels.

III. Penalizing fossil energy use, whether via regulatory caps or carbon taxes, is unlikely to foster the technological breakthroughs required to meet global energy needs without emissions.

A team of 18 energy experts led by New York University physics professor Martin Hoffert assessed possible technology options that might be used in coming decades to stabilize atmospheric CO_2 concentrations.[18] They examined wind and solar energy, nuclear fission and fusion, biomass fuels, efficiency improvements, carbon sequestration, and hydrogen fuel cells. The Hoffert team found that, "All these approaches currently have severe deficiencies that limit their ability to stabilize global climate." The researchers specifically took issue with the IPCC's claim that, "known technological options could achieve a broad range of atmospheric CO_2 stabilization levels, such as 550 ppm, 450 ppm or below over the next 100 years." World energy demand, they estimated, could triple by 2050. However, they found, "Energy sources that can produce 100 to 300 percent of present world power consumption without greenhouse emissions do not exist operationally or as pilot plants." Hoffert and his colleagues concluded that, "CO_2 is a combustion product vital to how civilization is powered; it cannot be regulated away."

Kyoto proponents might respond that they are not so much trying to "regulate away" CO_2 as create a market signal. Carbon penalties, they believe, will "green" energy markets, accelerating the transition to a hydrogen-solar future. Is this faith in the transforming power of carbon penalties justified?

Consider Europe's experience with motor fuel taxes. Many members of Congress think U.S. gasoline prices are too high. Yet consumers pay twice as much for gasoline in some European countries, due to high motor fuel taxes.[19] See the Figure below.[20]



In Europe, gasoline taxes may equal two and even three dollars a gallon. A one-dollar gasoline tax is roughly equivalent to a tax of $100 per ton of CO_2.[21] A three-dollar per gallon gasoline tax is an implicit $300 per ton CO_2 tax. That goes way beyond the carbon penalties contemplated in the global warming bills Congress is considering. But so far there has been no technological transformation in Europe. There is no miracle fuel. There are no zero-emission vehicles. Per capita car ownership is lower,[22] people drive smaller cars, and diesel vehicles dominate the market (because diesel fuel is taxed at lower rates than gasoline). But Europe is not one mile closer to achieving a "beyond petroleum" transport system than we are.

Indeed, despite implicit CO_2 taxes of $200 to $300 per ton on gasoline, EU transport sector CO_2 emissions in 2004 were 26 percent above 1990 levels, and are projected under current policies to be 35 percent above 1990 levels in 2010.[23]

EIA's analysis of the Bingaman-Specter draft legislation leads to a similarly dismal conclusion about the transforming power of carbon penalties in the electric power sector. The Bingaman-Specter proposal features a "safety-valve," under which emission permit prices would not exceed $7 per ton of CO_2 in 2012 and not increase by more than 5 percent annually above inflation. This relatively modest carbon penalty ends up having a huge effect on investment in coal-based electricity. Total energy from coal increases by 23 percent between 2004 and 2030, but that is "less than half the 53 percent increase projected in the reference case over the same time period." However, although high enough to deter investment in new capacity, allowance prices are "not sufficiently high to compensate for the increased capital and operating costs" of carbon capture and storage technologies. "As a result," says EIA, "power plants using carbon capture and storage are not projected to be commercially viable within the time frame."[24]

Now, you might think that if Congress just hits the power sector with a heavier regulatory hammer, utilities will invest in carbon capture and storage. There will be technological transformation. We will be a step closer to the day when we can meet people's energy needs without emissions.

I think it is far more likely that utilities will just stop building and operating coal plants. Remember, even a modest penalty of $7 per ton CO_2 cuts coal investment by more than half. Stiffer penalties would further erode the profitability of coal generation, driving investment into natural gas, nuclear, and wind—the high-cost end of today's electricity market—or perhaps out of the power sector altogether.

If anything, EIA's assessment of the Bingaman-Specter plan's impact on coal is conservative, because EIA does not model the effects on investor confidence of the political dynamic set in motion by carbon penalties.

Up to now the debate in Congress has been about *whether* to cap CO_2 emissions from power plants. Once a cap is enacted, no matter how modest to start with, there is a whole new ball game. Global warming activists will continually claim that Congress is not doing enough to save the planet. Accordingly, Congress will continually debate how

much and how fast to tighten the existing caps. The only "regulatory certainty" will be that regulatory costs will rise unpredictably. Few investors will want to put their money behind coal in such a risky investment climate.

IV. The history of the Acid Rain program *does not* support claims that substantial cuts in power plant emissions of CO_2 can be accomplished inexpensively.

We often hear that the Acid Rain cap-and-trade program established by the 1990 Clean Air Act Amendments (CAAA) shows that a similar program could reduce CO_2 emissions dramatically without decimating coal as an electricity fuel, and without significantly inflating consumer electric bills. We are told that industry estimates of the cost of sulfur dioxide (SO_2) emission permits turned out to be wildly overblown. We are assured that just as the SO_2 program did not doom coal-based power or make electricity unaffordable, neither would a carbon cap-and-trade system adversely affect U.S. fuel diversity or electricity consumers.

My testimony here draws on a forthcoming Competitive Enterprise Institute study by economist Ross McKitrick of the University of Guelph. Analogizing from the SO_2 cap-and-trade program to a global warming program is dubious for several reasons.

First, for two decades prior to enactment of the CAAA, U.S. SO_2 emissions had been falling. In fact, more than half of the post-1973 reduction in SO_2 emissions occurred before 1990. The CAAA SO_2 program built upon a steady downward trend in emissions. In sharp contrast, U.S. CO_2 emissions have risen fairly steadily since 1940, with dips of more than a year occurring only during energy crises and recessions. There is no long-term downward emissions trend to build upon.

Second, to comply with the SO_2 requirements, utilities (a) switched from using high-sulfur to low-sulfur coal and (b) installed scrubbers. Although there is low-sulfur coal, there is no low-carbon coal, and scrubbers for removing CO_2 do not exist.

What then of the claim that industry exaggerated the costs of SO_2 compliance? Industry projected that compliance costs in Phase I would run about $250 to $300 per ton. Instead, permit prices ranged from $100 to $150. One reason costs were lower than anticipated is that nobody foresaw the opportunity created by deregulation of the rail industry. Rail deregulation made it economical for eastern utilities to import low-sulfur coal from the Powder River Basin. This led to an over-investment in scrubbers, which also lowered marginal abatement costs. However, for Phase II of the program, industry forecasts were on the money. Permit prices were projected to range from $500 to $700 per ton. Prices trended upward to $500 per ton by the summer of 2004 and climbed above $1,500 per ton in late 2005 and early 2006.

In short, the SO_2 program should inspire little confidence that a CO_2 control program would preserve coal as a viable electricity fuel. McKitrick summarizes:

The factors that led to low initial costs for sulfur—a well-established downward trend in emissions, policy-induced availability of low-sulfur coal and the effectiveness of scrubbers—do not apply to CO_2. When the benefits of scrubbers and fuel source-switching were exhausted, compliance costs of SO_2 control policies were as high or higher than forecast, as was the case with the EU carbon market.

V. Cap-and-trade establishes an OPEC-like carbon cartel empowering producers to restrict supply, raise consumer prices, and reap windfall profits.

This has been the European experience. Countries allocated emissions free-of-charge to 12,000 or so large emitters. Because the governments handed out permits for more tons of CO_2 than the permit holders emitted, the system did not even reduce emissions.[25] However, that did not stop many firms, notably German utilities, from raising consumer electric bills to cover their alleged compliance costs.

Many prominent U.S. corporations—Duke Energy, Alcoa, and Goldman Sachs, to name a few—now support Kyoto-style regulation. This does not mean that regulatory climate policy is good for the economy. It means that some firms can profit—at least in the short-run—from global warming regulation.

It started with Enron! Enron was one of the most influential corporate lobbyists for Kyoto. Enron was a natural gas distributor, and Kyoto would kill coal-fired electric generation, boosting demand for Enron's product. Enron also produced wind turbines—another product whose market share would grow in a carbon-constrained world. And Enron's energy traders expected to make juicy commissions on the purchase and sale of carbon credits. An internal Enron memo enthused that Kyoto would "do more to promote Enron's business than almost any other regulatory initiative outside of restructuring the energy and natural gas industries in Europe and the United States."[26]

Enron may be defunct, but energy-rationing profiteers abound. Consider Duke Energy, which merged with Cinergy in May 2005. An October 2006 study by the Pew Center on Global Climate Change includes a table on the per-ton cost of Cinergy's various greenhouse gas reduction projects in 2004.[27] The table shows that 97 percent of Cinergy's emission reductions came from efficiency improvements in its overwhelmingly coal-fired electric generating stations. Cinergy's investment of $1.94 million in efficiency upgrades reduced the company's CO_2 emissions by 349,882 tons. This works out to a cost of $5.54 per ton of CO_2 reduced.

Duke belongs to a coalition called the U.S. Climate Action Partnership, or CAP. One of CAP's "six principles" is to "reward early action."[28] What this "principle" means is that the government should award carbon credits, applicable to a future cap-and-trade program, for emission reductions firms made "voluntarily" in the past. Now, suppose Duke is awarded early action credits for Cinergy's reductions, Congress enacts Phase I of the old McCain-Lieberman Climate Stewardship Act, and CO_2-equivalent permits sell for $15 a ton in 2010 and $45 a ton in 2025, as estimated by EIA.[29] In that case, Duke would

reap a windfall profit of between 170 percent and 712 percent.

The important point is this. Duke can cash in its early credits only to the extent that other firms are constrained by regulation buy to them. The costs those firms incur have economic impacts. If absorbed by the firms, the higher costs result in lower employment, lower wages, or less innovation. If passed on to customers, the costs increase consumer prices.

A report[30] by the Congressional Budget Office (CBO) confirms that cap-and-trade programs transfer wealth from consumers and competitors to the lucky holders of carbon credits. According to CBO, "A review of the existing literature and of the range of CO_2 policies now being debated suggests that the value of emission allowances might total between $50 billion and $300 billion per year (in 2007 dollars) by 2020."

CBO also finds that the price effects of cap-and-trade programs are "regressive in that poorer households would bear a larger burden relative to their income than wealthier households would." CBO "estimated that the price rises resulting from a 15 percent cut in CO_2 emissions would cost the average household in the lower one-fifth (quintile) of the income distribution about 3.3 percent of its average income. By comparison, a household in the top quintile would pay about 1.7 percent of its average income."

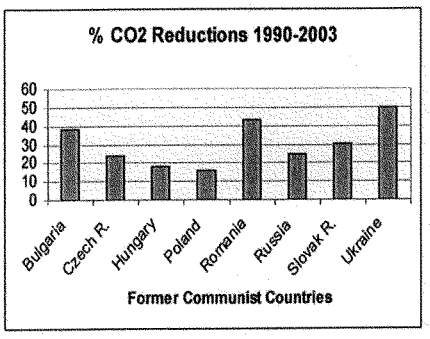
Renewable portfolio standard (RPS) programs—mandates requiring utilities to produce a specified percentage of their power from non-carbon or low-carbon energy sources—also transfer wealth from consumers and competitors to politically-favored producers. Senator Bingaman (D-NM) was pleased to announce EIA's finding that his proposed 15-percent RPS would raise consumer electric bills by less than one percent. He overlooks the wealth transfer effects. EIA estimates that a 15 percent RPS would shift about $18 billion annually from consumers to utilities.[31] EIA also estimates that the RPS will reduce power-sector CO_2 emissions by 222 million tons below the reference case in 2030. This means consumers will be paying $81 per ton of CO_2 avoided. That is significantly more than the "safety valve" price in Bingaman's cap-and-trade proposal.

There is a sure-fire way to squelch some (although not all)[32] of the rent seeking in global warming policy. Instead of allocating permits free of charge, make permits available only through competitive bidding in an auction open to all, and then prohibit permit holders from passing the costs on to their customers. That would take all the fun (and profit) out of cap-and-trade for most industry backers. It would go a long way to separate the energy-rationing profiteers from firms acting out of sincere environmental concern.

VI. Policymakers concerned about global warming should: (1) Support R&D, (2) reduce tax and regulatory barriers to innovation; and (3) target scarce international assistance efforts to save the most lives for each dollar invested.

The only countries that have substantially reduced CO_2 emissions over an extended period of time are the former Soviet Union and Eastern Europe. Their "method" was economic collapse. See the Figure below.

The main inconvenient truth in the climate debate is that nobody knows how to meet current, much less future anticipated, global energy needs with low- and non-emitting technologies. Regulatory climate strategies put the policy cart before the technology horse. Not until markets are capable of producing vast quantities of affordable energy without emissions would it be reasonable to consider mandatory emission reductions.



Percent CO_2 emission reductions of seven former communist countries, 1990-2003 Source: International Energy Agency data[33]

Everyone agrees that the solution to global warming is technology. How then should government foster technology development? Government-funded R&D is often wasteful. Nonetheless, an R&D strategy has merit, especially compared to carbon regulation and renewable energy mandates. Bjørn Lomborg recommends that all nations commit to spend 0.05 percent of GDP annually on R&D of non-carbon emitting energy technologies. A multi-lateral R&D program would have several advantages:

> This approach would cost about $25 billion a year, seven times cheaper than Kyoto and many more times cheaper than a Kyoto II. It would involve all nations, with richer nations naturally paying the larger share. It would let each country focus on its on future vision of energy needs, whether that means concentrating on renewable sources, nuclear energy, fusion, carbon storage, or searching for new and more exotic opportunities.[34]

A true "no regrets" option would be to reduce tax and other political impediments to innovation. A study by the International Energy Agency (IEA) finds that efficiency enhancements can lead to significant low-cost emission reductions in manufacturing operations. Surprisingly, some of the most efficient factories can be found in developing countries, simply because the factories are new:

> Much of the efficiency differences that have been identified can be attributed to the age of plants. New plants tend to be more efficient than older ones. As a consequence, the most efficient industries can in some cases be found in emerging economies where production is expanding. For example, the most efficient

> aluminum smelters are in Africa, and Brazil is among the most efficient cement producers. Similarly, some of the most efficient steel plants can be found in China. Industrial energy efficiency is consistently high in certain IEA member countries such as Japan, which has had active efficiency policies for decades.[35]

To accelerate efficiency improvement in the manufacturing sector, the power plant sector, and throughout the economy, policymakers should look for ways to lower the cost of replacing older plants and equipment with new capital stock. A study by the American Council for Capital Formation finds that the U.S. generally has less favorable capital cost recovery rules for electric generation, electric transmission and distribution, and petroleum refining than many of our trading partners. For example, in the rate of capital recovery for investment in combined heat and power systems, the U.S. lags behind all of the other countries surveyed (Brazil, Canada, China, Germany, India, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, and Taiwan).[36] Sometimes the best thing government can do is get out of the way.

Lomborg makes another reasonable recommendation based on the insight that it is not global warming per se that is worrisome, but the possible aggravating impacts of global warming on a number of pre-existing threats (for example, heat waves, drought, malaria, floods, hurricanes). Fortunately, although we do not know how to stop global warming at reasonable cost, we do know a lot about reducing social vulnerability to the threats that global warming may exacerbate.

All regulatory climate policies involve incurring relatively large costs in the present for relatively small or speculative benefits in the future. For a fraction of Kyoto's cost, industrial nations could dramatically reduce current death and suffering from HIV/AIDS, malaria, water-borne disease, and malnutrition. Alleviating those problems would have the added benefit of making poor countries wealthier and thus better able to manage the risks of climate change.

Similarly, changes in building codes, zoning, and government insurance programs could do much more to reduce hurricane-related risk, at far less cost, than any emission control program.[37]

Lomborg, working with four Nobel economists, other experts, and college students (70 percent from developing countries), ranked alternative investments to solve global problems according to how many lives could be saved and at what cost. The ranking—known as the Copenhagen Consensus—lists Kyoto and other climate regulation among the "bad investments." The Figure below summarizes the Copenhagen Consensus:

	Challenge	Opportunity
Very Good Opportunities	1 Diseases	Control of HIV/AIDS
	2 Malnutrition	Providing micro nutrients
	3 Subsidies and Trade	Trade liberalisation
	4 Diseases	Control of malaria
Good Opportunities	5 Malnutrition	Development of new agricultural technologies
	6 Sanitation & Water	Small-scale water technology for livelihoods
	7 Sanitation & Water	Community-managed water supply and sanitation
	8 Sanitation & Water	Research on water productivity in food production
	9 Government	Lowering the cost of starting a new business
Fair Opportunities	10 Migration	Lowering barriers to migration for skilled workers
	11 Malnutrition	Improving infant and child nutrition
	12 Malnutrition	Reducing the prevalence of low birth weight
	13 Diseases	Scaled-up basic health services
Bad Opportunities	14 Migration**	Guest worker programmes for the unskilled
	15 Climate	Optimal carbon tax ($25-300)
	16 Climate	The Kyoto Protocol
	17 Climate	Value-at-risk carbon tax ($100-450)

Table 1 Global priority list from Copenhagen Consensus, 2004.[17]

Conclusion

Regulatory climate strategies impose relatively large costs in the short term for relatively small or speculative benefits many decades hence. Such policies have a high potential to exploit consumers and stifle economic growth.

Rather than put the policy cart before the technology horse, policymakers concerned about global warming should encourage worldwide R&D investment in non-carbon-emitting energy technologies. They should eliminate tax and other political barriers to market-driven innovation and capital stock turnover. They should also target international assistance efforts where each dollar invested can do the most good, recognizing that carbon suppression policies are a poor investment of inescapably limited resources.

Thank you again for opportunity to present my views. I would be happy to try and answer any questions you may have.

Bio

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RESPONSES BY MARLO LEWIS TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. Some people say we can learn the lessons of the failed Kyoto cap and trade approach in setting up our system so that we don't make the same mistakes. Do you think that is correct or is the scheme itself fundamentally flawed?

Response. Cap-and-trade schemes are inherently vulnerable to political manipulation, because emission permits are politically created assets. In international trading systems, each government has an incentive to practice carbon mercantilism—skew baselines and allocations to increase domestic firms' supply of permits vis-à-vis their foreign competition. In Europe's Emission Trading System (ETS), member states handed out permits for more tons of carbon dioxide (CO_2) than their firms were emitting. When these shenanigans came to light, carbon credit prices cratered. Outright cheating—false reporting of emissions data—may also occur in countries like Russia, where institutional safeguards for transparency and accountability are weak.

A U.S. cap-and-trade program would undoubtedly be more rigorous and accountable than the ETS. But price volatility would still be a problem, as the history of the U.S. sulfur dioxide (SO_2) cap-and-trade program shows. Economist William Nordhaus observes that, "SO_2 trading prices have varied from a low of $70 per ton in 1996 to $1,500 per ton in late 2005. SO_2 allowances have a monthly volatility of 10 percent and an annual volatility of 43 percent over the last decade."[1] A recent AEI paper also points out that, "Over the last 3 years, SO_2 permit prices have risen 80 percent a year, despite the EPA's authority to auction additional permits as a 'safety valve' to smooth out this severe price volatility."[2]

In a forthcoming CEI paper, University of Guelph economist Ross McKitrick explains that reducing CO_2 is inherently more difficult than reducing SO_2; hence that price volatility is likely to be greater under a carbon cap-and-trade program. Sulfur dioxide emissions had been trending downward for almost two decades before the SO_2 trading program was enacted. Technology for removing SO_2 (scrubbers) was proven and widely available. Utilities had the option to purchase low-sulfur coal. In contrast, CO_2 emissions have been trending upwards for decades, CO_2 scrubbers do not exist, and there is no low-carbon coal.

For the same reasons, a U.S. carbon cap-and-trade program would raise consumer electricity prices even if U.S. utilities behave better than did their German counterparts. Under the ETS, German utilities obtained most of their permits free-of-charge. They nonetheless raised rates to cover their alleged compliance costs.

One thing is clear. The allocation rules will reflect special interest politics, not the general interest of consumers in affordable energy. The hearing provided a telling example.

Peter Darbee, chairman and CEO of PG&E in California, advocated a cap-and-trade scheme that allocates emissions permits based on each emitter's historical level of energy produced rather than on its historical level of emissions. This would favor utilities (like PG&E!) that don't burn much or any coal and instead already rely on higher-priced lower-emitting fuels.

In contrast, Jim Rogers, chairman and CEO of Duke Energy, advocated a cap-and-trade scheme that allocates permits based on each emitter's historical level of emissions rather than on its historical level of energy produced. This would favor companies (like Duke!) that burn a lot of coal. They would in effect be paid to switch to producing more expensive electricity from lower-emitting fuels.

Perhaps the only allocation scheme both PG&E and Duke would regard as "fair" is one that lets them pass compliance costs onto consumers.

Some say we could avoid the pitfalls of the ETS by auctioning emission permits among the relatively small number of "upstream" firms that sell coal, oil, and natural gas rather than allocating the permits free-of-charge to thousands of large "downstream" emitters. An upstream cap is administratively simpler. However, an auction would take much of the fun and profit out of cap-and-trade. Many firms who lobby for cap-and-trade do so in the expectation that they will "earn" credits for actions already taken ("credit for early action") or receive credits *gratis* for doing what they do anyway.

