CAP, AUCTION, AND TRADE: AUCTIONS AND REVENUE RECYCLING UNDER CARBON CAP AND TRADE

HEARING

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HEARING ON CAP, AUCTION, AND TRADE: AUCTIONS AND REVENUE RECYCLING UNDER CARBON CAP AND TRADE

WEDNESDAY, JANUARY 23, 2008

HOUSE OF REPRESENTATIVES,
SELECT COMMITTEE ON ENERGY INDEPENDENCE
AND GLOBAL WARMING,
Washington, DC.

The Committee met, pursuant to call, at 9:30 a.m., in Room 2128 Rayburn House Office Building, Hon. Edward Markey [chairman of the Committee] presiding.

Present: Representatives Markey, Blumenauer, Inslee, Larson, Herseth Sandlin, Cleaver, Hall, McNerney, Sensenbrenner, Sullivan and Blackburn.

The CHAIRMAN. Good morning. This past December the New Direction Congress passed the Energy Independence and Security Act, a momentous first step towards combating global warming pollution and securing our energy independence. With that down payment in place, Congress now must turn to the next great challenge: enacting an economy-wide cap-and-trade program that will reduce heat-trapping pollution 80 percent by 2050.

A cap-and-trade system harnesses the power of the market to ensure that pollution will be cut by a defined amount at the lowest possible cost. Cap-and-trade is an idea that is made in the U.S.A. Its advantages have been demonstrated under the Clean Air Act's highly successful acid rain program. The Europeans have adopted this idea for their emissions trading system for carbon dioxide. And, fortunately, we are now in a position to benefit from the lessons we have learned in implementing that system.

One of the most important questions that any cap-and-trade system must answer is how tradable pollution allowances should be distributed. Should they be given away for free to polluters or should they be auctioned off? The acid rain program and the early phases of the EU emissions trading system rely primarily on free allocation. But both economic theory and the EU's recent experience have taught us that giving allowances away may result in massive windfall profits for polluters and, surprisingly, does not lower costs to consumers.

In most cases, polluters will charge consumers for the value of the allowances, even if they receive those allowances for free. Auctioning avoids this problem and ensures that allowances distribution is transparent and fair based on the free market, rather than political deals. Auctioning also has the advantage of sending a car-

bon price signal that is loud and clear, not muffled by special interest giveaways. And, finally, auctioning can provide tens of billions of dollars of revenue, which can be used to greatly reduce the overall cost of the program and speed the transition to a low-carbon economy.

By investing auction revenues in technology research and development, efficiency, renewable energy, and rebates and tax cuts for low and middle-income households, we can provide a much needed stimulus to the economy, one that will get us out of the doldrums and unleash a clean, green revolution of innovation and prosperity.

For all of these reasons, economists have long been nearly unanimous in advocating auctioning over free allocation. Now, policymakers around the world are moving decisively towards robust action. As Mr. Zapfel, our witness from the EU will explain, the European Commission just this morning announced its proposal to move to 100 percent auctioning of allowances for electric utilities by 2013 and to increasing reliance on auctions for other industrial sources. At least six of the Northeastern states, including my home state of Massachusetts, represented this morning by Secretary of Energy and Environmental Affairs, Ian Bowles, are planning to use nearly 100 percent auctions to distribute allowances under the RGGI cap-and-trade program.

As Congress begins debate on cap-and-trade legislation, it is imperative that we learn from these experiences. The health of our planet's atmosphere is a sacred public trust that belongs to all of us, and the right to pollute it should not be given away for free, nor should we adopt a program that will enrich corporate polluters at consumers' expense.

I believe that with a well-designed cap-and-trade program based on robust auctions and revenue recycling, we can do our part to save the planet from global warming in a way that grows our economy, creates jobs, is efficient, transparent, and socially equitable. Our distinguished panel of witnesses today is well-qualified to help us to move forward on this endeavor.

I would also at this time like to inform the members that David Moulton, who serves as the Select Committee's Staff Director and Chief Counsel, will be leaving that position on February 7th. David is one of Capitol Hill's most experienced veterans. And, much to my regret, he has decided to retire from the Hill after more than 25 years of serving in the House and the Senate.

David has been at my side on every major issue I have worked on since 1985, from energy to the environment to telecommunications to consumer protection. Over the last 23 years, he has worked with me in a series of capacities, including Legislative Director, Chief of Staff in my personal office, and as Staff Director of the Subcommittee on Telecommunications and Finance, before assuming the role of Staff Director for this Committee.

Whether it is energy efficiency or the V-chip, children's educational television, or rollercoaster safety, protecting the Arctic refuge, or fighting global warming, David has been my closest adviser. He has combined a deep commitment to the public interest with a mastery of the legislative process.

Over the last year, David played a pivotal role in setting up the Select Committee. And he has helped to grow it into a force for change in this Congress and in the world.

David exemplifies all of the best qualities of the staff whose hard work and professionalism make it possible for this institution to serve the public. He combines the soul of John Audubon with the writing talents of Mark Twain. His skills, counsel, and creativity will be greatly missed by me and by all of my staff.

David, I want to thank you for all that you have done for me over the years. You are not only one of the top advisers that anyone in Congress has ever had, but you are also my very dear friend. And I wish the very best to you, your wife, Francie, and your two daughters in all of your endeavors in the years ahead.

And I know for myself and all of the staff of the Select Committee and the members of the Select Committee, we offer you our thanks for your public service. Thank you so much for everything you do.

[Applause.]

The CHAIRMAN. Let me turn to recognize the ranking member of the Select Committee, the gentleman from Wisconsin, Mr. Sensenbrenner.

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

First of all, let me say that I think I speak for over 72,000 other people who were in Lambeau Field Sunday night that we don't think global warming is such a bad thing. [Laughter.]

Because if it weren't for global warming, it might have been 20 below there, rather than just a little bit below the zero margin. And the game was bad.

Today's hearing will focus on the details of a cap-and-trade system. Specifically, the hearing will examine how carbon credits and allowances are to be distributed in a cap-and-trade system. However, I will not be offering much input into this nuance question because I will oppose a cap-and-trade regulatory regime and oppose it strongly, no matter how credits are distributed within the system.

My reason for opposing this mess is simple. From the outside of the Select Committee, I said that I will oppose any legislative effort that will hurt jobs and the economy. And I am convinced that a cap-and-trade system will do just that.

One needs look no further than Japan, Italy, and Spain to see what quicksand awaits U.S. ratepayers under a cap-and-trade system. Together these nations will have to fork over $33 billion to buy carbon credits according to a November 30th Bloomberg news article. This amounts to a tax on electricity in those countries since the cost of these credits will probably be hidden in the overall electricity bill.

Make no mistake. These costs are the price tag of the Kyoto treaty. President Bush has received much grief for failing to sign on to that bloated regulatory regime. But after seeing how it is raising electricity costs in Europe and Asia, I am pleased that the President followed my advice and kept the United States out of that bad deal.

The question isn't if a cap-and-trade system will raise electric costs. The question is how much they will raise costs. This is a question that I have been asking over and over today and throughout the year as we continue to examine this issue.

When this Select Committee conducted a field hearing in Seattle last November, I engaged with New York City Mayor Michael Bloomberg on the differences between a cap-and-trade system and a direct tax on carbon. While I disagree with Mayor Bloomberg on the need for carbon tax, we both agreed that at least a carbon tax is an honest attempt to reduce carbon emissions; whereas, a cap-and-trade system simply buries the cost deep within your electricity bill.

Cap-and-trade is a politician's dream, doesn't have to vote for the tax and then can run around and criticize the evil electricity companies for passing the cost of these credits on to consumers. It's a dishonest way of doing it. At least Mayor Bloomberg said that if we're going to do this type of a taxing system, we ought to do it the honest way.

If the politicians in Washington believe it is a good idea to use taxes in an effort to fight global warming, then they should show the ratepayers exactly how much they are spending on these so-called global warming solutions. I think most people would find that to be the real inconvenient truth.

Ten years ago, when I was Chair of the Science Committee, an employee of the Clinton administration testified that the Kyoto treaty and the cap-and-trade system that was envisioned in that would raise electric rates by 80 percent.

I can't face the senior citizens in my district, saying that a procedure that I have advocated cost them that much money. And what is going to happen to manufacturing when the cost of energy here goes up that much but the cost in China doesn't go up at all?

Since 2005, Europe has been under a cap-and-trade system. So far the results don't look good. Open Europe, a group that studied the system, found that it acted like a wealth transfer mechanism, subsidizing polluters in states making little effort to control carbon emissions while punishing states that had tougher emission allocations.

Perhaps the cost of this system would be worth it if they were actually creating measurable improvements to the environment. But as Open Europe notes, this regulatory system has actually led to an increase in emissions from Europe.

The American people deserve a technological approach to global warming that improves the environment while protecting the economy. They don't deserve a tax hike that masquerades as a solution.

I yield back the balance of my time.

The CHAIRMAN. Great. The gentleman's time has expired. The Chair recognizes the gentleman from Oregon, Mr. Blumenauer.

Mr. BLUMENAUER. Thank you, Mr. Chairman. I, as always, appreciate the eloquence of our ranking member. One of the fallacies I hear, though, in his presentation is that we are already paying huge costs as a result of global warming. And the scientific evidence is that it is going to be far greater.

The Stern review suggested that by investing as little as one percent of our GDP, we could avoid the worst effects. Failure to avoid

the worst effects could have the GDP worldwide dropping 20 percent. I mean, this is a wise investment.

And the good news is that a year from now, the United States will no longer be the single holdout of the industrialized countries that don't believe that we're going into a carbon-constrained economy. It is still open to how that carbon constrained. And it maybe that carbon tax has some merit.

I am intrigued, as you, Mr. Chairman, with the potential of the carbon cap-and-trade. It might just be the key to saving the planet, but it also might be very helpful to get us out of the current economic crisis that we find ourselves in because we have systematic weaknesses, economic deficit, environmental deficit, infrastructure deficit.

A cap-and-trade has a potential for creating a great deal of value. How that is captured and where it is allocated is of great interest to me. I am going to be posing some questions to this terrific panel that you have assembled to see if there is some way that a portion of this value could be reallocated to deal with crumbling infrastructure, in some places in the wrong places, invested in the wrong ways, that we might be able to take a portion of it to be able to revitalize the infrastructure, to reduce the carbon footprint over the long run while we stimulate the economy in the foreseeable future and avoid economic catastrophe in the future.

I deeply appreciate this opportunity and look forward to pursuing this. But be forewarned. This is something I would like some of our witnesses to think about with this.

The CHAIRMAN. Great. The gentleman's time has expired. The Chair recognizes the gentlelady from Tennessee, Ms. Blackburn.

Ms. BLACKBURN. Thank you, Mr. Chairman. Thank you for the hearing. And I want to thank our witnesses for being here today. I also want to apologize. We have an O&I Committee hearing with Energy and Commerce. So I am going to have to be up and down and back and forth today, Mr. Chairman, but I do thank our witnesses for being here. And I thank you that we are going to look at how a cap-and-trade would be administered and the prospects for such a system.

I will tell you right up front I have some grave concerns about this type carbon reduction scheme because of my belief that it would drastically affect the nation's energy supply and would significantly distort the market. So I join my colleagues in letting you know that I do have some questions that I would pose to you.

Now, I know that proponents of the cap-and-trade system argue that the system is necessary because humans are causing a global climate change through emissions and carbon dioxide. And, therefore, we have to institute something that is going to drive a change to this human behavior.

But then we turn around. And in our study and research, I have read several things in some of our scientific journals from the past decade that show that most, if not all, of our recent global warming is caused by the sun and other natural causes and cannot be specifically and irrefutably linked to human activity.

And if these schemes were to be implemented, they would have little to no effect in changing the current projected rate of temperature more than a couple of degrees over 100 years.

So I think that it is our responsibility. It's this Committee's, and it is Congress' responsibility to take reasonable actions to protect the environment. But closing coal plants and imposing massive energy costs on consumers in developing nations is in my opinion not the way we ought to go.

A cap-and-trade or a carbon tax system will likely lead to shuttering many of the power plants that are in existence today and would compromise the American job market and could lead to a greater dependence on foreign energy sources, rather than driving us toward energy independence. And all of this would end up having a negligible environmental effect.

In my opinion, that may be a little bit too steep a price to pay. This past summer, several of my colleagues and I traveled to Europe and firsthand had some firsthand visits with those on the cap-and-trade system. It raised some concerns. We look forward to hearing from you today.

I yield back.

The CHAIRMAN. Great. The gentlelady's time has expired. The Chair recognizes the gentleman from Washington, Mr. Inslee.

Mr. INSLEE. I was talking to the President of the National Academy of Sciences the other day. And he wasn't worrying about the sun wobbling around or sunspots destroying the climactic system of the Earth. This is a problem we have got to tackle. I am glad we are here because if we don't solve this problem, nothing else matters.

I want to make three comments about cap-and-trade. First, those who are critical of the cap-and-trade system, I would just simply say, as they say in Texas, show me what you've got. Show me what you've got to solve this problem. And those who criticize this and approach from a lot of other criticisms never come up with another system to solve this problem. It is the best system we have available, and we should implement it.

Second, for those who argue that a cap-and-trade system is sort of a camouflage system, trying to avoid responsibility, I would suggest the reason it is important is the first word. It is a cap. And a carbon tax does not have a cap. A carbon tax makes some assumptions about behavior that may or may not be true.

The European experience has been a tax alone does not and cannot solve the problem. You have to have a hard, meaningful, concrete, impenetrable, legally enforceable cap.

And this we guarantee our constituents. We are going to tell our grandkids we are going to have a solid, enforceable limitation on how many megatons of CO_2 we are putting into the atmosphere.

Third, the most important debate we will have in the next 12 months is on an auction because there are some things we can learn from Europe. It's true they don't know what football is, but there are some things we can learn from them.

And the number one lesson from Europe is that you have to have an auction if you are going to have a meaningfully successful cap-and-trade system, both for reasons of equity because of the tragedy of the commons that they first brainwashed me about in economics back 36 years ago but also because it has to work that way from an equity standpoint and an enforcement standpoint by putting a price on carbon. That is a lesson from Europe. They have learned

it. We don't have to go through their painful first few years. We can learn from their experience.

I will be working on legislation to have the earliest implementation of 100 percent oxygen as soon as humanly and politically possible. It is what I believe will be the single most important debate we have in Congress this year. And we hope that the forces of oxygen prevail for our grandkids' sake. It is a lesson from Europe. We have got to learn it.

Thank you.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Thank you, Mr. Chairman.

I want to thank the panel for coming here today. The cap-and-trade policies that are ultimately adopted by this government are not only extremely important, but it is also an extremely interesting process.

Speaking as a scientist, I look forward to getting into some of these details and having some fun mucking around, but, in particular, such a program will determine the direction of our economy. It will help or hurt our poor, our lower-income people. It will guide industry and, if done properly, will make America a leader as we move forward into the twenty-first century.

So, with little or no pressure on the panel, I look forward to your testimony. And I reserve the balance of my time.

The CHAIRMAN. The gentleman can do that. The Chair recognizes the gentlelady from South Dakota, Ms. Herseth Sandlin.

Ms. HERSETH SANDLIN. Thank you, Mr. Chairman. I will reserve my time for questions as well. Thank you.

The CHAIRMAN. The Chair recognizes the gentleman from Connecticut, Mr. Larson.

Mr. LARSON. Thank you very much, Mr. Chairman. I, too, look forward to the testimony. And I feel somewhat like that old George Gobel line. I feel like a pair of brown shoes at a black tuxedo event.

I do favor very strongly a specific tax credit, carbon tax credit, because I think that that is the most direct, most efficient means of us accomplishing a goal. I am skeptical about the cap-and-trade and remain to be convinced and certainly am anxious to hear from our panelists today.

But I am especially concerned about the auction and about how the auction takes place, how a cap-and-trade is going to be administered, what is going to happen down line to people when we know the costs are going to rise.

I especially am concerned in the Northeast about the constituents that I represent. And I feel that they would be more advantaged by making sure that we had a payroll tax deduction specifically tied to a carbon tax that would both benefit them and I think provide both an appropriate cap and a path forward for us to solve this very difficult problem.

I think it also would be helpful to us in dealing with our foreign partners, most notably in China and India, because of the transparency issues that obviously exist but remain to be convinced otherwise.

The CHAIRMAN. The gentleman's time has expired. And all time for opening statements from the members has been completed. So we will now turn to our panel.

And we will hear first from Mr. Dallas Burtraw. He is a Senior Fellow at Resources for the Future. Mr. Burtraw is an economist who is recognized as one of the leading national experts on emissions cap-and-trade systems. He has worked in this area for the past two decades and has played an important role in evaluating the Clean Air Act's acid rain program and has worked extensively on the Northeastern states' RGGI program and on the EU's emission trading system. We welcome you, Mr. Burtraw. Whenever you are ready, please begin.

Mr. BURTRAW. Thank you. Thank you for the opportunity to testify today.

STATEMENT OF DALLAS BURTRAW

Mr. BURTRAW. Resources for the Future neither lobbies nor takes positions on specific legislative or regulatory proposals. So I emphasize that the views I present today are my own. I mean, I am going to talk specifically about the question of how emission allowances are allocated or initially distributed in the implementation of a cap-and-trade program by addressing several specific questions.

The first is, what are the efficiency benefits of auctions? There are not many viewpoints that you can get most economists to agree on, but one of them is that the role of an auction in the implementation of an emissions cap-and-trade program delivers significant efficiency benefits.

One perceived virtue of auctions is that they are consistent with the principle of simplicity and transparency, which is valuable in the formation of a new market.

A second and equally forceful reason that economists favor an auction is that it makes funds available that can be used to achieve other goals. Depending on how these revenues are used, they can help in an important way to reduce the economic costs of climate policy. For the purposes of minimizing the costs and promoting economic growth, economists would favor dedicating the use of revenues from an auction to reduce preexisting taxes.

A second approach would be to reinvest some portion of allowance value to reinforce policy goals. For example, in the ten-state Northeast Regional Greenhouse Gas Initiative that takes effect in 2009, at least 25 percent of the allowance value which would be realized through an auction is to be budgeted to consumer benefit, such as investments and energy efficiency.

A third idea is that even a relatively small sliver of auction revenues would provide a relatively substantial infusion of support for research and development of new technologies. I know that others on this panel have other ideas that deserve consideration on this revenue question.

Second, would free allocation of allowances significantly reduce economic impacts on consumers? The group that is most affected by climate policy will be consumers.

In the electricity sector under an auction, although we find that some electricity generators are going to bear some costs under an auction, consumers of electricity bear about eight times greater

costs. This results because generators are able to pass along the cost to consumers through increasing prices.

Free allocation of emission allowances to generators cannot be expected to reduce this impact where there are competitive markets. The only important exception is in that portion of the electricity sector where there are regulated prices. And in these regions, consumers would benefit from free allocation to firms.

However, in general, throughout the economy, the ability of firms to pass on the cost of allowances does not hinge on how they receive the allowances initially. Sometimes one hears firms argue to the contrary, saying they would not charge their customers for emission allowances they received for free.

When one hears this, one might think that a different conversation needs to be had between those firms and their shareholders because it is shareholder value they would be giving away.

The fact that a firm and competitive market will charge its customers for the use of an asset that the firm has received for free is often a difficult idea for people to grasp at first but is wholly consistent with economic theory and is in general what has been observed in empirical studies. In general, giving allowances away for free to firms will provide little benefit to consumers.

There is one way that consumers could benefit from free allocation, however. And that is if citizens were to receive allowances' value directly. This approach has been called a cap-and-rebate to every person with a Social Security number.

Number three, to what extent do auctions deprive polluters of capital needed to invest in achieving substantial reductions in greenhouse gases? In the electricity sector, most new investment and generation relies on project-specific financing, meaning that each project is evaluated and financed independently with capital from outside the firm. As a consequence, implementation of an auction will not affect the availability of capital for financing new projects in the important electricity sector.

What proportion of allowance value is needed to compensate polluting firms? Overall, economic estimates suggest that the loss in market value of industries that are going to be heavily affected by climate policy is less than 30 percent of the value of emission allowances. This estimate masks some differences among firms because many firms turn out to be winners, and some firms are losers.

In the electricity sector, which, again, is the center of much attention, the industry as a whole would require just six percent of allowance value, but this accounts for firms that gain value. And to compensate only the losers would require about 11 percent of the allowance value.

Is it feasible to allocate, construction an allocation formula, that would efficiently target compensation to those firms that are adversely affected?

The award of free allowances is a blunt instrument for achieving compensation for producers. Free allocation tends to reward winners as well as losers, thereby eroding efficiency and the ability to compensate other affected parties.

We find the opportunity costs of compensation to producers in the electricity sector is five times the cost of compensation deliv-

ered successfully. The difference accrues to firms as windfall profits.

One way to improve this would be to apportion allowances for the states and let the states conduct allocation to achieve compensation goals. This cuts in half roughly the cost of achieving compensation or more modest compensation targets also reduce the cost. Nonetheless, under any strategy, there are important considerations regarding the difficulty of achieving compensation.

Finally, to what extent are the economic impacts of legislation on polluting firms likely to be spread among shareholders who hold diversified portfolios? In this modern age, the vast majority of shareholders hold few, if any, stocks in individual companies. Most of us hold assets in mutual funds. For this reason, the way to deliver compensation to owners of equity is to design an efficient policy in order to lessen the overall cost of the policy, which is precisely the virtue of the use of options.

Thank you for the opportunity to testify.

[The statement of Dallas Burtraw follows:]

Written Testimony of Dallas Burtraw

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

Prepared for the U.S. House of Representatives Select Committee on Energy Independence and Global Warming

Cap, Auction, and Trade:

Auctions and Revenue Recycling under Carbon Cap-and-Trade

January 23, 2008

Summary of Testimony

Cap, Auction, and Trade: Auctions and Revenue Recycling under Carbon Cap-and-Trade. A majority of economists favor the use of auctions over the free allocation of emissions allowances. One reason is that an auction satisfies the principle of simplicity and transparency. It is administratively simple and precludes regulated parties from seeking a more generous future allocation. The second and equally forceful reason is that it makes available funds that can be used to achieve related goals. Depending on how these revenues are used, they can help reduce the cost of policy significantly.

The harm to industry in the aggregate represents no more than 30 percent of the value of emissions allowances. Special attention is often focused on the electricity sector because it holds the potential for the largest emissions reductions in the first decades of climate policy. The harm in that sector in the aggregate is equal to only 6 percent of total allowance value. However, this statistic masks the fact that many firms are winners. Compensating firms is problematic because the delivery of compensation will be imprecise. Depending on the approach used and the compensation target, the opportunity cost of delivering compensation may be several times the amount of deserved compensation because much of the compensation will accrue to undeserving firms. Meanwhile, the harm to consumers in the electricity sector is eight times greater than that to producers. The best way to deliver compensation to consumers would be through broad-based approaches that preserve and enhance the efficiency advantages of an auction. Some leading possibilities would be revenue recycling to achieve broad-based reductions in preexisting taxes, investments in energy efficiency and research, and direct rebates of revenue to individuals.

Written Testimony of Dallas Burtraw
Cap, Auction, and Trade:
Auctions and Revenue Recycling Under Carbon Cap-and-Trade

Mr. Chairman, thank you for the opportunity to testify before the House Select Committee on Energy Independence and Global Warming. My name is **Dallas Burtraw,** and I am a senior fellow at Resources for the Future (RFF), a 55-year-old research institution based in Washington, D.C., that focuses on energy, environmental, and natural resource issues. RFF is independent and nonpartisan and shares the results of its economic and policy analyses with environmental and business advocates, academics, government agencies and legislative staff, members of the press, and interested citizens. RFF neither lobbies nor takes positions on specific legislative or regulatory proposals. I emphasize that the views I present today are my own.

Over the past 18 years, I have studied the performance of emissions cap-and-trade programs from both scholarly and practical perspectives. I have studied the sulfur dioxide (SO_2) emissions allowance trading program created by the 1990 Clean Air Act Amendments and the nitrogen oxide (NO_x) trading program in the northeastern United States. I also have studied the European Union Emission Trading Scheme (EU ETS). I have conducted analysis and modeling to support the northeastern states in the design of the Regional Greenhouse Gas Initiative (RGGI). Recently I worked with a team of researchers to develop recommendations for the design of an auction in RGGI on behalf of the New York State Energy Research and Development Authority.[1] I also worked

[1] Holt, C., Shobe, W., Burtraw, D., Palmer, K., and Goerce, J. 2007. *Auction Design for Selling Co2 Emission Allowances under the Regional Greenhouse Gas Initiative* (October 29).

with a team to provide guidance for the State of Maryland as it implements its plan to join RGGI.[2] Last year I also served on California's Market Advisory Board for implementation of the state's Assembly Bill 32, the centerpiece of the state's greenhouse gas initiative.[3]

I have been asked to comment generally on **how emissions allowances are allocated (i.e., initially distributed)** in the implementation of a cap-and-trade program. I will address six specific questions.