Question 2. Explain further why penalizing fossil fuel use through carbon mandates won't encourage new technologies.

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Response. Small carbon penalties are unlikely to create profit potentials big enough to justify major R&D investment in unproven technology. On the other hand, big carbon penalties can stifle the growth on which R&D programs ultimately depend. To believe in the technology-transforming power of mandates, one must have a strong faith in the wisdom of central planners—their ability to hit the sweet spot between penalties that are too light and penalties that are too heavy.

An example in my written testimony illustrates the point. EIA projects that the $7 per ton carbon penalty in the original Bingaman-Specter draft legislation would reduce new investment in coal generation by more than half. However, the penalty would not make investment in carbon capture and storage (CCS) economical. A bigger regulatory hammer might do the trick—but only if people were still willing to invest in coal! If a $7 per ton penalty drives out more than half of all new coal investment, tougher penalties might well kill coal as an electricity fuel. That is especially likely once investors realize that cost "certainty" is impossible, for reasons discussed next.

Question 3. Additional comment on cost "certainty."

Response. The National Commission on Energy Policy (NCEP) argues that a "safety valve"—a statutory ceiling on the per-ton cost of carbon reductions—should remove the fear that cap-and-trade would harm the U.S. economy. A safety valve, says NCEP, puts an end to years of sterile, my-model-is-better-than-your-model, debate over how much cap-and-trade would cost. We know in advance the maximum cost of carbon reductions—it is spelled out in the statute.

This argument is dubious for three reasons. First, as noted above, a similar "safety valve" did not prevent large price spikes in the SO_2 trading program. Second, no Congress can bind a future Congress, and once a new form of economic intervention is adopted, the door is open for more aggressive interventions of the same sort. The Federal income tax, which originally was supposed to apply only to the very rich, is the prime example. Another example with immediate relevance is the 7.5 billion gallon biofuel mandate, enacted in 2005. Less than 2 years later, Congress was debating mandates five times as large.

Third, none of the cap-and-trade bills under consideration would prohibit EPA from adopting national ambient air quality standards (NAAQS) for CO_2. Absent such prohibition, a NAAQS rulemaking for CO_2 is an almost inevitable outcome of the Supreme Court's decision in *Mass* v. *EPA*. The costs of a NAAQS program for CO_2 are potentially limitless.

In *Mass* v. *EPA*, the Court told EPA to consider regulating CO_2 emissions from new motor vehicles under Section 202 of the Clean Air Act. This sets the stage for a NAAQS rulemaking.

EPA's first step in regulating an air pollutant under Section 202 is to make a "judgment of endangerment." Such a regulation must be based on an official judgment that emissions of said pollutant "endanger public health or welfare." Section 202 directs EPA to take account cost and technological feasibility when setting emission standards for motor vehicles. That is why plaintiffs argued that CO_2 emission standards for cars would not harm the auto industry.

What plaintiffs conveniently neglected to mention is that an endangerment finding for CO_2 under Section 202 would trigger regulatory action under other Clean Air Act provisions. The most important is Section 108, the cornerstone of the NAAQS program. Whereas Section 202 sets emission rate (grams per mile) standards, Section 108 sets pollution concentration (parts per million) standards. That is, a NAAQS specifies how many parts per million (or billion) of a substance is allowable in the ambient air. The NAAQS program requires states to adopt policies that will reduce concentrations of the pollutant of concern to the allowable level.

And here's the kicker. In *Whitman* v. *American* Trucking, the Court said EPA may not take cost and feasibility into account when setting NAAQS.

In short, *Mass* v. *EPA* created a regulatory Pandora's Box. The Kyoto Protocol would barely slow the increase in CO_2 levels, yet could cost the U.S. economy hundreds of billions of dollars annually. One prominent scientist guesstimated that it would take "thirty Kyotos" to stabilize atmospheric CO_2 concentrations at a safe level. Plaintiffs in *Mass* v. *EPA* argued that current CO_2 levels endanger public health and welfare.

So if EPA were to develop NAAQS for CO_2, the agency would face enormous pressures to set the standard below current atmospheric levels. However, there is no known way to lower atmospheric levels or even freeze them in place short of massive de-industrialization.

That the winning plaintiffs in *Mass* v. *EPA* viewed their lawsuit as a step toward economy-wide CO_2 controls under the NAAQS program is no mere matter of logical inference. In 2003, three of the State AG plaintiffs, including lead attorney Tom

Reilly of Massachusetts, filed a notice of intent to sue EPA unless it initiated a NAAQS rulemaking for CO_2.

House Energy and Commerce Committee Chairman John Dingell's discussion draft legislation would have forestalled a NAAQS rulemaking, perhaps indefinitely. Dingell argued—correctly—that vehicular CO_2 standards are fuel economy standards by another name, and only one agency has the expertise to administer fuel economy standards: the National Highway Traffic Safety Administration (NHTSA). By reasserting NHTSA's sole jurisdiction over fuel economy regulation, Dingell's bill would have denied EPA the opportunity to make a judgment of endangerment about CO_2. That in turn would have kept EPA from pulling the regulatory trigger that starts a NAAQS rulemaking. But under pressure from Chairman Boxer, Speaker Pelosi, Chairman Waxman, Governor Schwarzenegger, and others, Dingell shelved his bill.

The bottom line: None of the climate bills Congress is debating can provide even the semblance of cost certainty, because none of the bills prohibits EPA from regulating CO_2 under the NAAQS program.

Thank you again for the opportunity to present my views.

Senator BOXER. Thank you, sir.

Mr. Murray, we welcome you. You are chairman, president and CEO of Murray Energy Corporation.

STATEMENT OF ROBERT E. MURRAY, CHAIRMAN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, MURRAY ENERGY CORPORATION

Mr. MURRAY. Thank you, Chairman Boxer and members of the committee.

At the outset, I want to congratulate the majority of this party and the Senators for picking three electric utilities that are outside the mainstream beliefs of the electric utility industry in the country. These three utilities are three of the four that have joined the U.S. Climate Action Partnership that advocate cap and trade. Cap and trade is a misnomer for people that don't know what they are talking about. It will destroy the American economy and it will depend on an international global trading marketplace, where under the Kyoto Protocol, which has been a farce, the other countries of this world who want to take economic advantage of us have already said they will cheat.

So I want to make it clear, these three and the other ones that belong do not represent the mainstream electric utilities in this country. But I congratulate the majority for having them here.

Climate change, or the so-called global warming issue, is a human one for American citizens, as the present courses of action being proposed by the U.S. House and Senate members and some Republicans will result in little or no environmental benefit, but will definitely destroy the lives or quality of life of millions of working American families and citizens on fixed incomes who depend on low-cost electricity for the maintenance of their jobs and living standards. Frankly, I feel very threatened about this, and afraid for these people who only want to work in honor and dignity.

These global warming proposals will kill; Johns Hopkins says up to 150,000 premature deaths every year. Reducing carbon dioxide emissions will impact our poorest families the worst. Raising energy costs will cost American jobs. The legislation you have proposed to date will lead to the deterioration of the American standards of living and accelerated exportation of more of our jobs to China and developing countries, who have already repeatedly ad-

vised, as recently as last week, June 21, that they were not going to do anything about their carbon emissions.

Remember, Senators, this is supposed to be a global warming issue, not a U.S. warming issue. All you are doing with this draconian legislation is destroying the families' standards of living, the ability to have jobs, increase the costs to people on fixed incomes, and export jobs to China who have already said they are not going to do anything about their emissions.

I don't buy that argument that the United States has to take the leadership. What? In destruction of more jobs? In the exportation of more jobs? Let's get real. You can't do this without worldwide participation, and you are not going to have it. All you are going to do is destroy American families and people on fixed incomes, their standard of living. It may not happen today, but they will get wise to it. And majority party, it will be the legacy that you leave for America.

The science of global warming is suspect. But there is no question what will happen to people on fixed incomes and American working families, 3 million of them to 4 million, according to Penn State. You know, Gore touts that Rachel Carson was his role model. She led to the banning of DDT, she killed millions of human beings around the world, no question about it. Now we have Albert Gore out there doing the same thing.

But is it going to be your legacy? Because I can tell you, Senators, that Lieberman bill, with McCain, destroys the American economy. Even the Bingaman-Spector bill will dial out 52 percent the lowest cost electricity in the United States, which is coal-fired, and destroy our economy.

It is virtually impossible to create a job today in our economy, and I don't know how many of you have actually created a job, but it is hard. But I can tell you that losing high-paying jobs by curtailing coal's use and the lowest cost 52 percent of electricity in America, will be extremely destructive. I don't need Albert Gore's computer model to tell me this. I saw it under the Clean Air Act Amendments of 1990. I saw a families separated, marriages broken up, I saw lives destroyed, I saw communities disrupted that will never come back in Ohio; 36,000 jobs in Ohio alone with the Clean Air Act Amendments.

Some of the elitists in this country and many in our congressional leadership today, particularly from California and New England, and the entertainment industry, including Mr. Gore, who cannot tell fact from fiction, have demonstrated an Olympian detachment from the impacts of draconian climate change. For them, the jobs and dreams destroyed as a result will be nothing more than the statistics and the cares of other people. The consequences are abstractions to them, but they are not to me. Because I can name many of the thousands of Americans whose lives will be destroyed by this ill-conceived global goofiness.

It is a human issue, not just an environmental one.

[The prepared statement of Mr. Murray follows:]

STATEMENT OF ROBERT E. MURRAY, CHAIRMAN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, MURRAY ENERGY CORPORATION

We thank the Members of the Senate Environment and Public Works Committee for the opportunity to provide this testimony today.

The climate change, or so-called "global warming", issue is a human one for American citizens, as the present courses of action being proposed by the U.S. House and Senate Majority Members and some Republicans will result in little or no environmental benefit, but will definitely destroy the lives or quality of life of millions of working American families and citizens on fixed incomes who depend on low cost electricity for the maintenance of their jobs and living standards. We feel very threatened, and frankly afraid, for these people, who only want to work in honor and dignity and have an acceptable quality of life, from what is going on in the Congress.

Raising energy costs, as this Congress seems intent on accomplishing, will kill American people. A Johns Hopkins University study revealed that replacing three-fourths (¾) of United States coal-based energy with higher priced energy will lead to one hundred fifty thousand (150,000) extra premature deaths annually, and with no benefit to the global environment.

Reducing carbon dioxide emissions will impact our poorest families the hardest, according to a recent report by the Congressional Budget Office. A 15 percent (15 percent) reduction in carbon dioxide emissions under a so-called cap and trade emissions system, a euphemism for politicians and many others who do not understand the subject and that it cannot work, will cost the poorest of our citizens 3 percent (3 percent) of their annual household income. The 15 percent (15 percent) reduction will cost the poorest 20 percent (20 percent) of Americans twice as much as the cost to the richest 20 percent (20 percent), as a percentage of total income. Usually, you congressional leaders in the Majority would condemn this as heartless and unconscionable.

Rising energy costs will also cost American jobs. The hysterical and out of control climate change or global warming issue, and the legislation that you have proposed, will lead to the deterioration of the American standard of living and the accelerated exportation of more of our jobs to China and other developing countries, which have repeatedly advised, as recent as last week, that they will not limit their carbon dioxide emissions.

According to a Pennsylvania State University study, replacing two-thirds (⅔) of United States coal-based energy with higher priced energy will cost America three million (3,000,000) jobs, with an upward estimate of possibly four million (4,000,000) American livelihoods.

Albert Gore touts that his role model has always been Rachel Carson, with her picture on his wall, who led the environmental movement to ban DDT. She and her environmental followers killed millions of human beings around the World with the ban on DDT, which has since been found by the World Health Organization to be very safe to humans in controlling global epidemics.

It seems to us that the leadership of this Congress, with the support of the Majority of this Committee and some Republicans, are intent in helping Mr. Gore and those of his ilk in achieving his unquestionable legacy, which will be the destruction of American lives and more death as a result of his hysterical global goofiness, with no environmental benefit. This then will be your legacy, also, as our current congressional leadership indicates from your statements and actions to date.

We do not know how many Members of the Congress, and particularly the Democrat Majority, have actually ever created a job for anyone. I have created three thousand three hundred (3,300) primary jobs and up to thirty-six thousand (36,000) secondary ones, according to The Pennsylvania State University, from a mortgaged home, and I can tell you that it is virtually impossible to do so today in our great country due to difficulties imposed by our own government at every turn.

From your statements and actions to date, few of our congressional leaders are giving adequate attention to the destruction that we will see for American working people and for those on fixed incomes from all of the energy and climate change proposals that have been discussed, introduced, or enacted in the House and Senate to date.

We are losing high paying manufacturing jobs in America to foreign countries at a rapid rate. The economic havoc that will be wrought on our country as a result of curbing coal's use, which accounts for the lowest cost and fifty-two percent (52 percent) of our electric generation, will be beyond comprehension.

I do not need one of Albert Gore's computer models to tell me this, as I saw what the enactment of the Clean Air Act Amendments of 1990 by this Congress did to the lives of many Americans. It resulted in the closure of one hundred eighteen (118) mines and the elimination of thirty-six thousand (36,000) primary and secondary jobs in Ohio alone. Some of these impacted communities will never recover. Families separated, some were impoverished, and many lost their homes because of legislation that the Majority in this Congress and the environmentalists call a "suc-

cess". Again, I did not learn of this destruction from computer models—I lived it and saw it firsthand. Climate change is a human issue.

Some wealthy elitists in our country and many in our congressional leadership, particularly from California and New England, and in the entertainment industry, including Mr. Gore, who cannot tell fact from fiction, have demonstrated an Olympian detachment from the impacts of draconian climate change policy. For them, the jobs and dreams destroyed as a result will be nothing more than the statistics and the cares of other people. The consequences are abstractions to them. But, they are not to me, as I can name many of the thousands of American citizens whose lives will be destroyed by these elitists' ill-conceived "global goofiness" campaigns.

It appears that the leadership of this Committee and of this Congress are attempting to export the draconian, so-called "global warming" measures, already enacted in California and proposed in some New England states, to the remainder of America. The residents of these states have not yet realized the cost to them of these actions. When they do, I would not want the legacy that the politicians from these areas, including some from your Majority, seem intent on leaving. The Pennsylvania State University study also shows that if coal production is curtailed by two-thirds (⅔) in America, California, itself, will lose fifty-eight million dollars ($58,000,000) annually in economic activity, and households will see an income decline of twenty-two million dollars ($22,000,000) per year. Most especially, three hundred thirty-nine thousand (339,000) Californians will lose their jobs. The nearly one million (1,000,000) person exodus from California last year is just the beginning. No business owner will ever consider choosing to site in California, because we can all, including those producing the economic studies, see the devastating economic decline that is imminent there, as well as in New England, from their actions and proposals.

While California will be adversely affected, the Central United States will be devastated from the curtailing of coal production, as this same study estimates that at least one million five hundred thousand (1,500,000) jobs will be lost in Arkansas, Iowa, Kansas, Louisiana, Minnesota, Missouri, Nebraska, Oklahoma, and Texas, alone. Also, the survival of the entire railroad industry in our country will be threatened.

The most "inconvenient truth" is that we do not know how to meet current, much less anticipated future, United States and global energy needs with low-and non-emitting technologies. Carbon penalties will suppress economic growth, rather than catapult human civilization into a "beyond petroleum" era. Until markets can actually supply large quantities of affordable, emissions-free energy, Congress should not be debating carbon caps, carbon taxes, or carbon emissions standards. The Majority seems to have taken the position that we do not need science or technology, because we are going to have legislation. Again, we are very threatened and afraid for all Americans on fixed incomes and our workers as a result of many of the statements and actions of this House and Senate. It is time that common sense be introduced into this hysterical, out of control, climate change debate, which alleged phenomenon, to our Nation's best scientists, is based on faulty science. While the science is uncertain, the congressional leadership's proposals and statements to date will definitely result in devastating economic hardship to our families' lives.

Remember, China announced last winter, and again June 21, just this past week, that they are not going to do anything about their carbon dioxide emissions post-Kyoto Protocol in 2012, nor have they done anything to date. According to a new study released by The Netherlands Environmental Assessment Agency, China's emissions surpassed those of the United States in 2006. By 2020 China, alone, notwithstanding the other G–77 nations, will consume five (5) times as much coal as the U.S. Thus, all of your proposals will simply export more American jobs to the developing countries, destroy the lives of many Americans, particularly those in manufacturing and on fixed incomes, and actually add more carbon dioxide emissions to the earth's atmosphere. China is currently bringing a new, 500 megawatt, coal-fired power plant on-line every week, and four hundred fifty-five (455) of them are in the planning stages.

Remember, the U.S. economy is uniquely vulnerable to schemes for capping coal use. Europe is not, which explains why Europeans pay little for capping carbon emissions and why they are so eager for us to cap ours. I can understand the incentives of European leaders in the competitive global marketplace. What we cannot understand is the congressional indifference.

If climate change is really a global issue, what is needed is the serious public investment of several billion dollars per year of taxpayer money over the next two (2) decades in its research. This investment will cost a trifle of any other course of action and will be productive.

While they are at it, the elitists who propose that we make do with less coal should explain the consequences to our national security. We are a country that is dangerously dependent on foreign energy—and at a time of fierce new competition from foreign rivals for the World's dwindling supply of oil. A decade ago, China was a net oil exporter. Last year, China's oil imports accounted for forty percent (40 percent) of the entire increase in global oil production.

Unilaterally restricting our reliance on coal takes us exactly in the wrong direction. It is naive and irresponsible for policymakers to think that an energy-dependent country like ours will not be vulnerable to foreign influence in the decades ahead.

Coal production is fundamental to the United States economy. Another Pennsylvania State University study found that, in 2015, if left alone, coal could contribute one trillion dollars ($1,000,000,000) to the United States economy and provide six million eight hundred thousand (6,800,000) jobs and three hundred sixty-two billion dollars ($362,000,000,000) in household income.

Unfortunately, there are a number of American companies, through the so-called U.S. Climate Action Partnership, that are promoting constraints on coal use and an irrational cap on carbon dioxide emissions to achieve greater profits and other competitive advantages, which transparent motivations are not in the best interests of American citizens.

These Companies include: General Electric, DuPont, Caterpillar, American International Group, General Motors, Dow Chemical, Johnson & Johnson, PepsiCo, Marsh, Boston Scientific, Alcoa, Alcan, Siemens, British Petroleum, Shell Oil, ConocoPhillips, Excelon, Entergy, PG&E, and PNM Resources.

Their proposed "cap and trade" scheme will not work and will be devastating for our country. "Cap and trade" would depend on an honest global emissions trading market where other countries will not cheat. It is "smoking opium" to think that our competitors will not cheat, as they already have under the farce called the Kyoto Protocol. Remember, leaders, the issue here is supposed to be "global warming", not "U.S. warming".

Again, these Companies have demonstrated the willingness to devastate the overall American economy for their own short term gains. Americans who are on fixed incomes or who depend on low cost electricity for their jobs to be competitive in the global marketplace had better be wary of these other American companies and their profit and competitive advantage motives.

In addition to these un-American Companies, we also have (1) nuclear power and natural gas producers looking for a larger share of coal's electricity market; (2) environmental groups hoping deceitful alarmism will scare gullible, guilt-ridden consumers and entertainers into filling their coffers; (3) news media fear mongers seeking higher ratings and newspaper sales; and (4) academics and think-tank know-it-alls eager to climb aboard the latest grant money train no matter where it is headed.

Carbon dioxide is a combustion product vital to how civilization is powered. It cannot be legislated or regulated away. Without drastic technological breakthroughs, it is not possible to stabilize atmospheric carbon dioxide emissions, even if it were necessary, and meet global energy demands. The only way to reduce emissions over the next two (2) decades, according to the most reliable sources, is to force Americans to use less energy than at present, much less.

Even the Bingaman/Specter legislation proposed will cut U.S. coal-fired electricity generation by two-thirds (2/3), according to the Energy Information Administration in a report published this year. The policy being advocated to prohibit coal fired power plants without carbon capture and sequestration technology will simply result in future blackouts and severe job destruction in our country. In a recent study by the Massachusetts Institute of Technology entitled "The Future of Coal", it is estimated that it will take eight (8) years and up to two hundred million dollars ($200,000,000) just to demonstrate the economic, environmental and technical performance of large scale carbon capture and storage technology. The study also shows that, at best, coal use will be less than half that of a no-cap case, and this would be disastrous.

We need to be realistic. The one billion five hundred million (1,500,000,000) tons of carbon dioxide, which likely is not contributing to any global warming, produced in the United States each year is equivalent to three (3) times the weight and one-third (⅓) the volume of all natural gas transported by the United States pipeline system. Our country does not have, and cannot have, the infrastructure to support the carbon capture, transportation and sequestration technology advocated by virtually every bill introduced in the Congress to date. Also, the liability and property rights issues that will be generated for the carbon dioxide sequestration will make it impossible to implement, again, with no environmental benefit.

We can tell you for certain that your global warming debate in the Congress, unfortunately for our country, has already very adversely affected the perceptions of and investment in the United States coal industry. We are being weakened daily by these discussions, and America cannot be without the lowest cost fifty-two percent (52 percent) of our electricity that the industry provides. No doubt, many coal producers will not survive the discussions of the draconian regulations that are taking place. You cannot legislate the policy cart before the technology horse, which you are trying to do.

We are already seeing the adverse affects of your global warming policies in the ethanol debacle, the use of which this congressional majority, this past week, demanded be drastically increased. Yet, ethanol from corn is twenty-six percent (26 percent) fuel inefficient, as it takes 1.26 times as much fossil fuel energy to make a gallon of cellulosic ethanol than that which we get out of it. Also, it depends on a fifty-one cent ($0.51) per gallon subsidy from the taxpayer. As a result, you in Congress have now raised the cost of steaks by five and one-half percent (5.5 percent) from a year ago, and chickens are up seven and seven-tenths percent (7.7 percent). According to a new survey by the Food Marketing Institute, more than forty percent (40 percent) of American consumers are changing their food buying habits in response to high energy prices. People are being forced to make the decision between the purchase of food or heat. The real cost of ethanol is far higher to Americans than the fossil fuels that you are attempting to eliminate and with no environmental benefit.

The American family is about to be a victim of one of the biggest con jobs in the history of this Republic. Congress could soon arbitrarily restrict the use of coal, our Nation's most abundant and affordable fuel for generating electricity. This leadership does not appreciate the pain that such a program will inflict on ordinary Americans, but when they start feeling it, it will be your legacy.

For the many reasons provided herein, and others that could not be presented today, the errant leadership of the U.S. Congress must stop the dishonest, hysterical, out of control campaign to enact the currently proposed climate change legislation that will result in no environmental benefit, but will destroy the very lives of our citizens on fixed incomes and America's working families.

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• The Johns Hopkins study (Harvey Brenner, "Health Benefits of Low Cost Energy An Econometric Case Study," Environmental Manager, November, 2005) found the following:

> *An econometric model was applied to a hypothetical regulatory case study, whereby U.S. coal was replaced by alternative higher-cost fuels such as natural gas for the purpose of electricity generation. The model was used to estimate the premature mortality associated with increased unemployment and reduced personal income. The adverse impacts on household income and unemployment due to the substitution of higher-cost energy sources were estimated to result in 195,000 additional premature deaths annually.*
>
> *The results from this hypothetical case study may be scaled to apply to specific policy initiatives affecting the U.S. coal-based electricity generation sector. For example, the U.S. Department of Energy's Energy Information Administration ("EIA") estimates that climate change bills currently before the U.S. Congress - such as Senate Amendment No. 2028, rejected by the Senate in 2003 and again in June, 2005 - could result in the displacement of up to 78% of U.S. coal-based electricity generation with higher-cost energy sources. The methodology employed here suggests that, absent any direct mitigation measures to offset expected decreases in employment and income, implementation of such measures could result in an annual increase of premature mortality rates by more than 150,000 Americans.*

• The Penn State study (Rose, A.Z., and Wei, D., "The Economic Impact of Coal Utilization and Displacement in the Continental United States, 2015," The Pennsylvania State University, July, 2006) found the following:

> *Assigning equal weight to each of the two energy price scenarios, we estimate the U.S. coal-fueled electric generation in 2015 will contribute:*
>
> *• $1.05 trillion (2005 $) in gross economic output;*
> *• $362 billion in annual household incomes; and*
> *• 6.8 million jobs.*
>
> *We also estimated the prospective net economic impacts of the "displacement" of coal-fueled electricity generation at assumed levels of 66% and 33% from a projected 2015 base.*
>
> *These levels of displacement are consistent with some of the potential impacts of major environmental policy initiatives in climate change or other areas. In these cases, we again calculated backward linkage and price differential effects to determine potential negative impacts on each state's economy.*
>
> *Additionally, we calculated potential positive economic benefits due to the operation of replacement electricity generation of various types. In all states, the net effect of*

displacing coal-based electricity was negative for the "high-price" scenarios, and, in nearly all states, the net effect was negative for the "low-price" scenarios.

Assigning equal weight to the high- and low-price scenarios, we estimate the average impacts of displacing 66% of coal-fueled generation in 2015 at:

- *$371 billion (2005 $) reduction in gross economic output;*
- *$142 billion reduction of annual household incomes; and*
- *2.7 million job losses.*

Assigning equal weight to the high- and low-price scenarios, we estimate the average impacts of displacing 33% of coal-based generation in 2015 at:

- *$166 billion (2005 $) reduction in gross economic output;*
- *$64 billion reduction of annual household incomes; and*
- *1.2 million job losses.*

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RESPONSES BY ROBERT E. MURRAY TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. A lot of people seem to think we don't need coal and we can keep the lights on and air conditioners running with natural gas or wind power. In short, they think coal is obsolete. Can you tell us why these people are wrong?

Response. Coal remains the most abundant and affordable energy resource available to the United States. The U.S. Energy Information Administration ("EIA") estimates that, by 2030, fifty-seven percent (57 percent) of all electricity generated in the United States will come from coal, if the industry is not destroyed by the current intentions of some in the Congress to enact so-called "global warming" legislation.

The major argument behind coal's continued use in our country is national population growth and rapid development in the Southeast and West. A growing population demands more energy, and, as a result, the EIA estimates that total U.S. energy consumption will grow by forty-one percent (41 percent) by 2030. Also, electricity consumption is projected to grow to 5.5 billion kilowatt hours from the current 2.1 billion kilowatt hours in this timeframe.

The average delivered price of coal—owing to its abundance and accessibility in the United States—has remained stable while other fuel sources have experienced price increases due to increased production costs, larger profit margins, geo-political instability, resource availability, and the state of America's import infrastructure. Indeed, electricity manufactured from natural gas now costs at least four (4) to five (5) times the cost of electricity from coal, with generation from nuclear, and particularly renewable, sources costing even more. Rightly, coal has underpinned the growth of the U.S. gross domestic product since the 1970s.

Coal's stability and impact on the economy must be emphasized. Coal is not reliant on the natural fluctuations of wind and sun, and does not generate a harmful waste by-product that requires long-term storage. The 240-year supply of coal in the United States makes it the ideal energy source to power our homes, our businesses and industries and—in the not-too-distant future—our vehicles.

If coal is constrained through a precipitous climate change or renewable portfolio standard policy, energy options become limited. The EIA estimates that in a scenario where coal use is constrained, the consumption of energy from renewable sources changes only slightly from current levels. Capital costs, regional characteristics and production limitations combine to limit the use of renewable sources such as wind, geothermal or solar. In the EIA base case, the outlook is actually for the share of renewable fuels in the power generation sector to remain flat—at nine percent (9 percent)—and for nuclear fuel's share to actually fall.

By the end of the EIA forecast period (2030), the percentage of electric power generated by fuel type is as follows:

Coal—54 percent
Nuclear—4 percent
Renewables—6 percent
Natural gas—36 percent

There are no other options than coal for low cost electricity generation that will allow American's manufacturers to be competitive with their products in the global market place and to hold down electric rates for our citizens on fixed incomes.

The National Petroleum Council's ("NPC") report, *Facing the Hard Truths About Energy,* which was delivered to the Secretary of Energy on July 18, 2007, indicates, among other conclusions, the following finding: Coal, oil, and natural gas will remain indispensable [emphasis added]. I urge all the members of the Committee on Environment and Public Works to acquire and examine this report and findings therein. Respected authorities such as the National Petroleum Council, the Energy Information Administration, the International Energy Agency, the Global Energy Technology Program, the Electric Power Research Institute, the Climate Change Science Program, the Massachusetts Institute of Technology, and numerous other credible sources all indicate that a future without coal is not possible. It is noteworthy that some of these projections carry far into the future—as much as a century or more. Collectively, this work and findings therein represent the thinking of some of the best and most respected minds in the country.

However, every bill addressing so-called global warming that has been introduced by the Congress, and now proposed by Senators John W. Warner and Joseph I. Lieberman, will eliminate low cost coal-fired electricity from America, our manufacturers and our citizens on fixed incomes.

What other options do we have? The nuclear industry observes that dozens of new reactors must be built over the next twenty (20) years simply to maintain nuclear power's current nineteen percent (19 percent) share of the growing electricity mar-

ket. Assuming that nuclear energy will take a protracted time to develop—which, owing to waste storage and local community opposition, is reasonable—the only economical choice becomes natural gas. As stated above, delivered natural gas prices have seen great fluctuations since the late 1990s, and it is often imported from unstable regions of the world.

Liquid natural gas ("LNG") is an expensive alternative energy source, but siting LNG plants is proving to be very difficult because of local and environmental pressure group opposition.

Wind power cannot be used to provide electricity base loads and must be backed up by a more reliable source of electricity such as a coal—fired power plant. Furthermore, no other source of electricity, except hydropower, can compete with the price of coal. Electric rates are the lowest where coal is the primary fuel.

In summary, America's growing energy needs, forty-one percent (41 percent) by 2030, cannot be met without higher coal production. Any alternatives being offered are impractical and considerably more expensive than coal. Congress must recognize, which it has not under its recent energy and climate change proposals, that coal has an indispensable role in the delivery of low cost energy to our citizens and in the economic competitiveness of our country.

Question 2. You testified about our pipeline limitations in terms of capturing, transporting, and sequestering carbon. Can you elaborate?

Response. Projections of the cumulative amount of carbon dioxide that may in the future be required to be captured, transported and sequestered (for example, that of Mr. James Dooley, Senior Staff Scientist, Joint Global Change Research Institute, Pacific Northwest Laboratory) could be on the order of tens of billions of tons annually. That is nearly 10,000 time the current global carbon dioxide storage industry as it exists today. Further, the Massachusetts Institute of Technology ("MIT"), in its report entitled "The Future of Coal", as well as the Battelle Global Energy Technology Strategy Program ("GTSP"), in their report entitled "Global Energy Technology Strategy—Addressing Climate Change", identify a number of significant issues relating to carbon capture and storage even before the consideration of pipeline infrastructure. These include geologic storage capacity; the engineering and technological challenges to retrofitting the current fleet of coal-fueled power plants with carbon capture equipment; developing technology to the point of an affordable per ton emissions price; site selection and liability issues; determining if any markets for carbon exist; minimizing parasitic energy loss at electric power plants, estimated to be about twenty (20) percent; and funding support for carbon capture and storage research and development programs.

Further there are numerous unresolved uncertainties about how to address the site-monitoring, insurance, liability and property rights issues involved in carbon transfer and storage. A huge pipeline system will be needed to transfer the carbon dioxide to locations for sequestration. With American's current litigious society, there is virtually no chance that these pipelines can be sited, or that the liability and property rights issues involved in carbon transfer and sequestration can ever be resolved for decades, if at all. We often cannot even site an electric transmission line in America today. However, once again, these concerns are preceded by the fact that, according to the Energy Information Agency, no full scale commercial carbon capture technology will be available until 2020. And, the Congress has demonstrated no will to provide the amounts of capital that will need to be expended to mature this technology.

We urge all members of the Committee on Environment and Public Words to acquire the aforementioned reports and examine them. In short, the capturing, transporting and sequestration of carbon remains a virtually impossible task that cannot be accomplished for at least twenty (20) years, if at all. Indeed MIT and GTSP do not perceive the possible wide spread deployment of carbon dioxide capture, transport and sequestered technology before about 2050.

Question 3. Are there any points you would like to elaborate on?

Response. Every so-called "global warming" or climate change proposal of the current U.S. Congress, including the outlined one from Senators Warren and Lieberman, will destroy the American economy by eliminating the fifty-two percent (52 percent) lowest cost electricity in our country. As a result, more jobs will be exported to manufacturers in foreign countries, such as China and India, which have already stated, repeatedly, that they are not going to do anything about carbon dioxide emissions. Furthermore, our citizens on fixed incomes will not be able to afford their electric bills under all of the House and Senate proposals. All of this is absolutely for no environmental benefit, according to the vast majority of the most respected climatologists in the World.

Second, I would like to submit for the record a letter that I wrote to Chairman Boxer replying to her ill-informed accusations made against Murray Energy's mine safety record in an attempt to discredit my testimony. This letter to Chairman Boxer is attached, which shows that my Companies and my safety records are among the best of any mining companies in the World, and I was recently given the Chief Executive Officer's Leadership Award for this by the International Society of Mine Safety Professionals.

In addition, we believe that, if the Senate Environment and Public Works Committee acquires the above noted reports and information, members of the Committee will understand better the need for coal. In addition, the production of "Facing the Hard Truths About Energy" report, that was recently produced for the Secretary of Energy, will be helpful to the Committee in that more than three hundred fifty (350) highly knowledgeable participants from energy industries, energy consultants, energy efficiency advocates, financial communities, academia, professional societies, environmental groups, nongovernmental organizations and United States government were involved. This report even engaged energy ministers in nineteen (19) countries.

Effort by the Congress to enact so-called "global warming" or climate change legislation should be abandoned in view of the facts set forth in the aforementioned begun. Otherwise, we will be driving America to energy starvation and economic disaster.

ROBERT E. MURRAY
Chairman, President & Chief Executive Officer

PHONE (216) 765-1240
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July 2, 2007

The Honorable Barbara Boxer
Chairwoman
Environment & Public Works Committee
United States Senate
112 Hart Senate Office Building
Washington, D.C. 20510

Dear Madam Chairwoman:

As you know, you attacked me personally and with false statements in an attempt to discredit my testimony before the Environment and Public Works Committee on Thursday, June 28, 2007, incorrectly asserting that I could not care about people on fixed incomes or working families because, to the effect, that I do not care about the safety of my employees. You cited an obscure January, 2006, article from *The Columbus Dispatch*. You said twice that you wanted the false statements in the misleading article placed in the hearing record.

In my testimony, I repeatedly asserted my very sincere concern about what increased electric rates will do to the quality of life and standard of living of persons on fixed incomes and to working families whose employers depend on low cost electricity to manufacture products to compete in the global marketplace.

Senator Boxer, in your very unfair overreach to discredit me, a person extremely respected in our industry, you cited the article from an errant and biased author for *The Columbus Dispatch*, whom we chose not to speak to (we generally talk to journalists), and which was published on January 15, 2006. My response to you, which you attempted to stop, was that you are wrong and that I "take the safety of our employees to bed with me every night". I told you that the referenced article was inspired by your friends at the United Mine Workers of America ("UMWA"), which are always attacking me personally in an attempt to organize our union-free operations, where our employees want nothing to do with the UMWA or any union.

We have looked up the obscure press release in *The Columbus Dispatch*, and it is a deliberate attack on all Ohio coal producers, but charges Murray Energy Corporation's ("Murray Energy") Powhatan No. 6 Mine of The Ohio Valley Coal Company and the Century Mine of American Energy Corporation with having the highest number of safety violations. The author, Randy Ludlow, does not bring out that our number of violations are higher because we produce over seventy-five percent (75%) of the underground mined coal in Ohio. Again, it is a very distorted article, and we chose not to speak to this errant and biased author.

The article also quotes UMWA representatives Tim Baker and Dennis O'Dell, who we have never heard of, and who have no knowledge of our Mines. Calling me the "Coal King", the author is simply attempting to do a "hatchet job" on the coal industry.

The fact is that I recently won the award from the International Society of Mine Safety Professionals, involving all types of mining, entitled The CEO Leadership Award, for my recognized "Record of Achievement" in employee and mine safety.

The presenters also stated that this is the "highest level of such training available for mine employees", in referring to our "Mine Fire Safety Prevention and Preparedness Program".

Enclosed are both newspaper and trade journal articles regarding my receipt of The CEO Leadership Award from the International Society of Mine Safety Professionals at the Society's Critical Issues Conference in Hershey, Pennsylvania.

In both 2005 and 2006 the number of citations at our Ohio Mines were about one-half (1/2) of those presented at all of the other longwall mines in the Pittsburgh No. 8 coal seam. Our NFDL Rate for all of Murray Energy's Mines in 2006 was 4.04 accidents per 200,000 man-hours worked, considerably less than the National average of 4.90 for the same period.

Most especially, Murray Energy's percentage decrease in its NFDL Rate at its Ohio operations over the past year is significantly greater than that experienced in the Nation. The National average was decreased five percent (5%), while the accidents at Murray Energy's Ohio Mines were reduced thirty-six percent (36%).

Senator Boxer, you flagrantly and unfairly reached out to attack and discredit me because you did not want to hear my testimony about what your ill-conceived and hysterical "global warming" rampage will do to American working families and citizens on fixed incomes. You further attempted to "rap me down" many times, when you allowed others to speak.

The way that you have conducted hearings on this entire issue has been extremely undemocratic, as you have attempted to totally control the debate with your actions and statements. As I stated in my testimony, I feel very threatened and afraid for many Americans because of you, Senator Boxer, and some of the Majority Members of your Committee.

Sincerely,

MURRAY ENERGY CORPORATION

Robert E. Murray

Robert E. Murray
Chairman, President and Chief Executive Officer

REM/bjb
Enclosure

Robert E. Murray Receives Mine Safety Recognition

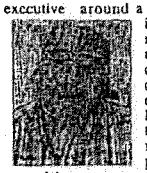
The president and chief executive officer of Murray Energy Corporation, Robert E. "Bob" Murray, has been awarded the Leadership Award presented by the International Society for Mine Safety Professionals at the Society's Critical Issues Conference held at the Hotel Hershey in Hershey, Pa.

Murray was nominated by James Dean, the director of the Mining Extension and Outreach Department of West Virginia.

"This award is dedicated to the individual in the mining industry who has significantly stood out as a leader in safety," said H.L. Boling, CMSP, a member of the society board of directors. He indicated that, in this year following the Quecreek Mine rescue, when world attention was focused on mine safety, special significance is attached to award.

"The motto of our society is 'Highest Degree of Safety,'" Boling said. "Bob Murray's innovation to promote safety in his mines, and his record of achievement, make him most deserved of this honor."

According to society executive director, Rod Higgins, there was "tremendous competition" for the leadership award.



Murray

Dean identified Murray Energy's Mine Fire Safety Prevention and Preparedness Program, which Murray introduced to his mines in four states, as the centerpiece for the nomination. The fire safety program, which Dean called "the highest level of such training" in mining, is built around a more-than $100,000 investment in a mobile mine simulator in which mine evacuation drills can be staged in fire conditions with 1,200-degree heat. Each of Murray Energy's more than 2,800 employees must successfully complete the training.

The Murray Energy program is directed by William Moser, a veteran of the WVU Mining Extension Emergency Preparedness Center. Trainees are guided by the slogan, "Prevention and Preparation, With Pride and Precision."

Murray said his "first objective is to prevent fire altogether. But faced with a fire, we will be the best prepared to fight it."

The Murray companies also last year created an executive position of corporate director for safety, and appointed Michael Lawless to fill it. Lawless spent 32 years with the U.S. Mine Safety and Health Administration, and serving as deputy administrator for Coal Mine Safety and Health.

Murray Energy is the largest privately-held coal company in the United States. Mines where the fire safety training has been conducted include: the Ohio Valley Coal Company, Powhatan No. 6 Mine, the American Energy Corporation, Century Mine in Ohio; Maple Creek Mining Inc., Maple Creek Mine in Pennsylvania; KenAmerican Resources Inc., Paradise Mine, in Kentucky; and American Coal Company, Galatia Mine in Illinois.

HONORED FOR MINE SAFETY

Robert E. Murray (second from left), president and CEO of Murray Energy Corp., is presented the Leadership Award from the International Society of Mine Safety Professionals, at the organization's 2003 annual conference in Hershey, Pa.

Murray is recognized for the Mine Safety Prevention and Preparedness Program he launched at his coal mines in Ohio, Pennsylvania, Illinois, and Kentucky.

The intensive, specialized safety training for all of Murray's 2,800 employees is centered around a more than $100,000 investment in a mobile simulator, in which mine evacuation drills can be staged in fire conditions with 1,200° heat. At left is Randy Tatton, society chairman. Society vice chairman, Tom Vanderwalker, is at far right, next to H.L. Boling, chairman of the Society Awards Committee.

Senator BOXER. Thank you, sir.

I ask unanimous consent to place in the record a statement by Senator Feinstein about the utility bills before the Senate.

[The prepared statement of Senator Feinstein follows:]

STATEMENT OF HON. DIANNE FEINSTEIN, U.S. SENATOR FROM THE STATE OF CALIFORNIA

Madame Chairman, members of the Committee, thank you for this opportunity to discuss legislation to address the No. 1 environmental issue facing this planet—global warming.

Let me begin by commending my good friend and colleague, Senator Boxer, for her leadership on this issue.