1. **What are the efficiency benefits of robust auctions of allowances under a cap-and-trade system?**

There are not many viewpoints you can get economists to agree on, but one exception is the role of an auction in the implementation of an emissions cap-and-trade program. The vast majority of public finance economists would recommend an auction as the most efficient way to allocate emissions allowances. There are several reasons for this. I will put them into two categories.

First, an auction satisfies the principle of simplicity and transparency. This is an important principle for the formation of a new market for an environmental commodity. Compared with other approaches, an auction helps maintain transparency and the perception of fairness, and it leads to more efficient pricing of goods in the economy,

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[2] Center for Integrative Environmental Research, University of Maryland. January 2007. *Economic and Energy Impacts from Maryland's Potential Participation in the Regional Greenhouse Gas Initiative.*

[3] *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California.* 2007. Recommendations of the Market Advisory Committee to the California Air Resources Board, (June 20).

which reduces the cost of the policy.

Generally speaking, auctions are viewed as more transparent than administrative approaches to the initial distribution of allowances. Parties have strong incentives to argue for an ever-increasing share of emissions allowances through free allocation, but the literature suggests that the use of auctions in telecommunications leads to less litigation.[4] Many authors suggest that auctions reduce what economists call "rent-seeking behavior," which is the incentive for regulated parties to invest resources in trying to affect the outcome of an administrative process that distributes allowances freely.[5] One particularly insidious aspect of free allocation is the adjustment to allocation rules that are usually made for new emissions sources and for old sources that retire. The SO_2 trading program has no adjustments for these sources, which is a virtue because it does not create incentives that would entice investment behavior to deviate from what is otherwise efficient. However, most other trading programs have such adjustments. In the NO_x budget program, for example, individual states determine the allocation of allowances; most have set-asides for new sources, and sources that retire lose their allocations. Adjustments also are ubiquitous in the EU Emission Trading Scheme. The problem with such adjustments is that they alter the incentives for investment and retirement in a way that can lead to unintended consequences. For instance, there is evidence that as a result of adjustments to allocation rules for new sources in the EU, the value of emissions allowances can cause less economic and higher-polluting emissions sources to be a preferred investment relative to other technologies. This can result from

[4] Binmore, K., and P. Klemperer (2002). "The Biggest Auction Ever: The Sale of the British 3G Telecom Licenses." *The Economic Journal* 112: C74–C76.
[5] Hepburn, C., Grubb, M., Neuhoff, K., Matthes, F., and Tse, M. 2006. "Auctioning of EU ETS Phase II Allowances: How and Why?" *Climate Policy* 6(1): 137–60.

the value of the subsidy that is received by those sources in the form of free allocations. Furthermore, the removal of allocations from sources that retire provides a financial incentive to continue the operation of existing facilities that are often inefficient and that otherwise would retire except for the value of the allowances that they earn by remaining in operation.[6] The use of an auction avoids this predicament entirely.

Another reason that an auction has efficiency benefits applies specifically to the electricity sector. Compared with free allocation, an auction approach tends to reduce the difference between price and marginal cost for electricity generation—a source of inefficiency that is endemic to the electricity industry.[7]

The second and equally forceful reason that economists favor an auction is that it makes available funds that can be used to achieve other goals. Depending on how these revenues are used, they can help reduce the social cost of climate policy in an important way.

For the purposes of minimizing the cost of climate policy on the economy and promoting economic growth, economists would favor dedicating the use of revenue from an auction to reduce preexisting taxes. This is especially important in the context of climate policy because it is likely to represent the most significant environmental initiative the country has ever pursued. Like any new regulation, climate policy imposes costs on households

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[6] Åhman, M., Burtraw, D., Kruger, J., and Zetterberg, L. 2007. "A Ten-Year Rule to Guide the Allocation of EU Emission Allowances." *Energy Policy* 35(3): 1718–30.

[7] Beamon, J.A., Leckey, T., and Martin, L. 2001. "Power Plant Emission Reductions Using a Generation Performance Standard." Draft. Washington, DC: U.S. Department of Energy, Energy Information Administration. Burtraw, D., Palmer, K., Bharvirkar, R., and Paul, A. 2001. "The Effect of Allowance Allocation on the Cost of Carbon Emissions Trading." RFF Discussion Paper 01-30, Washington, DC: Resources for the Future. Burtraw, D., Palmer, K., Bharvirkar, R., and Paul, A. 2002. "The Effect on Asset Values of the Allocation of Carbon Dioxide Emission Allowances." *The Electricity Journal* 15(5): 51–62. Parry, I.W.H. 2005. "Fiscal Interactions and the Costs of Controlling Pollution from Electricity." *Rand Journal of Economics* 36(4): 850–70.

and firms, and that cost acts like a virtual tax, reducing the real wages of workers. This hidden cost can be especially large under a cap-and-trade program because the price placed on the scarcity value of carbon is reflected in the cost of goods that use carbon in their production. However, one of the most important findings in environmental economics and public finance in the past 15 years is that the use of revenue raised through an auction (or an emissions tax), if dedicated to reducing other preexisting taxes, can reduce this cost substantially. This so-called revenue recycling would have truly dramatic efficiency advantages compared with free distribution.[8]

Some portion of auction revenue could be used in several ways to help reinforce program goals and lessen the impact of climate policy. For example, the Model Rule for the 10 northeastern states participating in RGGI specifies that each state must allocate at least 25 percent of its budgeted allowances to a consumer benefit or strategic energy purpose account. These "consumer benefit" allowances are to be sold or otherwise distributed to promote energy efficiency, to directly mitigate electricity ratepayer impacts, or to promote lower-carbon-emitting energy technologies. (Six of the 10 RGGI states so far intend to auction 100 percent of their budgeted allowances.) In a study for the State of Maryland, we found that the dedication of 25 percent of the allowance value to

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[8] Bovenberg, A.L., and Goulder, L.H. 1996. "Optimal Environmental Taxation in the Presence of Other Taxes: General Equilibrium Analyses." *American Economic Review* 86: 985–1000. Bovenberg, A., and de Mooij, R. 1994. "Environmental Levies and Distortionary Taxation." *American Economic Review* 84: 1085–89. Goulder, L.H., Parry, I.W.H., Williams III, R.C., and Burtraw, D. 1999. "The Cost-Effectiveness of Alternative Instruments for Environmental Protection in a Second-Best Setting." *Journal of Public Economics* 72(3): 329–360. Parry, I.W.H., Williams, R.C., and Goulder, L.H. 1999. "When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets." *Journal of Environmental Economics and Management* 37(1): 52–84. Smith, A.E., Ross, M.T., and Montgomery, W.D. 2002. "Implications of Trading Implementation Design for Equity-Efficiency Trade-Offs in Carbon Permit Allocations." Washington, DC: Charles River Associates.

investments in end-use efficiency could offset any increase in retail electricity price that would occur from the state's joining RGGI.[9] This research indicates that investing just a portion of the allowance revenues can offset the impact of the policy on consumers while also advancing climate policy goals.

Auction revenue also can help support the attainment of efficiency in our energy infrastructure more broadly. A small sliver of auction revenues would provide a relatively substantial infusion of support for research and development of new technologies, or it could provide incentives for investment, such as an investment tax credit aimed at promoting innovative technologies or modernizing industries that are especially vulnerable to the policy.

Finally, a related issue involves adaptation to climate change. Atmospheric scientists tell us that we are already at the point where some climate warming is inevitable and that adaptation will be necessary. Adaptation to climate change will likely involve significant investment by the private and public sectors. An auction provides revenues that can be directed toward these adaptation activities.

2. Compared with a full auction of allowances, would free allocation of allowances significantly reduce economic impacts on consumers, and if not, why not?

Our modeling indicates that the group most affected by climate policy will be consumers. The electricity sector has been studied in detail because it constitutes about 40 percent of

[9] Center for Integrative Environmental Research, University of Maryland. January 2007. *Economic and Energy Impacts from Maryland's Potential Participation in the Regional Greenhouse Gas Initiative.*

the nation's CO_2 emissions, but it is expected to provide two-thirds to three-quarters of emissions reductions in the first decades of a policy. When 100 percent of CO_2 emissions allowances used by the electricity sector are auctioned, we find that although firms bear some cost, consumers of electricity bear an eight times greater cost. This results because firms in the electricity sector are able to pass costs along to consumers through increasing prices. The burden to consumers reflects the vast majority of the cost of climate policy to the electricity sector.

It is interesting to consider where impacts are felt by electricity consumers. Figure A illustrates the changes that would occur under a $15 allowance price in the year 2015. Arrayed across the bottom is a sampling of regions of the country based on the share of coal-fired electricity generation, represented by the growing mountain from left to right. The dotted line across the graph represents the average electricity price that is expected nationally from the CO_2 price of $15/ton. The lower part of each bar represents the electricity price in the base case with no federal CO_2 cap, and upper part represents the increase in electricity price that would result from the policy. There are two things to note from this figure. One is that those regions of the country that use the most coal use will experience the greatest change in electricity price. The second is that these regions will still have lower electricity prices than other parts of the country. In other words, the electricity customers who would bear the greatest change in costs due to climate policy still end up with prices that are lower than much of the nation.

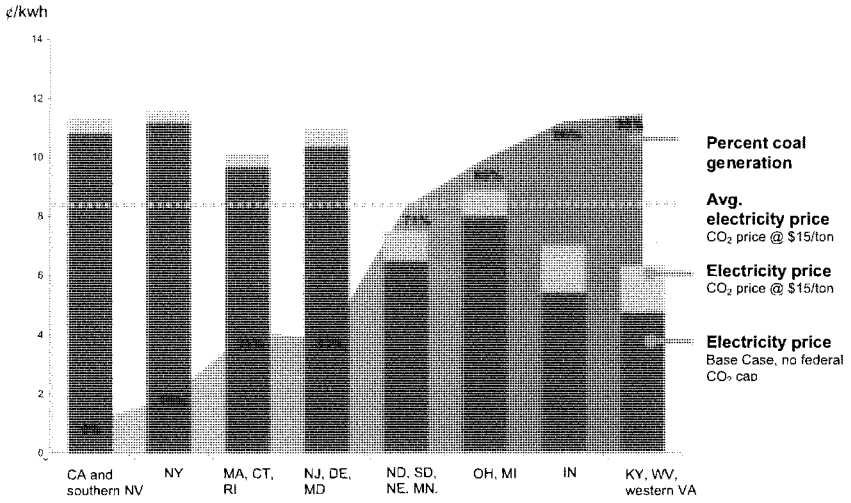

Figure A. Distribution of change in electricity prices by region (2015).

In some cases the free allocation of allowances can reduce economic impacts on consumers, but whether that occurs depends on how free allocation occurs and to whom it is directed. As a general principle, in competitive markets free allocation to firms will not benefit consumers because the economic value of a commodity in a competitive market is determined by its scarcity. Emissions allowances are a valuable asset, and as long as there is a liquid allowance market, a firm can sell allowances at the market price instead of using them for its own compliance responsibilities. Therefore, the firm will recognize the lost opportunity for revenue from the sale of an allowance each time it uses the allowance itself for compliance.

The fact that a firm in a competitive market will charge its customers for the use

of an asset that the firm has received for free is often a difficult idea for people to grasp at first, but it is wholly consistent with economic theory and it is in general what is observed in empirical studies. Indeed, sometimes economists seek evidenee of noncompetitive behavior and "market power" by looking for instances when the price of a good differs from the cost of factor inputs used in its production. An emissions allowance in a cap-and-trade program is one such factor. If a firm did not pass through the cost of an allowance in the pricing of its product, it would be *prima facie* evidence of a noncompetitive market—and of possible market manipulation.

In a recent project, we conducted laboratory economic experiments with human subjects to see how people actually behaved when faced with a pricing decision in the context of allowance trading. In the experiments, subjects were rewarded financially for how well they performed in the laboratory. Subjects were asked to determine the price for a good they were going to sell into a market, and production of that good required the use of an allowance along with other inputs. The subjects were sometimes given allowances for free, and sometimes they had to pay for them. In the laboratory we found a variety of behaviors; at first many subjects did not include the value of an allowance in setting their product price when they received the allowance for free. But subjects who did behave in accordance with economic theory had substantially greater earnings. Furthermore, we observed learning. Subjects who did not charge for the allowances they received for free learned quickly through trial and error that they could boost their earnings by doing so.

In a competitive market, the degree to which firms are actually able to charge customers for any change in cost depends on technical issues involving the relative elasticities of demand and supply, but theory clearly indicates that firms will charge

customers to the degree they are able to do so. The use of allowances constitutes a change in the cost of production. The important idea is that the ability of firms to pass on a change in the cost of production does not hinge on how they received the allowances initially. Sometimes one hears firms arguing to the contrary, saying, "We would not charge our customers for emissions allowances we received for free!" When one hears this, one might think that a different conversation needs to occur between those firms and their shareholders, because it is shareholder value that is being given away if such behavior is evident in fact.

Economists think most markets are fundamentally competitive, at least in the long run, so in most markets economists would not expect to see consumers receive the benefit from free allocation to firms. However, a substantial portion of the electricity market is not competitive, but instead operates under cost-of-service regulation. In these cases regulators set prices to allow firms to recover their costs, and costs are calculated on an original cost basis. If allowances are received for free by regulated electricity generators, then the addition to the cost basis for the purpose of cost recovery is zero. This is the one case where the benefit of free allocation to emitters or producers can be expected to be passed on to consumers. Roughly speaking, this situation applies to about half of the electricity customers in the country.

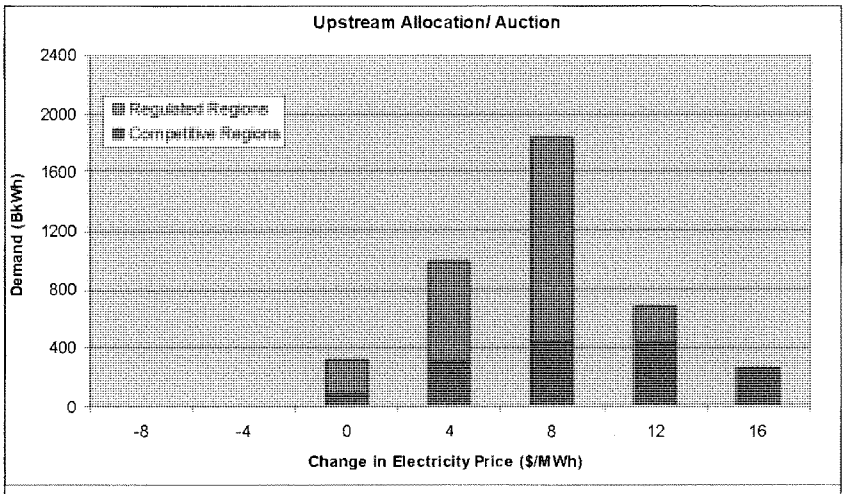

Figure B. Distribution of change in electricity prices by region (2015).

That some electricity consumers can be expected to benefit from free allocation to producers in regulated regions of the country but those in regions with market-based prices will not introduces a challenging dilemma to climate policy. Figures B and C illustrate this dilemma.[10] Figure B shows the change in retail electricity price that could be expected from a modest climate policy that introduces a price on allowances of $15/ton. The two colors in Figure B correspond to customers in regulated and competitive regions of the country. More or less, both sets of customers would experience a similar change in price under an auction; the difference would be driven primarily by the carbon intensity of electricity generation, which is consistent with the way a cap-and-trade program is expected to work.

[10] Burtraw, D., and Palmer, K. 2007. "Compensation Rules for Climate Policy in the Electricity Sector." Resources for the Future Discussion Paper 07-41, and additional analysis.

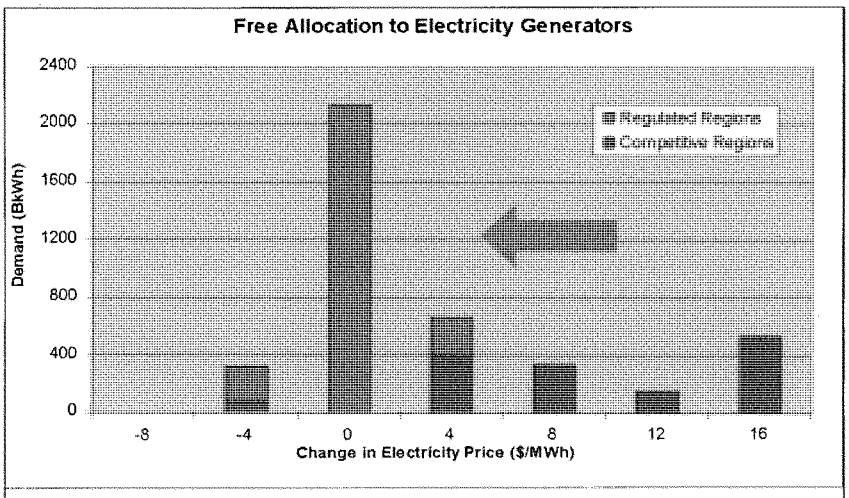

Figure C. Distribution of change in electricity prices by region (2015).

Figure C illustrates what would happen to electricity prices if there were free allocation to producers. In this case producers in regulated regions would be expected to allow their customers to receive the benefit of free allocation, but producers in competitive regions would not. The consequence is that an asymmetry emerges that is tied not to the amount of carbon emissions but rather to the nature of electricity sector regulation. For advocates of free allocation, this dilemma has been one of the most difficult stumbling blocks in thinking through how to craft climate policy: under free allocation, electricity customers in different regions are treated differently.

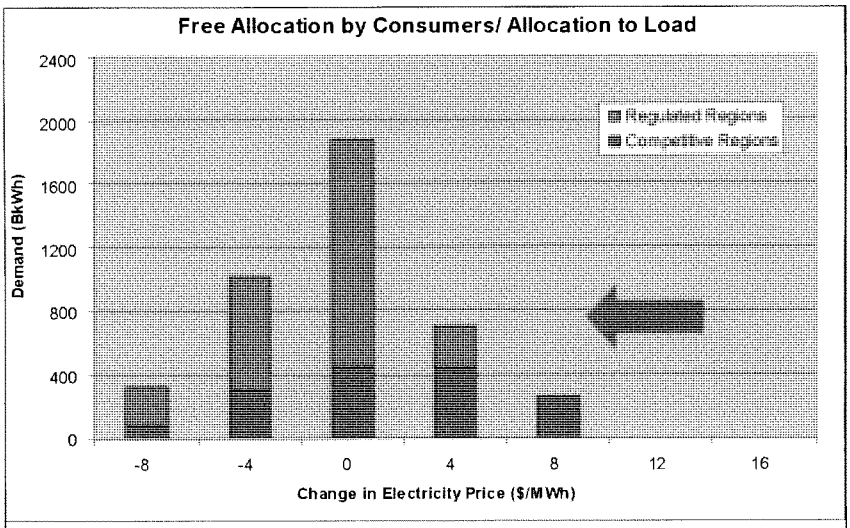

Figure D. Distribution of change in electricity prices by region (2015).

One other way that free allocation could directly benefit electricity consumers would be if that allocation were given to consumers directly, rather than to producers. This approach would allocate allowances to "load-serving entities," the retail electricity companies that deliver electricity to customers. In general, the retail electricity distribution companies would be expected to share the value associated with free allocation with customers. Although retail companies would see the cost of power in the wholesale power market increase under a cap-and-trade program, they would have substantial allowance value to apply against that cost increase, and this would reduce the cost impact for their customers. The consequences of this type of policy are illustrated in Figure D: free allocation to retail electricity load-serving entities on behalf of their customers on the basis of consumption would tend to recover the symmetry in the impact of climate policy across regulated and competitive regions. For this reason, this approach

has gained some support as a potential path to compromise from surprisingly different types of firms in the electricity industry. Furthermore, it would soften the impact on electricity customers substantially. It begs the question of whether allocation to load should be on the basis of consumption, emissions, population, or some weighted average. Each approach produces a somewhat different result.

Unfortunately, free allocation to load-serving entities comes with an important efficiency cost. When electricity customers do not see the increase in retail electricity prices, they have no incentive to reduce electricity consumption: their electricity bills (and national climate policy) will play less of a role when it comes time to purchase a new refrigerator, so they will be less inclined to choose an efficient model. Across the sector, this effect would lead to more electricity consumption, and under an economy-wide program, it would lead to more emissions from the electricity sector. In the example we modeled, it leads to a 15 percent increase in allowance price under the cap-and-trade program and requires greater emissions reductions for the rest of the economy. Essentially, the free allocation to electricity customers is a subsidy to electricity consumption that is not received by users of natural gas or transportation fuels or by industry or commerce, except to the degree that they consume electricity. That means that more emissions reductions have to be achieved in these other sectors, which raises the cost of climate policy in an important way. Nonetheless, because free allocation to customers has the political virtue of lessening the price effect, it remains an idea for how to construct a transition path to phasing in a full auction in the electricity sector.

There is one other way that consumers can benefit from free allocation. That is if consumers, as citizens, receive allowance value directly. This approach has recently been

called "cap, auction, and rebate." The idea is that allowance values from an auction could be returned directly to every individual who has a social security number. It would be the most progressive in its distributional consequences of all the approaches that have been suggested. Other than direct allocation on a per capita basis or some other formula that might take advantage of information about household income or some other criterion, the other way to achieve broad-based compensation for consumers is recycling the revenue raised in an auction to reduce preexisting taxes.

3. **To what extent do full or robust auctions deprive polluters of the capital needed to invest in achieving substantial reductions in greenhouse gas emissions?**

I have the most knowledge about the electricity sector. In this sector over the past 15 years, the major share of new investment in generation has come from nonregulated entities. As a change from the somewhat distant past, when projects were funded with corporate financing, today the industry generally relies on project-specific financing, meaning that each project is evaluated and financed independently with capital from outside the firm. This trend is likely to continue into the future. As a consequence, I believe, a change in the cost of operation is not likely to have a first-order effect on the availability of capital for financing new projects.

A different issue involves the cost of capital in the industry. Firms in regulated regions of the country enjoy a lower cost of capital because of the presumed lower risk associated with their investments. This is a separate issue but one that may be relevant in thinking about how to finance large investments in new technology in the future.

4. What proportion of allowance value is needed to compensate polluting firms for the economic impacts of climate change legislation?

The need to compensate firms depends on how the effect on firms is measured. Some previous studies have analyzed the effect at the facility level, which provide a high estimate. Effects at the facility level do not make sense because facilities do not have independent standing. Facilities are owned by shareholders, and shareholders own a portfolio of facilities, some of which may lose and others of which may gain value.

Another approach is to measure the effect on firms at the industry level, which yields a relatively low estimate. One general equilibrium study considered the effect of a constant $25 allowance value sufficient to achieve emissions reductions of 18 percent in the long run.[11] Most of the economic effect would be felt in the oil, gas, and coal industries, which could be compensated with just 19 percent of allowance value. Compensating other downstream industries would require somewhat greater allowance value. The most important of these downstream industries is the electricity sector, but that would be much less affected than would the primary fuel sectors in the researchers' model. Another study using a general equilibrium model estimated the effects of a 14 percent decrease in emissions to be achieved by 2010, and a 32 percent decrease by 2030.[12] That study estimated that the reduction in equity value in the electricity sector would be equivalent to 6 percent of the total allowance value. In recent work, we reached a similar estimate using a detailed simulation model of the electricity sector. This value

[11] Bovenberg, A.L., and Goulder, L.H. 2001. "Neutralizing the Adverse Industry Impacts of CO2 Abatement policies: What Does it Cost?" In C. Carraro and G. Metcalf (eds.), *Behavioral and Distributional Effects of Environmental Policy.* Chicago: University of Chicago Press.
[12] Smith, A.E., Ross, M.T., and Montgomery, W.D. 2002. "Implications of Trading Implementation Design for Equity-Efficiency Trade-Offs in Carbon Permit Allocations." Washington, DC: Charles River Associates.

appears relatively small, given that the electricity sector is expected to contribute substantially to emissions reductions throughout the economy. The reason the value is small is that firms own a portfolio of facilities. Although high-emitting power plants will suffer a decline in market value, low- and nonemitting power plants will experience an increase in value. As noted above, the effect at the firm level is the effect over a portfolio of assets. Furthermore, the effect on an industry-wide basis represents the effect over a collection of firms, each holding diverse portfolios.

Overall, one can reasonably conclude that the economy-wide harm, measured as a potential loss in the market value of industries most affected by climate policy, is likely to be equal to or less than 30 percent of the value of emissions allowances. It should be noted that this value masks some differences among firms, especially in the electricity sector, where important regional differences in the fuel and technology used for electricity generation would create winners and losers in the industry. The estimate that 6.4 percent would be sufficient for compensation at the industry level underestimates the cumulative losses for firms that lose value. We find losses at these firms cumulate to 10.6 percent of total allowance value, whereas the gains to firms that realize an increase in value cumulate to 4.3 percent of allowance value. These figures net out to arrive at the 6.4 percent value.[13]

5. **Is it feasible to design an allocation formula that could efficiently target compensation to those firms adversely affected by climate change legislation and avoid windfall profits?**

The award of free allowances is a blunt instrument for achieving compensation

[13] Numbers do not add due to rounding.

for producers. This is especially true when implemented at the federal level. Free allocation tends to reward both winners and losers, thereby eroding efficiency and the ability to compensate other affected parties.