I would also like to thank the members of the Committee for your great diligence and hard work on this difficult issue. I have particularly enjoyed working with Senator Carper, with whom I have cosponsored the Electric Utility Cap and Trade Act of 2007.

Last week, the Senate worked out the details of a landmark compromise to aid our economy, improve our security, and tackle our nation's second largest source of greenhouse gasses—automotive emissions.

This legislation broke a stalemate that we have faced for over two decades. It was an important first step in a comprehensive effort to reduce greenhouse gas emissions.

Today, we can take the next step. We have an historic opportunity to build-upon this momentum. We are poised and ready to take on an even greater legislative challenge—reducing emissions from our nation's single largest source of greenhouse gasses, electric utilities.

To that end, I have introduced the Electric Utility Cap and Trade Act. This bill, which is cosponsored by Senator Carper, establishes a national cap and trade system for electric utilities, which account for one-third of our nation's greenhouse gas emissions.

The bill has been endorsed by 6 major energy companies, and is the most far-reaching bill to garner strong support from the electric power industry to date.

These companies include:

- Pacific Gas & Electric (PG&E) Corporation,
- Calpine,
- Florida Power & Light,
- Entergy,
- Exelon, and
- Public Service Enterprise Group.

Together, these companies operate in 42 states, produce approximately 150,000 megawatts of energy, and provide more than 15 percent of the U.S. electricity.

Here is how the bill would work. It would establish a cap and trade program for the electricity sector. The cap is designed to provide both flexibility and long-term regulatory certainty.

- In 2011, the bill would cap greenhouse gas emissions at 2006 levels—a 6 percent reduction from anticipated emissions from the electric sector.
- In 2015, it would ratchet the cap down to 2001 levels—a 16 percent reduction from anticipated levels.
- In 2016, the bill would reduce the cap further to 1 percent below 2001 levels. And, from 2017 to 2019 it would require additional annual 1 percent reductions.
- By 2020, emissions would be reduced 25 percent below anticipated levels.

And after that, emissions will be reduced even further—by an additional 1.5 percent a year and potentially more—if the EPA, based on scientific evidence—believes that more needs to be done to avert the most dire consequences of global warming.

That's the cap. It is consistent with the best available science, and provides flexibility to alter the pace of future change, in response to future advances in our understanding of the Earth's climate.

The bill also establishes emissions credit trading and banking, which gives companies additional flexibility to embrace new technologies, encourage innovation, and find the lowest cost reductions across the entire economy.

Additional flexibility comes through the unlimited use of an offsets program. This would include farm, forest, wetland and international offsets to provide significant cost control measures without weakening the program's overall effectiveness.

These offsets will only be issued to projects that can ensure real greenhouse gas reduction benefits. Under this program, companies can:

• Buy low-cost emission "credits" from farmers, foresters and other landowners who reduce tillage and change other cropping practices, grow trees, and protect wetlands and forests.

• Buy up to 25 percent of their carbon credits from low-cost projects in developing nations and other countries, allowing U.S. companies to profit from selling technologies to developing nations.

• If the cost of the program gets too high, EPA will let companies buy more low-cost carbon credits from foreign nations or postpone some emission reductions until a later date.

Finally, the bill provides for flexibility through innovation. By giving a portion of emission credits for free on the basis of electricity production and auctioning the remainder, the bill speeds the development of new energy and efficiency technologies that will provide a diverse set of strategies for reducing greenhouse gas emissions.

In 2011, when the program begins, 15 percent of credits will be auctioned, steadily rising to 100 percent auctions by 2036. Based on a price range of $5-$30 per ton of carbon dioxide equivalent, these auctions are expected to raise $2-$12 billion by 2011; and $9-$55 billion by 2036.

These auctions will not be a new tax, and proceeds will go directly to the development and deployment of low-carbon energy and industrial technology.

I believe that this bill's greatest asset is its combination of certainty and flexibility.

• It provides the certainty of a long-term cap that is consistent with the recommendations of the environmental and industry leaders working together in the United States Climate Action partnership (USCAP).

• It provides the flexibility needed to meet the cap in the most cost effective manner—including offsets, and alter the schedule of future emissions reductions in a manner consistent with the best science the world has to offer.

The bill also addresses critical details of program design, such as how many credits auctioned, how free credits are given to utilities, and how farm, forest, and wetland credits are integrated into the program.

The use of offsets, in particular, will enable low cost reductions in greenhouse gas emissions, with simultaneous improvements in air quality, wildlife habitat, and water and soil conservation.

I believe that certainty, flexibility, and environmental protection are bipartisan principles to which we can all agree. The challenge is to work out the details.

Fifteen States, with more than 100 million citizens and representing over one-third of the U.S. population, have already agreed to binding cuts in greenhouse gas emissions. The citizens and elected leaders of these States have set a bold historic precedent. The States are leading the way, and it is time for Congress to act.

I urge my colleagues to join me in working to craft a bipartisan compromise that moves aggressively to reduce greenhouse gas emissions, while treating all parties in a fair and equitable manner. And I believe the Electric Utility Cap and Trade Act of 2007 provides a strong foundation for this compromise. Together, we can move one step closer to a comprehensive answer to the problem of global warming. And the time to act is now.

Thank you.

Senator INHOFE. I would ask unanimous consent to place Senator Bond's opening statement into the record.

[The prepared statement of Senator Bond was not received at time of print.]

Senator BOXER. Certainly.

Anybody else have an opening statement they wish to place into the record?

OK, so we are going to finish this now, Dr. Borelli, you will be our last person to speak, and then we will take a break and come back and continue with questions. Go ahead, Doctor.

STATEMENT OF THOMAS J. BORELLI, PH.D., PORTFOLIO MANAGER, FREE ENTERPRISE ACTION FUND

Mr. BORELLI. We thank the members of the committee——

Senator BOXER. Oh, I am sorry, I didn't give you a proper introduction. You are the portfolio manager of Free Enterprise Action Fund.

Mr. BORELLI. That is correct, Madam Chair.

We thank the members of the Committee on Environment and Public Works for inviting me to provide this testimony today. I am Tom Borelli, portfolio manager of the Free Enterprise Action Fund, a publicly traded mutual fund. Our fund seeks to increase our returns by advancing free market principles in the companies we own.

All too often, today's CEOs make decisions based on appeasing social and political pressure or by trying to generate revenue through legislation. In our view, these strategies are short-sighted, because they stymie competition, innovation and jeopardize future earnings. For these very reasons, we strongly oppose cap and trade legislation and company participation in the U.S. Climate Action Partnership.

Accordingly, we are in opposition to legislation that sets carbon dioxide limits and allocations for the utility industries, including companies we own, like PG&E and Duke Energy. While the science implicating human activity on global warming is uncertain and speculative, the economic costs of cap and trade legislation are certain and severe. We are deeply concerned about the effect of cap and trade on both the U.S. economy and on future profitability of the companies we own in our portfolio.

Some CEOs support cap and trade because they think they can ride the waves of political opinion and gain the political process to obtain Government subsidies and greater carbon allocations. Others support cap and trade because they think it is good public relations. However, jumping on the global warming bandwagon to be liked or chase transient uncertain gifts from Congress does not constitute a sound business plan. The Free Enterprise Action Fund is the only mutual fund that is using its shareholder standing to demand a debate about global warming in the board room.

Through our interactions with CEOs are some of the largest companies in America, we have discovered that they have not evaluated or disclosed the severe economic consequences of cap and trade legislation to their customers or their shareholders. By neglecting to conduct proper due diligence regarding the impact of carbon dioxide regulations to their business, these CEOs are deceiving their shareholders. Such deception and negligence potentially exposes these companies to lower earnings and possibly shareholder lawsuits.

Many CEOs are ignoring Government studies that estimated the economic impact of cap and trade. For example, the Energy Information Administration found cap and trade will raise gasoline prices by nearly 53 percent, raise energy prices by more than 86 percent and reduce economic growth by almost 2 percent. More recently, the Congressional Budget Office report on cap and trade reported the costs will be borne by consumers, especially the poor, who would face persistently higher prices for products, such as electricity and gasoline.

Given the severe impact on high energy prices on economic growth, CEOs should be very worried about cap and trade. Unfortunately, we have found that many CEOs are detached from economic reality. Caterpillar's participation in U.S. CAP is a perfect

illustration of CEO incompetence and deception surrounding cap and trade legislation.

Caterpillar's CEO admitted he did not conduct a cost benefit analysis before deciding to join the U.S. CAP. In addition, he was not aware of the CBO study that found these regulations would hurt his coal industry customers. Caterpillar's future profit depends on a growing economy and growth in the energy and mining industries. In fact, according to its 10K filings with the Securities and Exchange Commission, it cites a decline in economic growth in the mining industry as a key business risk.

Yet Caterpillar is supporting cap and trade regulations that are going to harm the economy and the coal industry, a key customer for Caterpillar. Astonishingly, Caterpillar is lobbying against its own earnings. Not only is the CEO harming the economy, he is keeping his shareholders in the dark. Nowhere does Caterpillar disclose that its support of cap and trade can lead to a decline in its own business.

Similarly, Dupont's 10K repeatedly warns its shareholders about the negative impact of high energy prices on its business, but nowhere can shareholders find any disclosure from Dupont that cap and trade will raise energy prices. From the perspective of a portfolio manager, I am extremely concerned about the economic impact of cap and trade legislation on the economy and our portfolio. Growth of the stock market depends on cheap and plentiful energy supply to feed a thriving economy. Capping energy is capping economic growth.

This matter brings to mind a saying attributed to Socialist Karl Marx and Vladimir Lenin: the last capitalist we hang shall be the one who sold us the rope. Companies supporting cap and trade are not only selling the rope, they are building the scaffold. Thank you.

[The prepared statement of Mr. Borelli follows:]

STATEMENT OF THOMAS J. BORELLI PH.D., PORTFOLIO MANAGER, FREE ENTERPRISE ACTION FUND

We thank the Members of the Committee on Environment and Public Works for inviting me to provide this testimony today.

I am Tom Borelli, a portfolio manager for the Free Enterprise Action Fund (ticker FEAOX) a publicly traded mutual fund. Our fund seeks to increase our returns by advancing free market principles in the companies we own. To meet our financial goals and the free market values of our shareholders, we frequently challenge CEO decisions that may harm the company's long-term profitability.

All too often, today's CEOs make decisions based on appeasing social and political pressure or by trying to generate revenue through legislation that favor their company. In our view, these strategies are shortsighted because they stymie competition, innovation and jeopardize future earnings.

For these very reasons, we strongly oppose cap and trade legislation and company participation in the United States Climate Action Partnership (USCAP). Accordingly, we are in opposition to legislation that sets carbon dioxide limits and allocations for the utility industry.

While the science implicating human activity on global warming is uncertain and speculative, the economic costs of cap and trade legislation are certain and severe. We are deeply concerned about the affect of cap and trade on both the U.S. economy and on the future profitability of the companies in our portfolio—including PG&E and Duke Energy.

Some CEOs support cap and trade because they believe they can ride the waves of public opinion and game the political process to obtain government subsidies and greater carbon allocations. Others support cap and trade because they think its good public relations.

However, jumping on the global warming bandwagon to be liked or chase transient and uncertain gifts from Congress does not constitute a sound business plan.

Moreover, by pursuing these ill-conceived strategies, CEOs are overlooking their primary responsibility to their shareholders.

The Free Enterprise Action Fund is the only mutual fund that is using its shareholder standing to demand a debate about global warming in the boardroom. We have challenged numerous corporations—including those in the utility industry—to justify their support of carbon dioxide regulations.

For example, we have written to utility companies including PG&E asking them to justify their support of carbon dioxide emission limits and to estimate the increase in energy costs to consumers. Their response has been superficial, dismissive and did not disclose an estimated rate increase to consumers.

However, our advocacy efforts beyond the utility industry are more illuminating. Through our interactions with the CEOs of some of the largest companies in America, we have shockingly discovered that they have not evaluated or disclosed the severe economic consequences of cap and trade legislation to their customers or shareholders.

By neglecting to conduct proper due-diligence regarding the impact of carbon dioxide regulations to their business, these CEOs are deceiving their shareholders. Such deception and negligence potentially exposes these companies to consumer dissatisfaction, lower earnings and possibly shareholder lawsuits.

Specifically, companies are negligent because they are:

- Refusing to consider alternative views on the science
- Refusing to conduct basic cost-benefit analysis of the regulatory scenarios like cap and trade on their business
- Failing to disclose the consequences of cap and trade legislation to their shareholders
- Failing to disclose that pursing cap and trade regulations may harm its customers and shareholders

Many CEOs are ignoring government studies that estimate the economic impact of cap and trade. For example, during the Clinton administration the Energy Information Agency found under the best scenario, cap and trade will:

- Raise gasoline prices by nearly 53 percent
- Raise energy prices by more than 86 percent
- Reduce economic growth by 1.9 percent, which is $256 billion of 2006 GDP
- Reduce economic activity across most industries including the construction, manufacturing, transportation and finance industries
- Raise interest rates because higher energy prices will exert upward pressure on overall prices and contribute to inflation

More recently, the Congressional Budget Office (CBO) report on Cap and Trade concluded:

". . . most of the cost of meeting a cap on CO_2 emissions would be borne by consumers, who would face persistently higher prices for products such as electricity and gasoline. Those price increases would be regressive in that poorer households would bear a larger burden relative to their income than wealthier households would."

Given the severe impact on energy prices and overall economic growth, CEOs should be very worried about cap and trade legislation. Unfortunately, we found through our questions at annual shareholder meetings that CEOs are detached from the economic reality of cap and trade. For example:

GE's CEO Jeff Immelt refuses to have GE report to its shareholders regarding the cost and benefits of the company's support of global warming regulations. Moreover, he claimed he could grow GE's earnings even if cap and trade legislation caused a decline of GDP of 2 percent. Followers of GE's stock will recognize that the company's share price has underperformed the stock market under good economic conditions.

J.P. Morgan's CEO Jamie Dimon was unaware of the economic impact of cap and trade but said he would not support regulations that would harm his company's earnings. Yet the company's environmental policy states they are going to lead an effort to lobby for a national policy on global warming.

Citi's CEO Chuck Prince was also unaware of the economic impact of cap and trade but he felt the economic pain resulting from global warming regulations is worth the environmental gain. Citi supports a national policy to reduce greenhouse gas emissions but its funding of new coal power plants is the subject of criticism by environmental activists.

Caterpillar's CEO James Owens admitted he did not conduct a cost-benefit analysis of cap and trade before deciding to join USCAP. In addition, he was not aware

of the CBO study that found cap and trade regulations would hurt his coal industry customers.

This CEO survey illustrates a complete ignorance about the consequences of global warming regulations on the economy and their businesses.

Caterpillar's participation in USCAP is a perfect illustration of CEO incompetence and deception surrounding cap and trade legislation. Caterpillar's future profit depends on a growing economy and growth in the energy and mining industries. In fact, according to its 10-K filing with the Security and Exchange Commission (SEC), it cites a decline in the economic growth and a decline in the mining industry as a key risk to its business.

Yet inexplicably, Mr. Owens is a member of USCAP, which supports cap and trade regulations that are going to harm the economy and the coal business—a key customer for Caterpillar products. Astonishingly, CEO Owens is lobbying against his own earnings!

Not only is Owens harming his company, he is keeping his shareholders in the dark. Nowhere does Caterpillar disclose to its shareholders that its support of cap and trade can potentially lead to a decline in its business.

Similarly, DuPont is another member of USCAP who may be lobbying against its own earnings. DuPont's 10–K filing repeatedly warns its shareholders about the negative impact of high-energy prices on its business. Yet according to government studies, cap and trade will increase energy prices. Again, nowhere can shareholders find any disclosure from DuPont that its involvement in cap and trade regulations is a potential business risk.

From the perspective of a portfolio manager, I am extremely concerned about the economic impact of cap and trade legislation on the economy and our portfolio. Growth of the stock market depends on a cheap and plentiful energy supply to feed a thriving economy. Capping energy is capping economic growth.

More concerning is the myopic view of CEOs who only talk about the so-called benefits of addressing global warming but are totally unaware of the ramifications of carbon caps on the U.S. economy.

What little gain a few companies may obtain from cap and trade must be balanced against the overall affect the legislation will have on the economy. Ironically, a few companies may win the battle for cap and trade but loose the war for earnings because of an economic downturn.

This matter brings to mind the saying attributed to socialists Karl Marx and Vladimir Lenin: the last capitalist we hang shall be the one who sold us the rope. Companies supporting cap and trade are not only selling the rope, they are building the scaffold.

RESPONSE BY THOMAS J. BORELLI TO AN ADDITIONAL QUESTION FROM SENATOR BOXER

Question. You assert that the science linking human activity and global warming is speculative despite the recent report by the International Panel on Climate Change that it is more than 90 percent certain that human activities are largely responsible for global warming. Earlier in your career, you served as the manager of corporate scientific affairs for the Philip Morris Company in 1990. Philip Morris long disputed the link between smoking and lung cancer in the face of strong and ultimately overwhelming scientific evidence to the contrary. What is your personal standard for deciding when scientific evidence is sufficient to warrant action by businesses or government to save lives that might otherwise be lost?

Response. First, I'd like to thank the Environment and Public Works Committee for the opportunity to testify on this important topic. Only an open and honest public debate will enable Congress to arrive at the proper legislative outcome regarding global warming.

My views on human activity and climate change are an outgrowth of a diverse array of career experiences, which includes science, government and public policy. Starting with my undergraduate degree in microbiology, I earned a masters degree and doctorate in biochemistry and molecular biology where I conducted applied and basic research for General Foods. In 1987, I worked as a staff member for the Democratic majority for the House Science, Space and Technology Committee.

Following my congressional experience, I worked for Philip Morris (now Altria) in a variety of roles in corporate affairs. After leaving Altria in 2005, I co-founded an investment company, Action Fund Management LLC, which serves as an advisor to the Free Enterprise Action Fund—a publicly traded mutual fund.

In the course of my broad work experience, I have acquired a deep and unique understanding regarding the interplay between science and politics and the affect government action has on corporations and the economy.

All too often, the politicization of science has caused significant harm to the public—including reduced individual liberties, onerous laws that harm company earnings, lost jobs and diminished U.S. competitiveness in a global marketplace—with little, if any, public benefit.

Given my collective experiences, I'm deeply concerned about government overreaction to fears about climate change. Unlike previous environmental issues, legislative efforts to control carbon dioxide emissions have the potential to transform our economy.

I view legislation to restrict carbon dioxide emissions to address global warming concerns via a cap-and-trade scheme in a very different light. Not only is there great uncertainty regarding the impact of man's influence on global climate change, but the proposed government action to restrict carbon dioxide emissions will hurt the economy, reduce our standard of living, drive employment overseas and dramatically reduce our liberty—all causing massive harm to society.

I also want to thank you for drawing my attention to compare the scientific evidence regarding cigarette smoking and global warming. While epidemiology and climate sciences are vastly different, some of the underpinning principles of determining causation are relevant. I believe this comparison will enlighten the committee to recognize the major scientific gaps regarding the link between carbon dioxide emissions and global warming.

The evidence linking atmospheric carbon dioxide (the subject of cap-and-trade legislation) to global warming does not support many of the criteria that were used to establish the causal relationship between smoking and lung cancer.

For example:

Temporal relationship.—The exposure occurs before the outcome.

With cigarettes, smoking precedes the occurrence of lung cancer.

However, global warming data obtained from ice core samples shows that atmospheric carbon dioxide follows warming. This finding is the exact opposite of the assumptions made in climate models that predict man made climate change.

In addition, the temperature changes in the 20th century don't correlate with atmospheric carbon dioxide levels. For instance, the greatest amount of warming occurred in the early part of the century while a period of global cooling happened from the 1940s to the 1970s, even though that is when increasing levels of atmospheric CO_2 occurred.

Specificity.—A particular agent causes a specific outcome.

Cigarette smoking caused a significant increase in lung cancer rates. Prior to smoking, lung cancer was a rare disease.

Regarding global warming, carbon dioxide is a minor greenhouse gas. Water vapor and methane have significantly greater ability to absorb and trap heat. In addition, natural sources of greenhouse gases far exceed the amount of carbon dioxide attributed to human activity.

Second, periods of global warming have been independent of human activity and carbon dioxide levels. For example, historical records during the past millennium show there was a medieval warming period when Vikings farmed Greenland and a mini ice age during the 14th to the 19th century.

Plausibility.—The correlation between agent and outcome agrees with the accepted understanding of the scientific process.

Since cigarette smoke contains thousands of chemicals including many carcinogens, the relationship between smoking and lung cancer is consistent with the theory of chemical carcinogenesis.

Regarding global warming, however, the observed warming is greater on the earth's surface than in the lower atmosphere (troposphere). This observation is directly opposite the climate model predictions for greenhouse gas warming where warming is suppose to occur initially in the lower atmosphere.

Alternative Explanations.—In order to prove causality it is important to rule out other explanations.

With cigarette smoke, no other agent was identified that could explain the significant relationship between smoking and lung cancer.

With global warming, recent evidence strongly supports that the solar activity of the sun may be responsible for the warming of the earth. Recent studies found a correlation between increased solar activity—measured by sunspots—with increasing earth temperatures, as well as a decrease in solar activity with decreasing temperatures.

Given the serious data gaps regarding the relationship between carbon dioxide emissions and global warming, I believe the prudent government response should not involve cap-and-trade legislation.

Clearly, there remains great scientific uncertainty surrounding the role played by carbon dioxide in global warming. In this instance, I recommend the Congress take a very conservative stance and follow the Hippocratic Oath: first do no harm.

RESPONSES BY THOMAS J. BORELLI TO ADDITIONAL QUESTIONS FROM SENATOR INHOFE

Question 1. What is missing regarding business risks in the 10–K filings?

Response. Federal securities law requires publicly traded companies to file detailed annual reports with the U.S. Securities and Exchange Commission (Form 10–K) disclosing their business and financial condition.

In addition to comprehensive disclosure, companies are required to "describe in plain English" their operating environments and disclose business risks that could have a measurable impact on future operations and earnings.

As part of this filing, companies disclose a variety of external factors such as litigation, regulations and other government actions, as well as economic conditions that could adversely affect a company's future and serve as a warning to current and prospective investors.

Companies participating in the U.S. Climate Action Partnership (USCAP) have failed to disclose the potential adverse business consequences of cap-and-trade legislation in their 10–K filings. For example, Caterpillar Inc.—a USCAP member—failed to disclose that its active support of cap-and-trade may harm the company reducing economic growth and reducing demand for coal. The coal industry is a major customer of Caterpillar.

In Caterpillar's 2007 10–K filing, the company acknowledges that a decline in economic growth and a decline in the mining industry is a key business risk. For instance, it states:

> *Changes in Economic Conditions of Industries We Serve.*—The energy and mining industries are major users of our machines and engines. Decisions to purchase our machines and engines are dependent upon performance of these industries. If demand of output in these industries increases, the demand for our products would likely increase and vice versa.

Yet despite Caterpillar's dependence on the energy and mining industry, the company supports cap-and-trade regulations that are likely to damage those industries. The Congressional Budget Office's (CBO) report "Trade-Offs in Allocating Allowances for CO_2 Emissions" reported that a cap on carbon dioxide emissions could result in a 40 percent decline in U.S. coal production.

Moreover, Caterpillar's voluntary participation in USCAP is controversial and has already cost the company one of its customers in the coal industry. Murray Energy Corporation refuses to buy Caterpillar products because the company's active support of cap-and-trade threatens the coal industry.

Finally, Caterpillar's membership in USCAP is not based on a thorough review of the impact of cap-and-trade on its business. Caterpillar CEO Jim Owens stated at the 2007 shareholder meeting that the company had not conducted a cost-benefit analysis to estimate the business impact of cap-and-trade regulations. Instead, Caterpillar's participation is based on his view that the company needed a "seat at the table" with the other industries and activists that are pursuing regulations.

Shareholders should be informed through its 10–K filing that: (1) cap-and-trade regulations are harmful to Caterpillar's business because of the impact of the legislation on the economy and the coal industry; (2) Caterpillar's support for cap-and-trade regulations is controversial and it may result in a boycott of its products and; (3) Caterpillar did not conduct an analysis to determine the benefits and risks of participation in USCAP.

Interestingly, Caterpillar finds it appropriate to list even remote business risks like disease epidemics in its 2007 10–K filing:

> *Disease Epidemics.*—Historical data shows that major flu epidemics often caused sharp drops in economic output. Such epidemics are difficult to forecast, either in their occurrence or in their impact. So, such an event would have the potential to impact our results more unfavorably than we would assume in our outlooks.

Yet the company fails to disclose that its support of cap-and-trade legislation will harm its business.

Shareholders have a right to know the consequences of Caterpillar's effort to support cap-and-trade legislation. Fair, transparent and full disclosure of the business risk of cap-and-trade would allow shareholders to make an informed decision about investing in Caterpillar.

The aforementioned disclosures would allow shareholders to evaluate the external business risk of global warming regulations on Caterpillar's business by providing insight into the judgment, and decisionmaking capability of company management.

Question 2. As a portfolio manager what concerns you regarding cap-and-trade legislation?

Response. Cap-and-trade legislation would harm the investment community in three major ways.

First, cap-and-trade legislation would harm the economy and the future profitability of businesses. Yet despite these negative consequences, corporations have not factored these costs in their estimates of future earnings.

This assessment is based on our experience at shareholder meetings where we discovered that CEOs were surprisingly ignorant regarding the negative impact of cap-and-trade regulations on the economy.

Business leaders are unaware that the Energy Information Administration's (EIA) study of cap-and-trade found that prices for energy and gasoline would rise significantly and that economic growth would decline by almost 2 percent.

Higher energy prices would increase operating costs and negatively affect earnings. Consumers would also bear the cost of higher energy prices, reducing disposable income and leaving fewer dollars to spend on goods and services. Finally, higher energy prices would increase inflationary pressures.

Because of higher energy prices and a decline in economic growth, cap-and-trade legislation would harm individual company earnings, the economy and stock market prices.

In addition to the direct impact on earnings, companies have not considered or contemplated the consequences of fanning the flames of global warming hysteria on their products—this is especially true for companies that are participating in the United States Climate Action Partnership (USCAP).

Environmental activist calls for immediate reductions in carbon dioxide emissions are creating a legislative and public policy nightmare for some corporations.

General Electric faces legislation in California calling for the banning of incandescent light bulbs—a company product and invention of company founder, Thomas Edison. Activists are also calling for a ban on the use of coal-fired electricity power plants thereby jeopardizing GE's technology for reducing carbon dioxide emissions from coal-fired power plants.

PepsiCo faces calls for the banning of bottled water. Elected officials responding to the populist theme of combating global warming are actively pursing efforts to reduce bottled water consumption. Aquafina, the top selling brand of bottled water, is a PepsiCo product.

The mayor of San Francisco recently banned the purchase of bottled water by the city government. The mayor justified his action by stating, "As the city advances its Local Climate Action Plan to combat global warming, it is paramount that we initiate policies that limit the most significant contributions to climate change."

San Francisco is not an isolated case. Salt Lake City Mayor Ross (Rocky) Anderson is urging the U.S. Conference of Mayors to promote tap water as a way to limit greenhouse-gas emissions. New York City just initiated a $700,000 media campaign to promote the use of tap water over bottled water. News articles on the campaign note that plastic water bottles are disposed in landfill sites, and production and distribution contributes to global warming.

As the bottled water movement moves nationwide, it will threaten a major growth area for the entire bottled water industry, harming the profitability of PepsiCo, Coke and Nestle.

Finally, companies are keeping shareholders in the dark about the consequences of cap-and-trade on their businesses. Companies like Caterpillar (see above), PepsiCo, GE, and DuPont are not disclosing the impact of these regulations in their 10–K filings with the Securities and Exchange Commission (SEC).

Unfortunately, without company disclosure about the harmful impact of cap-and-trade legislation on their company, portfolio managers and the public are making investment decisions devoid of such knowledge.

Senator BOXER. Well, I look forward to coming back——

[Laughter.]

Senator BOXER [continuing]. And hearing from some of the great capitalists respond to your charges. It will be extremely interesting. I wouldn't miss it for the world.

So I will be back, as I hope everybody will be back. Just talk among yourselves and we will get back as soon as we know what the situation is with immigration. So we will see you within probably 20 minutes, a half hour at most.

We will stand in recess.

[Recess.]

Senator BOXER. The committee will come to order.

We will start with the questioning. Each colleague will have 5 minutes. I will now go to the early bird, so Paul, if you could keep me advised as to who was here first, that would be fine.

Excuse me, I am just trying to find a paper here. Dr. Borelli, you and Mr. Murray were very hostile, in my opinion, toward the utility companies who are here today who serve millions of Americans, and questioned their adherence to capitalism. I think Mr. Murray actually blamed the Clean Air Act Amendments for marriages breaking up. Now, I have heard a lot in my lifetime, but I have never heard anyone blame the Clean Air Act for marriages breaking up.

So I am just going to ask my friends from the utilities who are here today to address the issue as to whether they think that their companies are abandoning capitalism and if they are somehow out of the mainstream of where they ought to be. I am going to start with Mr. Darbee.

Mr. DARBEE. Thank you, Madam Chairman. We actually think that it is very important to take this stance. It is very consistent with the view of our shareholders. What we have found is that 70 percent of the people in California view themselves as very concerned about the environment. They are our customers, and our regulators feel the same way. They have totally supported the view. So when you are meeting your customers' needs and your regulators' needs and you are moving in a consistent direction, that usually is consistent with meeting the needs of your shareholders.

Additionally, it occurs to us that there may be liabilities for companies in the future and problems for companies in the future that arise from global warming. For example, it is anticipated, as the Earth warms in the next 50 years, that rainfall in California will be very substantially diminished. That means that our hydro facilities will be providing less water as they are this year, and therefore, we will not have access to clean, inexpensive hydro energy.

So we have thought long and hard about the approach we are taking and its relationship with the shareholder and concluded it is very consistent with that. We have discussed it extensively at our board level and they have agreed with that conclusion and supported it heartily.

Senator BOXER. Thank you. Now I would ask Mr. Jim Rogers to comment, and then Lewis Hay. Just to remind everyone, President and CEO of Duke Energy, is Duke Energy becoming socialistic and communistic or what?

Mr. ROGERS. We are far from that. I should say that Mr. Murray is one of our important coal suppliers. We buy over 4 million tons a year of coal from him. I appreciate his comments, but the fact

of the matter is, he is a little off the mark. Because one of the reasons that we are addressing this issue is because we think it is critical that we do. We are the third largest consumer of coal in the country. We burn almost 50 million tons of coal a year. We want to make sure we can build a bridge to a low-carbon economy. This is all about getting going and building a bridge.

We are going to go there, whether we go there in 20 years or 40 years or 60 years, we are going to go there. The sooner we go to work, the most cost-effective it will be. As I said at the outset, I am here on behalf of my consumers. I will tell you, I was the only CEO in the industry that supported the Clean Air Act Amendments in 1990. I took a lot of criticism for that. But at the end of the day, we have made it where I can see that we are on the edge of stepping off the SO_2 bridge. We have done it without any adverse impact on our customers. And we smoothed the transition, because we started early. My judgment is, we can smooth the transition into a low-carbon economy if we start early.

Senator BOXER. Thank you. Then finally, answering the charges that you have lost your way, Mr. Hay, could you comment?

Mr. HAY. First of all, I would echo the comments of my peers, I agree with them, so I am not going to repeat them. But no, we have not abandoned capitalism. We are very clean, as I mentioned in my testimony, and yet we are still a profitable company and doing very well. In fact, *Fortune Magazine* just named us the most admired company in our industry.

What I think is most important, and what I think Mr. Murray is probably alluding to, is that we need cost certainty. If we have great cost uncertainty, it could do damage to our economy. If we extract a lot of costs from our customers, it could do damage to our country. So that is why we propose recycling it.

I did want to comment on the jobs aspect, because I think that is an important issue. We are concerned about jobs. We don't want jobs to go overseas, and that needs to be addressed in any program that is put forth. But the one thing I want to say is, there are going to be plenty of jobs available as we build new nuclear plants, as we build more wind facilities, as we build geothermal facilities, all of that. We can't get enough skilled workers as it is. If we do something about the environment, we are going to need a lot more.

Further, that is not just going to be nuclear and those kinds of facilities. It is going to be new, cleaner coal plants. Just as an interesting point, if we replaced the oldest fully paid, fully depreciated coal plants that are the most inefficient out there, just with conventional coal plants, nothing fancy from a technology standpoint, we could reduce our industry's emissions by over 10 percent. So I think we are going to be still burning a lot of coal in the future, and I am willing to bet on our engineers and technologists to come up with ways to do it even cleaner in the future.

Senator BOXER. Thank you, sir.

I am going to put into the record the report that I received from the British Environmental Minister, where he says that since 1990 in Great Britain they have had a 15 percent reduction in carbon, since 1990, and their GDP rose 45 percent. So maybe Mr. Murray and Mr. Borelli might want to take a look at that.

[The referenced material was not received at time of print.]

Senator BOXER. Thank you. I have gone over for a minute, so I am happy to give an extra minute to Senator Inhofe.

Senator INHOFE. Thank you, Madam Chairman. I think a couple of good things have happened in this hearing. For one thing, there seems to be a lot of support in the event that it came about for an economy-wide as opposed to a utility-wide approach to this thing. I have felt the same way. I think it is important, if everyone is going to be miserable, let them all be miserable.

The other thing that I think is significant is the discussion as to whether or not a carbon tax in the event that we are doing something like this, I would think that would be, and I think there were five people who mentioned in their opening statement that probably would be the best approach if we had to get to that point. Real quickly, I would just ask, does anyone disagree with that? To me it is a more honest way of doing it. Does it masquerade the cost of this thing? Are there those who disagree with that?

[Several witnesses raise hands.]

Senator INHOFE. OK, that is, well, now, you are one of them who was on that side of it, I think, Mr. Darbee. You testified earlier this year that a carbon tax is the most efficient way to regulate greenhouses gases. That is out of your testimony.

Mr. DARBEE. Right.

Senator INHOFE. But let's go to the next question.

Mr. DARBEE. Was that a question, Senator?

Senator INHOFE. No, it wasn't a question. It was a statement. It was out of your statement.

Let me ask, Mr. Donohue, is there any cap and trade policy out there that you would be for?

Mr. DONOHUE. We have watched very carefully what has happened in Europe, their efforts to deal with Kyoto. The Chairman made the point of what happened in England and what they basically did is eliminated their coal-fired plants, for a number of reasons. We have watched what has happened there with upstream and downstream cap and trade issues, with a great deal of complexity and some corruption.

But if you had a cap and trade system that measured against our five criteria, was structured in such a way that it had strong support and it protected jobs, it used new technology, did a lot of other things, didn't put a great, huge new bureaucracy in, we would look at it. What I am asking, and what I believe this committee ought to think very seriously about, is how do we get an unemotional, serious look at the unintended circumstances of whatever we choose to do.

As I said in my statement, we are going to take a very hard look at this. We are going to listen to everybody's position on it. We are going to measure it against our criteria and we are going to be open to learning. If we are going to operate on these issues without learning, without looking at what happened to others, without considering questions, you saw the stuff with ethanol, that everybody was passing last week. At the same time, we are getting a report that that is going to make it impossible for us to reach our objectives in protecting the atmosphere.

So we need to look at what is going on. Senator, I look forward to working with you and a lot of people here to learn as much as

I can to share that with my members and to come up with something that deals with this.

Senator INHOFE. I appreciate that. Yes, Mr. Lewis.

Mr. LEWIS. [Remarks off microphone.] Senator Inhofe, thank you. First, about Britain's emission reduction, that was the result of the dash to gas tax. That is when Britain, for economic reasons, switched from taxpayer-subsidized coal to free market natural gas, which made a lot of sense when natural gas was less expensive than coal. But now coal is cheaper than natural gas, so Britain is switching back from natural gas and Britain's emissions are going up.

But as far as this whole issue of cost certainty and carbon taxes and so on, the whole idea of cost certainty or regulatory certainty is a chimera. It is impossible. Just think about the biofuel mandate that was enacted in 2005, which was supposed to go up to 7.5 billion gallons. Now all of a sudden, we have proposals for mandates up to 36 billion gallons. Every time you put in place one of these policies, you just open the door for demands for even tougher policies.

I want to make one point clear, which I think is critical and I don't think enough people are paying attention to it. Unless the legislation you are considering takes the regulatory action out of EPA's hands with respect to carbon dioxide, you can't even have a pretext of cost certainty or regulatory certainty, because as soon as EPA gets around to making a judgment that carbon dioxide emissions endanger public health and welfare, it will have to start a NAAQS (National Ambient Air Quality Standards) rulemaking. The Supreme Court has forbidden EPA to take costs and technical feasibility into account when setting national ambient air quality standards. Some folks at this table think the current CO_2 levels endanger public health and welfare, the only way we can lower CO_2 levels below current levels would be by de-industrializing the world.

Senator INHOFE. That is a good point. I am glad you brought that up. We are rapidly running out of time here.

I just wanted to ask Mr. Murray, first of all, I appreciate your testimony. Back in 1997, when we have our 95 to 0 vote on the Byrd-Hagel amendment, that was all of us up here who were there at that time voted in favor of that, saying that we would not agree to this type of an approach unless the developing nations would participate and it would not hurt the economy. Do you feel strongly that that should be true today?

Mr. MURRAY. [Remarks off microphone.] Yes, back to 1995 [inaudible] should be the one taking?

First of all, globally, the Kyoto Protocol is just a farce. Not one country except Sweden has complied. The Chairman mentioned Great Britain. They took credit for excluding the coal industry and going to four times more expensive RC gas 20 years ago, and they retroactively took credit. These foreigners are going to cheat, and every bill that you have introduced depends on global trading. They are interested in the standard of living. They will continue to cheat.

The coal use in China right now will increase five times between now and 2020, five times. They are bringing on a new 500 mega-

watt power plant every 5 days. They have 455 on the drawing board. I say this with all the respect that I can: it is smoking opium for this Senate to take a position to destroy American jobs, quintuple the cost of living for people on a fixed income, and export the jobs to countries who have already said they are going to continue to emit CO_2.

So nothing has changed, Senator. It still should be at 25. The Chairman said she didn't believe what I said about Ohio. You have my invitation, Ma'am, to come out, because you people inside the beltway and you Senators do, on the majority side, give a clear appearance that you don't have the foggiest idea what a person does to pack a lunch and go to work or wear a hard hat.

Senator BOXER. Sir——

Mr. MURRAY. You are inside the beltway. I know what is going on out there.

Senator BOXER [continuing]. Sir, I would appreciate you didn't have that kind of edge. Because I have some information here about you, that you have the biggest fines against you of any other miner in Ohio. You know, you come up here and say how much you care about ordinary people, the Clean Air Act split up families. But we read here in *The Columbus Dispatch* of Ohio, that you own the two largest mines which recorded injury rates about a fourth higher than the national average. So let's not have a double standard about how much you care about people. That is all I will say on the point.

Mr. MURRAY. Madam Chair, I am going to respond to that. You are flat-out wrong.

Senator BOXER. Fine.

Mr. MURRAY. That information came from your friends at the United Mine Workers and the unions. It is not fair. Today, my safety record at my coal mines, and I take it to bed with me every night, and I resent you bringing this in.

Senator BOXER. Right.

Mr. MURRAY. Because my employees are important to me, and I take their safety to bed every night. My safety record today is one of the best in the coal industry anywhere. So don't take propaganda from the United Mine Workers and tell the public that it is fact. Because you are flat-out wrong, Madam.

Senator BOXER. OK, sir. We will place in the record an article from *The Columbus Dispatch* of Ohio, January 15, 2006, I am not going to argue with you, sir, I am going to put this and let it stand. It is cited chapter and verse. But I don't appreciate your attacking members of this committee.

[The referenced material follows:]

The Columbus Dispatch

The Columbus Dispatch (Ohio)

January 15, 2006 Sunday
Home Final Edition

Safety still an issue in Ohio coal mines; Five killed in underground accidents during past decade

BYLINE: Randy Ludlow, THE COLUMBUS DISPATCH

SECTION: NEWS; Pg. 01C

LENGTH: 1072 words

James Wright knew well the hazards accompanying his job, but for $20 an hour -- top dollar in Appalachia -- it was a risk worth taking.

The 24-year-old donned a hard hat and cap light and descended into a coal mine, where roofs can collapse, equipment can malfunction, a spark can cause catastrophe and men can make fatal mistakes.

The championship high-school football player and avid fisherman was the most recent miner -- the fifth during the past decade -- to die in Ohio's underground coal mines.

He was killed in a Tuscarawas County mine on June 10 when he was struck and crushed by a coal-shuttle car operated by one of his best friends.

"It was just a horrible accident," said his father, Clarence Wright, of Lisbon. "It was his choice. He knew the danger. But it's still hard to take."

Coal mining has a well-earned reputation as a historically dangerous way to earn a living, but safety improvements and constant inspections -- and perhaps some luck -- have dulled its deadly edge in Ohio.

Federal records show the Sago Mine, where a dozen died in West Virginia after an explosion Jan. 2, had a checkered safety record.

None of Ohio's 10 underground coal mines are as troubled as Sago, but they are not without some problems.

Ohio's two largest mines recorded injury rates about one-fourth higher than the national average last year while being cited for serious violations by the federal Mine Safety and Health Administration.

The mines are owned by Ohio's coal king, Robert E. Murray, a resident of the Cleveland suburb of Moreland Hills and mining engineering graduate of Ohio State University.

Murray Energy owns the American Energy Corp.'s Century Mine in Monroe County. A mile away, the company's Ohio Valley Coal Co. Powhatan No. 6 Mine in Belmont County reaches 700 feet deep and stretches for miles.