We have examined the role of simple decision rules in guiding the delivery of compensation to shareholders in the electricity sector. We examined a variety of approaches that would use publicly available information about facilities' fuel consumption and technology. The best approach was the use of emissions rates averaged across the firm.

If allocation remains a federal responsibility, full compensation could be achieved with 31 percent of allowances nationally. If we first apportion allowances by region, this constitutes 65 percent of the emissions allowances in the competitive regions. This approach still leaves a net gain in the industry equal to four times the harm to the industry in the absence of compensation. In other words, the opportunity cost is five times the magnitude of deserved compensation that is delivered successfully.

As an alternative to federal allocation, we also explored apportionment of allowance budgets to states and decentralized allocation to emitters. If regions or states were apportioned emissions allowances in a manner analogous to emissions budgets under the nitrogen oxide (NO_x) trading programs, compensation would be more efficient. If allowance budgets were implemented on a regional level, the same compensation target could be achieved with just 32 percent of the emissions allowances in competitive regions (15 percent of allowances nationally), leaving a net gain in the industry of 1.5 times the harm in the absence of compensation. This is the

most cost-effective strategy we discovered, and it would require an allowance value that is 2.5 times as great as the harm to the industry in the absence of compensation.

A key finding is that compensation has a significant opportunity cost, especially if the goal is to achieve full compensation. If free allocation to achieve compensation is implemented at the federal level, we find that the incremental cost in allowance value of compensating for the last increment of harm in the electricity sector would be 10 times the magnitude of that harm. Implemented at the regional or state level, that ratio falls, requiring the use of allowance value equal to about 4.5 times the harm. One way to improve the cost-effectiveness of compensation policy is to adopt relatively modest compensation goals. For example, one could fully compensate the firm that is midway between the firm that just barely loses from the policy and the firm suffering the greatest harm, allowing firms that are worse off than this one to continue to suffer some harm. This approach requires compensation equal to 11 percent of the allowance value nationally, or 22 percent in competitive regions. The magnitude of allowance value used for compensation would be 1.5 times the harm to the industry in the absence of compensation, still leaving many winners as well as some moderate losses. Nonetheless, under any strategy, there are important considerations regarding the difficulty of targeting compensation to its intended recipients and the opportunity cost of diverting allowance value from other purposes.

6. **To what extent are the economic impacts of legislation on polluting firms likely to be spread among shareholders who hold diversified portfolios, and how does this affect the rationale for or against seeking to compensate firms?**

   Measuring the expected impact of climate policy in a granular way helps us

forecast what parts of the economy are vulnerable to the policy. In some cases, specific communities or groups of workers may be hard hit by climate policy, just as certain communities may be hard hit by a warming climate. This information can help policymakers craft compensation and other policies to soften the blow.

However, in this modern age the vast majority of shareholders hold few if any stocks in individual companies. Most assets are held in mutual funds. If most investment occurs not in the form of stock or bond holdings in individual firms but in a portfolio of firms captured in various industry indices held by mutual funds or large pension funds, then the industry-level measure might be the preferred measure of damage. A growing portion of the stocks on Wall Street are held by mutual funds or institutional investors, totaling $9 trillion in 2005, suggesting that for many investors, the effect on the industry and the overall economy is more relevant than the effect on individual firms. For this reason, designing the policy as efficiently as possible to lessen its overall cost is perhaps the most effective way to minimize harm to the owners of equity in the economy. In effect, the way to deliver compensation to owners of equity is to design an efficient policy, which is precisely the virtue of the use of auctions.

Thank you for the opportunity to testify today.

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

The CHAIRMAN. Thank you, sir, very much.

Our second witness is Mr. Peter Zapfel. Mr. Zapfel is the Coordinator for Carbon Markets and Energy Policy for the European Commission. Mr. Zapfel has represented the European Commission as a delegation member in the U.N. climate negotiations and has been actively involved in the commission's work on emissions allowance trading, including the EU's proposal just released today to transform the EU emissions system post-2012.

I would like to state for the record that the Committee appreciates Mr. Zapfel's voluntary participation. The Committee recognizes that because of Mr. Zapfel's status as a representative of the European Commission, neither Congress nor the Committee have legal authority over his presentation today.

We welcome you, Mr. Zapfel. And whenever you are ready, please begin.

STATEMENT OF PETER ZAPFEL

Mr. ZAPFEL. Mr. Chairman, members of the Committee, it is a pleasure to testify today. In particular, as you alluded already, before we have earlier this morning when you were getting out of your beds, the European Commission has tabled a set of legislative proposals to implement our far-reaching climate and energy policy goals for the next decade.

What I would like to do in my five minutes of intervention here focusing on auctioning is give you some information of what we have proposed this morning, why we have proposed to go to auctioning as the main method of allocation, give some experience we have with free allocation, and end up with a few recommendations.

Before going into auctioning, I also, however, want to point out that the core of our proposal this morning on reviewing our carbon-trading scheme is the proposal to bring down the emissions cap, the number of allowed emissions, by 21 percent in 2020 compared to the emissions level in the trading scheme in 2005. So we have a very robust emissions cap proposed that will drive forward the carbon market and deliver environmental benefits and also create a well-functioning carbon market.

The Commission has this morning proposed that as of 2013, as of the start of the third trading period, we make auctioning the main method of allocating allowances and we go and do a transition so that by 2020, in principle auctioning is the only method of allocating allowances to the European common market.

Free allocation would immediately end at the end of the second rating period in 2012 from our plans. And for other industrial installations in other sectors covered by our scheme, free allocation would be phased out over an eight-year period so that by the end of the third trading period in 2020, we would no longer in principle have free allocation.

Why have we made these proposals? We see three merits, in principle, for auctioning. Auctioning has merits in simplicity. Auctioning has merits in transparency. And auctioning is also seen as advantageous from our side for the efficiency in the clear carbon pricing that it creates.

What experience do we have in Europe with free allocation for the first eight years, the first two phases of our scheme? Free allo-

cation is a very complex process to handle. The asset value of the allowances of the carbon allowances is considerable. And for the formal process, you need a device to allocate the allowances free of charge. You need a lot of data, which is administratively a very cumbersome process, the first point.

The second point of free allocation tends to be a rather in-transparent process while this major asset value is allocated into the allowance market.

Thirdly, because of the periodic nature that we do the allocation process and because of the possibility and, actually, the rules for free allocation change from period to period, this has the potential actually to distort decision-making by actors in the market and has, in fact, to some extent distorted decision-making.

And, fourthly, as has already been alluded to in introductory statements, free allocation creates distributional disadvantages for some sectors in a sense that the additional benefits in terms of companies increasing their prices far outweigh the additional costs and you create something which politically is called windfall profits.

Finally, as I said, some recommendations. I think we reckon in the European Union that auctioning as a method of allocating emission allowances is a fairly new thing in emission markets.

There are several environmental markets operated here in the United States. Some auctioning has taken place there. Also we in Europe at this stage have limited experience with auctioning. But in a number of fields on a daily basis—on a very regular basis—governments organize the allocation of economic assets by auctions. And we can learn a great deal from such other government-driven auctions; for example, for government bonds, for spectrum licenses. So we are not starting something completely new with transitioning to auction as the main method of allocating carbon allowances.

There are two things I want to raise at the end of my testimony of what is crucial in our view to make auctioning a successful mechanism of allocating allowances. First of all, we think we need to take time to design the auction mechanism very well. That's why we have proposed today to trust in principle. We want to go to auctioning, but we will work out as part of the implementation process a detailed regulation. And we want to work with a lot with stakeholders, with the experts in financial markets to design a well-functioning auctioning mechanism because the economic assets involved are considerable. So we need more time to work that out in a good way.

And, secondly, we need smart ways of recycling the revenues from the auctioning. There are various things to which the allowance value, the revenue can be put to. And there is further work to be done in working out, as I say, in a smart and effective way to allocate, to recycle the revenues.

Thank you very much.

[The statement of Peter Zapfel follows:]

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Embargoed until 23 January 2008, 6 am E.S.T.

Hearing by the Select Committee on Energy Independence and Global Warming U.S. House of Representatives on "Cap, Auction and Trade: Auctions and Revenue Recycling under Carbon Cap and Trade"

Written statement by
Peter Zapfel
Directorate General for Environment
European Commission, Brussels

Introduction

The method to allocate allowances is one of the most important decisions to be taken in the design of a robust carbon cap and trade system. Two principal methods are at hand – some share of the needed allowances can be given away for free to regulated entities or they can be sold / auctioned. While both methods have been researched in detail, the practical experience that exists so far is largely on different ways of giving away allowances for free. For example the operational cap and trade systems to control air pollutants at federal and state level in the United States are largely based on free allocation. These free allowances were the result of significant reductions from existing emissions (about 50 to 80%) and were meant, in part, to compensate firms for the reduced value of existing capital assets. Currently, free allocations in these US systems only cover about 20 to 30% of the baseline in these programs.

In general, carbon allowances represent a much larger asset value than e.g. sulphur dioxide allowances. Allocating them for free, rather than by means of a market mechanism, is a major distributional exercise for the responsible legislator or regulatory agency. Free allocations not only involve a complex exercise but also require substantial and robust emissions and other data to avoid distributional outcomes that are perceived as unfair. Finally, regulated companies subject to the carbon cap and trade system will pass on as much of the allowance value to their customers (in the form of increased prices) as the market situation allows, even if the allowances are allocated for free. This leads to the distributional effect (dubbed windfall profits), where carbon-intensive companies actually see increased profitability due to the implementation of a robust carbon market. The more robust the

system (i.e. the higher the value of the allowances), the more significant these distributional effects are likely to be.

For all these reasons, the interest in auctioning as an allocation method for carbon allowances is growing world-wide. The European Union is now discussing legislation that is likely to make auctioning the key allocation method for carbon allowances in Europe's emissions trading system (EU ETS) by 2020. For some sectors – notably power generators – free allocation will probably be phased out immediately at the start of the third trading period in 2013, while other sectors will in principle see a gradual phase-out of free allocation over the third trading period intended to run until 2020. The forthcoming regional carbon market in the US Northeast (Regional Greenhouse Gas Initiative) will see each participating state auctioning off at least 25% of the allowances it creates and some participating RGGI states have decided to auction 100% right from the start in 2009. In the discussions of other emerging carbon markets (e.g. New Zealand, Australia) a significant amount of auctioning is being considered from the beginning.

Designing and implementing auctions presents a technical challenge for this relatively new sector due to the limited practical experience with auctioning in operational emissions markets. However, governments conduct auctions of other economic assets with considerable value on a regular basis (e.g. government or treasury bonds, spectrum licenses) and these offer rich experience and institutional arrangements to draw from.

Allocation provisions in EU ETS Directive

Existing rules for the first and second trading period

Inspired and informed by practice in existing and well functioning US air pollutant cap and trade schemes at the time the initial rules were agreed earlier in this decade, Europe has based its allocation policy in the carbon market largely on free allocation.

The Directive[1] of 13 October 2003, setting up the EU ETS, contains provisions that fix the minimum amount of free allocation at 95% of the total amount of allowances that each Member State created in the first trading period (running from 2005 to 2007). The minimum amount of free allocation is 90% in the second trading period (running from 2008 to 2012). Thus, in the first trading period, Member States were allowed to auction up to 5% of total allowances, while for the second trading period the Directive provides for auctioning of allowances up to 10% of the total amount. The Directive does not provide for any such limit from 2013 onwards.

The current rules governing allocation in the EU ETS do set a rather loose framework at European level beyond the above mentioned provisions. Detailed rules for free allocation in the first and second trading period were set at Member State level, leading to a rich diversity of approaches that generated concerns in terms of transparency and fair competition. This has given rise to preferences expressed by Member States and a wide range of stakeholders for much more harmonisation. These have been expressed in the ongoing review of the rules for the EU ETS in the third trading period and beyond.

Rules for inclusion of aviation during the second trading period

A legislative process to include aviation in the EU ETS is currently in full swing. After a first reading of the Commission's proposal in the Environmental Council and European Parliament we can expect the aviation sector to be integrated into the EU ETS in 2011 or 2012, and a share of 10 to 25% of the allowances allocated for the extension to aviation to be auctioned, with the rest allocated for free. Both the European Parliament and the Council agree that revenues should be used to tackle climate change in the EU and third countries and may be used to cover the cost of administrating the EU ETS.

Proposed rules for the third trading period

[1] Directive 2003/87/EC of the European Parliament and of the Council establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 98/61/EC

Today, 23 January 2008, the European Commission adopted a proposal for changes to the legal framework of the EU ETS that are intended to apply as of the start of the third trading period. This proposal will now be discussed by the Environment Council and the European Parliament, which act as co-legislators. It can be expected that the final rule changes will be set within the next two years.

A core element of the proposal is to make auctioning the basic principle of allocation because of its simplicity, transparency and economic efficiency. This is necessary in order to achieve the EU's climate change objectives in the most cost-effective way, and to eliminate the distortions of competition in the EU internal market inherent to the lack of harmonisation in the current EU ETS.

Continued free allocation has a negative impact on the efficiency of a carbon market, in particular when complemented – as in the current EU ETS rules – with special allocation rules for installations that are closed and for new entrants. Once an installation closes, it should no longer receive free allowances. Terminating free allocation upon closure, however, reduces the incentive to close old, inefficient plants. If new entrants do receive an allocation corresponding to the number of free allowances given to existing installations, it encourages investment in high-emitting activities. Such rules for closure and new entrants reduce the incentives for structural change and emission reductions would for a larger part have to be achieved by more costly operational measures. Thus, auctioning best ensures the smooth transition to a low-carbon economy. Moreover, auctioning allows to eliminate undesirable distributional effects and put new entrants and economies with higher than average growth on the same competitive footing as existing producers.

Because the power generation sector is not exposed to competition from outside the EU, it can fully pass on the value of carbon allowances. Full auctioning should therefore be the rule from 2013 onwards for the power sector. For other sectors covered, a transitional system to phase out free allocation over time should be foreseen, potentially with the exception of higher, but still limited, levels of free allocation for sectors exposed to competition from outside the EU. This implies a gradual introduction of auctioning over the period from 2013 to 2020 for these sectors.

In the third trading period, the maximum number of allowances allocated for free to those installations and sectors eligible for free allocation, will be determined by looking at actual emissions in the first trading period (2005 to 2007), and by the proportion of actual total emissions in the first trading period that came for these installations and sectors. This proportion will then be applied to the total cap for the third trading period, to determine their maximum free allocation. According to the proposal, the maximum amount of allowances distributed to installations that are for the first time included in the EU ETS from 2013 onwards shall not exceed in 2013 the total verified emissions these newly included installations emitted in 2006. Subsequently, the number of allowances given for free will decrease according to a linear path.

The proposal foresees that approximately two thirds of the total number of allowances would be auctioned at the start of the third trading period, increasing throughout the period. In terms of quantity this translates into some 1.2 billion allowances in 2013 increasing to some 1.7 billion allowances in 2020.

The proposal is that the EU's 27 Member States will carry out the auctions. The proposal contains a concrete distribution key establishing relative shares per Member State and a procedure to determine the absolute amount of allowances that is allocated to each Member State for auctioning purposes. The distribution will be largely based on emissions in sector covered by the EU ETS in 2005, with a part redistributed in order to take account of different GDP levels and differences in emissions trends across EU Member States.

However, the Commission is concerned that differing auction designs and modalities could create distortions in Europe's internal market. For instance, uncoordinated timing and volumes of auctions organised by individual Member States may result in dynamics that confuse market participants. For this reason the Commission proposes to set harmonised rules for auctioning that every Member State has to respect. These rules will be established by means of a Commission Regulation that will be elaborated by 2010 as part of the implementation process.

Use of auction revenue

Proposal for the third trading period

The proposal of 23 January 2008 includes provisions on what percentage of the auction revenues should be used to reduce greenhouse gas emissions and to adapt to impacts of climate change, to fund the development of renewable energies to meet the EU's commitment of using 20% renewable energies by 2020, for the capture and storage of greenhouse gases and for measures to avoid deforestation. The need to use part of the auction revenues to help developing countries adapt to the impacts of climate change, especially Least Developed Countries is emphasised. It is proposed that Member State earmark 20% of the revenues generated for combating climate change.

Phase 2 auction revenues

In the first trading period, four countries decided to auction or sell a minor part of the allowances (Denmark, Hungary, Ireland and Lithuania). Less than 1% of the total number of allowances was allocated in this way. The revenues generated were therefore rather limited. In Ireland the auction revenues were used to cover administrative costs for the agency charged with implementing the EU ETS.

In the second trading period, an estimated 3 to 4% of the EU-wide cap is expected to be auctioned or sold and the number of Member States making use of the option to auction will at least double.

Germany has decided to auction the largest amount of allowances in the second trading period, both in percentage terms and absolute amounts. It will auction 200 million allowances in 2008 to 2012 (40 million per year), amounting to almost 9% of the total number of allowances created in Germany. The allowances will initially be sold at the going market price via organised carbon exchanges into the secondary market on a very regular basis, whereas by 2010 the sale will switch to auctions. Detailed auction rules are currently under development. Germany is also in the

process of elaborating a program to spend part of the auction revenues on measures to support climate protection, including energy efficiency measures primarily in the household sector and at municipal level.

The United Kingdom is expected to auction 7% of the allowances allocated during the second trading period, amounting to approximately 85 million allowances over the five-year period, plus those allowances from installations that close during the period and any unused surplus from the New Entrant Reserve. As the government's spending priorities are not in general determined by the way in which money is raised, revenues from auctions will go into the Consolidated Fund, a general fund for public revenues. Nonetheless, the increase in the budget of the Department for Environment, Food and Rural Affairs, based on a comprehensive spending review that ensures efficient allocation of revenues according to priorities, allows for allocation of substantial resources for climate change mitigation including the Environmental Transformation Fund and adaptation. A government consultation is ongoing on the detailed auction rules.

The Netherlands plans to auction 16 million allowances over the period, amounting to 4% of the number of allowances. The revenues are intended to be used to compensate small energy users both for the increased energy bills due to higher gas prices and for a tax to stimulate renewable energy projects.

Other countries that have decided to auction allowances in the second trading period include Austria, Belgium, Hungary and Ireland. However, no details with regard to the use of auction revenues are available at this stage.

Expected economic impacts of auctioning and revenue recycling

In order to underpin the energy and climate package of 23 January 2008 the Commission undertook a comprehensive (regulatory) impact assessment including an economic analysis of the effects of auctioning compared to free allocation of allowances.

This analysis concluded that the full auctioning of allowances has no negative macro-economic impact and is in fact preferable to other distribution methods in terms of efficiency of the emissions trading system and the elimination of any undesirable distributional effects of free allocation.

Recycling of auction revenue, if done in an efficient and smart way, has a positive impact on the overall economy: GDP growth, private consumption and employment all come out better with auctioning in comparison to free allocation. These positive effects have been found with alternative economic modelling tools both in case the auction revenue was recycled to households and where it was used for promoting research and development of low-carbon technology.

Final remarks

After commencing the European carbon market for the first eight years largely based on free allocation, Europe is likely to transition to full auctioning in the course of the next decade. The evolution of Europe's allocation policy forms part of an international trend and auctioning is a major element in forthcoming and proposed national or regional carbon trading schemes.

The European Union is fully committed to building a global carbon market as a cornerstone of an efficient and effective way to reduce global greenhouse gas emissions in the coming decades.

The European Union is actively collaborating at technical level in the International Carbon Action Partnership with other nations and regions around the world that work on the design and implementation of mandatory and robust carbon trading schemes.

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The CHAIRMAN. Thank you, Mr. Zapfel. We very much appreciate your being here today.

Next we have Ian Bowles. He is the Secretary of Energy and Environmental Affairs for my home state of Massachusetts. He is a recognized national leader in climate and energy policy. Secretary Bowles oversees the state's six environmental natural resources and energy regulatory agencies. Among other things, Secretary Bowles has the lead role in Massachusetts' implementation of the Regional Greenhouse Gas Initiative, RGGI.

Prior to serving as secretary, Mr. Bowles was Associate Director of the White House Council on Environmental Quality under President Clinton.

We welcome you. Mr. Secretary, whenever you are ready, please begin.

STATEMENT OF IAN BOWLES

Mr. BOWLES. Thank you very much Mr. Chairman and members of the Committee. Thank you for your focus on this tremendously important topic today. I am delighted to be here.

My comments today reflect the general context in New England. We have expensive electricity. We have no indigenous coal and natural gas, face transportation costs to bring those fuels to our region. We have on average lower greenhouse gas emissions than the rest of the nation. And we have across New England a deregulated power market.

In Massachusetts, we have also made—and other New England states have as well—considerable investments in energy efficiency. And in Massachusetts, we are currently in a rate decoupling proceeding where we are trying to eliminate the current economic incentive on our distribution utilities to maximize power sales at a time when we are trying to cut greenhouse gas emissions.

We already have in place some limited greenhouse gas limits on our power plants. And, as the Chairman noted, we are in the process of transitioning to the RGGI system the first of next year.

In renewable energy, we are moving forward with three new biomass power plants, the Cape Wind project, a sizeable solar program, and new incentives for biofuels. And, as the Chairman noted, we have combined, first state in the nation to do so, our energy and environmental agencies together to focus on three key goals: tapping the economic potential of the burgeoning clean energy sector—in Massachusetts, we have got a quarter of billion dollars of private venture capital investment and a great deal of job creation in that area—second, curbing our greenhouse gas emissions; and, third, reducing our energy costs.

When Governor Patrick brought Massachusetts into the RGGI process early last year, one of the central questions we faced was whether to auction for allowances or whether to grant them. Based on our analysis, we concluded that auctioning was a better way to protect the interests of the ratepayer.

And the core thing to know there is that in a deregulated power market, the value, the economic value, the market value, of an allowance is going to make its way into the electricity bill one way or another, whether that generator decides to expend the allowance as they dispatch power to the grid, whether they save those allow-

ances for a future generation event in the future, or whether they decide to sell those allowances. And either way that value is priced in, whether or not that allowance is given out or whether it is sold to the generator.

On the contrary, if you sell it to the generator, then you've got those revenues to do something with and you can protect the ratepayers. And that's what we decided to do with our auction proceeds. And our first auctions begin in the second quarter of this year as we move into the compliance period for RGGI.

As we did an analysis of what we should spend those monies on to best protect the ratepayer and achieve our environmental objectives, energy efficiency stood out above all else. We have the opportunity to not only save money for the ratepayers but also to lock in permanent greenhouse gas emissions reductions.

In terms of the cost of RGGI, we see in the first couple of years less than a one percent increase in potential electricity bills. And as energy efficiency investments grab hold and accrue over time, within ten years, we see over five percent energy savings.

Now, why is that? It's because we've got a great deal of energy efficiency left in our system and, indeed, across the nation that is cheaper in many cases than power generation.

In terms of how much revenue we are going to produce, if it's a $1 permit, you will produce about $26 million. If it's a $5 permit, it will be $133 million. At the higher end of that scale would be effectively doubling our investment in energy efficiency in the Commonwealth.

As you think about a federal system, I would make a couple of key points. One is that states, I think, are in the best position to deliver energy efficiency services. It's something where the federal government is somewhat too removed from the individual ratepayers and the end-use consumers. It's something that states have done a great deal on. And I think you could set up objective standards to say, "What is the performance basis that we would like to see for use of proceeds down at the state level for energy efficiency?"

I would also make that point that as compared to a grandfathering scheme, where you are giving out allowances, the auctions really level the playing field across all of the different sectors, instead of building in potentially unfair treatment for early movers.

As we conduct our auctions this summer, we are going to focus on a few things. I will mention them quickly. I am happy to get into more detail in the questions.

We are going to have our auctions open to any qualified buyer. As we watch the market develop, we may add rules in the future to make sure there isn't any hoarding or anything of that nature. We are going to have a sophisticated market monitoring system so we know who some of the players are. And then as we go forward, we are going to use a three-year compliance period to allow some flexibility between years because emissions vary depending on things like weather events.

Finally, I just would mention I have submitted a longer ten-page appendix. And I would be delighted to take questions. And I thank

you for your focus on this. We in the states look forward to engaging with the Congress as you move forward.

Thank you very much, Mr. Chairman.

[The statement of Ian Bowles follows:]

Testimony of Ian Bowles
Secretary of Energy and Environmental Affairs
Commonwealth of Massachusetts
Select Committee on Energy Independence and Global Warming
U.S. House of Representatives
January 23, 2008

Thank you, Chairman Markey and members of the Committee. Thank you for your leadership on this tremendously important issue.

My comments today reflect the general context in New England – compared with the rest of the country, we have expensive electricity (due to a lack of indigenous coal or natural gas resources), lower GHG emissions, and a deregulated power market. In MA, we have also made considerable investment in energy efficiency and are currently in the process of "decoupling" our utility rate structure – a process designed to eliminate the economic incentive for utilities to maximize power sales. We already have in place GHG limitations on our largest power plants and have built GHG emission reductions into the state environmental review process – a policy that is leading to greater private investment in green buildings. In renewable energy, we are moving forward with three biomass power plants, the Cape Wind project, a sizeable solar program and new incentives for biofuels. And Governor Patrick has combined the six energy and environmental regulatory agencies under one Secretariat to focus on three main goals: tapping the economic potential of the rapidly growing clean energy technology sector in Massachusetts, curbing our GHG emissions and reducing energy costs.