The Century Mine ranked 11th (5.8 million tons) and the Powhatan Mine 19th (4.3 million tons) in the United States in the amount of underground coal extracted in 2004.

Powhatan has the spottier record between Murray's two mines.

Federal inspectors cited Ohio Valley Coal last year for 494 safety violations and the company paid $147,431 in fines -- nearly triple the combined amount of fines levied against Ohio's nine other underground coal mines.

More than 100 of the violations -- for failing to test for explosive methane gas, accumulations of dangerous coal dust, ventilation problems, unsupported roofs, unsafe equipment and others -- were "significant and substantial."

To federal mine inspectors, "significant and substantial" means there's a reasonable chance the hazard could harm miners.

Inspectors also issued 13 orders instructing miners to clear areas where an "imminent danger" was detected.

On Dec. 7, the mine was evacuated when a fire consumed 2,400 feet of a conveyor belt. No one was hurt.

Powhatan's record last year was an improvement from years past. In 2002, the mine attracted 620 safety-violation citations and $277,006 in fines.

"Conditions at that mine are a concern," said Tim Baker, who toured Powhatan six months ago as deputy administrator of occupational safety and health with the United Mine Workers of America.

The Century Mine near Beallsville attracted 157 safety violations, $18,452 in fines and no withdrawal orders in 2004.

On paper, it would appear the nonunionized Century Mine is safer, but that's misleading, said Dennis O'Dell, the UMW's safety and health administrator.

Federal mine inspectors are not as aggressive in citing nonunion mines for violations, O'Dell said. At Powhatan, union safety-committee members can press inspectors to address violations while the union contract protects them from retaliation. Nonunion miners have no such protection and balk at raising safety concerns, he said.

Murray and officials of his coal companies declined to be interviewed. He issued a statement saying that his mines have outstanding safety records. The two companies' 725 miners pull out three-fourths of Ohio's underground coal.

U.S. Department of Labor officials declined requests for interviews with Ohio mine-inspection officials, saying they were too busy.

Jerry Stewart, mine-safety manager for the Ohio Department of Natural Resources' Division of Mineral Resources Management, said coal mining has changed dramatically from the old days, when dozens died each year.

A methane-gas explosion in a Sunday Creek Coal Co. mine near Millfield in Athens County killed 82 miners on Nov. 5, 1930, in Ohio's worst mine disaster.

Stewart credits Ohio's underground-mine operators and their 1,060 miners for generally addressing problems before they create a danger.

"Everybody is constantly, every day, correcting hazards as an integrated part of each job. There are a lot of hazards there and a lot of efforts go into taking care of them, but there still remains a danger," he said.

State and federal inspectors regularly visit both surface and underground coal mines with a goal of keeping miners safe, Stewart said.

Surface-mining operations for sand, gravel and limestone have proven more dangerous than underground coal mines since 2000, with seven workers killed aboveground, he said.

The state maintains a coal-mine rescue network of seven teams of seven employees from various coal mines. Their breathing and firefighting equipment is stored at stations in New Philadelphia, Shadyside and Glouster.

Thankfully, Stewart said, there has been no need in recent years to call out the rescue teams.

Senator BOXER. Now, we are going to move on.

Mr. MURRAY. I don't appreciate your attaching every American working person.

Senator BOXER. Sir, if you had the record among American workers that I had, you would be happy.

Let me call on Senator Carper.

Senator CARPER. Now onto more mundane matters.

[Laughter.]

Senator CARPER. I want to go back to a point I made earlier. Senator Alexander and I, in fact, to an extent Senator Sanders and I, we actually agree on a lot. Personally, I want an economy-wide bill.

But in terms of how we proceed with respect to utility emissions, we want to address four pollutants, not just CO_2. We want to address sulfur dioxide, nitrogen oxide, and mercury as well. In fact, Senator Alexander and I both have basically the same goals. By 2015, we want to reduce nitrogen oxide emissions by 70 percent; by 2015, we want to reduce sulfur dioxide emissions by some 80 percent. Both of those are a cap and trade approach. By 2015, we would like to reduce mercury emissions from plants that generate mercury by 90 percent.

We also agree that by 2016, CO_2 emissions from utility plants ought to be back where they were in 2001. That is a lot of agreement. We also agree to a cap and trade approach, we agree that we want to have some element of an auction in terms of the allocation approach. I call for going to a full auction system by 2036, he calls for maintaining it, I think, at about 20 percent auction in terms of the allocation of credits or allowances. So there is actually a whole lot of agreement.

We have heard in the testimony here today though sort of whether we agree on a carbon tax, I don't think that is going to happen, at least not on my watch, on whether it should be an output-based allocation, should it be an input-based allocation. My approach, and the approach that the co-sponsors of my bill have said, and some of you have agreed to, and I thank you for that, we ought to try to reward those who create electricity, the more electricity with the least amount of input is something we ought to be incentivizing. That is really our focus. I realize that others don't see it that way.

I talk a lot about, along with my friend, Joe Lieberman, here, we talk a lot about third ways. I think third way, Democratic way, Republican way, well, how about a third way. Today I want you to think about a fourth way, and I want to ask some of our witnesses to think about a fourth way. The fourth way may be one of the ways, output-based allocation, input-based allocation and auction approach, and maybe another approach that a couple of you are familiar with and we are hearing folks talking about, where the allocation doesn't go, credits don't go to the power generators, but rather, it might go to local distribution companies.

I would just like to have some discussion on that. Mr. Darbee, if we could start off with you, I would kind of like to go down the row here. But Mr. Darbee, any comments you have on that, and we will just go to Mr. Grumet and to others, please.

Mr. DARBEE. I would be happy to, Senator.

I think it is important that as one approaches this problem, we learn from the successes of acid rain, as well as the problems in

Europe. What we saw in Europe with the cap and trade program implemented there, one, there were too many allocations, allowances that were allocated. But also what we saw was the producers that were generating energy received these allowances and in effect, they were rewarded twice. The price of power went up and they received payments for that, because of the coal. But then they also received the allowances. That was problematic.

We have thought about that, and felt that the right solution would be to distribute the allowances to the load serving entities of the utilities. Now, I am sure many would say that is a very self-serving point of view. But at the same time, in every statement we have said, we feel then the benefits of that should be passed directly to our customers.

So we would propose that some of the funds might be used for technology, R&D, so that would be it. Also for the people who are suffering from an income standpoint and can't afford the price of power, that they would get the benefits. Then something like an average payment out to the customers, not a per kilowatt bill, but an average payment out to them would be useful. That way, there wouldn't be any windfall for generators, and the people who have paid already for high-priced power, as we have in California, at about 8½ cents per kilowatt hour for energy, they would not pay twice for a cap and trade program, not pay twice for clean energy, they would in fact get a credit back, recognizing that they have supported clean energy for a substantial period of time.

Senator CARPER. Could we ask for an additional 2 minutes, just to let a couple more people respond to that one question?

Senator BOXER. Go ahead.

Senator CARPER. Thank you very much. Mr. Grumet, I would ask that you be pretty crisp in your response.

Mr. GRUMET. I will do my best, Senator. Let me just reflect broadly on the challenge. That is that the electric sector is complicated because of the diversity of generation, different carbon footprints, and the diversity of regulatory structures. So one of the big challenges with the electric sector that we don't deal with in the petroleum sector is that we have regulated and de-regulated companies. Those different regulatory treatments affect how companies can pass the costs through, which at the end of the day really is what matters, the costs you bear are the costs that you receive in fuel prices that you can't pass on to somebody else.

The commission is grappling with a concern which would have kind of a perverse impact, which is that in a regulated coal-heavy utility portfolio, free allocations would be required by the State regulators to be passed through to the ultimate consumer. The good news is you would lower the price, the bad news is you basically are blunting the purpose of the program. A natural gas company with much lower carbon footprint in a de-regulated State would pass the entire cost along to consumers. So you could actually have a situation where lower carbon-producing utilities in de-regulated States, that their customers would receive a higher price signal than heavier intensive carbon generators in a regulated industry. So the idea is that the distribution companies, since they are all regulated, provide an opportunity to basically leapfrog over the generators to the State regulators.

Senator CARPER. I am going to ask you to wrap it up right there, if you would just bear with me. I want to hear from David Hawkins. Do you have any comments on this, Mr. Hawkins?

Mr. HAWKINS. Yes, Senator, and I will be brief. We believe that if there are allocations outside the auction approach that they should be made to the local distribution companies. We think that is the right place to do it.

Senator CARPER. Mr. Hay?

Mr. HAY. I think that is an idea that has a lot of merit. I do have one concern.

Senator CARPER. What would that be?

Mr. HAY. That would be just how, you are now delegating to each State public service commission how to get the money back to the customers. You may end up with very different approaches, and it could dilute the price signal that customers need. But other than that, I think the idea has tremendous merit.

Senator CARPER. Good. Mr. Rogers, you have about 10 seconds. I'm sorry.

Mr. ROGERS. I think it has merit, but I would say go back and let's stay grounded as to why the allowance system was developed in 1990. It was really to use those allowances to use existing plants to continue to run through the transition period. It was to help those that are adversely impacted. That is the sole purpose. There are a lot of other good reasons to use these allowances, I am sure. But the reality is, the purpose was to help those that are adversely affected. That is those 25 States where more than 50 percent of the people rely on electricity from coal. We have to help them transition. Allowances are nothing more than a transition mechanism.

Senator CARPER. Thanks. I would just conclude by saying my friend Mr. Donohue is pretty good at finding a deal. There may be an agreement to be found on this. I would welcome your helping us define that.

Mr. DONOHUE. I look forward to working with you, Senator.

Senator BOXER. Senator Voinovich, and then we are going to go to Senator Klobuchar.

Senator VOINOVICH. Thank you, Madam Chairman.

I would like to call the attention of the witnesses and the committee to the map that was submitted as part, I think, of Mr. Rogers' testimony, and would like to bring to the attention of this committee that the perspective of members of the U.S. Senate have a whole lot to do with whether they are in the green, the red or the blue. I can understand the gentleman from California, you have 1 percent from coal. So you have a different perspective on things than some of the other people here that represent other States.

Senator BOXER. I think it is a little more than that. It is not 1 percent.

Senator VOINOVICH. That is what it says.

Mr. DARBEE. It is about 1 percent, Senator. We used to have a lot more coal, but we have worked very hard to clean up that portfolio.

Senator BOXER. Yes, used to be a lot more. Thank you.

Senator VOINOVICH. OK, so I think also that the colors also will color the judgment on allocation of credits. I would again like to bring to the attention of the utilities represented here, and this

committee, that the long-term reconciliation of differences of opinion among the utilities on how credits be allocated is very important. Down the road, if we go and get any kind of legislation passed, Madam Chairman, that will be the Achilles heel, as Senator Carper and I know, when we worked together last year on another piece of legislation.

The question I have is, assuming that you agree that technology is not currently commercially available to capture and store carbon, how would you pay to accelerate the technology to make it commercially viable? Or do you believe that using an economy-based cap and trade, an economy-based protocol, will stimulate and fast-track the technology? That is one question. Mr. Lewis, I would like you to respond to that.

The second question is, if I have the time, is that how do you deal with nations who compete with the United States of America who have made it very clear that they aren't going to sacrifice jobs on the altar of the environment, and pretty, I mean, I know the Chinese, and I will tell you, jobs trump everything. So I would like to hear from you, Mr. Lewis.

Mr. LEWIS. Thank you. You often hear climate change described in terms of a security threat, and you even hear people say, even the military now looks at this as a security threat. Well, in the history of this country, to my knowledge, we have never addressed security threats by constraining particular sectors of the economy with regulation or even the entire economy. What we have done is tax people, for example, to build the atom bomb, the Manhattan Project, or the Apollo Project, which is often invoked as a metaphor for what we ought to do in the area of climate change.

So I would recommend that if there is this great potential for carbon capture and storage, fund it through tax payments, and not through cap and trade that is put in place before we know that carbon capture and storage is economical. There is a huge study out, just a few months ago by MIT, The Future of Coal, and I am sure many people have looked at it. But it basically says it will take $250 million and 8 years just to determine whether carbon capture and storage is economical, assuming at $30 a ton carbon dioxide penalty. That doesn't even address all of the problems with infrastructure and liability.

How many decades has it been since some people thought it was a good idea to have a depository for spent nuclear fuel in Nevada? Chairman Reid says that will never happen on his watch. So how many people are going to want to have billions of tons of CO_2 stored in their State, or want to have a pipeline system comparable to the natural gas pipeline system running through their back yards?

So the idea that we should require CO_2 reductions now as if we already knew that carbon capture and storage was economical and could ever become operational, I think is putting the cart before the horse.

Mr. DONOHUE. Senator, may I just add one sentence on the issue about China and India? We all know that they are creating a lot of pollution that comes to California and the West Coast and other places. It is very difficult in India, with 800 million people still digging in the dirt, and you are right on target. The only thing I

see coming out of China and India that is encouraging at this point is that they are focused on energy efficiency, that is, how to get more kilowatts out of less energy. The new foreign minister, who used to be the Ambassador to the United States, is absolutely laser-focused on that. I think that will begin a small diminution in the pollution. We ought to encourage that.

Senator VOINOVICH. By the way, the legislation, the Hagel bill that we got passed, has helped that, because we created the Asian Pacific Initiative, which is where we should be going. But the issue is that if we move down, we have to capture some way some of the costs that we are going to have, versus the costs that they are not willing to come up with, in terms of our competitive position.

Mr. DONOHUE. I agree with that, Senator.

Mr. MURRAY. Senator, one quick comment on your question. The Energy Information Administration of the Department of Energy says that carbon capture technology will not be available until 2020, at the earliest. MIT has confirmed this in a study that Marlo referred to. As long as you don't have the technology to capture, as long as we are going to have an international marketplace in which the cap and trade would take place, it is a figment of an imagination. It will never work. It will work to the disadvantage of the United States of America and these people, that I truly care about, that are working families and people on fixed incomes.

So anything that this Senate would ever do must be international. The other countries must step up. It is naive to think that we have to take the lead. They are not going to. They are not going to follow us. So I think we need to look at America first.

The fact that technology is not there, it is a dishonest international marketplace, cap and trade is a figment for people that don't know what they are talking about.

Senator BOXER. Thank you, Senator Voinovich.

Senator Klobuchar.

Senator KLOBUCHAR. Senator Lieberman can go before me, Senator Boxer. I have a few minutes left. I think he was next, right?

Senator LIEBERMAN. You can go ahead.

Senator KLOBUCHAR. All right, thank you.

I first wanted to note for the record, I know we were talking about miners. My grandpa worked in iron ore mines, he wore a hard hat every day, Mr. Lewis, and my dad grew up working in the iron ore mines. They also both loved their environment and were great outdoors people. My grandpa was a great hunter, and I believe there are ways to work on these two issues, the workers' issues as well as the environmental issues together. That is what I have been trying to do here.

So my approach is to look at how we can make sure that we are protecting consumers as we go forward, what I consider with our major challenge, which is doing something about climate change. I wanted to ask you, Mr. Grumet, there was some discussion about this MIT study about how it would, I think it was Mr. Donohue that talked about how it would result in significant electricity price increases. I have to tell you, from my perspective with Excel Energy in Minnesota, not in the cap and trade context, but in the renewable standard, we have a 25 percent renewable standard by

2025. They don't believe it is going to lead to increases and have been supportive of this measure.

So I think Mr. Donohue said it would increase electricity rates by 30 to 75 percent, according to the MIT study. Is that your take on this study?

Mr. GRUMET. Well, Senator Klobuchar, we did look at the MIT study, which I think is a very good study. One of the pieces I think in the description that I was confused by, Mr. Donohue, was that it implied that all of the increases over this 25-year-period were going to be due to the climate program. My read of the study is that under business as usual, electricity prices are presumed to increase by 38 percent. So I think you need to subtract that 38 percent from your 30 to 75 number as a starting point, so that you can isolate what is actually being attributed to climate change.

Now, we have not looked, at the Energy Commission, all of the bills. I think most people are aware we have worked closely with Senators Bingaman and Specter, and I had looked at the assessment of that bill. I was also taken that the characterization from the Chamber just ignored the cost cap in the Bingaman-Specter bill. While that cost cap is not popular with everybody, its purpose is to avoid these kinds of, I think, rather exaggerated assessments that it is not possible to have a cap and trade system without harming the economy. I think that we have demonstrated clearly, EIA has demonstrated clearly that of course, that is not true. We agree with the Byrd-Hagel requirements; we agree with the need for international linkage. But we don't take the defeatist tone that it is not possible.

Our own assessment of what the MIT study said about the Bingaman-Specter bill is that it would increase electricity prices by about 5 to 10 percent between now and 2030. That is real. We have just submitted to the record our own analysis of the Commission's now-strengthened proposals, which would raise the cost cap to a starting point of $10, and our own assessment, which we will share with you, suggests that optimistically the cost increase would only be 5 percent. Pessimistically, worst case, if the safety valve was triggered right away, it would be 15 percent.

The last thing I will say is, under no circumstances could a carbon system that started with a $10 price cause the electricity prices to go up by more than 15 percent if that price was triggered right away. I think taking the "I think" and "I hope" and "please trust me, I am a good guy" out of the equation, is going to be necessary to forge the kind of compromise we are going to need to legislative.

Senator KLOBUCHAR. Thank you.

Mr. Donohue, you said in your testimony here that you wanted to have all the facts for us to go forward. I guess that seems to me inconsistent with the position of the Chamber in the last few weeks on the carbon registry bill that I put forward, which was supported by Senator Lieberman, Senator McCain, Senator Coleman, Senator Snowe, Senator Collins, none of which I would really describe as radicals on the economy. Yet you have sent this key vote alert, saying that in fact this bill may be considered a key vote for Senators, presumably if they voted against it.

I just wanted to ask you some things that were contained in this letter. Because really, the idea was to get a national registry, giv-

ing the EPA the power to get the information. In the letter you said that it would be overbroad, unduly burdensome and would be virtually impossible to implement. I am just wondering where you came from on that, given that right now, we have about two or three different agencies collecting this information. Some do it every 3 years, some do it every year, some do it every few weeks. I wonder why you would consider this so impossible to implement and overbroad.

Mr. DONOHUE. Thank you for asking, Senator. I thought you might react to our letter.

We sent that letter for three reasons. The first is that our understanding was that while working on the energy bill, we were going to try and leave the carbon and the cap and trade carbon issues and all of that to these hearings and to future legislation. That is how it was described that we were going to deal with this matter. There was no conversation about it ahead of time, and that was our first reaction.

The second reaction was that we really believe that there is great question with some of the carbon collection, information collection. We thought it would be very, very useful to have this conversation and to measure those pieces of legislation against the objectives we are all trying to get to. The third reason that we oppose that is that we thought it was going to get very much, it was going to have a negative effect on a lot of the other things that we were trying to deal with in that energy bill, where we were basically rolling back all, many of the good things that were put in place in 2005.

Having said that, and I am not sure that is satisfactory, going forward, we will be very happy to sit down and talk with you about it in the right piece of legislation, with adequate discussion and hearings, and you may be very persuasive. Certainly there is nothing personal in going after that bill. It was something that was put in at the last minute without preparation, without discussion, and in a way that we thought would be detrimental and ought to be heard in another forum. We would be glad to work with you on it.

Senator KLOBUCHAR. Mr. Donohue, if I could just respond to that, one of the reasons we did it is that many large corporations were calling for this, because of the fact that we have 31 States doing this, developing their own registry. I believe that if you look at the record from other hearings, this kind of thing, a national carbon registry was discussed that didn't dictate what the policy was. If you are talking about past actions, the Senate actually passed, Senator Brownback and Senator Corzine introduced nearly the exact same amendment that said it would be voluntary. If the registry contained less than 60 percent of the total national greenhouse gases in the United States, this was 5 years ago, then it would become mandatory.

Now, that bill, which was part of the energy bill, actually never became law. But if you are talking about past actions, this has been discussed. I do look forward to talking with you about this in the future. But I just believe that some of the allegations made in the letter, for whatever purpose you did it, were not correct.

Mr. DONOHUE. Thank you. I look forward to talking to you, Senator.

Senator KLOBUCHAR. Thank you.

Senator BOXER. Thank you very much, Senator, for your leadership. There is no question this is coming. So we look forward to your continuing to give us your thoughts and ideas as we move this along.

Senator Whitehouse.

Senator WHITEHOUSE. Thank you, Chairman.

When I first started out in my public service career, I was involved in utility regulation. Way back in the early 1980s, we did one of the first what we called conservation rates, with Narragansett Electric, part of the New England Power System in Rhode Island. I was representing the Attorney General in those negotiations. This was before phrases like demand side management, which are old hat now, even came up. This was sort of primitive.

So now looking at an environment under which you all are under enormous environmental pressure with respect to your emissions, and when you look at the various slices of a solution, you see that one of the largest slices is reducing demand. It also tends to be one of the cheapest slices. In fact, from a lot of perspectives, it is actually a net gainer economically.