Auction v. Allocate – Protecting the Public's Interest

When Governor Patrick brought Massachusetts into the Regional Greenhouse Gas Initiative just over a year ago, one of the central questions we had to grapple with was how to distribute emissions allowances to power generators – by free allocation or auction. We came to the conclusion that auctioning allowances, and using the proceeds for the benefit of consumers, was the best way to meet our environmental objectives and cut electricity costs. By contrast, direct allocation could result in windfall profits for power generators, at the expense of business and residential customers.

The central point to understand – and it is not intuitive – is that, in our deregulated market for power generation, the impact of emissions allowances on electricity prices is exactly the same whether allowances are sold at auction or given away for free. As power generators determine the price at which it becomes economic for their plants to produce power, they have to decide whether to expend allowances in order to generate electricity, save those allowances for a time when electricity prices are

higher, or sell allowances to other power producers who need to meet their compliance obligations. In any of these three scenarios, the market price of allowances becomes a component of the price of electricity.

It is tempting to think that, if you make generators pay for the emissions they produce, it will drive electricity prices up, but if you give allowances away for free, it won't. But it's not true. The price impact is the same either way.

Auctioning is the right way to distribute allowances for other reasons as well. In "grandfathering" schemes, allowances are distributed according to past emission levels, or by share of the electricity market – in either case giving preferential treatment to low-cost, high-emitting power sources. An auction levels the playing field and lets the market decide where the allowances go, instead of government. This is a critical point for a Federal program – Congress should design a system that gives fair treatment to state and power generators who are already paying the price for clean energy and sends a clear market signal to all GHG emitters.

Use of Auction Proceeds – Maximizing Ratepayers Savings and Environmental Benefits

Auctions also generate revenue that can be used to further our energy and emissions reduction goals. In our case, we were looking to utilize these funds to reduce electricity costs and promote clean energy. On the state level, we determined that the best way to do both is to invest in energy efficiency – it locks in permanent savings for consumers and permanent reductions in GHG emissions for the environment.

In Massachusetts, our analysis of the ratepayer impacts of RGGI showed that spending auction proceeds on energy efficiency would result in small short-term costs but long-term savings. This is due to the large amount of cost-effective energy efficiency investments available in our state – and across the country. With allowance prices estimated at $1 to $5 per ton of CO_2, auctioning Massachusetts's share of the RGGI cap would raise between $26 million and $133 million. We currently spend about $125M/year on energy efficiency programs, which save three-to-four dollars for every dollar invested. At $5/ton, we could double our energy efficiency investments. Customers who get efficiency upgrades in lighting, air conditioning, production equipment, and appliances that use less electricity would save the most, but all consumers would save in the form of lower rates, as reduced demand takes pressure off capacity at times of peak usage.

While it is important that a federal program also give substantial new financial incentives to develop new clean energy technologies, energy efficiency gives the greatest near term return for the ratepayers. For the most part, energy efficiency

programs don't lend themselves to federal administration and auction proceeds should return to the states provided they meet objective standards for efficiency.

Lessons for a Federal Program

With the Regional Greenhouse Gas Initiative going into effect next year for the first time, we are just starting to learn how to operate an auction-based cap-and-trade program. I am sure we will learn as much from RGGI's early trials and adjustments as from its long-term achievements.

Speaking only for Massachusetts here – we hope to see a RGGI-wide auction process, but our regulations allow us to hold our own if necessary – we anticipate four auctions a year, each one selling portions of current and future years' allowances. At the start, auctions will be open to any qualified buyer, although if we see evidence of hoarding or gaming, we will adjust participation rules. We think it's best to establish a low reserve price and bring any unsold allowances back into market at a later date. And we will institute a sophisticated market monitoring system, so we can determine whether the market is functioning with the openness and transparency we are seeking. We also will use a three-year compliance period and unlimited forward banking rights for unused allowances, to allow maximum flexibility in achieving our environmental goals.

* * *

Since the early 1990s, Congress, successive Administrations and many states have implemented a variety of market-based approaches to environmental protection. This is an American innovation and experience shows market-based approaches encourage technology innovation and spur economic growth. We look forward to working with you and your colleagues to assist in developing a national system for curbing carbon emissions, while also allowing the states to experiment with ways to take environmental policies further. We pledge to work with you to get the most effective national program in place as quickly as possible.

The CHAIRMAN. Thank you, Mr. Secretary, very much.

Our next witness, Mr. John Podesta, is the President and CEO of the Center for American Progress. Mr. Podesta served as Chief of Staff to President Bill Clinton from October of 1998 to January of 2001, where he was responsible for directing, managing, and overseeing all policy development, daily operations, and staff activities of the White House.

Mr. Podesta has also held a number of other senior positions on Capitol Hill and in the White House and is a recognized expert on technology policy, amongst other areas. We are very fortunate to have him with us here today.

We welcome you back, John. Whenever you are ready, please begin.

Mr. PODESTA. Thank you, Mr. Chairman.

STATEMENT OF JOHN PODESTA

Mr. PODESTA. And I started with David Moulton, but they kicked me out a lot faster. So it's nice to be back here.

You have got my full statement.

[The statement of John Podesta follows:]

Testimony of John D. Podesta

Before the House Select Committee for Energy Independence and Global Warming
U.S. House of Representatives

Hearing on "Cap, Auction, and Trade: Allowance Auctions and Revenue Recycling Under Carbon Cap and Trade"

January 23, 2008

Thank you, Chairman Markey, Congressman Sensenbrenner, and members of the Committee. I am John Podesta, President and Chief Executive Officer of the Center for American Progress.

Global warming is one of the greatest challenges our world faces, and as our understanding of its implications increases, the case for dramatic, immediate action is only made stronger.

Just last week, for instance, we learned a new, startling fact: the western Antarctic ice sheet is melting at a faster rate than anticipated by scientific models.[1]

This news was particularly disturbing because sea level rise may be well above the "expected" A1B emission scenario projected in the International Panel on Climate Change's Fourth Assessment Report which had already foreseen a sea level rise during the next 30 years that would have severe global consequences. Perhaps the best we can

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[1] Eric Rignot and others, "Recent Antarctic ice mass loss from radar interferometry and regional climate modeling," *Nature Geoscience* (13 January 2008): doi:10.1038/ngeo102, available at http://www.nature.com/ngeo/journal/vaop/ncurrent/abs/ngeo102.html (last accessed January 2008).

hope for and certainly the least we ought to plan for is a climate that will cause severe damage to coastal cities, trading centers and ecosystems around the world.

We have to come to grips with a climate that will force highly destabilizing human migration in some of the most politically fragile regions of the world. For instance, a climate that will put Lagos at risk by 2015, and will pose enormous challenges for Nigeria and the entire West African region, not to mention the impact it would have on international oil supplies.[2]

We face a climate that will inflict severe damage on the coastal wetlands of Bangladesh and its groundwater supplies, thus driving more people inland and fomenting instability as the resettled population would have to compete for scarce resources with the established residents. Others would migrate abroad, creating heightened political tension not only in South Asia, but Europe and Southeast Asia as well.

Increasing water scarcity due to climate change will also contribute to instability throughout the world. Although we are not likely to see "water wars" per se, countries will more aggressively pursue the kinds of technological and political solutions that currently enable them to exist in regions that are stretched past their water limits. This is likely to be the case in the Middle East where water shortages will coincide with a population boom.

[2] M. Boko and others, "Africa. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change." In M.L. Parry and others, Eds., IPCC Fourth Assessment Report (Cambridge: Cambridge University Press, 2007) available at http://www.ipcc-wg2.org/ (last accessed October 2007).

And this, as I mentioned, was before we learned that the rate at which the western Antarctic ice sheet is melting means that the sea level rise this century may be measured not in inches, not even in feet, but in meters.

Global warming greatly complicates the challenge of restoring economic growth and shared prosperity. Here in the U.S., Americans are already burdened by near record oil prices and high gasoline and electricity bills. This is one of the consequences of the Bush Administration's refusal to adopt a clean energy strategy and solutions.

The challenge we face now is nothing short of the conversion of an economy sustained by high-carbon energy—putting both our national security and the health of our planet at serious risk—to one based on low-carbon, sustainable sources of energy. The scale of this undertaking is immense but its potential is also enormous.

Our traditional understanding of energy security has been largely limited to assuring adequate supplies of energy to fuel our economy. That will remain a necessary concern, of course, but not a sufficient one. Going forward our leaders will have to act on an understanding of energy security that turns not just on the supply but on the carbon content of the energy we use. Otherwise, we will consign ourselves long-term to the mercy of international markets and an increasingly variable climate. We must act now and act boldly to put ourselves on a sustainable footing, in the interest of our national, economic, environmental, and energy security. Simply put, energy will rapidly transform the world for good or ill. The question for the United States is whether we will participate as a leader in the global energy revolution.

The scale of the change we need is daunting but achievable.

We must create a virtuous circle of rising economic fortunes for a growing global middle class. This must include an energy strategy comprising complementary policies that reduce our nation's carbon footprint, revolutionize energy production and consumption, lower costs for consumers over time, create new green-collar jobs, and spur innovation and leadership in the global low-carbon technology marketplace.

It is clear that energy policy is economic policy: in order to reverse the economic downturn we are currently facing and to capture the opportunities provided by a low-carbon energy transformation, we must put energy at the center of our nation's economic transformation and economic growth. The U.S. economy is currently dependent on a few high-carbon, increasingly-expensive energy sources like oil. Fundamentally changing how we produce and consume energy, investing in low-carbon innovation, and transforming our economy to a low-carbon model are key to promoting economic mobility, growth, job creation, and re-gaining technological leadership in the global innovation marketplace.

The U.S. Congress obviously realizes the importance of energy policy to the U.S. economy – last year's passage of the Energy Independence and Security Act is a demonstration of this – and I congratulate you for your leadership on this achievement. But we must do more, both to reduce our national greenhouse gas emissions and to jumpstart the technological innovation and investment needed to get us on the right track, not only to stimulate and grow the economy but also to avoid the worst effects of global warming. The longer we wait to act, the costs to our productivity growth, our national security, and our environment will only continue to skyrocket.

I appreciate the opportunity to be with you today to discuss the design of a national cap and trade program for global warming emissions which must be a fundamental part of our energy and economic policy.

The Center for American Progress (CAP) recently released a report, entitled "Capturing the Energy Opportunity: Creating a Low-Carbon Economy," which outlines our strategy for transforming our economy from a high-carbon to a low-carbon model. In this report, we propose ten steps that the next Administration can take to transform the economy from a high-to low-carbon model and capture the opportunities provided by this transformation.

CAP recommends an energy strategy that employs a cap and trade system with a 100 percent auction of carbon permits and a suite of public investment policies *funded by the auction revenue*. Any national cap and trade system should be designed to achieve a level of reductions that will limit the temperature increase to 3.6°F (2°C) above pre-industrial levels, the level at which scientists believe we have at least a strong likelihood of avoiding the worst impacts of catastrophic climate change.

At the core of this proposal is a fundamental commitment by the federal government to assist low- and middle-income Americans with rising energy costs *and* to public investment in green-collar jobs, research, development, and deployment of low carbon technologies, re-committing to leading in international global warming negotiations, and re-envisioning the way the federal government does business so that low-carbon energy is a centerpiece.

It is becoming increasingly clear that our nation will adopt a cap and trade program to

control and reduce global warming emissions: regional efforts to reduce emissions, such as the Regional Greenhouse Gas Initiative, have chosen to employ a cap and trade mechanism, and bills currently in the U.S. Congress which have large bi-partisan support, such as the Lieberman-Warner Climate Security Act (S. 2191), and Rep. Waxman's Safe Climate Act, (H.R. 1590) also rely on a cap and trade system to achieve reductions.

Moreover, cap and trade makes sense. Markets are essential to creating a low-carbon economy, and a cap-and-trade program should be at the core of a greenhouse gas emission reduction strategy. Once businesses have to factor the cost of emitting CO_2 (and other greenhouse gases) into their bottom lines, the power of the marketplace will start to push toward efficiency, low-carbon fuels, renewable energy, and carbon-capture-and-storage technologies for coal-fired power. Market-based pricing is a critical part of the equation but will not work to rapidly transform our economy to a low-carbon model without accompanying public investment in complementary clean energy and innovation policies and policies to reduce energy costs for low and middle income Americans.

A cap-and-trade system will identify the necessary level of carbon reductions, and then allow the marketplace to price the cost of those emissions. Moreover, the cap-and-trade market model boasts a great track record in reducing acid rain. In fact, the United States actually "wrote the book" on cap-and-trade, creating the oldest and arguably most successful emissions trading system for sulfur dioxide under the acid rain program of the 1990 Clean Air Act Amendments, which has reduced SO_2 emissions at a fraction of anticipated costs and engendered health benefits exceeding program costs by more than 40 to 1.[3]

[3] Benjamin Goldstein, "Learning from Europe: Designing Cap-and-Trade Programs that Work" (Washington: Center for American Progress, 2007) available at http://www.americanprogress.org/issues/2007/06/g8_cap_and_trade.html (last accessed October 2007).

Further, by adopting a market-based model for reducing greenhouse gas emissions, the United States can link up with the rapidly growing international marketplace for carbon credits. The United States can learn from the growing pains in the European carbon market in the design of our cap-and-trade system—giving too many credits away for free to carbon-intensive industries rather than requiring those companies to purchase the credits on the open market, led to extreme price volatility in the European marketplace and windfall profits for utilities. Giving away the credits also has the potential to exacerbate the regressivity of consumer price increases as the Director of the Congressional Budget Office Peter Orszag has noted.[4]

Requiring emitters to buy 100 percent of their carbon credits will avoid windfall profits for polluting industries. Ensuring that the number of carbon credits available in the marketplace is linked to a strict emissions cap will help avoid carbon permit price volatility and achieve real emission reductions. And, once the United States enacts its own carbon cap, our cap-and-trade marketplace will integrate more fully into the emerging global marketplace, providing much more liquidity and allowing our highly competitive derivatives exchanges to deploy their proven trading prowess in a new and critical global marketplace for carbon credits.

Some economists argue that if we set the right price in a cap and trade system, we could dispense with complementary policies such as vehicle fuel efficiency standards, new power plant performance standards, decoupling of electricity rates and use, etc. However, markets do not operate perfectly, and this argument is flawed in practice. Because the energy component of overall cost is often not that high, the carbon price signal required to spur many of the changes we need would be too high as a matter of political reality. In addition, fuel economy standards ensure that the U.S. protects its economic and national security by reducing its dependence on oil.

[4] Congressional Budget Office, Issues in Climate Change November 16, 2007, available at http://cbo.gov/ftpdocs/88xx/doc8819/11-16-ClimateChangeConf.pdf (last accessed January 2008).

A cap and trade program is necessary but it is not sufficient; we must also involve large public investment in low carbon infrastructure, job training, tax incentives, and research and development of new technologies. And, the time is ripe for this investment, not just because the costs of *inaction* with respect to global warming, national security, and economic mobility will only grow increasingly higher, but also because Americans support public investment. A recent poll found that 61% of Americans support public investment rather than tax cuts as a way to improve the economy.[5]

Specifically, our proposal would allocate ten percent of cap and trade auction revenue to businesses operating in energy intensive sectors to compensate shareholders, employees, and communities in those sectors. Half of the remaining 90 percent of the revenue will be allocated to low- and moderate-income Americans to help offset energy price increases.

It is the polluting industries, and not hardworking American families, who should be bearing the brunt of the cost of this transformation. To ensure that low- and moderate-income Americans are protected from short-term increases in energy costs, we propose committing an estimated $336 billion over 10 years to tax rebates and other income support to offset their higher costs. We need policies that will hold low- and middle-income Americans harmless through tax benefits and other measures and that will ensure that the lowest-income Americans who are not eligible for traditional tax benefits also receive these funds.

[5] Ruy Teixeira, "What the public really wants on budget priorities," based on a 2007 poll by Hart Research for AFSCME/US Action, (Washington: Center for American Progress and The Century Foundation, 2007) available at http://www.americanprogress.org/issues/2007/11/pdf/WTPRW_Nov.pdf (last accessed January 2008).

Energy cost increases for high-income households would represent a relatively small percentage of their post-tax income. And even though we expect the cap-and-trade program to increase the unit price of energy consumption, we also fully expect that proposed new incentives for energy efficiency would work to lower overall energy expenditures.

We recommend that the remaining half of the revenue go to spur science and technology innovation and to drive our transition to a low-carbon economy by funding research and development, tax incentives, and other initiatives. And the public supports this: 71 percent of Americans are ready to quickly change from using coal and oil to using clean, alternative energy.[6] Transportation and electricity account for 72 percent of U.S. CO2 emissions from energy, so our policies focus on these two sectors.[7]

First, we must re-envision our transportation sector. We must continue to press for increases in vehicle fuel efficiency. The Energy Independence and Security Act was a landmark achievement in part because of its mandated increase of fleet wide vehicle fuel efficiency to 35 miles per gallon by 2020 – the first Congressionally-mandated increase in vehicle fuel efficiency in over 30 years. Thank you Mr. Chairman for your years of leadership to make this policy a reality. But, we can do more than this –we support a 55 miles per gallon standard by 2030. This goal is readily achievable through the swift development of existing fuel-efficient technologies and through the dedicated research and development to deploy new technologies. Providing incentives to U.S. auto manufacturers to retool their automotive fleets and consumer tax credits for the purchase

[6] John Podesta, Daniel J. Weiss, and Laura Nichols, "Americans Feel New Urgency on Energy Independence and Global Warming," (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/pressroom/releases/2007/04/environmental_poll.html (last accessed October 2007).

[7] Energy Information Administration, *U.S. Emissions Data*, (Department of Energy, 2007) available at http://www.eia.doe.gov/environment.html (last accessed October 2007).

of more fuel efficient vehicles will also help pave the way for clean transportation in this country.

Following on the heels of the Energy Independence and Security Act production mandate of 36 billion gallons of biofuels by 2022, we must also ensure that we increase the availability of the lowest greenhouse gas-emitting and most sustainably-produced fuels, including electricity. We recommend that we improve our distribution and fueling infrastructure so that Americans across the country can make choices at the pump (or electric fueling station) about the fuels they want to purchase.

Less fuel-intensive transportation options means fewer greenhouse gases. To boost greater use of alternative transportation we propose new investment in more diverse and lower-carbon transportation infrastructure such as local mass-transit networks, regional and interstate long-distance high-speed rail systems, and green city programs to encourage the redevelopment of urban areas and reduce long commutes and suburban sprawl.

Energy efficiency is the cheapest, fastest, cleanest way to reduce the carbon intensity of our economy. To this end, we propose requiring efficiency improvements in electricity and natural gas distribution, a major upgrade of the U.S. electricity grid to increase energy and national security, improved distributed generation, and increased transmission efficiency. Additional significant gains in efficiency can be made by requiring upgrades for our appliances and private, commercial, and federal buildings.

If we look at California, it has held its per capita electricity consumption roughly constant at about 7000 kilowatt-hours per person since the mid-1970s[8], while electricity in the rest of America has continued to grow and is now nearly 5000 kilowatt-hours per person higher than in California. This occurred while California's economy continued to lead the nation.

We can lower the amount of greenhouses gases produced by electric power through investments in renewable energy sources and advanced-coal energy production. We propose a new national renewable electricity standard to require 25 percent of energy produced in the United States to come from renewable sources by 2025, increasing distributed renewable electricity generation and facilitating investment in renewable energy by improving the structure of production tax credits and low interest loans. Any cap and trade bill should also include an emission performance standard for all new coal-fired facilities equivalent to the best available carbon capture-and-store technology, and the provision of federal funds to help offset additional costs of implementing carbon capture-and-storage technology. Revenues from allowance auctions should pay for these incentives.

The urgency of this issue demands a president willing to make the low-carbon energy challenge a top priority in the White House—a centerpiece not only of his or her energy policy but also of his or her economic program—to produce broad-based growth and sustain American economic leadership in the 21st century. This task is so encompassing it will demand that the incoming president in 2009 reorganize the mission and responsibility of all relevant government agencies—economic, national security, and environmental. As part of this reorganization, to the next President, we recommend that the next President create a White House National Energy Council to lead all other agencies in making energy and global warming top administration priorities. The new

[8] California Energy Commission, *US Per Capita Electricity Use By State in 2003*, available at http://www.energy.ca.gov/electricity/us_percapita_electricity_2003.html ((last accessed January 2008).

Council will ensure that the U.S. government leads the way on all of these fronts, not just by adopting these proposals but also by wielding the purchasing power of the federal government to promote low-carbon technologies, implementing new tax policies, and coordinating R&D across the entire platform of federal research activity. It must also spur interagency alternative energy-related research and development, and help demonstrate the efficacy of these new clean technologies and ensure these technologies can make it in the marketplace. The federal government must also ensure that taxpayer investments reduce and withstand the effects of global warming both at home and abroad and that steps are taken to boost the sustainability of new foreign aid given likely impact of climate change in project-feasibility assessments.

In our proposal we also recommend that the government create a Clean Energy Jobs Corp to promote new "green collar" jobs in a new clean economy and must more than double currently existing federal investment in low-carbon energy research, development, and deployment.

Finally, global warming is obviously an international problem that requires concerted action by all countries. As such, we think the United States needs to reclaim the lead in global efforts to combat climate change by getting our own house in order while simultaneously joining current international efforts to reduce greenhouse gas emissions. This means creating an E-8 of nations comprised of leading developed and developing countries devoted to addressing global ecological and resource issues. And it means taking the lead once again in the U.N. Framework Convention for Climate Change global warming negotiations. As a component of these efforts, the United States must also invest in the energy, environment, and infrastructure sectors in developing nations to alleviate energy poverty with low-carbon energy systems and to help these nations adapt to the effects of climate change.

Adoption of a combination of shorter-term stimulus and longer-term public investment policies will not only enable the U.S. to once again become a world leader in low-carbon energy innovation but will also diversify our energy base, thus fostering economic stability and helping to boost economic growth because businesses and individuals can plan better for the future.

Placing energy at the center of our economic strategy and making smart public investments will also build new workforces – world class green-collar as well as science and engineering workforces –providing good jobs and pathways out of poverty for Americans, including those who were left out of the high-carbon economy. We cannot continue to wait on jumpstarting this energy transformation – waiting will only reduce productivity growth and jeopardize our nation's economic, environmental, and international security.

Thank you, Mr. Chairman and the members of the Committee, for inviting me today. I'd be happy to take any questions you may have.

Mr. PODESTA. I would like to make four quick points. First, I would like to take this up a notch. Make no mistake. While it may be slow-moving, I think we are in a crisis. As our understanding of the implications of global warming increase, the case for dramatic, immediate action is only made stronger.

Just last week, we learned that the western Antarctic ice sheet is melting faster, at a rate that was anticipated this could mean a sea-level rise of two meters, as Dr. Pachari noted, in this century, not the inches or feet, as originally predicted by the IPCC Fourth Assessment, which will threaten population centers, agricultural patterns, and coastal ecosystems around the world.

Perhaps the best we can hope for and certainly the least we ought to plan for is a climate that will cause severe economic dislocation and national security challenges to the United States. Worldwide we are already feeling some of the economic consequences of climate change. We will soon feel the national security consequences of human migration, food shortages, water scarcity, destructive weather events, spread of disease, and national resource competition.

The challenge I think we face as a nation and a world is nothing short of conversion of our economy that is sustained by high-carbon energy, putting both our national security and the health of our planet at risk to one based on low-carbon, sustainable sources of energy. The scale of that undertaking is immense, but its potential, as the Chairman noted, is also enormous.

My second point is that energy policy is economic policy. In order to reverse the economic downturn we are currently facing and to capture the opportunities provided by a low-carbon energy transformation, we must put energy at the center of our nation's economic growth. Fundamentally changing how we produce and consume energy, investing in low-carbon innovation, and transforming our economy to a low-carbon model are key to promoting economic growth, mobility, job creation, and regaining the technological leadership in the global innovation marketplace.

Mr. Sensenbrenner noted a ten-year-old EIA projection, which proves I think in more recent projections to be wrong. I would note that ten years ago the United States had 44 percent of the solar market. Today we have nine percent, a loss mostly to Japan and Germany. I think the jobs of the future clearly are on the clean energy side.

The U.S. Congress obviously realizes the importance of energy policy to the Economy. I commend the Congress for passing the 2007 energy bill and particularly for your work, Mr. Chairman, over the years on the raising the CAFE standard.

The Center for American Progress recently released a report entitled "Capturing the Energy Opportunity" that laid out a strategy that we believe is pro growth, provides opportunity, and takes on global warming, all in a fiscally responsible way. At the core of that strategy is a fundamental commitment of the federal government to invest in green-collar jobs, research and development, and deployment of low-carbon technology, and to assist low and middle-income Americans with rising energy costs.