Again, it has been a while since I have been involved in this, because the conservation rates were many years ago, and Mr. Rogers, I practiced down at FERC, which at that point didn't have a great interest in these matters. But I gather that is improving since then.

What do you think is the best way, I am going to ask this of the utility representatives, Mr. Darbee, Mr. Hay and Mr. Rogers, what do you think is the best way for the Senate, for Congress to help you institutionalize increasing conservation and efficiency into your power mix, so that it is seen as much of your portfolio as any other and you are able to recover it, your investment in that sort of a power source?

Mr. Darbee.

Mr. DARBEE. Senator, you are absolutely on target. I assure you that so long as power companies produce more profits by generating more power, they will do it as surely as the sun rises tomorrow. Thirty years ago in California, the regulators and policymakers took an approach that we actually opposed at the time. What they did was they broke the linkage between making more money and selling more kilowatt hours. It is called decoupling. That neutralized the incentive for us to sell more power.

Then they overlaid on that a system of incentives that amounted to more than $100 million, for us to encourage our customers to use less. That program has been fantastically successful. It has avoided, as I said in my statement, the construction of 24 power plants in the last 30 years.

During that period of time, per capita energy use in California has remained flat, whereas across the country it has gone up 50 percent. So my point is, the technology for clean coal doesn't exist today. But if we align the financial incentives for utilities, we could make great movement forward. That actually would cause the United States to be more competitive with other countries, because we would use power more efficiently.

We have sent delegations to China, and the Chinese have looked at this, because they are very inefficient, how they use power. They

want to come up the curve on energy efficiency as quickly as they can. So actually, they want to take steps toward solving global warming and being more efficient and more competitive. So I think that is a critical thing.

I just want to go back to one of the earlier comments. Anyone who is really serious about dealing with global warming understands that we need a carbon registry to set the baseline as soon as possible.

Senator WHITEHOUSE. Understood. Mr. Hay, if you could just elaborate a little bit in your answer on what the next steps would be. I think a lot of people have put the kind of price signal in for conservation. But yet, when we look at the conservation piece, it is still huge. So what are the next steps that we need to take, so that you all have the proper incentive and the proper reward to really pursue additional home insulation, whatever the steps are that will make the most sense?

Mr. HAY. Thank you, Senator. Generally, I agree with your comments. I think there is a huge opportunity in energy conservation. We have done some benchmarking across our industry and the performance is very varied, from some companies that are doing a fantastic job, like Mr. Darbee's, and I would rate my company in the same way, and the DOE does as well, to some that have done nothing.

Nonetheless, I do think it is, and I agree with Mr. Darbee that we need more incentives, and that will move us forward. But it is a State by State issue. We have different regulatory structures literally in every State. Decoupling is one solution. But I would point out in Florida, we have a totally different approach. Our PSC will not allow us to build a new plant until we have proven to them that we have done everything economically possible in terms of energy efficiency and conservation.

So while we do have an incentive to sell more power, generally, we can't do it, we don't have the means to do it, unless we prove to our commission that we have done everything. The only thing I can say going forward, besides getting all the States aligned and sort of benchmarking and getting everybody to the levels that the top performers are at. As I said, that would reduce emissions by about 10 percent in our sector.

There is, it is still a State by State issue. There are new technologies that could allow us to do even better than what we are doing today.

Senator WHITEHOUSE. Thank you. I just got the courteous permission of the Chairman and of Senator Lieberman to allow Mr. Rogers to answer as well, even though I am over my time.

Mr. ROGERS. Senator, I am very supportive of what you are proposing. In the 20th century, we provided universal access to electricity. That was our mission. In the 21st century, I think our mission should be to provide universal access to energy efficiency products and services. It is going to require a paradigm change in terms of how we are regulated at the State level. I think that we have a proposal that we filed in North Carolina called Save a Watt, where we get rewarded in the same way we get rewarded for building a new megawatt, for every megawatt we can reduce, we earn off of it.

So the way to think about this is that historically, think about the last decade and a half, the real price of electricity has gone down. Most of the DSM programs that came out of the 1980s or 1990s were about educating consumers, where the bill was a small part of the disposable income and it was back of mind. You spent a lot of money moving it to top of mind. It didn't really work, although more and more people are becoming aware.

What we really need is to change the mission of utility companies in this country and give them the mission to go in and put chips in refrigerators, chips in air conditioners, to give them the mission to invest in new infrastructure and commercial businesses and industrial businesses, so that at the end of the day we can reduce usage, and do it systematically.

Senator WHITEHOUSE. Including timing costs, changing the time of day of use, all those sorts of things.

Mr. ROGERS. But I would go even a step further. Most of our customers have busy lives. We are connected with price signals 24/7. If we put a chip in the refrigerator or the air conditioning and we can remotely control it, our goal is to maintain their comfort and convenience while at the same time making sure we are reducing the demand at key times.

So I think there is a lot of rich thinking, and I should say, I am currently co-chairman of the National Action Plan on Energy Efficiency, as well as co-chair of the Alliance to Save Energy. So I have been very engaged in this issue. I see great promise in the future.

But what you all need to do is really encourage States, develop principles and really say to the State, you have to change the paradigm, you have to give these companies the mission to give universal access to energy efficiency products and services.

Senator WHITEHOUSE. Very good. I would be pleased to followup with any of you offline. I know my time has expired. I do have some familiarity with your industry from my past. I do think this is an important thing to work on. I look froward to working with you, and I thank the Chair.

Senator BOXER. Thank you, Senator Whitehouse.

Senator Lieberman.

Senator LIEBERMAN. Thanks, Madam Chair. Thanks to the witnesses for your testimony. We have heard some very helpful testimony this morning. I think it comes at a moment where, as I said earlier, I believe that a majority of members of this committee, certainly of the subcommittee that I am privileged to chair, but I believe the overall committee, are ready to write a bill. In other words, we have heard a lot of testimony, people have reached a judgment that climate change is a real problem, that the way to deal with it is through a national cap and trade system to create some predictability, set national goals and figure out the best way to achieve them.

Having reached that understanding and agreement and alliance with Senator Warner, which I deeply appreciate, he and I both understand, as we now begin to reach out to the stakeholders in the business community and the environment community, experts of various kinds on this, that we have a lot of decisions to make within that larger architecture that I have described. In that sense, your testimony today has been very important.

Mr. Donohue, I particularly want to thank you. I think your testimony on behalf of the Chamber of Commerce has been very encouraging to me, which is to say that you have recognized we have a problem and you have left yourself open on behalf of the Chamber to a national cap and trade system, depending on how it works. I really invite you and your staff to get involved with us in putting it together.

You made a statement in response to the question Senator Inhofe asked about whether under any circumstance you could see yourself supporting, or the Chamber supporting cap and trade, which was, you said it was possible, you would want to see the details, and you were concerned about unintended consequences. I think that is the phrase you used. I agree with you. Senator Warner and I and others have talked about this. This is the question that some resolve with what they call a safety valve, others call it an off ramp.

John Warner, I am going to give him credit, because I am sorry he is not here to say it himself, he said we ought to have an off ramp, but it ought not to be too easy an off ramp. Because if it is too easy an off ramp, then the economic calculations that some of the witnesses made, to invest enormous amounts of money in complying with technology to comply with this system, could be thrown totally off, because the market will be skewed.

So John used the example of the highways, which, if they are dramatically downhill, then there are emergency off ramps. That is what we are looking for, is an emergency off ramp. That is why, I am going to ask Mr. Hawkins in a minute, but that is why I am troubled by some of the proposals to have Congress mandate a price off ramp, which I think may be much too inflexible. We are looking for, Senator Warner and I are looking for some kind of market mechanism here.

So first off, I wanted to thank you, Mr. Donohue, invite your participation. Second, ask if you have any thoughts about how we might create an emergency off ramp. Because we want this, obviously, to deal with a critical environmental problem. But we also want it not only not to be harmful to the economy, we hope it will help.

Mr. DONOHUE. Senator, first of all, thank you for your comments. Than you for your logic in trying to figure out what might be the benefit and/or the unintended circumstances. We very much look forward to working with you and your colleagues on that. I am not going to attempt, in the middle of my members that all have different views, which I promise you are going to bring them to some collective effort over time, to comment on off ramps, simply to say that your instincts, which usually are pretty good about things like this, encourage me as I might encourage you, and we will sit down and talk about it. We need, all of us, to get smarter on this. We need to look ahead to the cause and effect of what we do. If we take just a little longer to get that done, I think in the last analysis, when we look back on whatever we do, we will feel better about it. So we look forward to a vigorous participation with you and I will assure you that not only the Chamber but its companies are always available to you and your colleagues to talk about it.

Senator LIEBERMAN. Thanks, Mr. Donohue.

Mr. Hawkins, you, I think, were the one who testified, or maybe one of two, about so-called safety valve or off ramps. I want you to offer some testimony about what you have heard and whether you have any ideas about how we would best do this.

Mr. HAWKINS. Yes, thank you, Senator. I do appreciate the emphasis on the idea of an emergency.

What I would say is that the problem with the safety valve or the off ramp concept is that it undermines the basic market provisions of the cap and trade system.

Senator LIEBERMAN. Right.

Mr. HAWKINS. We are going to depend to get costs reduced in this program on the ingenuity of entrepreneurs who see a business opportunity that basically say, it is a new world. Low-carbon energy resources have an economic value. I can put money into it, I can go to my board of directors and get money allocated for the intense expenditures that may be necessary up front to bring an innovative new product or process to market. They need for that business plan to work to know that the market signal is going to be there.

If you introduce these concepts of off ramps or safety valves, you fundamentally conflict with that. You set a number that they know they have to beat, or their investment is going to be either worth nothing or worth a lot less. That makes it a more difficult hurdle to get that work done, which could, ironically, lead to higher overall prices for this program. Somebody might be paying money to the Treasury to purchase these additional printed allowances, but they wouldn't be getting the emission reductions.

So we think that the concept of banking as a hedging strategy, the concept of borrowing, are ways to address this issue, and perhaps the metaphor is, rather than an off ramp, it is a lane change. But let's stay on the road.

Senator LIEBERMAN. So you would prefer to, you would see the banking and borrowing provisions, which I think it is fair to say Senator Warner and I will include in our draft, as the answer to that problem as opposed to an off ramp, emergency or otherwise?

Mr. HAWKINS. It is part of the answer, Senator. Another answer, frankly, comes from all sorts of groups. We will have all sorts of information about how well this is performing.

There is always the off ramp that Congress has, which is to take a look at a program, see how it is working, and if the case can be made that some adjustment in time tables or rates are appropriate, then Congress can respond. We have seen that happen in the Clean Air Act over the past 35, 37 years. The first schedule for attaining the health-based standards in the 1970 Clean Air Act was 1975. There have been a series of adjustments, both in the tools and the objectives over time. I am sure everyone doesn't think it has been a model of perfection, but it has worked to clean up the air, to provide real signals for progress. It has done it with an economy that has grown rapidly in the meantime.

Senator LIEBERMAN. I will tell you that Senator Warner and I have been talking about using some of the thinking of the U.S. Climate Action Partnership as a basis for what we are going to put together. The goal there is a 2050 goal and a 60 to 80 percent range of reduction of current greenhouse gas emissions. To do that

and avoid potentially disastrous economic consequences as part of a crash program toward the end, you also have to set some goals and points of review by Congress of how this is working at 5, 10, 15 year periods. So we would like to obviously involve all of you in helping us present interim goals that are reasonable and doable.

I note Mr. Darbee, Mr. Grumet and Mr. Hay.

Mr. DARBEE. Senator, let me say that I think you have it exactly right, that we should have an off ramp. But it should be somewhat of an emergency off ramp. We are thinking about prices between, let's say, $10 and $20 for carbon, somewhere it should be set. That off ramp price should go up every year on a prescribed and gradual rate over time.

In California, some years ago, we implemented a deregulation plan. The results of that, because reality was different than the theory that we anticipated, was catastrophic. It was a complex situation, but it was catastrophic. My concern is when one has a model, it may look good. But in implementation it may look significantly different. Therefore, a safety valve at a high level that is difficult to access makes sense. Because we wouldn't want a repeat of the catastrophic experiment we had with deregulation in California to occur on a broader scale with respect to cap and trade in the United States.

Senator LIEBERMAN. Good point. Very helpful.

Mr. Grumet.

Mr. GRUMET. Thank you, Senator Lieberman. Just a couple of quick points. Our Commission is focused very much on the on ramp to this debate, recognizing that at the moment, the price of venting a ton of carbon into the atmosphere is zero. What an off ramp does, regardless of the price, is it takes the anxiety out of the debate. That does reduce the signal, because anxiety encourages some people to put in great efforts.

But we also think it is probably the critical aspect that is going to allow 60 members of the U.S. Senate to move this Congress. The two other points I would make quickly, and I agree very much with David and Peter, that this should not be an escape valve, this should be an off ramp. The analysis that we have just presented suggests that you can achieve significant reductions along the lines of what we proposed with a starting price of $10 that does go up every year and never trigger the safety valve, if you are basically optimistic about the pace of technology, if you believe that vehicle fuel economy standards are going to be increased, if you believe that we are going to see more renewables, you will never trigger the safety valve.

So I think there is a bit of a choice here, and you have to pick one side of the argument. If you are as I am, and I think David, a technology optimist, then the off ramp is there to not convince us that we need it, but it is to address the people who are no longer in the room that this is a program that they can tolerate. If you are a pessimist, then we actually think you need it.

The last thing I will say is, I think we focus too much just on the price signal. Because ultimately we are not going to set a carbon price at the outset of this program which is going to be adequate to move us quickly toward things like carbon sequestration. I just don't believe it is possible.

However, we have another option. We can invest significant resources to accelerate those technologies. If you took the 1.9 cents per kilowatt wind production tax credit, and afforded it to carbon sequestration, which it presently doesn't have access to, that is a $24 a ton incentive. What our commission has proposed is to couple these two things, to have a starting price of $10, which we think we could get done right now, and then provide through bonus allocations an incentive for zero-based coal equal to what we provide for wind. That is $24, day one, legislation that I think you could enact in this Congress, you could have a $34 price signal for carbon sequestration. That is real money, and I think it could happen soon.

So our argument is just not to focus simply on the price signal or on the technology but think about how you can put them together in a way that can move us toward timely action.

Senator LIEBERMAN. Thanks. Mr. Hay, last word, because I have to go. Maybe some of you have to go, too.

Mr. HAY. [Remarks off microphone.] I would be happy to comment on that. I agree with Mr. Darbee's comments. [inaudible.]

Senator LIEBERMAN. Right.

Mr. HAY. Even in very well established markets, like the gas market that has been around for years, we are now seeing evidence just earlier this week that it is possible that a company like Amarinth may have manipulated the gas market last summer, costing consumers huge amounts of money in terms of increased costs of natural gas.

So every time we do a tweak to cap and trade, we do run the risk of unintended consequences. For instance, banking and borrowing, I think if it is done right, it could work. But I do worry about people borrowing and banking to hoard credits and therefore manipulating the market. I just want to urge you, every market that we have ever tried to start in this country, and I am a big believer in markets, but you have to do it carefully. The electricity markets in some of the States that have them, they are still changing the rules today, many, many years after they have been established. As we saw in California, if you get it wrong, it can be devastating. So we have to be very careful and think this through.

Senator LIEBERMAN. Very helpful.

Jim, did you want to say something?

Mr. ROGERS. I think the important point here is that you have a goal of 20, 50, 60 to 80 percent.

Senator LIEBERMAN. Right.

Mr. ROGERS. So you need to be careful in terms of how you set the off ramps, how you set the pricing on the way. Because for instance, most estimates today say to get carbon capture and sequestration, you need the price to be about $25 to $30, to kind of give you the range, to bring that online. So again, I think the other important point is, if you don't have a solid carbon price, and I am supportive of this safety valve concept, but if you undermine the price, it gets very difficult to have a clear price signal, so the behavior actually is real behavior. So that is the challenge.

Senator LIEBERMAN. That is the challenge, to make sure that in trying to reduce some of the anxiety, to deal with the unintended consequences, we don't eliminate the market-based aspect to what

we are trying to do here. Because that clearly is one of its most attractive features. Of course we know in other circumstances, such as the Clean Air Act, it has worked.

So your testimony has been very helpful. I do want to say, again, for Senator Warner and myself, our door is open, I suppose to anybody who agrees that we have a problem and we have to do something about it. Then we will figure out together how to do it best. We are going to focus on this intensely in the coming weeks. Because we really do set ourselves a goal for being able to present a mark from the two of us to our subcommittee before we break for the August recess.

Thank you all, very, very much. Thanks, Madam Chairman, for an excellent hearing.

Senator BOXER. Senator Lieberman, thank you for your amazing leadership on this, not just this partnership with Senator Warner, but your previous partnership with Senator McCain, and all the work you did before most people even knew this was an issue. I just want to thank you so much.

I just want to say, Mr. Grumet, I have here an analysis of the Bingaman proposal which I think you have been working on with the safety valve and without a safety valve. My problem is that you have it with a safety valve, the kind that you want, it doesn't do that much better than business as usual. So I would hate to see us construct an entirely new system here that has a purpose, and as Mr. Rogers says, undermines the price, and then we wind up not making much progress. That is something I don't want to be associated with.

So I am going to let you see this analysis.

Mr. GRUMET. Whose analysis is it?

Senator BOXER. Whose analyses is this, Mike?

Mr. GRUMET. Oh, it is a chart.

Senator BOXER. WRI, the World Resources Institute. I am going to show this to you, because if this is wrong, that would be good.

Mr. GRUMET. It is wrong. I am very familiar with it. It is wrong, and we provided you some detailed economic analysis today which shows you can get a 15 percent reduction from business as usual without triggering a $10 safety valve.

Senator BOXER. Fifteen percent reduction?

Mr. GRUMET. Fifteen percent reduction.

Senator BOXER. What do you think we should do for the environment?

Mr. GRUMET. I think ultimately we need to get a 60 to 80 percent reduction by 2050.

Senator BOXER. Exactly.

Mr. GRUMET. However, I am much more interested in focusing on the next 15 years than the next 50 years. I think the science says more than anything that we need to act with urgency. So I am very concerned that we can have the debate about an 80 percent reduction for another 8 years.

Senator BOXER. I couldn't agree with you more. I agree with you.

The problem is, where we might differ, I don't know, because we really haven't had a chance to discuss this at length, is that I believe, and I have said this to the CEQ who had this argument, because President Bush doesn't want to have any mandatory caps, he

is different from where you are, they just say, we need technology to solve this. Totally right. But if you don't have the credibility, if you don't have the consistency, if you don't have the certainty, you are not going to get the technology.

How do I know this? I am from California. I meet with venture capitalists every day. I meet with the business community in Silicon Valley and they want certainty. Well, first, let me say I am going to close this. I just want to thank everyone on the panel. This has been very, very, very instructive. It actually turned into a broader discussion than I even thought it would, and given the announcement that Senators Lieberman and Warner made, it was a very fitting day to have this. We didn't know when we set it we would have that great news, that they were working on this.

But I guess what I want to do is actually direct my closing comments to Mr. Donohue and also echo the view that, I am very pleased at your being open to looking at this. In all my 30 years of public life, it has been a long time, I have never seen business so far ahead of Government on an environmental issue. I just want to say to those of you who are out there, thank you, thank you, thank you. I think the factors that weigh into this are people who are responsible, responsible about their country, about their grandkids, about the future. I think Mr. Rogers alluded to this.

But I am not corny enough to think that it stops there. It is also a sensible business decision to make. We need a planet that is going to survive. Let's just be honest. If the scientists are right, yes, there are a few who don't agree, and we know that. But if the vast majority of scientists are right, we have a problem on our hands. One of the things I realized when I started to immerse myself a little bit into these predictions is that the good news is, the things that we do to combat global warming are all really good for us, they are good for consumers, they are good for our health, they are good for our families.

So this is, I believe, instead of approaching this with fear, we should approach it as a huge opportunity for America. I think the vision that I see is not one of people suffering, but rather, the creation of a whole new green economy. We are already seeing it in my State. I think if we took off our green eyeshades for a minute and just looked at a little bit at the bigger picture. When we put the green eyeshades back on, I think we will see real opportunity.

Now, who are these businesses? I mean, these are the businesses that belong, just some of them, to the U.S. Climate Action Partnership: Alcoa, Alcan, Boston Scientific, BP, Caterpillar, Conoco, Deere, Dow, Duke, Dupont, FPL, GE, GM and now Ford and Chrysler have jumped on, Johnson and Johnson, Marsh, PepsiCo, PG&E, I don't know if I mentioned, Shell, Siemens Corporation, it goes on and on.

This is capitalistic America saying that we should respond. This is an opportunity. They have risen to the challenge.

I realize, Mr. Donohue, that you represent a way broader cross section. But what I want to say is, in America, if we grab onto a challenge, there is nothing stopping us. We all know why we are so proud to be Americans. That is how I see this.

Now, I look at my home State, the most energy efficient State, the least energy use per capita, a State that has had enormous

growth, people want to come there. The job opportunities are enormous. It is so amazing to me, to see what we have done.

So I hope, Mr. Donohue, and I am sure you do come out to California now and then. I would love to be with you when you visit Silicon Valley and talk to some of our people. Some of them came and actually talked to Senator Warner about the opportunities. As we go into the century and get deeper into the century, we should be a leader, we shouldn't shrink from the challenge. We shouldn't sit there and say, oh, China is not doing this, oh, India is not doing this. We don't wait around for China to do the right thing. We lead the way.

I think with the news today, yesterday, that we had from members of my committee that have forged a bond to commit to producing this legislation, we have this chance now. I want as the Chair of this committee, to hear all of you. I want to hear from coal country. I want to hear from everybody. Because I think we can make this a win-win. Surely if we do nothing, if we walk away from this challenge, it is a lose-lose, all across the board, it just is.

I mean, again, as a spiritual person, and we had the most amazing testimony from religious leaders here, it is God's green Earth. So we can't walk away from this challenge. Now, if some scientists have exaggerated this thing and it is only half as bad as they said, we are ahead of the game. If it is worse than they said, we will do as much as we can to get ahead of it.

But as I say, Mr. Donohue, I think you are a pivotal person here. I want to imbue on you this strength to take this on and to do your level best and to lead. Because what a moment we could have in history here if we made that breakthrough. So sir, would you like to respond?

Mr. DONOHUE. Well, first of all, Madam Chairman, I would like to thank you for your confidence in the Chamber and your thoughtful comments. I would like to make just two additional issues. I was very pleased to hear yourself and Senator Lieberman and others talk about a willingness to consider these matters in a broader context, as you indicated, the hearing has expanded, so that we could look at the unintended circumstances, so we might look just a little bit further ahead, and we would make more thoughtful decisions. I look forward, on behalf of all of the names you read and the people here, and you can see they don't all agree on everything, participating in this process.

The second thing is, I would like to see you in California, and I would like us to go together to the high-tech area, and have a little fun on one thing just beyond the normal conversation. We are beginning to look at how much electricity is consumed by all of the high-tech devices, all of the servers, all of the Internet, all of that. Those companies had better get involved in this, because the percentage of electricity that they are using would astound them, and it is, because they are beginning to look, and it astounds us. It is a good place to go, and I accept your invitation.

Senator BOXER. Good.

Mr. DONOHUE. I will try and find out when we are both going to be there at the same time.

Senator BOXER. Well, we will work on that.

Mr. DONOHUE. I would also invite you to come to the Chamber.

Senator BOXER. Sure.

Mr. DONOHUE. We will get together a broader group of industries to express some of their interests and concerns, some of them legitimate and some of them probably not, and let you have an opportunity to talk to them. I thank you very much for including us.

Senator BOXER. Absolutely. I think this is essential. As Chair of this committee, one of the first things I said when I took the gavel is, I want to bring bipartisanship back to this committee. Because this committee has an unbelievably wonderful history. All the landmark laws, whether it is Endangered Species Act, that I opened up with, so I am closing full circle here, with the fact that we are able now to de-list the bald eagle, because of the Endangered Species Act. We have had successes in the Clean Air Act and the Safe Drinking Water Act, and the Clean Water Act, all of these, the Superfund Program, all of those, not without controversy, not without difficulty. But the fact of the matter is, Republicans and Democrats, Presidents of both parties, Congresses led by both parties, we have managed to keep these laws. I view what we are going to do here on climate change as one of those landmark moments.

I am a believer in America doing the right thing at the end of the day. We will do the right thing here. I am a believer in listening to all sides before we decide. I do agree with you, when we go to the Silicon Valley and when we visit the various communications sectors down there, they understand that they have a responsibility.

The most beautiful thing, I think, about that area is, and I will tell you a story, Mr. Donohue, that just amazed me, when I first ran for the Senate, I went to the Silicon Valley and I had a meeting with a very large group there. I thought, well, they are going to tell me, I am going to ask them the most important thing I could do for them, because I always like to ask that question of every group, what is the most important thing, or the two most important things.

I felt it was going to be, lower my taxes, lower my taxes. I went in there and they said, education. Please, we have got to have an educated work force. So then I thought, I pushed them further. What is your second most important issue? I thought they would say lower my taxes. They said, housing. We really worry that our workers can't afford the housing prices here in California.

So this is a group that really, they do very well, but they do good things for the country. What could be better than that, to have a business that does so well, and many of you represent those businesses who do so well, but also, you are stewards of the environment and you care about our families. This is really important.

So Mr. Donohue, you and I will work together and go west.

Mr. DONOHUE. Senator, you ended with a story, perhaps I can end with a story.

Senator BOXER. Sure.

Mr. DONOHUE. Since the early 1970s, this country has spent $3 trillion cleaning the air, the water and the land, along the lines of some of the issues you have discussed. The Federal Government of the United States has spent about 20 percent of that. I would probably say it has encouraged the spending of a good deal more of it. But when you look at the accomplishment that we have made in

this country to date on that with 80 percent private money, and compare it to what some of our developed nation trading partners have done, notwithstanding the press that we get on the subject. I am very proud of what we have done and I look forward to seeing how we can do more in the future.

Senator BOXER. It is a good story. It is a good story, it is a great story.

On this one, we are going to work together, or we really, we won't succeed. So we must work together.

So I want to thank all of you very much, and we stand adjourned.

[Whereupon, at 1 p.m., the committee was adjourned.]

EUROPEAN UNION

DELEGATION OF THE EUROPEAN COMMISSION

Head of Delegation

FEB 22 2007
D/272

The Honorable Barbara Boxer
Chairman, Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510

Dear Madame Chairman,

In recent publications in the media and in statements by U.S. Administration officials as well as at the Hearing on the U.S. Climate Action Partnership report, which you organized in the Senate Committee on Environment and Public Works on February 13, 2007, incorrect or incomplete information has been presented about the European Union (EU) climate policy. In particular, this concerns the EU's achievements to date by comparison to achievements in the U.S., and whether the EU will meet its obligation under the Kyoto Protocol, which is to reduce its emissions by 8% by 2012.

This letter is intended to put the facts before you[1].

To start, I would like to address one major misunderstanding in the discussions in the U.S.: we hear statements such as those from Senator Inhofe that only a few EU countries are on target to meet their Kyoto obligations and that other EU members will fail to do so, thus implying that the EU will not meet its Kyoto obligations. That is not correct. The EU is on track to meet its Kyoto commitment.

Of course, the performances of individual EU member states vary, but under the Kyoto Protocol, it is the 15 countries that were EU Member States when the Kyoto Protocol was signed in 1997 (EU-15) that have a joint commitment to reduce emissions by 8% by 2012[2]. Individual EU-15 Member States do also have individual targets but these are EU internal targets in the framework of our joint commitment. This joint commitment allows some EU countries to increase their emissions, while others reduce theirs significantly. The contributions of each Member State to achieving the 8% reduction are set down in EU law and are legally binding. It is thus inappropriate to assess the EU's overall performance on the basis of the performance of a few individual Member States. If the U.S. ratified the Kyoto Protocol with its foreseen 7% reduction target, I doubt if the U.S. would agree that its overall performance should be assessed by focusing on a few individual states rather than the overall U.S. performance.

[1] See also the 2006 Progress Report COM(2006)658 at http://ec.europa.eu/environment/climat/pdf/kyotoreport_en.pdf

[2] Since 2004, 12 new countries have become members of the EU, most recently Bulgaria and Romania in January 2007. Ten of these twelve have Kyoto targets ranging between -6 and -8% reductions on 1990 levels. Cyprus and Malta do no have targets.

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In the year 2000, the 15 EU Member States had stabilized greenhouse gas emissions at 1990 level and by 2004 they had reduced their emissions by 0.8% compared to 1990.

In the U.S., emissions grew by 15.8% between 1990 and 2004. The U.S. still lags far behind the EU which has seen its economy grow with a far lesser effect in terms of emissions.

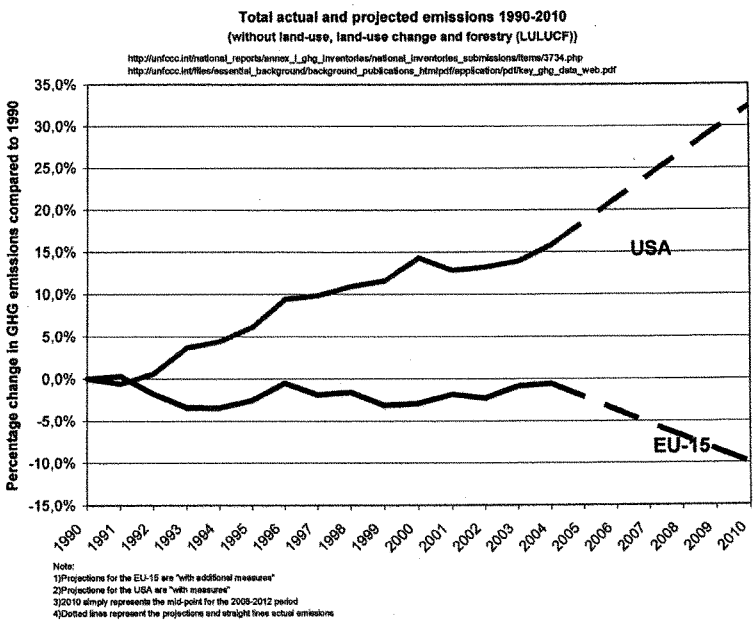
Between 1990 and 2002, greenhouse gas (GHG) emissions per unit of GDP decreased proportionately more in the EU than they did in the U.S., although they were at similar levels back in 1990. It seems that despite its improvement in recent years, the U.S. is not fully exploiting its potential for emission reductions.

When examining other important indicators such as energy use per capita or GHG emissions per capita which take into account the significant population increase in the U.S. in recent years the energy use and GHG emission figures for the U.S. have remained almost double of what they are for the EU. Increasing energy efficiency would decrease GHG emissions whilst reducing fuel imports.

The 2000-2004 time period

During the period 2000-2004, recently chosen as a reference period by the U.S. Administration, emissions in the U.S. grew more slowly than in the EU. However, in absolute terms the U.S. increase in GHG over that period was still more than in any other country in the world or than the EU as a whole (US: 29 million tonnes of CO_2, EU-27: just under 21 million tonnes of CO_2).

The selection of the limited 2000-2004 period for comparison of progress in reducing GHG emissions is far from representative. It is the longer term that is relevant in terms of successfully addressing climate change. The chart below, based on official UNFCCC data, shows how US and EU emissions have evolved and are projected to evolve between 1990 and 2010.



Furthermore, despite the developments in relative GHG emissions trends in the U.S. over the last couple of years, the future is not promising. By 2010, emissions in the U.S. are projected to be 32.4% above 1990 levels.

In contrast, the action taken at the EU level and currently under implementation at the national Member State level, is projected to result in an absolute reduction in emissions of 10.8 % from the base year 1990 by 2010 across the 25 Member States and by 8% for the EU-15 when existing (0.6%) and additional measures (4%) as well as the use of Kyoto mechanisms (2.6%) and carbon sinks (0.8%) are taken into account.

Amongst other measures such as a wide range of energy efficiency, renewable energy targets, vehicle emission and fuel standards to reduce greenhouse gas emissions, the EU has introduced a EU-wide cap and trade system which provides industry with the necessary (financial) incentives to take action and innovate in the most cost effective way.

The EU Emission Trading System (ETS) started January 1, 2005 for a three year pilot phase. Currently, it involves more than 10,000 companies, covering around 2 billion tonnes of CO_2 emissions (half of EU's total CO_2 emissions) with transactions valued at $ 19 billion in 2006. Emissions trading has two main advantages: it introduces climate change considerations in industry's financial bottom line and through the linking directive it opens up markets to Clean Development Mechanism projects in developing countries. Currently, credits from emission-

reducing projects in 169 countries representing more than 90% of the global population can be used by companies to meet part of their reduction objectives.

In addition to industry, the EU member states are also making use of the Kyoto mechanisms. The projected use of Kyoto mechanisms by 10 Member States is expected to amount to 110.6 million tonnes of CO_2eq. per year of the commitment period. This amount corresponds to over 30% of the total required emission reduction for the EU-15 of about 342 million tonnes CO_2 equivalents per year during the first commitment period. The total budget already allocated by member states amounts to about 3 billion EURO.

The EU ETS pilot phase has shown that there is room for improvement in the initial allocation, which is being addressed. An over-allocation of emissions permits in some Member States and in small and medium sized sectors for this initial period, resulting from the use of projected emissions and from a lack of data on actual emissions when the system was launched, has led to a relative drop in permit prices for the 2005-7 period. On the other hand, these price movements alongside high trading volumes are an indication that the market mechanism itself is functioning as it should. Thanks to reporting required under the EU ETS, we have the data to improve allocations for the second trading period which runs from 2008 and 2012. This is already reflected in the forward price for second phase permits. EU ETS is a very important tool for the future. We are currently working on streamlining its design for trading from 2013 onwards and expanding it to more sectors and other GHGs.

For your information, I attach some annexes with an overview of EU policies and measures, and a recent table on the EU performance under Kyoto.

The way forward

The EU is pleased to see that the climate debate is gaining momentum in Congress, in many states and with other stakeholders, and that the U.S. as a whole has started to make progress in reducing the growth of its emissions. The EU is certainly keen to exchange experiences with all interested parties in the U.S. regarding new and existing policies and measures, research programs and other initiatives and assess what is the best way forward in tackling the pressing and long term challenge of climate change. The EU has gained a lot of experience of using market-based measures such as emissions trading, and is keen to share this experience and avoid any need for the US to "reinvent the wheel" when it comes to the building blocks of emissions trading such as monitoring requirements and electronic registries.

On the basis of the scientific assessment of man-made climate change impacts, the EU's objective is to limit the average increase in global temperature to a maximum of 2 degrees Celsius (3.6 Fahrenheit) above pre-industrial levels. If the world stays within this threshold, we will still see some serious impacts, but we would have a reasonable chance of avoiding catastrophic consequences. A 3.6 degree Fahrenheit target would translate into making sure that global GHG emissions peak by 2020 and then fall drastically – by around 50% over 1990 levels to ensure that atmospheric concentrations stabilize at around 450 ppm. The EU's own calculations show that these concentrations could be achieved if developed countries as a group were to reduce their emissions by 30% by 2020 and by 60% - 80% by 2050, and if developing countries with some support limit their growth in emissions before 2020 and to reduce them in absolute terms thereafter.

The EU is looking for a shared vision amongst major GHG emitters of what needs to be done to tackle climate change. We propose these objectives and reduction paths as a framework to guide action. To underline its commitment to action, the EU has agreed an independent reduction target of at least 20% by 2020, if there is no outcome of the negotiations on a global binding post-2012 agreement.

The EU is open to discussing the details of this framework and of the actions needed with other countries and with the US in particular. One thing is nonetheless certain: time is running short and decisions need to be made as soon as possible.

Yours sincerely,

John Bruton

Ambassador

Annex I:

European Climate Change Programme (ECCP)

Status of implementation of important ECCP I identified policies and measures

Measure	Reduction potential EU-15, 2010 (Mt. CO_2)	Entry into force	Starting to deliver
EU emission trading scheme	~ NAP2	2003	2005
Link Joint Implementation (JI)/ Clean Development Mechanism (CDM) projects to emission trading	~ NAP2	2004	2005/2008
F-Gases Regulation and Directive on Mobile Air Conditioning	23	2006	2008
Dir. on the promotion of electricity from renewable energy sources	100-125	2001	2003
Directive on the promotion of Cogeneration of Heat and Power (CHP)	65	2004	2006
Directive on energy performance of buildings	35-45	2003	2006
Directive on the promotion of transport bio-fuels	35-40	2003	2005
Directive on the promotion of energy efficiency and energy services	40-55	2003	2006
ACEA voluntary agreement	75-80	1998	1999
Energy labeling directives	20	1992	1993
Total	**393-453**		

Note: The emission reduction potential for the various ECCP measures are (ex-ante) estimates. The 'ex ante' ECCP evaluation of the potential of a certain measure does not necessarily coincide with the actual realisation in the field, as not all of the detailed provisions of the proposals or adopted measures have been taken into account in the pre-evaluation. Another reason is that the estimated potential is sometimes based on reaching certain (indicative) targets, which will need to be proven in practice (eg., CHP and biofuels proposals).

Annex II: the EU's Kyoto performance

Greenhouse gas emissions trends and Kyoto Protocol targets for 2008-2012
(source: European Environment Agency, 2006)

MEMBER STATE	Base year[1] (million tonnes)	2004 (million tonnes)	Change base year–2004 (%)	Change 2003–2004 (million tonnes)	Change 2003–2004 (%)	Targets 2008–12 under Kyoto Protocol and EU burden sharing (%)	Distance to target indicator (index points) in brackets: excluding Kyoto mechanisms and sinks (%)
Austria	78.9	91.3	+15.7 %	-1.2	-1.3 %	-13.0 %	+17.9 (+24.8)
Belgium	146.9	147.9	+0.7 %	0.3	+0.2 %	-7.5 %	+1.8 (+5.9)
Cyprus [2]	6.0	8.9	+48.2 %	-0.3	-3.0 %	no target	no target
Czech Republic	196.3	147.1	-25.1 %	-0.5	-0.3 %	-8.0 %	-19.9 (-19.5)
Denmark	69.3	68.1	-1.8 %	-6.0	-8.1 %	-21.0 %	+7.9 (+12.9)
Estonia	42.6	21.3	-50.0 %	0.1	+0.7 %	-8.0 %	-44.4
Finland	71.1	81.4	+14.5 %	-4.2	-4.9 %	0.0 %	+13.1 (+14.5)
France	567.1	562.6	-0.8 %	1.5	+0.3 %	0.0 %	-1.2 (-0.8)
Germany	1230.0	1015.3	-17.5 %	-9.1	-0.9 %	-21.0 %	-2.8
Greece	111.1	137.6	+23.9 %	0.3	+0.3 %	+25.0 %	+6.4
Hungary	122.2	83.1	-32.0 %	-0.2	-0.2 %	-6.0 %	-27.8
Ireland	55.8	68.5	+22.7 %	0.1	+0.1 %	+13.0 %	+6.5 (+13.6)
Italy	519.6	582.5	+12.1 %	5.1	+0.9 %	-6.5 %	+9.9 (+16.7)
Latvia	25.9	10.7	-58.5 %	0.0	+0.4 %	-8.0 %	-52.9
Lithuania	50.9	20.3	-60.1 %	3.1	+17.9 %	-8.0 %	-54.5
Luxembourg	12.7	12.7	+0.3 %	1.3	+11.3 %	-28.0 %	+3.3 (+19.9)
Malta [2]	2.2	3.2	+45.9 %	0.1	+4.2 %	no target	no target
The Netherlands	214.3	217.8	+1.6 %	2.5	+1.1 %	-6.0 %	-0.7 (+5.8)
Poland	565.3	386.4	-31.6 %	3.7	+1.0 %	-6.0 %	-27.4
Portugal	60.0	84.5	+41.0 %	0.9	+1.0 %	+27.0 %	+14.6 (+22.1)
Slovakia	73.2	51.0	-30.3 %	-0.1	-0.1 %	-8.0 %	-24.7
Slovenia	20.2	20.1	-0.8 %	0.4	+2.0 %	-8.0 %	-1.0 (+4.8)
Spain	289.4	427.9	+47.9 %	19.7	+4.8 %	+15.0 %	+31.2 (+37.4)
Sweden	72.5	69.9	-3.6 %	-1.1	-1.5 %	+4.0 %	-8.4 (-6.4)
The United Kingdom	767.9	659.3	-14.1 %	1.3	+0.2 %	-12.5 %	-5.8 (-5.4)
EU-15	4266.4	4227.4	-0.9 %	11.5	+0.3 %	-8.0 %	-2.3 (-4.7)
EU-10	1104.9	752.2	-31.9%	6.5	+0.9%	no common target	no common target
EU-25	5371.3	4979.6	-7.3 %	18.1	+0.4 %	no common target	no common target

([1]) For EU-15 the base year for CO_2, CH_4 and N_2O is 1990; for the fluorinated gases 13 Member States have indicated to select 1995 as the base year, whereas Austria and France have chosen 1990. As the EC inventory is the sum of Member States' inventories, the EC base year estimates for fluorinated gas emissions are the sum of 1995 emissions for 13 Member States and 1990 emissions for Austria and France.

([2]) Cyprus and Malta did not provide GHG emission estimates for 2004, therefore the data provided in this table is based on gap filling.

The base-year emissions reported in this table are the latest data available from national greenhouse gas inventories (6 June 2006). Final data will be available in the report on the EU's assigned amount (pursuant to Article 3, Paragraphs 7 and 8 of the Kyoto Protocol) under the UNFCCC, due end of 2006.

Note: Malta and Cyprus do not have Kyoto targets.