My third point is that a cap-and-trade needs to be at the center of that energy policy. CAP advocates an energy strategy that em-

ploys both a cap-and-trade system and a suite of public investment policies funded by the auction revenue of carbon permits.

A cap-and-trade will identify the necessary level of carbon reductions to get us to a point where we have a sustainable planet and allow the marketplace to price the cost of those emissions. In order to avoid a windfall profit for polluting industries, we recommend auctioning 100 percent of the carbon credits. Our proposal would allocate ten percent of auction revenue to businesses operating in energy-intensive sectors to compensate shareholders, employees, and communities in those sectors. We recommend half of the remaining 90 percent of the revenue be allocated to low and moderate-income Americans to help offset energy price increases.

Polluting industries, and not hardworking American families, should shoulder the burden of this transformation to a new energy in the future. And to ensure that low and moderate-income Americans are protected from short-term increases in energy costs, we estimate and commit $336 billion over 10 years for income support and for middle class tax support. The remaining half of the revenue would go to support science and technology innovation; drive transition to a low-carbon economy by funding R&D; efficiency, as Ian has mentioned; and other initiatives, including infrastructure investment, Mr. Blumenauer.

To meet the overall goal of emissions reduction under this cap-and-trade model, we recommend adopting complementary policies. For example, we support going further than what the Congress has recently passed in implementing a 55-mile-per-gallon cap-based standard by 2030, improving our distribution in fueling infrastructure, investing in transportation infrastructure, and another suite on the electricity side, including creating a performance standard for all new coal-fired facilities equivalent to the best available carbon capture and store technology.

So my last point, and I will conclude by saying that we cannot continue waiting to jumpstart this energy transformation. Adopting a combination of short-term stimulus and long-term public investment policies will not only enable for the U.S. to once again become a world leader in low-carbon energy innovation but will also diversify our energy base, thus fostering economic stability, helping to boost economic growth, creating new green-collar jobs, and boosting productivity for our economy. We think we can create a virtuous cycle and a win-win situation for the American public.

Thank you.

The CHAIRMAN. Thank you, Mr. Podesta.

And our final witness, Mr. Robert Greenstein, the founder and Executive Director of the Center on Budget and Policy Priorities. Mr. Greenstein has written numerous reports, analyses, and articles on budget and poverty-related issues, including most recently how best to design planet policies to address impacts on low-income households. For his outstanding work at the center, Mr Greenstein was awarded a McArthur fellowship.

We welcome you here today. Whenever you are ready, please begin.

Mr. GREENSTEIN. Thank you, Mr. Chairman.

STATEMENT OF ROBERT GREENSTEIN

Mr. GREENSTEIN. My focus is on the effects that climate change policies can have on the budgets of American families and the federal budget and the implications that has for the design of a cap-and-trade system.

Our analysis indicates that Congress can design climate change policy that is environmentally sound and fiscally responsible, treats consumers fairly, and avoids increases in poverty. But to do so, the policy will have to be well-designed, and it will need to generate sufficient revenue to meet the requirements of sound climate change policy and mitigate the impacts on vulnerable populations. That means it will be essential to auction most or all of the allowances.

Our analysis of these issues can be summed up in four key numbers. Number one, $750 to $950 per year. That is the average increase in energy-related costs for the poorest fifth of the population from a quite modest, 15 percent, reduction in emissions, the kind of target that is often mentioned for, say, 2020. As you know, climate change policies work, in part, by raising the price of fossil fuel energy products to encourage efficiency and the substitution of clean energy sources. That will raise costs to consumers for a variety of items, from gasoline and electricity to food, mass transit, and other products that have energy inputs.

Households with limited incomes will be affected the most because they spend a larger share of their income on energy-related products than more affluent households do. And they also are less able to afford investments that can reduce their energy consumption, such as buying a new energy-efficient car or going out and buying a new heating system for their home. If climate change legislation is passed but nothing is done to protect people of limited means, more of them will slip into poverty, those who are poor will become poorer, and the trend toward widening income inequality will be aggravated. Now let me give you a little context.

This figure of $750 to $950 per year in increased costs for the bottom fifth of the population, from a 15 percent reduction in emissions, the people in question, the bottom fifth of the population, have average income of only a little over $13,000 a year. So 750 to 950 would be a big hit on them.

Figure number 2, $50 billion to $300 billion per year. That is the Congressional Budget Office estimate of the resources potentially generated by climate change policies. That is CBO's estimate of the value of the emissions permits under a cap-and-trade system. In other words, it is the amount of the proceeds the government would receive if the permits were fully auctioned off.

Key figure number 3, approximately 14 percent. That is the share of the auction proceeds needed to fully offset the increased energy costs that low-income consumers would face. In my written testimony, I outline principles for designing a mechanism, an approach to fully and efficiently offset the increased energy costs on the bottom 20 percent of the U.S. population and also provide some relief to hard-pressed working families in the next to the bottom 20 percent. That could all be done for about 14 percent. That is one-seventh of the value of the proceeds from auctioning off the permits in a cap-and-trade system.

Now, if Congress wanted to assist middle-income consumers as well, that could be accomplished if a somewhat larger share of the proceeds were used for that purpose. For example, with approximately half of the allowance value, half of the value of the permits, Congress could fully compensate the bottom 60 percent of Americans and provide significant compensation to the next 20 percent, leaving out only the most affluent 20 percent, which is the group that consumes the most energy and is most able to afford to make sizeable adjustments in their consumption patterns.

My final, my fourth, key number, less than 15 percent. That is the Congressional Budget Office's estimate of the share of the allowance value that is needed to fully compensate energy companies and other emitters for financial losses due to climate change policies.

CBO has conducted a review of all of the literature in the field. There are a number of studies that have been conducted. The broad set of findings are that the net impact on the emitters could be in terms of potential economic losses would be offset for less than 15 percent of the permits. And CBO has called the provision of a larger share of the permits free to emitters as an approach that would result in, CBO's terms, windfall profits for the companies receiving the free allowances.

Now, there is a misconception—Mr. Chairman, you referred to it in your opening remarks—a misconception some have that energy prices will not rise or not rise as much if the allowances are given away. That belief flies in the face of the basic laws of supply and demand. A cap on emissions will limit the supply of energy from fossil fuels. And when supply is restricted, prices rise. Regardless of whether the government gives away or sells the allowances, the energy companies will be able to sell their products at the higher price. They will be able to charge what the market will bear.

Harvard economist Greg Mankiw, who served as Chair of President George W. Bush's Council of Economic Advisers, has characterized a cap-and-trade mechanism in which the allowances are given away in large numbers for free as a form of, in Mankiw's words, corporate welfare. Now——

The CHAIRMAN. If you could please summarize?

Mr. GREENSTEIN. Let me summarize. The final thing I simply wanted to mention was the impact on budgets. Higher energy prices will raise the cost of federal, state, and local services. The cost of heating schools, hospitals, and the like will go up. Cost-of-living adjustments for Social Security and veterans' programs will need to be higher to reflect the higher energy costs.

The Pentagon is the nation's single largest consumer of energy. And its costs will rise. Those can all be addressed, too, those issues, by devoting a share of the permits to offsetting the resulting increases in federal, state, and local costs, all of which comes back to the same issue.

All of these things can be taken care of if most or all of the permits are auctioned off. If they are not, you get a potential for increased poverty, increased deficits in debt from the higher government costs, alongside windfall profits for emitters.

Thank you.

[The statement of Robert Greenstein follows:]

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TESTIMONY OF ROBERT GREENSTEIN, EXECUTIVE DIRECTOR, CENTER ON BUDGET AND POLICY PRIORITIES

HEARING ON "CAP, AUCTION, AND TRADE: AUCTIONS AND REVENUE RECYCLING UNDER CARBON CAP AND TRADE"

SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

Strong measures are needed to reduce greenhouse gas emissions and prevent costly and potentially catastrophic environmental and economic damages from climate change. The Center on Budget and Policy Priorities' area of expertise is not in environmental policy per se, but rather in the impacts that climate change policies can have on the budgets of American families — especially those of modest means — and on the federal budget.

Congress can develop climate change policy that is environmentally and economically sound and fiscally responsible, treats low-income families equitably, and avoids increases in poverty and hardship. To achieve these objectives, however, the policy will have to be well designed. This means generating sufficient resources to address the requirements and challenges of sound climate-change policy and mitigating the impact on vulnerable populations, especially people with low incomes. If Congress decides to adopt a cap-and-trade approach, it will be essential to auction off most or all of the emission allowances, and to devote an adequate share of the proceeds to assisting low- and moderate-income consumers.

Four Key Numbers on Climate Policy, Low-Income Consumers, and the Budget

Our analysis of the effects of climate-change policy on the budgets of low-income households and the federal budget can be summed up in four key sets of numbers.

One caveat about these numbers is that they rely on economic models and predictions about the future that are inherently difficult to make with fine precision. The numbers demonstrate, however, the dimensions of the problem to be solved, and our accompanying analysis shows that it indeed can be solved.

1. $750 - $950 per year: the average increase in energy-related costs for the poorest fifth of the population from a modest (15 percent) emissions reduction

Effective climate-change policies work in part by raising the prices of fossil-fuel energy products to encourage energy efficiency and the substitution of clean energy sources. This is essential to prevent extensive environmental and economic damage from climate change. However, it will raise costs to consumers for a wide array of products and services, from gasoline and electricity to food, mass transit, and other products or services with significant energy inputs.

Households with limited incomes will be affected the most by those higher prices, since they spend a larger share of their incomes on energy-related products and services than more affluent households do. They also are less able to afford investments that can reduce their energy consumption, such as buying a more efficient car or a new heating and cooling system. If nothing is done to protect people of limited means, many more of them will slip into poverty, those who are poor will become poorer, and the trend toward widening income inequality will be aggravated.

$750 to $950 per year is our estimate of how much, if left to fend for themselves, average families in the poorest 20 percent of the population would have to come up with to cover the increased costs arising from a 15 percent reduction in emissions.[1] This is a group whose average income is only modestly over $13,000 a year, and our $750-$950 estimate already takes into account increases in cost of living adjustments that they may receive, such as through the annual Social Security COLA, as a result of higher energy costs. Moreover, the 15 percent reduction in emissions, which is what CBO uses in its analysis, is relatively modest by the standards of current proposals. It is 15 percent below business-as-usual levels (what emissions would be if there were no restrictions), *not* 15 percent below the 1990 or 2005 levels that are often used as benchmarks in legislative proposals. Those benchmarks themselves are well below business-as-usual levels.

2. $50 billion to $300 billion per year: resources potentially generated by climate-change policies to help low-income consumers and to address other climate-change-related needs

Fortunately, the same climate-change measures that generate higher energy-related costs can also generate substantial resources to cover those costs. CBO estimates that various recent proposals to limit greenhouse-gas emissions by establishing a cap-and-trade system would create a valuable resource — emission permits — that would be worth $50 billion to $300 billion per year by 2020, depending on the specifics of each proposal. That is how much revenue the government could expect to raise if it auctioned off all of the permits.

3. Approximately 14 percent: share of auction proceeds needed to fully offset the increased energy-related costs faced by low-income consumers

The amount of revenue the government could raise by auctioning off all of the permits in a cap-and-trade system is far more than what would be needed to protect low-income consumers from higher energy-related prices arising from climate-change legislation. We estimate that a program

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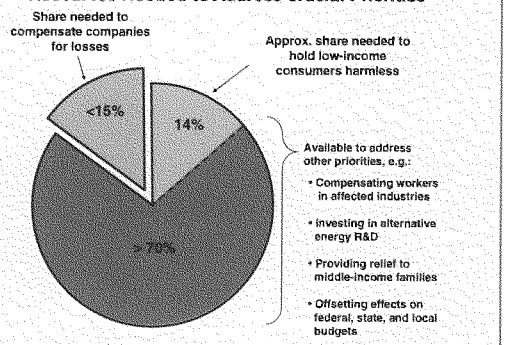
[1] The Congressional Budget Office has provided a figure of $680 for the average increase in cost for the bottom 20 percent of *households*. Using CBO's own household-size-adjustment methodology, we have estimated the impact on the poorest 20 percent of *people*. (The bottom fifth of households disproportionately consists of one- and two-person households, and as a result, includes significantly less than one-fifth of the people in the United States.) For a fuller explanation of this adjustment, see http://www.cbpp.org/10-25-07climate.htm, footnote 1.

designed according to the principles laid out later in this testimony, which would fully offset the impact on the poorest 20 percent of people and also provide some relief to many hard-pressed working families in the next 20 percent, could be fully funded with approximately 14 percent of the resources that would be generated by auctioning off all the allowances in a cap-and-trade system.

The specific dollar amounts in our first two sets of numbers — $750 to $950 per year of added costs for low-income consumers and $50 to $300 billion per year of potential revenue are tied to specific emissions targets, but the 14 percent figure is not. When the emissions target is looser (and hence the emissions reduction is smaller) — as it would be in the early years of most proposals — the dollar amount of revenue that could be raised would be lower, but so too would be the increase in energy prices and the amount of added costs that households would face. As the cap tightens and larger emissions reductions are called for, the added costs to households increase, but so too does the potential revenue that would be available to offset those costs. But no matter what the point in time, the amount needed to protect low-income consumers would always be about 14 percent of the revenue that could be generated. In other words, Congress does not need to guess at what the right amount to provide to assist low-income consumers will be; by setting aside 14 percent of the allowance value in a cap-and-trade system in perpetuity, it can be sure to have shielded these consumers from whatever the price impacts on them are in any given year.

FIGURE 1

Well-Designed Climate Policies Can Generate the Resources Needed to Address Crucial Priorities



Source: Share needed to compensate companies for losses based on estimates cited by the Congressional Budget Office (CBO). Share needed to hold low-income consumers harmless reflects CBPP calculations using the Consumer Expenditure Survey, Current Population Survey, and CBO methodology.

If Congress wanted to assist middle-income consumers as well, that could be accomplished, if a sufficient share of the allowance value from a cap-and-trade regime were set aside for that purpose. For example, with approximately half of the allowance value, Congress could fully compensate 60 percent of American households and provide significant compensation to the next 20 percent, leaving out only the wealthiest 20 percent of households, who have the most disposable income, consume the most energy, and are the most able to make adjustments to their own consumption patterns in order to reduce their carbon footprints.

4. Less than 15 percent: share of potential budget resources needed to fully compensate energy companies and other emitters for financial losses due to climate-change policies

Although the resources that can be generated by sound climate-change policies are substantial, so too are the budget claims arising from those policies. Besides the need to protect vulnerable populations, those claims include basic research into alternative energy sources, assistance for

workers and communities that depend on the coal industry and other industries most affected by the shift to a less carbon-intensive economy, and other needs. In addition, higher energy prices will drive up the cost to federal, state, and local governments of providing many important services and benefits. Unless these costs are offset, government services will have to be reduced or taxes raised, or the federal deficit will rise.

In a cap-and-trade system, making sure there are adequate budget resources requires that most of the emission allowances are auctioned off, not given away for free to energy companies and other emitters due to misconceptions about the financial losses they would incur. One misconception is that those losses would be very large. CBO's review of the evidence, however, concludes that less than 15 percent of the total value of the allowances would be sufficient to offset the net financial losses of companies affected by policies to restrict emissions. More than that would simply create what CBO has called "windfall profits" for companies receiving the free allowances.

A related misconception about cap-and-trade may also contribute to the belief that large numbers of emission allowances should be given away to energy companies and other industrial emitters. This is the mistaken belief that energy prices will not rise (or not rise as much) if the allowances are given away. That belief is *not* correct; it flies in the face of the basic law of supply and demand. A cap on emissions will limit the supply of energy produced from fossil fuels. When supply is restricted, prices rise — just as when there is a banana shortage, the price of bananas goes up. Regardless of whether the government gives away or sells the allowances, energy companies will be able to sell their products at the higher price. If companies receive allowances for free, they will still be able to charge the higher price — they will be able to charge what the market will bear — and will reap what CBO has termed "windfall profits." Indeed, Harvard economist Greg Mankiw, who served as Chairman of President George W. Bush's Council of Economic Advisers, has characterized a cap-and-trade mechanism under which the allowances are given away as "corporate welfare."[2] (As an analogy, if a distributor has purchased large quantities of a product at one price but some external event then causes the supply of future quantities of that product to fall — and the market price of the product to rise correspondingly — the distributor will not keep his prices low just because he purchased the products before their price climbed. He will charge what the market will bear. In the same way, energy companies will charge what the market will bear whether they obtain the permits for free or purchase them through an auction.)

Avoiding Regressive Outcomes While Meeting Other Climate-Related Priorities

The policies needed to reduce greenhouse-gas emissions would, by themselves, result in regressive changes in energy prices. But they also can generate substantial revenue that could be used to offset those regressive impacts. Our analysis, like that of CBO, shows that the potential revenue from auctioning off emission allowances under a cap-and-trade system could yield more than enough revenue to offset the losses likely to be experienced by low- and moderate-income families and by workers in the industries hit hardest by the adjustment to a less carbon-intensive economy. The revenue could be sufficient both to address these issues and to meet various other legitimate purposes arising from the legislation as well (see figure 1).

[2] Greg Mankiw, "Greg Mankiw's Blog: Random Observations for Students of Economics," August 2, 2007.

In contrast, giving away a substantial fraction of emission allowances to existing energy producers would do almost nothing to compensate low- and moderate-income families for their losses. A very large percentage of the benefits of such a giveaway would go to shareholders of the energy companies, most of whom have high incomes, while little revenue would be available to mitigate the effects on those least well-off.

Addressing regressivity and adjustment costs would not be the only claims on the resources that could be generated by a cap-and-trade system. Governments at all levels would pay more for the energy and energy-related products that they consume directly. For example, the Defense Department is the single largest consumer of energy in the United States. In addition, there would be impacts on living costs and economic activity, which, while modest in the overall economy, could nevertheless trigger increases in automatic cost-of-living adjustments in Social Security and other benefit programs and some modest reductions in tax revenues. These issues can be addressed — and any increases in deficits and debt avoided — by using a share of the allowances to offset such tax and expenditure changes. (Note: action to reduce the damages from climate change should have positive effects on the budget over the longer run, by reducing government expenditures for such things as natural disasters, crop failures, and disease epidemics. In other words, in the absence of effective climate-change policies, natural events are likely to occur sooner or later that entail large federal costs and throw the budget farther out of whack.)

In addition, although higher energy prices would create strong incentives for energy conservation and for investment in clean-energy technologies, there will be claims for additional subsidies to encourage a wide variety of activities in the name of combating climate change. In many cases (including various types of basic alternative energy research), such investments can be a valuable complement to the market incentives provided by a cap-and-trade system. Such spending will be wasteful, however, if it merely subsidizes activity that would take place anyway or that is not well focused on reducing greenhouse-gas emissions.

If lawmakers capture the necessary revenue and make wise choices among competing claims in designing climate-change policy, they can achieve the economic and environmental benefits from reducing greenhouse-gas emissions while addressing the impact of higher prices on low-income consumers and other legitimate new claims on available resources. (It might even be possible to achieve some modest deficit reduction, which would be valuable at a time when, as this Committee well knows, the pressures on the federal budget will be increasing.)

If, however, lawmakers give away too many emissions rights to existing emitters, as a number of the bills currently pending in Congress would do, they will fail to capture sufficient resources to meet these needs, while conferring windfall profits on energy companies and other emitters. This latter course would risk large increases in deficits and debt (already on course to reach unsustainable levels in future decades), significant increases in poverty and hardship, and a further widening of the gap between rich and poor.

Designing Climate-Change Legislation That Shields Low-Income Households From Increased Poverty And Hardship

Making sure that sufficient resources are available to shield low-income households from increased poverty and hardship is crucial in the design of climate-change policies. But it is only the first step needed to avoid increases in poverty. It also is vital to use the resources made available for

this purpose in a way that is effective in reaching low-income households, efficient (with low administrative costs), and consistent with energy conservation goals. At this early stage of the debate, no climate-change legislation introduced on Capitol Hill meets this goal, although there is a growing interest among a number of lawmakers in finding effective ways to protect low-income people from increased costs.

To shield vulnerable households from higher energy costs in a manner that is both effective and efficient, we recommend that policymakers follow these five basic principles.

1. ***Fully protect the most vulnerable households.*** Climate-change legislation should not make poor families poorer or push more people into poverty. To avoid that outcome, climate rebates should be designed to fully offset higher energy-related costs for low-income families. A good place to start is by fully protecting households in the bottom fifth of the income spectrum — those with average incomes of $13,000 — or less than $27,000 for a family of three. Families at modestly higher income levels that struggle to make ends meet will need some help, as well, in coping with higher bills.

2. ***Use mechanisms that reach all or nearly all low-income households.*** Some low-income households work for low wages and could receive their climate rebate through the tax code, such as through an increase in the Earned Income Tax Credit. But others are elderly, unemployed (especially during recessions), or have serious disabilities. Climate rebates need to reach all of them.

   Fortunately, policymakers can tap existing mechanisms to reach the large number of low-income households that cannot be reached through a tax rebate mechanism because their incomes are so low they are not required to file a federal income tax return. For example, "climate rebates" could be provided through the electronic benefit transfer (EBT) systems that state human service agencies use to provide assistance to many poor people. Policymakers could fill any remaining gaps, and provide weatherization assistance, through some increases in the Low Income Home Energy Assistance Program.

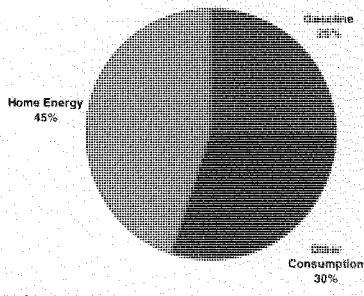
3. ***Minimize red tape.*** Funds set aside for low-income consumers should go to intended beneficiaries, not to administrative costs or profits. Accordingly, policymakers should provide assistance as much as possible through existing, proven delivery mechanisms rather than new public or private bureaucracies.

4. ***Don't focus solely on utility bills.*** For households in the bottom fifth of the population,

FIGURE 2

Impact on Low-Income Households Goes Well Beyond Home Energy

Share of Loss in Purchasing Power for Poorest 20 Percent of People by Product Category



Source: CBPP calculations based on Consumer Expenditure Survey data and CBO methodology.

higher home energy prices will account for *less than half* of the hit on their budgets from a cap-and-trade system. And about 20 percent of the households in the bottom fifth have their utility bills reflected in their rent, so they pay for utilities only indirectly, through the rents their landlords charge. Policymakers should structure "climate-change rebates" so they can also help low-income families with these rent increases, as well as higher prices for gasoline and other products and services that are sensitive to energy costs.

5. ***Adjust for family size.*** Larger households should receive more help than smaller households because they have higher expenses. Families with several children will generally consume more energy, and consequently face larger burdens from increased energy costs, than individuals living alone. Many other forms of assistance vary by household size; this one should as well.

Conclusion

Well-designed climate-change policy that auctions most or all of the permits can generate resources that can be used to avoid regressive outcomes and address other legitimate budgetary claims that arise from the new policy. Policymakers should recognize the importance both of generating adequate revenue and of addressing concerns regarding equity and fiscal responsibility, so that they avoid ending up with a policy that increases poverty and further widens gaps between rich and poor, increases deficits and debt, or both.

The CHAIRMAN. Thank you, Mr. Greenstein, very much.

And now we'll turn to questions from the Select Committee. The Chair will recognize himself.

Mr. Zapfel, thank you again for being here today. It is very important to us.

The EU is making a big change today. They are moving in a completely different direction than they did in their original phase in dealing with greenhouse gas emissions.

What happened when the allocation was free for the various sectors of the European economy? What was it that you found happened?

Mr. ZAPFEL. Thank you, Chairman.

As I pointed out before, when we go into the fourth year of free allocation now in our first rating period and, thus, in our second rating period, we have predominantly free allocation, we learned very early on, even before our trading scheme started via the future markets on the side of our prices, that the value of the allowances get priced, first and foremost, into electricity.

We continue to do ongoing economic assessment. Our scheme is now just going into its fourth year. There is empirical evidence we continue to learn. But in principle, we see that, as has been said before, even if allowances are given for free, some sectors find it fairly easy to include the value of allowances into the prices. And this distributional effect is something that has resulted in a lot of debate in Europe and is actually one of the multi-weighting factors proposals that we have made today.

The CHAIRMAN. Okay. So how do you deal with the challenge? Many people say that this is an unprecedented step that you are taking and that industry is unprepared to deal with the consequences of having an auction system. What is your response to that?

Mr. ZAPFEL. It is not something we do overnight. As you know, we are now in the year of 2008. And the proposal is that the changes come in the year 2013.

In principle, overall in the design of the regulatory framework for our carbon market, we pay a lot of attention to that we give this new market sufficient regulatory stability. And one of the key issues there is that we give sufficient foresight so we don't do changes overnight.

We had, for example, a lot of debate whether we should already change our rules on very short notice so that the second phase would already see regulatory changes. The Commission has not entered in such changes because we think for the market to develop well, to work efficiently, it needs sufficient lead time so that everybody can prepare for the rule changes.

The CHAIRMAN. And how are you dealing with industry opposition? And which industries are most opposed to moving to an auction system?

Mr. ZAPFEL. I think, also as you said before, I think we are not the only ones across the world who is considering starting a legislative debate to move towards auctioning.

We, of course, follow very carefully the debate in the United States. We have seen what is happening in the RGGI system or what has been decided in the RGGI system. There are other carbon

markets designed around the world, in Australia and New Zealand. There is a debate here. So I think we are moving along an international trend that is developing.

Of course, I think from the perspective of an individual business, if you are subjected to a carbon cap, it is always a preference for an industry to ask for free allowance, rather than to have to pay for the allowance. I think that is a natural opposition that we have in our political process.

What is important to us is that there is to continue to empirically evaluate what are the real effects. What empirical evidence do we have? As I said, so far, there is no compelling empirical evidence that this is damaging. What we reckon is that some sectors, as I said, the borrow sector can move quicker. And other sectors need some time to adapt, industrial sectors, which we give more time to adapt to those changes.

The CHAIRMAN. Okay. Thank you.

Mr. Podesta, you are an expert on the budget and appropriations process. What recommendations would you make to ensure that any revenues that do come from an auction system are, in fact, preserved for R&D, are preserved to take care of the poorest citizens, who may be affected by this very dramatic change in the way in which we regulate energy in our country?

Mr. PODESTA. Mr. Markey, that is a very good question, but I think that we have dealt with it before in the Land and Water Conservation Fund and other funds that could be segregated either through the direct appropriations process or moving in the direction that we see, for example, in the Lieberman-Warner bill, where the money is deposited directly into certain accounts that would be used only for the purposes that would be put forward.

But I think that's in the end of the day I think a critical question to ensure that the money goes to both what Mr. Greenstein spoke about, which is to cushion the burden. Again, in our proposal, we take it up to the middle class so that while they may see net increases in their energy pricing, we also believe that their energy bills can over the mid term bend down, as we have seen in California, because they are using less energy as efficiency is driven through the system. But ultimately they are going to pay a little bit more.

And we think that those accounts need to be balanced and that the structure of the cap-and-trade system needs to essentially fence off that money so that both of those things can take place: the right kind of investments and protection of working people in this country.

The CHAIRMAN. Thank you, Mr. Podesta. Again, Mr. Zapfel, thank you for being here. We feel like we are here on day one at 8:00 A.M. of the new era of auctioning. And I personally just want to praise the European Union for their courage in moving in that direction. I think it is the correct direction.

The Chair's time has expired. And I recognize the gentleman from Wisconsin, Mr. Sensenbrenner.

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

As I think we all know, there is a great deal of concern about the direction that our economy is taking. And the fix is on for a bipartisan economic stimulus package. And the debate is over not

whether to stimulate the economy but how best to do it. The bottom line is that there will be money pumped into the economy to try to prevent a recession from occurring or worse.

Now, I am a member of Congress. And everybody up here is a member of Congress. How does a member of Congress justify voting to pump money into the economy in an economic stimulus package and then turn around and support a cap-and-trade program, which takes money out of the economy and could cost both consumers and businesses billions of dollars? Let me start with you, Mr. Podesta, since your advice is always very good to members of Congress.

Mr. PODESTA. Well, Mr. Sensenbrenner, I don't think you need to have that net impact. In fact, I think, as I said, you could create the virtuous cycle of taking money out of the economy that's going towards polluting the atmosphere, creating a worldwide crisis, causing us long-term national security problems that will require us to put more money into defense, take that money out from the pollution side, put it back in through rebates for low-income people, middle class people, and investments that will build a long-term economy.

Mr. SENSENBRENNER. Okay. First of all, we don't need to get into the science, but CO_2 is not a pollutant. CO_2 is a naturally occurring gas. It's not like sulfur dioxide or something like that. Every time we exhale, we exhale CO_2. And that is not polluting this room.

Mr. PODESTA. I never thought I would say this, but I agree with the Supreme Court and disagree with you, Mr. Sensenbrenner.

Mr. SENSENBRENNER. Well, the Supreme Court is not right all the time either.

Mr. PODESTA. I agree with that.

Mr. SENSENBRENNER. Okay. Yes. The thing is let me continue on this. In 2000, the CBO did a study on cap-and-trade system and determined that the cap-and-trade system would be tremendously regressive.

Now, I think that both you and Mr. Greenstein seemed to indicate that without tinkering around with the cap-and-trade system, it would be regressive and without the tinkering around, we end up giving carbon breaks for the rich using carbon, instead of tax and debate in the vernacular.

If we go to tinkering around, which people are debating about, aren't we turning cap-and-trade into a wealth redistribution system? Mr. Greenstein.

Mr. GREENSTEIN. I would say the answer is no. Under a cap-and-trade system, you have a decision. You have to make a decision. You give the permits away for free. You auction them off. You have to make a decision.

The CBO report indicates if you have a cap-and-trade system and you give away the permits for free, you have highly regressive effects. If you have a cap-and-trade system and you auction off some substantial share to all of the permits, then whether it's regressive, progressive, or neither of the above, sort of make this just kind of right in the middle, depends on what you do with the proceeds from those permits that you auction off.

But the only way in which it is clearly regressive is if you either—if you give away a substantial share of the permits for free,

it is clearly going to be regressive because you clearly won't have enough money to offset the regressivity that the increases in consumer prices alone would cause.

As long as you auction off a substantial share of the permits, you have the potential to ensure that the system is not regressive. You can make it progressive if you want to. You can simply avoid the regressivity.

Mr. SENSENBRENNER. But getting back to what Mayor Bloomberg told this Committee last November in Seattle, you know, why not be honest? If we're going to increase energy costs to do this, why doesn't Congress directly levy a tax, which is the honest way of doing it? And that way members of Congress have to be accountable for their votes one way or the other, rather than simply folding the cost of this into energy bills and then Congress taking a bow for "giving money away" to people that we decide need to get the money from the auction. Isn't Mayor Bloomberg right in saying, "Let's be up front and honest," rather than, you know, going through this tremendously bureaucratic system with all kinds of values of who deserves the money from the auction and who doesn't?

Mr. GREENSTEIN. There may be a different set of answers on the panel here. Let me quickly note for starters that your prior question, "Is it regressive? Is it not regressive?" the same question applies to a carbon tax. It would all depend on what you did with the proceeds for——

Mr. SENSENBRENNER. Yes. I am not for carbon tax either. [Laughter.]

Mr. GREENSTEIN. Now, as you know, the advantage of a cap-and-trade is you have a firm cap on emissions. And the disadvantage is you don't know in advance the impact on the price. With the carbon tax, you have certainty on the price but uncertainty on the exact level of emissions reduction that you get. Many economists, including——

Mr. SENSENBRENNER. Well, my time is up. You know, Europe has had cap-and-trade. And the amount of emissions has gone up. So my time is up. Thank you. Europe has failed, don't need to copy them.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from Oregon, Mr. Blumenauer.

Mr. BLUMENAUER. One of the benefits of the head in the sand attitude of this administration is that we have a chance to look at the experiences in other parts of the world as people are struggling with how we are going to have a carbon-constrained economy.

Lots of things are not pollutants in the natural order. I mean, CO_2 in its normal amounts is not salt, but if we get too much of a good thing, we have real problems. And I appreciate our witnesses saying that these things are not mutually exclusive in terms of stimulating the economy by not taking it out of the economy.

Everything I heard from the witnesses is you are thinking that this is not somehow something that is going to be shot into space that is going to be circling the planet. This value is going to be reinvested somewhere. It is going to be a windfall in the hands of some. It is going to be targeted towards redevelopment.

Mr. Podesta, I am not certain that I would use the Land and Water Conservation Fund as an example that gives me hope. I think we can learn from that experience as well. But you are suggesting that it is part of a comprehensive strategy.

As I hinted at in my opening statement, what I am interested in is your observations about making it part of a comprehensive strategy that focuses on the two principal expenditures of American households, both in terms of dollars and in terms of carbon, housing and transportation.

I would be interested in observations, particularly from the right wing here on the panel, at least my right wing, in terms of how you think we can best harness the value that could be created to help households with infrastructure and energy conservation and transportation that would reduce their carbon footprint, stimulate the economy, and protect their economic security.

Mr. PODESTA. Well, let me begin. I think the Congress—and, again, I commend you—has already taken a giant step by increasing vehicle efficiency on the transportation side. There is obviously more investment to do in transportation, in smart growth, in some of the initiatives that you have championed in more mass transit spending, et cetera. And I think some of the proceeds of the auction should go and ought to go to those kinds of investments.

On the housing side, I think you get it that through, again, complementary policies through the cap-and-trade, better building codes, a smart grid, investment in the electric infrastructure so that you could have real-time metering and basically begin to do what has happened in California, which over the past 30 years has kept its per capita energy consumption flat while the United States energy consumption has grown by 40 percent while maintaining high levels of growth in the economy and high levels of wealth in the state.

So I think those complementary policies—and Mr. Bowles is trying to implement those in Massachusetts—are directly going at the issues of efficiency, building codes. That is where the low-hanging fruit is. And we need to pay attention to that, in addition to creating the right kind of structure over the cap-and-trade.

Mr. BLUMENAUER. Mr. Bowles, you referenced the trade-off in terms of the one percent increase, five percent longer-term savings in energy. Can you talk about in a little more detail how you think you can seize on that and make that sort of difference?

Mr. BOWLES. Yes. I mean, just the key point, I think, of the question is—and I would agree with everything John just said—that we have a tremendously inefficient and creaky electricity system in the United States. We need to upgrade transmission. We need real-time metering. And we need a hell of a lot more end-use efficiency. It is the lowest-hanging fruit.

So when Congress thinks about what should we be doing to use these auction proceeds, I think a lot of the whole panel agrees that auctioning makes sense. Once you got the proceeds, what do you do? How do you prioritize it? I would use the criteria of, how can we save the most for consumers, low-income middle class? I mean, how can we lock in the greatest environmental benefits?

I think things like appliance standards, which Congress has moved forward on, vitally important. Building codes are at the

state level. We in Massachusetts are joining the International Energy Conservation Code, vitally important. So I think you can do a great deal of that.

On the efficiency side, there is a tremendous amount of return. We did an economic analysis. In fact, it was done under the Romney administration—I am happy to share it with the Committee—that showed the disproportionate returns that would come from allocating the auction proceeds to energy efficiency. We could see savings above five percent in commercial, industrial, and residential parts of the electricity sector. So that's the lowest-hanging fruit and I think the biggest opportunity for savings.

The CHAIRMAN. The gentleman's time has expired. The gentleman from Oklahoma, Mr. Sullivan.

Mr. SULLIVAN. Thank you, Mr. Chairman.

I would like to thank all of the panelists for being here today. I guess this question is for anybody who wants to answer it or as many of you that want to answer it. What certainty do we have that any cap-and-trade program would achieve carbon target certainty? And also with all of the trading going on, where do you see the tangible reductions taking place? Anybody?

Mr. BURTRAW. On the second part first, our modeling and modeling by the EIA suggest that over the first couple of decades of a climate policy, although the electricity sector is responsible for about 40 percent of the CO_2 emissions in the country, it's expected to account for two-thirds to three-quarters of the emission reductions that would be achieved. That is why there is so much attention given to the electricity sector.

The other part of your question is, how can we be sure that a cap would be obtained and not violated? That has been the predominant success of capped programs previously. The issue when there have been emission increases has been when a cap was initially set at a level that was regrettable and not as tight as perhaps it could have or should have been.

Mr. SULLIVAN. Yes, sir?

Mr. ZAPFEL. Yes. When we designed our carbon market in Europe, we studied very carefully the experience in the U.S. The main thing to achieve the emissions reductions is to have a very credible and robust compliance and enforcement system.

The price of a carbon allowance today in Europe is roughly 20 to 22 euros per ton of CO_2. If you fail to surrender the emission allowance, there is a financial penalty levied on the company of 100 euros per ton of CO_2. So that creates a very strong incentive to comply with the cap.

And the reductions come not from the trading of the allowances but come from the carbon price signal that you create in the economies. So you make it worthwhile to innovate, to push forward on the technological front and bring the emissions down.

Mr. BOWLES. I would just add—and thank you for the excellent question—that one of the benefits of auctioning is you have price discovery and you figure out what it is worth to have one of these allowances.

If you just give them away, you don't have that information. So you can adjust your cap at the federal level to say, "Are we hitting our target? And do we need to send a louder price signal into the

economy?" I think it's a real benefit of the cap and the auction approach that you don't get necessarily from a carbon tax approach.

Mr. SULLIVAN. Anyone else? How much time do I have left?

The CHAIRMAN. The witnesses can take 2 minutes and 23 seconds.

Mr. SULLIVAN. Okay. I've got——

The CHAIRMAN. You can yield it back or ask a question.

Mr. SULLIVAN. I've got one more question. I'll ask anybody.

The CHAIRMAN. Okay. Please?

Mr. SULLIVAN. Would you say that the allowances and their prices should be set by Congress, the administration, or the market? What if the price of allowance skyrocketed to an unsustainable level? What would be the backup plan? I guess you kind of talked about a little of that.

Mr. BOWLES. Let me just comment quickly on what we have done in the Regional Greenhouse Gas system. So there are two different triggers based on price that allow access to a larger market for offsets. So there is a large market for carbon offsets, which are other ways to achieve greenhouse gas reduction. So it starts out in a New England market, then goes national, and goes international based on price triggers. So as price goes up, you have an increasing pool of alternative ways to reach compliance.

I don't know if that answers your question.

Mr. SENSENBRENNER. Would the gentleman from Oklahoma yield?

Mr. SULLIVAN. Yes, I will yield.

Mr. SENSENBRENNER. I was just advised that the Times of London reported this morning that the United Kingdom under the new European system that Mr. Zapfel described would end up having to pay an additional 6 billion pounds, or $12 billion, a year in order to comply with this.

You know, I am just wondering what the hit on the British economy would be, which is an economy that is much smaller than the American economy, with this kind of essentially a bureaucratic hit. Maybe Mr. Zapfel can answer that.

Mr. ZAPFEL. I cannot confirm the figures that you put forward. We have undertaken a substantial evaluation for the EU overall. We have come to the conclusion that our far-reaching climate and energy targets, so not just the reductions via the weighting scheme, overall can be achieved at a fairly affordable cost of roughly half a percent of our GDP. All of this needs to be compared to the——

Mr. SENSENBRENNER. If the gentleman will yield further, a $12 billion hit on the economy of the United Kingdom is not insignificant. And this is what the largest and most respected newspaper in the United Kingdom analyzed what you have just announced today. It ain't free.

Mr. ZAPFEL. As I said, I cannot confirm those figures. Overall for the European economy overall, the costs are fairly insignificant. We also have to look at the cost of non-action, as has been outlined in the Stern report, which can be a lot more considerable than cost of bringing down our emissions.

Let me also use the occasion because you said no emissions have been reduced. There is some research. Your statement refers to the

first period, the first trading period, 2005 to 2007, which was for us in Europe a learning period.

We didn't have the benefit, as you have in the U.S., with air pollutant trading programs, SOx and nitrogen trading programs. So we started from scratch in Europe. Our emissions cap was not binding in 2005 to 2007. Also, we do not have our Kyoto commitments kicking in in 2005 to 2007.

We brought down the emissions cap for the trading scheme in the second phase already about 10 percent compared to the first phase, which makes sure that we will see emissions reductions in the second phase. And, as I stated in my introductory statement before, this emissions cap will come down by another 11 percent so that we are 21 percent below 2005 emissions by the year 2020, which guarantees emissions reduction and the environmental integrity of the European common market.

The CHAIRMAN. The gentleman's time has expired. And the Chair will recognize the gentleman from Washington State, Mr. Inslee.

Mr. INSLEE. Thank you.

I think Mr. Greenstein mentioned that someone argued that this would be corporate welfare if you don't have an auction system. I just want to ask about the logic of that.

Going back to this issue of the tragedy of the commons, my understanding is that people who argue that essentially say, "Look, there is an asset. The atmosphere only has a limited carrying capacity for CO_2." And if we're going to give rights away to people to pollute that, you are giving away a scarce asset. It has an economic value.

And, therefore, it would be a sense of welfare of giving away a public asset for free. It would be like giving away gold from our national parks or the like. Is that the logic? And does an auction solve that problem?

Mr. GREENSTEIN. Well, an auction does solve that problem, but you don't have to go to that logic to reach the corporate welfare conclusion. And the term isn't mine, although I would agree with it.

What is interesting is the "corporate welfare" term in this context actually is Greg Mankiw's term. He is a leading conservative Republican economist at Harvard. He was the Chair of President George W. Bush's Council of Economic Advisers.

What Mankiw was saying—you don't even have to go to the commons thing to get it. What Mankiw was saying was, "Look, if in a cap-and-trade system you give to energy companies and other emitters allowances that exceed in value the increased costs they will incur under the new system, then you're giving them a form of welfare. It's one thing if you simply offset the increased costs that will occur, but if you go beyond that and you just give them these permits, which they can sell for billions of dollars above and beyond what is needed to offset their costs, that is corporate welfare."

That is what CBO is essentially saying as well. CBO's term is "windfall profits." Mankiw's is "corporate welfare." It is simply saying you give them more than they need to offset their costs. You are giving away billions of dollars in gain to these companies and their shareholders. That is clearly a form of windfall.

Mr. INSLEE. I appreciate that.

Mr. Podesta, I really appreciate you are basically saying that environmental policy in this case isn't economic policy, it's a view I share. I want to let you know you are not alone.

I was just looking at a report from McKinsey and Company. It just came out in December. They concluded that almost 40 percent of abatement could be achieved at negative marginal costs. In other words, 40 percent of your savings of CO_2 you would actually reduce your costs. There would actually be a profit margin for the U.S. economy, if you will. And it talked about the barriers to achieving those 40 percent improvements or principal capital accumulation to do the work, the rehabbing your house, the acquisition of new heating and cooling system, more efficient cars, the whole nine yards.

I just wondered if you could give me any more thoughts about how we could fence off the revenues from a cap-and-trade system to be used for the legitimate purposes of that, both R&D, help to consumers to weatherize their homes, help to them to obtain new efficient equipment. What is the best way to do it? I know you gave us some ideas, but what is the best way in the real life to do that?

Mr. PODESTA. Well, as I said—and maybe I could provide some more information for the record, Mr. Inslee—I think that creating accounts in which the Congress decides where that money is going to go, either by allocating permits to it, which is the approach taken in the new Lieberman-Warner bill, or by auctioning 100 percent of the permits, which is our preferred approach, segregating that money and making those important investments but ensuring that that money is available, either through tax credits, which, again, we hope to see, I think, the production tax credits reauthorized in this session of Congress on renewable energy or through direct investments that could be operated either through the states or directly, is the best way that takes, again, a good chunk of that money and apply it to the very real challenge.

The other place that we would spend some money is on innovation itself, into boosting the R&D portfolio of the United States. We have seen enormous returns of investment in the past, particularly at DARPA and the DOD programs, but if you think about the information technology revolution driven by federal investment at the front end, I think you can imagine at least an energy innovation virtuous cycle driven by investment at the federal level into these new technologies.

We see a lot of venture capital pouring into that arena right now, but I think if you had the right kind of investment portfolio from the federal government, that would really quicken the change that we need.

Mr. INSLEE. Thank you.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Thank you, Mr. Chairman.

Mr. Podesta, you laid out in your testimony how the revenue from a cap-and-trade scheme based on auction might be equitably distributed. I think that is a terrific approach. Can you recap your proposal and then comment on how free giveaway of the cap-and-trade system would distribute revenue?

Mr. PODESTA. Well, I think that, you know, again, we have had your European experience described here this morning. I think going to the second part of the question, I think if you have a free giveaway and no watch and no allocation of revenue, what is likely to happen is rates will go up. The generating companies will pocket the money. Their shareholders would do very well. And the people at the other end will do very badly.

So we support the kinds of proposals that Mr. Greenspan—Mr. Greenstein was—he's still a liberal. [Laughter.]

Mr. Greenstein was talking about taking 45 percent of the auction share and rebating that to people, either directly through the tax code or, particularly for low-income people, where that mechanism doesn't work very well, to do it through other kinds of income supports, which Bob, of course, is the expert on, and then taking 45 percent, making these public investments that I described.

And then we also recognize that and I think the work that CBO has done suggests that 10 to 15 percent of the revenue might go to companies and communities particularly hard hit by increasing the costs of production of energy.

I am thinking here particularly in places hard hit that are coal-producing and those kinds of arena. The CBO estimates that that looks like to be about 10 to 15 percent of the revenue. So we would say put that back into those communities, help them weather the transition to a new economy.

Mr. GREENSTEIN. Can I add one quick point on that? There have been questions from several members to John on, how do you make sure the money actually goes for these purposes? And there have been discussions of trust funds and the like. I think we need to separate out the discretionary part of the budget, the appropriated part, from the other parts, entitlements, taxes, and so forth.

You would need some kind of trust fund mechanism like that for the discretionary part. You wouldn't—and I wouldn't recommend it—for the consumer relief part. If you're giving part of the consumer relief through an expansion in the earned income tax credit or a new tax credit, such as Mr. Larson has in his bill that's based on the first certain amount of the payroll tax that is paid, we don't have anything in the tax code where the IRS has to look each year at how much money is in a particular trust fund and make the tax credit go up and down every year.

You just do the tax credit. You work with CBO and the Joint Tax Committee. You have an estimate of how much revenue is going to come in from the auctioning of the proceeds. You design the appropriate tax credits that you need. You make sure the scores all fit, and you go forward.

So trust fund thing would be needed for the discretionary part. For the tax part and the direct spending part, you need some direct spending for the low-income people, as John mentioned. You just write that into the cap-and-trade bill, and you go forward.

Mr. MCNERNEY. Thank you.

Mr. Bowles, in a state like Massachusetts and also in California, we're starting to see the effects of RGGI and AB 32. Do you have any specific recommendations in terms of how to make sure that the federal programs complement those, instead of what other possibilities there are?

Mr. BOWLES. Thank you for the excellent question. One thing I just would try to underscore for this whole discussion is a lot of the cost-negative items that Mr. Inslee mentioned from the McKinsey report, which I commend to the Committee to read, are really implemented by the states, things like building codes, energy efficiency, building renewable power plants, zoning, smart growth. A lot of the easy stuff we need to do is going to be implemented by the states.

So I really encourage the Committee and the Congress to look at giving financial incentives with some of those auction proceeds to say if you, state, are doing all those things plus rate decoupling, maximizing efficiency, then we're going to support you.

You need to create some incentive because the states are the units that regulate the utilities and have such a big role where a lot of the easy things are going to be done first.

Back to your broader question. Look, I think the Congress could do us in California and 17 other states a great favor by making sure EPA got out of the way on the CAL LEV standards. They are vitally important and goes beyond what the CAFE increase, which is terrific, does. Obviously we're seeking EPA implementation of the Mass v. EPA case on the Clean Air Act.

And so I think there are a lot of things that the Bush administration could do to get out of the way of states like Massachusetts and California. But thank you for the question.

Mr. MCNERNEY. Thank you. I yield.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentlelady from South Dakota, Ms. Herseth Sandlin.

Ms. HERSETH SANDLIN. Thank you, Mr. Chairman.

I thank all of our witnesses today for helping illuminate further in acknowledging and helping quantify what costs may be associated with making this transition but also identifying the economic opportunities that exist and ensuring that we don't ignore the fact that there are costs to inaction.

I do want to describe sort of a set of circumstances, though, as it relates to the part of the country that I represent, the great plains in rural America, and just get your thoughts if you could comment on if we do move to a cap-and-trade and as we discussed the issue of free allocations versus auctions and then reinvesting and recycling the revenue, just to get your thoughts on whether or not we phase this in and give time to adapt, as Mr. Zapfel described, or if we move to something more 100 percent auction nearly immediately with what we set up because I have some concerns about that in light of the circumstances present in, say, South Dakota.

On the positive side of cap-and-trade for South Dakota, I see greater incentives to develop our wind resources, greater incentives to develop solar resources throughout our area in the Southeast and other regions, reinvestment in our hydroelectric facilities, the investment for carbon capture and sequestration because we are a very heavily coal-dependent region of the country.

There are also economic opportunities here for agriculture as it relates to certain farming and grazing practices as carbon storage and transitioning to integrating new technologies for cleaner burning coal in our coal-fired facilities that service our rural electric co-

operatives. But that is sort of the difficult side here of cap-and-trade that when you have rural electric cooperatives, you have rural consumers, you have very poor consumers in certain parts of the Great Plains that live on Native American reservations when we are still working to develop the transmission that some of you talked about, the need to sort of reinvest in the infrastructure of our transmission capacity for wind, time to measure just precisely—and the Chicago Climate Exchange is trying to do this for agriculture. It seems to me that we need a little time to adapt.

And that's why I think that, at least for now, I sort of favor more of a phase-in approach, rather than something that is nearly a 100 percent option immediately within the system.

So if you could comment on that and then, Mr. Zapfel, if you could also comment on perhaps as you describe, maybe an initial misjudgment in the European system being that they were free allocations versus an auction, now you're making that transition, but I understand that you chose not to help measure, quantify and measure, for agriculture to participate in the cap-and-trade system in Europe. And if you could comment on that?

Mr. GREENSTEIN. Could I make a comment on the phase-in issue? We should note that under all of the bills, there is a major phase-in in the sense that the emissions reduction target is a small amount of emissions reduction initially. And that phases in very gradually over a number of decades. That is the major phase-in.

With regard to the permits, one could do something where you give away a large share of the permits for free initially and then phase that down. The Lieberman-Warner bill I think gives away 40 percent or more of the permits for free initially. And on paper it eventually phases it to zero.

My concern is, the politics being what they are and the power of the companies being what they are, I believe that if Lieberman-Warner were enacted, we would never get to zero. The Congress would come back and change the law well before we got to zero and that we could end up getting stuck permanently at too high a level.

That doesn't mean you couldn't do any phasing at all, but I think the notion of starting with—I don't know—more than 15 or 20 percent of the permits being given away, starting with any higher percentage and just assuming you're phasing it way down I think is dangerous.

I think it risks the potential that before the phase-down occurs, companies get the law changed. And then the various purposes for which you thought you had money, such as a number of the things you just mentioned, can't get the resources to be funded.

Mr. BURTRAW. I would like to just add the phase-in in terms of the changes in electricity prices is going to be immediate. So the program can be put in place, and you can talk about allocation in different ways, but you are going to see an immediate change in product prices.

So there is no phase-in to talk about except in some portions of the country in the electricity sector, where there are two alternatives in those regions of the country where there are regulated prices and a free allocation to firms will get passed through to consumers and soften the blow initially. But the problem is that treats the country in a very asymmetric way because you have roughly

half the country under cost-of-service and half the country with competitive electricity markets. I think that's inviting a new civil war.

So an approach that has emerged recently that has surprising support from very disparate companies would be free allocation to load serving entities. These are the retail electricity companies that deliver electricity services directly to customers. And they could be expected to pass through to customers the value of the emission allowances.

This has a politically attractive appeal that it would keep electricity prices low and would look like a phase-in as we enter the new constrained carbon regime. The problem, as other speakers have already mentioned, is this constitutes essentially a subsidy to electricity consumption that you don't get for natural gas or transportation fuels or to industry and commerce. And so to put this in place, to enshrine this, would dramatically raise the cost of carbon policy nationally. We don't want to get our feet stuck in cement there.

So if you want to look for a phase-in, allocation to load, as is the component of the Lieberman-Warner bill, is a reasonable way to start, but I would urge you to think about that as a rapid transition to a full auction and recognize coming from the Great Plains, you know, this creation of this $350 billion a year in intangible property right is analogous—the last time we saw this in American history was the assignment of property rights in the great American West because this is going to be on a recurring annual basis. This is an enormous new property right.

And the question is, to whom will it accrue over the rest of the century? And that's why the auction is such an important question.

The CHAIRMAN. And the gentlelady's time has expired. But could you, Mr. Zapfel, deal with this issue of how Europe is treating the agriculture sector? I think it is important for us to hear that.

Mr. ZAPFEL. Yes. It is a pleasure to do so.

Our common market is not as it is discussed here, an economy program. We see the common market as one of the essential elements of bringing down our emissions.

We have reviewed now whether we should include credits from agriculture and forestry, but we remain of the opinion that for the time being, they should stay outside of our carbon trading mechanism for mainly two reasons. First of all, we need high-quality monitoring/reporting of the emissions, which we do not see we can do yet in those sectors. And, secondly, we also haven't been able to address the questions of permanence and leakage yet. Especially in the forest, if you grow forests but in the same time other places you cut down forest, so the permanence in the leaking is important.

As Mr. Sensenbrenner, Congressman Sensenbrenner, has pointed out, the environmental integrity of the common markets delivering emission reductions is essential, also for the public. So, for that reason, we have proposed that agriculture and forestry credits stay out of the system up to 2020.

The CHAIRMAN. Great. The gentlelady's time has expired. The Chair recognizes the gentleman from Connecticut, Mr. Larson.

Mr. LARSON. Thank you, Mr. Chairman. And thank you for putting together this incredible panel. And it is with a certain amount

of trepidation that I go forward with my questioning knowing the vast amount of work that you and my good friend and colleague Jay Inslee have done on cap-and-trade.

My only regret is that you didn't have Polar bears here today so that we could have more of the press here on such a weighty issue of discussion of the cap-and-trade system versus something that I think still needs to be pursued in terms of dialogue and discussion in terms of a carbon tax.

Now, I say that, and I want to thank Mr. Podesta because I thought he started off and framed this in the appropriate—we're in a crisis. And this crisis has to be solved. And it has to be solved now.

The inconvenient truth is that, as you heard our good colleague from Wisconsin say, that, well, the most direct and straightforward transparent way to deal with this, of course, would be for a carbon tax. But, of course, he wouldn't be for that. And neither would a lot of colleagues because of the anathema attached to taxes.

And, of course, we have an aversion to taxes in this country. For example, we fund a war or, well, we don't fund the war with taxes. We go into debt with a war and tell the American people that it is being paid for. So I believe that the choices are difficult and they become more clear.

And I thank Mr. Greenstein also for I think illuminating the choices that we face here: one that deals with the certainty of emissions, the other with the certainty of price. I come down on the side of the certainty of price.

I am proud to have initiated legislation along with Mr. Blumenauer and Mr. Miller that pretty much follows what Vice President Gore—and, my God, if we can get Vice President Gore and the President of the Chamber of Commerce to agree that this is the way that we should go in terms of a carbon tax and that it should have to offset the mitigating factors and the regressivity of it a direct payroll reduction that corresponds in it so that you can get down-the-road relief for people that actually need it, then I think we've got something, notwithstanding I am interested in this whole auctioning thing.

I have to say, I have to give this the Augie and Ray's test. Now, most of you don't know what Augie and Ray's is. It's a little hamburger/hot dog joint in East Hartford, where most of the people that I know gather. But they're pretty down to Earth, you know, and they read people pretty well, debate the Red Sox and the Yankees, yadda yadda yadda.

But here is the deal. You say auctioning to them, and they're looking at me like I am on Mars. And I've got to be honest. How would it work? Who administers it? Mr. Greenstein and even Mr. Sensenbrenner make some sense when they say, isn't there a more direct, specific, easier way for us to administer something, albeit it may be a tax? And how is this all going to transpire?

This is not going to be—and I heard Mr. Greenstein talk about the Lieberman-Warner bill. Gee, is this a hedge fund windfall? How would this be administered? How do the proponents of this see this auction actually taking place? Who controls it? Who sets up the auction? Who is purchasing? What is going on here? Mr. Bowles? Thank you.

Mr. BOWLES. Let me just comment from our experience in New England, Connecticut being an important member of the RGGI process. The easiest thing to do is what we are doing first, which is power generation only. Covered plants in the RGGI footprint are 25 megawatts and up.

They bid into the ISO every day into the bid stack to figure out whether they're going to dispatch power or not. So they do it every day. They know how to do it. It's not complicated. All we have to do to set up the auction process is get one of the auction vendors in the RGGI organization——

Mr. LARSON. What is an auction vendor?

Mr. BOWLES. Auction vendors are folks who run the NO_X program, people who administer any number of other——

Mr. LARSON. You can see my problem here.

Mr. BOWLES. Yes, but——

Mr. LARSON. You say, "auction vendor." You say it runs the NO_X program. I would say, "The NO_X program" at Augie's. They would be saying, "Are you talking about the Sox or the Nox? What are you talking about here?"

Mr. BOWLES. I guess all I am suggesting to you is that——

Mr. LARSON. You are doing a very good job, by the way. I didn't mean to interrupt you, but I am trying to make a point here about how this will all take place.

Continue, please, Mr. Bowles. I'm sorry.

Mr. BOWLES. I was just going to say I think the answer to your voters is to simply say, "Power generators do this every day. Nothing much changes except that we're going to make them pay for this little thing to help protect the environment. And we're going to find a way to pass that back into more savings for you" because, like Massachusetts, Connecticut is also just passing least cost procurement through legislature. And there is going to be a bunch of savings available.

So I guess I would say in the power sector, it is quite simple, and it happens today. I think it is more complicated to move into other sectors, particularly to explain. But thank you for the question.

Mr. LARSON. Mr. Greenstein.

Mr. GREENSTEIN. I don't think the big complexity is administering the auction. You know, we had auctions of the electromagnetic spectrum. The FCC administered that. We could establish a new federal agency to run the auctions. I do——

Mr. LARSON. Would that be a more efficient way to do this?

Mr. GREENSTEIN. I do want to say that, all else being equal, I would prefer a carbon tax to a cap-and-trade. Having said that, I don't want to let the perfect be the enemy of the good. I am not sure you could pass a carbon tax. I think you would be more likely able to pass a cap-and-trade than a carbon tax.

And if you have a cap-and-trade with an auction, what that auction really does is to make the cap-and-trade more like a carbon tax, not fully, just partly. I mean, if you can pass a carbon tax, more power to you, but I think part of how we got here is the sense that that would be hard to pass.

Mr. LARSON. Thank you.

The CHAIRMAN. The gentleman's time has expired. I think if we could pass a carbon tax, it probably would be less power to us subsequently, but I think that's a lesson that we have learned.

The Chair recognizes the gentleman from New York, Mr. Hall.

Mr. HALL. Thank you, Mr. Chairman.

And thank you to all of the witnesses. I think part of what needs to happen is as you are educating us, we need to go out to our constituents and to the country and help to educate them so that they will understand that the corner store or, you know, the deli that I go to in my district when people talk about a carbon tax versus a cap-and-trade, to help them understand what that is. It's not, as you say, given the NO_X and the SO_X and, you know, the successful change in chlorofluorocarbons that was wrought by a similar kind of governmental process. This is proven ground.

I also come from a place myself, moral place and a philosophical place, that says that there is, there should be, and there exists an implicit environmental bill of rights and that every one of us, every child born on this planet, has a right to breathe clean air and to have clean water to drink and unsoiled soil for their food to be grown in.

And so I object to the idea that, oh, we're interfering with business. Somehow we got way ahead of ourselves and polluted the planet and the ecosystem to the point where we're not only dealing with or trying to deal with climate change, but we're also suffering from asthma epidemics and emphysema epidemics in our inner cities, especially among our children. And last summer across the entire State of New York, there were a number of days when we had dangerous air quality alerts in rural parts of the state, where you wouldn't expect that. And it's because of the pollution moving from other power plants in the Midwest or wherever across state lines.

And so by trying to deal with greenhouse gas emissions, we will also be dealing with our dependency on foreign sources of oil, a balance of trade deficit, creating new jobs in new industries and new technologies here, making ourselves more independent, keeping our sovereignty, not having to fight wars in unstable parts of the world, et cetera, et cetera. So there are so many. It's a win-win-win thing we're talking about. Cap-and-trade is only one small aspect of it.

So having made that little bit of a speech, I want to ask Secretary Bowles. In particular, I am interested in the idea that efficiency seems to be endorsed unanimously as one of the most effective and immediate steps we can take to cut greenhouse gases and our power bills.

But under the current system, it is counterintuitive for utilities to pitch in since they make their money by selling power. In your testimony, you reference efforts to decouple sales from revenue. Could you elaborate on those efforts and what types of investments we could make with auction revenues or allowance incentives that we could use to bridge the gap?

Mr. BOWLES. Thank you for the excellent question. And thank you for your statement, very well-said, at the beginning. I would agree.

New York State just did a rate decoupling, as I am sure you know. The public utility commissions of the states regulate utilities. They have got a history of rate-making that is, by and large,

tied to volumetric sales of power, whether or not those utilities own the power generation or not.

So in the half of the country, as Dallas mentioned, that has a deregulated power system, New York and Massachusetts and all of New England, our utilities don't own the power generators. They own just the wires. So they bring it to your house. And the power generators own power generation.

So we have inherited a system in the past where it made sense to measure rate recovery for the utilities based on the volumetric sales. It seems like a simple thing. Instead, the criteria should be on performance and reliability, outages, things like that, least cost service, so making sure that the utilities are bringing good power and reliable power to your doorstep but not incenting them or discouraging them on the volume of power that they sell.

And that is really the crux of rate decoupling, is severing that link, that manifest economic incentive that says to the utilities, "Maximize power sales in order to maximize revenue for your shareholders." Instead, we need the utilities to be indifferent or, in fact, incented on a performance basis to be partners in energy conservation.

I think the utilities—New York has got a terrific model with NYSERDA. In different states, the utilities, such as Massachusetts, actually run the efficiency programs. And that is a good thing because they are very close to their partners, but they need the type of oversight to make sure their spending is done well.

So I think a federal incentive in terms of conditioning some of the auction proceeds back to states who have done decoupling and have done least cost procurement, things of that nature, really makes a ton of sense for getting that low-hanging fruit.

Thank you for the question.

Mr. PODESTA. Very briefly, the same applies to the natural gas market as well.

Mr. HALL. Thank you.

The next question I have is, how directly do you think we should try to—I guess I am done.

The CHAIRMAN. Ask one more question.

Mr. HALL. Okay. I will ask my last question. What would you think of, Mr. Podesta, for starters, for instance, a proposal to target auction revenue by using the sales of credits for power plants to do something like helping car companies to put electric vehicles into mass production or to build alternative fuel infrastructure?

Mr. PODESTA. Well, I think that, again, that is exactly the kind of incentives that you want to encourage. That not only helps, to go back to your opening statement, on the overall CO_2 problem and the global warming problem, but I think if we could move the transportation fleet more onto the electric grid through plug-in hybrids and other types of new generational vehicles, you have also dealt with the oil security problem, which is another pressing problem the United States faces, both from a balance of trade perspective but, most importantly, I think, from the sources of oil and where that money is actually flowing to in the United States.

So I think that is important. And I think that some of those proceeds and we would recommend that some of those proceeds go to the U.S. auto companies in the form of tax rebates to re-tool to get

onto this new generation of vehicles that, either through plug-in hybrids or, as General Motors is moving towards, a slightly different platform, the Chevy Volt.

Mr. HALL. Thank you very much. I yield back. Thank you.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentleman from Missouri, Mr. Cleaver. And I think there is going to be a roll call coming up in just a very little bit, up on the House floor. But if each member for a second round would like to have two minutes to ask if they have one compelling question, we can recognize them for a second round. On the first round, to complete the first round, we will recognize the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman. I apologize I was late. I've had another committee hearing.

And I only have two questions. And I guess I should preface it by saying I support either cap-and-trade or carbon tax, either way. But I am going to take a little negative slant here. And I hope this hasn't already surfaced.

When I was mayor of Kansas City, we had a municipal ordinance that would allow us to fine slum landlords $2,000 each time their property was cited as violating the city code. And we discovered after about five years that there were some landlords who actually built the fines into the cost of doing business because, you know, you are only going to get caught every month or every other month. And so they just built it in.

What happens if there are power plants or entities participating in the program from just placing the cost of polluting into what they spend to do business? And it's not a matter of stopping. It's just a matter of I'm going to pay the cost.

Mr. BOWLES. I guess I just would say that I think that really summarizes the argument for auctioning, instead of allowances, because the power generators will charge their customers for the economic value of that permit because they can sell it to someone else or they can expend it when they run or they can save it for the future.

So I would say that concern is best addressed through having an auction, whether it is a clear transparent understanding of what the value is. And then you also have the revenue that you can go back to help out low-income energy consumers to get control of their own energy bill through, things like energy efficiency.

But others may have answers as well.

Mr. GREENSTEIN. I would add that the whole purpose of the cap-and-trade system is really to raise prices in a sense for fossil fuel energy and create the incentive for private actors in the market, companies and consumers, to switch to cleaner, more efficient forms of fuel.

In fact, I think—so to the degree that a company keeps prices higher putting all of this in, then whether it's wind and solar or all sorts of other forms of alternative energy that may not be that economically attractive now, they become very economically attractive because they become cheaper.

One other quick point on that is when you are thinking about how to use the proceeds. Certain things that can't happen now without government subsidies in the energy sector no longer need

government subsidies under a cap-and-trade because the price point has changed.

And, in fact, listening to the discussion this morning, Mr. Chairman, I started to become a little concerned that I would offer a caution. When you design the legislation, make sure you don't squander some of the proceeds on efficiency incentives that the government isn't needed anymore, that the market itself will drive as a result of the changes in prices that the cap-and-trade will come about.

I'm not saying you don't need any energy efficiency subsidies, but I think you may need less than you think you would need if the cap-and-trade works the way it is supposed to.

Mr. CLEAVER. Thank you. Actually, you answered my second question, Mr. Greenstein. Thank you.

The CHAIRMAN. And Mr. Burtraw, do you want to respond to Mr. Cleaver?

Mr. BURTRAW. Yes, sir. I just wanted to point out that for fossil fuel consumption, the electricity sector, there are in place continuous emission monitors that record on a 15-minute basis the emissions from the power plant. So this is electronically reported. And also major fuel users report to the EIA their fuel use. It's fairly transparent to calculate the carbon content of fuels that are being used.

So that is one fortunate aspect of this problem that with a lesson we have learned from that sulfur dioxide trading program. With certain penalties in place, you can expect to achieve virtually 100 percent compliance under this program.

The CHAIRMAN. The gentleman's time has expired. Now we will go to a lightning round here, give members if they want two minutes to ask any follow-up questions they would like to make. The Chair recognizes the gentleman from Washington State.

Mr. INSLEE. Thank you.

We went to Europe last summer and looked at the cap-and-trade experience. And it was described to me as a great scandal, the situation where there was an allocation without auction. And then there are windfall profits in the billions of dollars taken by utilities in Europe.

And consumers in Europe were outraged by this when they found out they had been gamed by this system that this asset had been given to the utilities and then they turned around and put it in the rate base and charged the consumers the implicit value of not selling the asset. And they said not selling the asset was a cost to the utility which then they turned around and sent right to the consumers.

So what I was hearing from Europe is that give-away system turned out to be a scandalous affair and I presume is one of the things that is driving the move now towards more of an auction.

I just wonder, Mr. Zapfel, if you could comment on that. Was I reading that situation correctly? And then I want to ask Mr. Burtraw to what extent could that be replicated in the United States?

Mr. ZAPFEL. Thank you, Congressman.

I would not go as far as considering it as a scandal, but I think what we have learned in practice is that the same thing happens

that, for example, Mr. Burtraw would show, even if you give away the allowances for free in some sectors, it is very easy to pass them on in the prices.

So this conceptual effect has very much proven it would be so also in practice. And this is, as I have stated already in my introductory statement, one of the main multi-weighting factors that we move over to auctioning now.

So I would not see this as—we had initially this perception in Europe that our mechanism was failing because this was happening, but now as we go ahead on this, more and more people look into this and research this. This is demonstrating that the carbon market is, in effect, functioning, that the price signal is created, and the price signal works itself through the economy. And the efficiency advantages of the common market can be realized in practice.

What we talk about with allocating allowances is a distributional effect. And where in society do you want to put the distributional effect? Do you want to give it to the taxpayer in the first place or do you want to give it to the shareholders of the power company?

Mr. BURTRAW. Sir, to a first order, we would estimate that the change in product prices will not depend on how that allocation occurs. So if you are giving away this valuable asset to firms, that is a transfer that is a form of compensation. There is a second form of compensation they receive, which is the changes in revenues, the changes in product prices. And this opens the possibility for potentially dramatic overcompensation or what people have called windfall profits.

So the same thing I would expect to occur in the U.S., as was observed in the EU if there was free allocation of emission allowances to generators or to emitters throughout the economy generally.

Mr. INSLEE. Thank you.

The CHAIRMAN. The gentleman's time has expired. Mr. Podesta, you would like to respond.

Mr. PODESTA. Actually, I would just like to disagree with my friend Mr. Greenstein for a second. I think the chances of the Congress overinvesting in public goods is small. And I think that the amount of money that we're talking about to incentivize states to decouple rates to do home weatherization, to add the kind of efficiency boost in the early days of this I think would be money well-spent and, again, creates a virtuous cycle of efficiency, productivity in the economy, and job creation.

And so I wouldn't worry just about the price. I think sort of applying some of that revenue against that efficiency portfolio would be a very good thing for you to do as you design this cap-and-trade.

The CHAIRMAN. Mr. Greenstein, 20-second rebuttal?

Mr. GREENSTEIN. I am all for weatherization. I think when you write this bill, you will be besieged by various industries and interests, promoting all sorts of subsidies and tax credits that are billed as green and pro efficiency. And a substantial share of them will not be necessary. The market signal will do it. And if you give into them, you won't have enough money for other key things, like consumer needs.

The CHAIRMAN. The gentleman's time has expired. The gentleman from California, Mr. McNerney.

Mr. MCNERNEY. Thank you.

The CHAIRMAN. Two minutes.

Mr. MCNERNEY. One of the auctioning schemes I am aware of starts with the first year of the auction giving out permits equal to the amount of carbon produced in the prior year and then reducing that level by a percent or two per year until over a 30-year period you have reached your long-term goals.

Now, that would allow businesses to plan ahead for auctioning price increases and so on. Is there another scheme that makes more sense than that or is that basically what you are advocating, whoever would care? Mr. Greenstein.

Mr. GREENSTEIN. I am sorry. Clearly everyone is talking about phasing in the tightening the cap over time. I think that is the key. No one is talking about going to, say, a 50 percent emissions reduction in 10 or 15 years. The key I think is to have that emissions cap gradually tighten over an extended period of time, have people know where that cap is going over an extended period of time. And that is the key thing I think for the planning of the future.

Mr. PODESTA. The old McCain-Lieberman bill stair-stepped down. It had more dramatic reductions at a stair-step level. But I think that a phased reduction is a more sensible way. It is easier to plan. And it permits you to hit your target and again get the pollution savings that are necessary.

But I think the most important issue at the end of the day is what you are trying to get to. And I would say Europe has adopted the target of hitting a two degrees Centigrade rise in temperature above pre-industrial level by 2050. That is I think an appropriate target. And sort of creating the curve to get you to that point in 2050 with early action between now and 2020 and 2025 is really critical.

Mr. BOWLES. Could I just comment on that, Mr. Chairman, just to say I draw a distinction between a phase-in of a cap versus a phase-in of auction versus allowance. I think a weakness to my mind of some of the Senate bills is the phasing in of auctioning. I mean, an auction process is manifestly superior in terms of returning benefits to the ratepayer and consumer. I think phasing in the cap, of course, makes sense.

Mr. GREENSTEIN. I fully agree with that.

The CHAIRMAN. The gentleman's time has expired. The Chair recognizes the gentlelady from South Dakota.

Ms. HERSETH SANDLIN. Okay. Let me pursue that a little bit further because I know you think and, to a degree, I agree with you the auction is the way to level the playing field. But there are certain regions of the country that start out at a disadvantage. And I am very concerned.

Mr. Podesta, if you could respond to this? Because, as you laid out how you see the percentages of how you allocate the revenue, I don't see sufficient revenue there to dramatically improve our transmission capacities.

So when I am in South Dakota and we are dealing with the Western area power administration of the West and the Midwest independent system operator to the East and we have got all this

wind that we can't get out that would benefit the electricity providers and other businesses in South Dakota, I mean, I would be more willing to identify it as a weakness in terms of the phase-in of the auction if there were some combination of the investment in the infrastructure with a cap-and-trade. And so if you could comment on that?

Mr. PODESTA. Well, I think, again, there are two different issues involved with that. We apply ten percent to try to soften the blow, if you will, on communities that are particularly affected. You know, you could argue it's 15 percent, but it's probably not much more than that.

There is a second question, which is, does giving away the auction permits actually result in the investment or does auctioning the permits and then having the money available to make those investments, which is the better system?

I think the people on the panel all think that a more transparent system is auction the permits and then use the proceeds of the permits to upgrade the grid, make the R&D investments, et cetera.

Ms. HERSETH SANDLIN. And I don't think I disagree with you on that. My concern is the 100 percent auction at the outset. I mean, I am looking at it as building in some time. And maybe the weakness of the Senate bills is they build in too much time, they start too low.

Mr. PODESTA. Right.

Ms. HERSETH SANDLIN. But you can understand my concern about——

Mr. PODESTA. I think that if you are going to move in that direction, though, you also may want to condition what those permits are being granted for with respect to the reinvestment, for example, in the grid upgrade so that they are not just being passed back as a sort of benny, as was the European experience that Mr. Inslee has described in a larger sense to the shareholders of those companies.

Ms. HERSETH SANDLIN. Okay.

The CHAIRMAN. The gentlelady's time has expired. The gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman.

For the last two years, I guess the people who are in the Northeast area of our country have been very, very pleased because there has been a ten percent reduction in greenhouse gas emissions but not because of any intentionality on the part of power plants. The weather has been mild. And as a result of the weather being mild and there is a ten percent decrease in emissions, isn't that dangerous when we are talking about trying to create incentives for people to reduce their emissions?

I mean, what if the cap is above? It may be too high above the emissions. Doesn't that just have a negative impact?

Mr. BOWLES. I would just comment——

Mr. CLEAVER. And how do we handle it?

Mr. BOWLES [continuing]. To say that that is an argument for multi-year compliance periods because you do have weather events and you have got increases and decreases in energy use during that.

So I would say the Regional Greenhouse Gas Initiative is a three-year compliance period. We also in our trading scheme have unlimited banking going forward. So if you buy a permit, you can use it in the out years. And so I think that is best dealt with through market rules.

But I agree you will have fluctuation based on weather events.

Mr. CLEAVER. Mr. Burtraw.

Mr. BURTRAW. Yes. I would like to add I really echo your concern. I think as we look across the performance of emissions trading systems previously, although there is a lot of concern about price spikes and cost containment, empirically the most important phenomena has been price collapses or prices have turned out to be much less than we thought because, well, it turns out economic incentives work and a lot of innovation comes to the market.

So one of the ways to protect against that is a reserve price in an auction, which makes—and that is a standard feature of good modern auction design. You are going to find it on eBay the next time you try to go auction something there. And so it puts in a floor on the value of emission allowances within an auction and thereby provides sustainable expectations for innovators and new investors going forward.

Mr. CLEAVER. Do all of you agree with that? [No response.] Then I guess I must agree as well [Laughter.]

Mr. PODESTA. Particularly if eBay does it.

The CHAIRMAN. All right. The gentleman's time has expired. I am going to ask a final question here, and I am then going to ask each one of you in reverse order of the original statements to each give us your one-minute summary of what you want the Select Committee on Global Warming to know as we are going through this year and trying to make recommendations on how to construct a program to deal with this issue. We are also waiting for Mr. Blumenauer to return. And hopefully he can make it here before the end of that process.

Mr. Burtraw, let me ask you this question. When we did the acid rain bill back in 1990, all of the allowances were given away. And everyone says that worked great. What is different with this problem, the CO_2 problem? Why is that lesson from 1990 not applicable to this issue of dealing with greenhouse gases because that is a very commonly asked question? And all of you on this panel seem to disagree with that approach of giving away the allowances. And the acid rain process did work. So what is the difference?

Mr. BURTRAW. There are two things that are different. Number one, that was only targeting the electricity sector. And in 1990, 100 percent of the electricity sector was under cost of service regulation. So if the regulators were awake and doing their job, they were going to make sure that companies could not charge consumers for something they had received for free.

So consumers were well-protected under traditional cost of service regulation. Today we have had half the country in the electricity sector move away from that for their very own good reasons.

The second is that, again, that was only in the electricity sector. And today we're looking at a program that is going to affect the entire economy. So with that type of free allocation in the electricity sector, it made sense in that it suppressed electricity, any change

in electricity, prices any more than needed to happen there, but when we go economy-wide, that type of an approach for those regions of the country in the electricity sector that are still regulated will constitute a subsidy to electricity consumption. And that is going to cause a disequilibrium in marginal costs across the economy and raise the costs of carbon policy significantly.

Our modeling, for example, suggests that it could push up national allowance prices by 15 percent. That means all of the other sectors of the economy are going to have to work that much harder.

The CHAIRMAN. Great. Thank you.

I received a letter from the Southern Alliance for Clean Energy regarding the subject of today's hearing. And I would like to ask unanimous consent that it be included in the record.

Without objection, so ordered.

Let me turn now to our concluding one-minute statements. And we will begin with you, Mr. Greenstein.

Mr. GREENSTEIN. I think the case has been well-made at this hearing for auctioning the permits and also for the need, both substantively and politically, for consumer relief. So I won't use up much of my one minute on that.

However, there is one issue I mentioned in my testimony we never came back to. And it's kind of I think maybe not on the radar screen. So let me spend 30 seconds on that.

We really do need to pay attention to the fact that the price point, the increase in prices, which will create incentives for various efficiencies, will also raise the price of everything from heating school buildings, education at the state and local level, to a variety of federal programs from the Pentagon's cost to veterans' cost of living increases.

And you need to make sure that there is some room within the allowances to deal with those costs that the public sector is going to incur. You don't want an impact of cap-and-trade to be cuts in local education budgets or cuts in veterans' programs. I know it is not as politically attractive as this incentive and that incentive, but I think it is a key part of what needs to be taken into account or we end up having cuts in basic services, increases in other taxes, or big increases in deficits down the road as a result of the impact of higher energy prices on the important things that local, state, and the federal governments do.

The CHAIRMAN. Thank you, Mr. Greenstein.

Mr. Podesta.

Mr. PODESTA. Again very briefly, the cost of doing nothing is a lot more than the cost of doing something. And I think if we get this right and I think cap-and-trade is at the heart of a new energy policy, it can really power the economy forward.

It is not as sexy as sort of complex, undecipherable financial instruments, but maybe if we put the minds of the people who currently are on Wall Street trying to do that towards innovation in this sector, it will create jobs, it will create efficiency, it will create productivity, and it will be a great boon to places like South Dakota as well as the rest of the country.

The CHAIRMAN. Thank you, Mr. Podesta.

Mr. Bowles.

Mr. BOWLES. Mr. Chairman, I would ask your permission to include a longer appendix as part of my testimony I've prepared for the Committee.

The CHAIRMAN. Without objection, it will be included.

[The appendix offered by Mr. Bowles follows on page 129.]

Mr. BOWLES. I would echo John's point about the clean energy economic opportunity. The United States, the great inventor of technology that is exported to the world in so many areas, has been lagging behind. Governor Patrick has made this a central part of his economic development strategy. And I think we need to start looking at it in the opportunity context more.

Second, I just would tell the Committee we have also built in greenhouse gases to our state environmental review process. And we have seen new proposals for green buildings. We saw the Harvard Allston campus agree to the first legally enforceable cap on greenhouse gas emissions from a real estate development project. That is another area that we can get into that I think is important.

And, third, I would just say send clear signals and level the playing field. Don't penalize early action states as you move forward. And measures like auctions really set an even playing field. And I encourage you to move forward as quickly as you can.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Bowles.

Mr. Zapfel, again a special thanks to you for being here today.

Mr. ZAPFEL. Thank you, Mr. Chairman.

I would want to go back to the broader context in my closing statement of beyond the auctioning. I think we have seen, both in the United States and in Europe, we see, that environmental markets can deliver sulfur and nitrogen oxide markets here. The common market starts to deliver in Europe.

So there has been I think some of the debate you were having here now should you go for a cap-and-trade system. We had the same debate in Europe. But now three or four years after introducing our system, it has become a feature of daily business in Europe. And we got used to it. We got used to having a common price of some $30 a ton of CO_2. And nobody has ever revised down our macroeconomic cost projections. So the economy can continue to steam ahead with a common price.

EU is ahead in the common market while you are ahead in the effluent pollutant markets. We have learned a lot from you on the effluent pollutant experience. We stand ready to continue to transfer this dialogue, transfer this experience to where we are ahead on the common market.

We are not ahead everywhere. On auctioning I think we are a bit of a latecomer. And we can collaborate even more. So I think together, the U.S. and Europe, we can make headway in building a global common market and solving the big challenge we have ahead of us, bringing the emissions, greenhouse gas emissions, down significantly over the decades to come.

Thank you for this opportunity to testify.

The CHAIRMAN. Thank you, Mr. Zapfel.

And you are the cleanup, Mr. Burtraw.

Mr. BURTRAW. Yes. Thank you.

Well, first of all, I would just like to leave the impression that auction design is actually fairly simple. Emission allowance is a very simple commodity compared to the spectrum auction or the daily electricity auctions. And this is not the time to go into it in great detail, but, really, it is dramatically simple.

So do not be intimidated by the notion that designing and putting in place an auction for emission allowance is going to be a difficult thing to accomplish. It is probably one of the more simple auctions that could be designed. And it is not at all uncommon for the government to now charge for things that previously it gave away for free to put such a mechanism as that in place.

And, secondly, I would just like to leave the question in your mind with you of where does this value come from in the first place. It really comes from citizens in the U.S. in terms of their value isn't being taken out of the economy or sent away and burned but, rather, it's changing the way that property rights are assigned throughout the economy.

An approach that I think is a candidate approach with all others, I mean, an economist prefers an auction because of the opportunity to use auction revenue to promote economic growth and other program goals, but also another approach that could be a candidate would be to use an FDR type of an approach and see that these emission allowances belong to citizens and they could be directly allocated to citizens. That would be the most way to achieve the most progressive income distribution as a consequence.

The CHAIRMAN. Thank you, Mr. Burtraw, very much. And I agree with you on that spectrum auction point in 1993 working with the Clinton administration. We moved over 200 megahertz of spectrum. We created a third, fourth, fifth, and sixth cell phone license in every community. And it revolutionized the wireless marketplace moving from analog to digital.

Up until then we had given away the spectrum, but by changing the model, we actually created a more entrepreneurial environment and derived more revenues for the federal government. I don't think it is as complex. I do agree with you on that as well.

Before closing, I would like to thank the outstanding panel. I think we are unanimous in that that this was a first class panel and an excellent way to kick off this important debate this year. I think we have learned that robust auctions and well-targeted revenue recycling must be a core element of a cap-and-trade system. This is the only way to ensure that we can meet the goal of saving the planet while keeping the playing field level, ensuring consumers are protecting, and spurring innovation and economic growth as we move to a low-carbon economy. I think it is also clear that we need to look closely at mechanisms for oversight of auctions and the carbon market to ensure simplicity, transparency, and fairness.

With that, this hearing on carbon auctions is adjourned. Going once, going twice, sold.

[Whereupon, at 11:58 a.m., the foregoing matter was concluded.]

March 27, 2008

Dear Mr. Zapfel,
Following your appearance in front of the Select Committee on Energy Independence and Global Warming, members of the committee submitted additional questions for your attention. I have attached the document with those questions to this email. Please respond at your earliest convenience, or within 2 weeks. Responses may be submitted in electronic form, at aliya.brodsky@mail.house.gov. Please call with any questious or concerns.

Thank you,
Ali Brodsky

Ali Brodsky
Chief Clerk
Select Committee on Energy Independence and Global Warming
(202)225-4012
Aliya.Brodsky@mail.house.gov

1) Do you recognize that in states that are regulated by public service commissions or like entities, it is impossible for a utility to experience a windfall profit under the cap and trade scenario?

   In order to provide a reply in substance I would need to have a better understanding of the mandate of public service commissions. In a normal market setting the value of free allowances will enter power prices, be it in the form of opportunity costs (in case allowances are allocated free of charge) or financial costs (in case allowances are auctioned). Inclusion of the carbon price is also necessary to create an undistorted price signal guiding operational and investment decisions and allowing companies to make cost-effective abatement choices.
   Even in cases where retail power prices are regulated by public service commissions and the pass-through of the allowance value is prevented, the allowance price may be passed through in wholesale power prices and result in what is usually referred to as 'windfall profits'.

2) The Congressional Budget Office's study in 2000, also noted that "the share of price increases would be borne by producers of carbon-intensive goods and services." They go on to say that "In addition, members of households might incur costs through their role as workers. Employees in carbon-intensive industries – such as the local coal industry – could lose their jobs as a result of lower demand for those products, and wages in those industries could be temporarily depressed." Given the economic forecasts that have recently been in the news, does it make sense for you to push a program that could raise unemployment?

The transition to a low-carbon economy and society will require gradual structural changes with some sectors growing while others declining. Growing sectors will create new employment opportunities. The European Commission has analyzed the employment effects of the Climate and Energy Package of January 2008 in the impact assessment accompanying the Package and found them to be marginal, i.e. an increase in employment by 0.05 %.
The current economic situation in the US originates largely in the sub-prime mortgage crisis. Economies will continue to go through economic cycles. However this should not make us deviate from the path to a low-carbon economy. The IPCC tells us that we must act immediately to significantly reduce greenhouse gas emissions, if we are to avoid dangerous levels of climate change.

3) I am concerned about the ease of implementation and the cost effectiveness of proposed cap-and-trade programs. What certainty do we have that the price of allowances will not be so outrageous that inflation does not skyrocket?

A cap-and-trade program is a priori not easier or more difficult to implement than alternative measures to reach a given target. Furthermore, it ensures that the cheapest emission reductions are carried out first, and the more expensive ones later.
Many factors can and do influence the allowance price, but in principle, the price of the allowances will only be as high as necessary to achieve the cap.

If it were to be higher than increase, an incentive would be created for more innovation and higher emission reductions, which would erode the value of allowances.
Three years of experience with the European carbon market has shown that the allowance price has no discernible influence on macro-economic inflation and there is therefore no reason to be concerned about 'skyrocketing' inflation.
One way to contain costs in a carbon trading system is to recognize the use of international offsets, i.e. CDM credits or other credits issued for reductions in the developing world. These reductions are usually cheaper than reductions in developed countries. The EU ETS recognizes such offsets subject to qualitative and quantitative constraints.

4) The fundamental questions that must be asked about any cap-and-trade program are: who would have to hold the emission allowances, how would policy makers allocate the allowances and distribute their value, and would the government set a ceiling on the price of allowances?

The first two aspects mentioned are important design elements of a cap-and-trade program.
The EU ETS offers an example for practically viable choices for these two elements. In Europe allowances have to be held / surrendered by large stationary sources (downstream approach to the point of obligation). In the end, allowances should be held / surrendered by those who have the ability to influence the emissions.
As regards allocation many options are possible and national allocation plans drawn up under the EU ETS offer a rich repository. The administratively easiest way to allocate is certainly to auction them, as in that case the authority in charge does not have to collect and verify plant-level data needed for free allocation.
I disagree that the question of a government setting a ceiling on the price for allowances should be a fundamental design question. For the emission trading system to work in an economically efficient way the government should set and enforce the rules but not intervene in the outcome of the market process itself. If the government were to intervene and hold the short-term price of allowances below the level needed to respect the cap.

incentives for low-carbon research and development may be undermined, thereby retarding technological progress towards a low-carbon economy and increasing the allowance price in the medium-term.
The most important fundamental question of a cap-and-trade scheme is the level of the emissions cap, i.e. the total number of allowances, which determines the environmental benefit.

5) Do you think that the American public actually know how much a cap and trade system will cost them? Wouldn't it be more efficient to ask Americans to cut back on their own personal carbon footprint and not charge them for this service?

While I do understand that EPA and others have analyzed the economic effects of some proposed cap-and-trade systems, I am not in a position to respond to the first question. As for the second question, costs will be incurred no matter whether reductions in carbon emissions are achieved by a cap-and-trade system or other measures. A cap-and-trade system is likely to lead to lower overall costs of achieving reductions and therefore economically more efficient.

6) In Mr. Zapfel's testimony, he states that there is a "need to use part of the auction revenues to help developing countries adapt to the impacts of climate change" and the EU would dedicate funds to that purpose. Do you support a similar provision with which we should do with this windfall of tax revenue that cap and trade provides?

The European Commission has recommended to EU Member States to use some of the revenue from auctioning of carbon allowances to facilitate developing countries' adaptation to the impacts of climate change. Adaptation is one of the four elements agreed in the Bali roadmap and additional funding for adaptation from developed countries will be necessary to achieve a good post-2012 agreement in Copenhagen in December 2009.

7) What are your specific assumptions about revenue recycling, particularly the role of the federal government vs. state government in the estimates of the percentage of auction proceeds needed to compensate low income consumers, middle income families, and small businesses?

The European Commission has no view on the distribution of tasks between the federal government and state governments in the US.

8) How many member countries are currently suing the EU over the cap and trade system that the EU put in place? What is the status of these suits?

The cap-and-trade system is supported by all 27 Member States and not contested in court. Eight Member States are suing the Commission because of the Commission's decision on their respective National Allocation Plans for the period 2008 to 2012. All of these cases are pending and decisions are not expected before 2009. One Member State has withdrawn its court challenge.

9) It seems that the EU changing allocation methods is yet another sign that the EU system hasn't been working very well. How do you respond to that statement?

The first trading period was always intended to be a learning-by-doing period. The fact that the EU considers to move from predominantly free allocation towards full auctioning of allowances is just a sign that valuable lessons have been learned in the early years and the willingness exists to improve the functioning of the system, but also to make it simpler so as to facilitate linking with other suitable trading systems, like a well designed US federal carbon market.

10) On the issue of including aviation during the second trading period, I believe that this is in direct violation of the Chicago Convention and that the U.S. State Department has been backing our airlines, which would be your foreign carriers, on their objection to

inclusion in your trading system. If they are successful in their objections, how will that impact your plans going forward?

The European Commission has considered carefully the consistency of the proposal with international law including the Chicago Convention and does not share the view that inclusion of aviation in the EU Emissions Trading System would be incompatible with that Convention. On the contrary, the Chicago Convention recognizes the right of each Contracting Party to apply on a non-discriminatory basis its own air laws and regulations to the aircraft of all States.

1) Are you familiar with the Open Europe report on the failure of the EU emissions trading scheme? Are the proposed rules that you describe going to address the concerns outlined in this report?

I presume that you refer to the Open Europe report of March 2008 [http://www.openeurope.org.uk/research/whatworks.pdf]. It lists a number of perceived shortcomings of emissions trading in general and the EU ETS in particular. Although I do not agree with the report's conclusion that emissions trading is ineffective, I agree on certain criticisms of the EU ETS which have been addressed in the proposal for a revised trading system.

Thus, the Commission proposes to provide long-term predictability to industry by introducing, directly in the legislation, an EU-wide emission cap for the ETS that decreases annually along a straight line until 2020 and beyond. The cap is strict enough to ensure scarcity in the carbon market and contribute to our target of an overall reduction in greenhouse gas emissions of 20% by 2020 as compared to 1990. Extending the length of the trading periods from 5 to 8 years will also increase the stability and predictability in the system. Furthermore, we estimate that, overall, operators will be able to comply with one third of their reduction obligations through the use of CDM credits, not more. We fully agree that there has been too little auctioning in the system so far, and therefore propose auctioning as the basic principle for allocation as from the next trading period.

12) How would you characterize the price of energy in the EU as compared to the United States? Is it higher or lower? Do some Member States who have much higher costs than others?

This is a very broad question. It is not clear to what energy carriers the question refers to (coal, oil, natural gas, electricity) and whether it concerns wholesale or retail prices. In general, as in the United States, prices differ across individual Member States, while some convergence has e.g. been achieved in electricity prices due to progress in liberalizing (deregulating) Europe's power markets.

13) With 27 Member States carrying out your auctions, what guarantee do you have that there will be transparency in the system? Are there specific requirements for revenue recycling or do Member States control what happens to the funds that are gained from the auction?

The detailed provisions on auctioning are yet to be determined in a separate Regulation, which will guarantee a transparent process. It is furthermore possible that Member States cooperate to develop common auction platforms. Even the use of a single EU auction platform is possible.
While the final decisions rests with individual Member States, the European Commission's proposal for a revised EU ETS contains a recommendation to Member States to use at least 20% of their auction revenues to fight and adapt to climate change in various ways, both domestically and internationally.

14) In your testimony, you state that there is a "need to use part of the auction revenues to help developing countries adapt to the impacts of climate change" and the EU would dedicate funds to that purpose. What mechanism would be used to distribute those funds and how would you choose which countries to assist? How do your member states feel about tax revenue raised on their businesses being sent to African countries?

The European Commission proposes that Member States use at least 20% of their auction revenues to fight climate change in various ways, including by helping developing countries adapt to the impacts of climate change. Individual Member States will decide about concrete mechanisms and further details of the use of auction revenue accruing as of 2013.

Hon. Ian Bowles, Secretary of Energy and Environmental Affairs
Answers to Questions Posed by the Select Committee

Q1 Why has Massachusetts opted to allocate allowances under RGGI primarily through auctions, as opposed to distributing them for free to incumbent polluters?

After careful examination, the Commonwealth plans to auction nearly 100% of RGGI allowances, and use the proceeds to benefit ratepayers and best meet our environmental objectives. By investing auction proceeds in energy efficiency, we can maximize the opportunity to reduce greenhouse gas emissions, save money for consumers, and grow our clean energy economy. By contrast, direct or free allocation creates a manifest risk of windfall profits for power generators, coming at the expense of business and residential customers.

This decision was informed by quantitative analysis of market dynamics, related review of theoretical literature on emissions markets, and extensive historical experience of federal and state market-based environmental programs.

Allowances in the federal acid rain program were allocated freely to generators on the basis of historical emissions. Massachusetts has rejected this approach in subsequent programs because (1) allowances are allocated to facilities even after they have shut down, and are not available for new facilities; and, (2) we now realize that generators add the value of these allowances to their cost of production, raising prices for end users, even when they get allowances for free.

To avoid allocating to shutdown facilities and accommodate new generators, and support efficient generators, Massachusetts has recently employed "updating, output-based" allocations to distribute NO_x allowances. In an updating, output-based system, allowances are allocated each year to generators based on electrical output, and these allocations are updated regularly based on recent generation data. This system has the important advantage of directing financial benefits toward efficient generators. But it does not solve the problem that generators are able to charge consumers for the value of allowances they have received free of cost.

Massachusetts has also used "set-aside accounts" to direct allowance value toward preferred energy solutions such as energy efficiency and renewable energy. Allowances allocated through set-aside accounts can be sold to emitters. Such sales have double benefits: the cost of buying allowances deters pollution and the profit from selling allowances rewards preferred solutions.

Updating, output-based allocations and set-aside accounts therefore represent initial attempts to direct allowance value toward preferred outcomes, but they retain some disadvantages that are inherent in direct allocations. Auctions represent further progress toward the goal of capturing allowance value for public use, and they avoid significant disadvantages of direct allocations.

It is also important to understand that auctions are not a new, untested idea. The federal Acid Rain Program has utilized auctions to distribute a small fraction of allowances. Small-scale auctions of greenhouse gas allowances in Europe have been so successful, compared with direct allocations, that European countries plan to greatly expand the use of auctions in the future.

We conclude our discussion of auctions by presenting five significant reasons that we plan to auction our share of RGGI allowances:

1. In a deregulated energy market, auctions will not result in larger electricity price impacts than direct allocations. Generators benefit from direct allocations because they are able to include the value of allocated allowances in the prices that they charge to electricity customers. Under auctions, rates still rise by the value of the allowances, but the government can spend the revenue in a way that benefits electricity customers or promotes other societal benefit. In the European Union (EU) and the federal acid rain program, allowances were freely allocated to generators and resulted in windfall profits for those generators.

2. The proceeds from auctions can be used to drive down the direct costs of the program for electricity customers. Our experience with revenue collected through system benefit charges on electricity bills shows that money spent on energy efficiency provides disproportionate savings and can be very effective at improving the overall efficiency of the electricity grid. Modeling done during the Regional Greenhouse Gas Initiative planning process has shown that spending auction revenue on further efficiency will significantly mitigate rate impacts that could otherwise result from the program. (See Q3 below for a more detailed discussion.)

3. Auctions create a level playing field for all fossil-fired generators, whether they are large, small, new, existing and using any fossil fuel. Any direct allocation scheme requires the government to choose which generators should benefit from receiving freely allocated allowances, and which ones should lose. Generators, not regulators, are best able to decide how many allowances they need to meet market conditions. Auctions promote competition and provide a market-based mechanism that allows generators to decide how many allowances they need to continue generating, and plan purchases accordingly.

4. Auctions have proven to be a useful way to capture the value of public goods for the highest public use. Recent auctions of rights to utilize broadcasting frequencies represent an important example. Massachusetts intends to use revenue from allowance auctions to advance program-specific goals such as energy efficiency. Additional priorities may include demand response, incentives for clean energy technology, and direct ratepayer mitigation.

5. Auctions provide regulators, the public, and market participants with important information about allowance prices. This information is absolutely critical to any effort to evaluate the success of the program from a cost-benefit perspective.

While our consideration of allowance auctions has thus far been largely limited to the electric power sector, we suspect that our conclusions are broadly applicable, and we urge the Committee to consider auctioning allowances across all sectors of the economy.

Q2 How much auction revenue does Massachusetts expect to generate through RGGI allowance auctions, and what does it plan to do with these revenues?

This depends on the price of allowances. Under RGGI, MA is allocated approximately 26.7 million short tons per year, therefore:

At $1 / allowance MA revenue = $27 million
At $5 / allowance MA revenue = $130 million
At $10 /allowance MA revenue = $270 million

For perspective, our current energy efficiency programs, which are funded through a 0.025 cent per kWh charge on all ratepayers, bring in $125M that is invested in award-winning energy efficiency programs that save three-to-four dollars for every dollar invested. This system benefit charge procures only a small amount of the energy efficiency that can be economically implemented across the MA economy. At $5/ton, the additional revenue from the RGGI CO_2 allowance auctions could double our energy efficiency investments and enable Massachusetts to capture even more of the economical energy efficiency measures available in our economy.

Modeling of the RGGI program to project changes in the region's electric generation fuel mix and costs was performed with ICF's Integrated Planning Model (IPM). Under the reference case of the RGGI policy, CO_2 allowance prices were projected to rise from $2/ton at the start of the program in 2009 to $3/ton in 2015, and to $5.50/ton in 2024.

If allowance prices under a federal program closely track RGGI allowance prices, then auction revenue for the power sector alone (approximately 2.5 billion short tons initially) would be as follows:

At $1 / allowance US revenue = $2.5 billion
At $5 / allowance US revenue = $12 billion
At $10 /allowance US revenue = $25 billion

If allowances accounting for all US emissions were auctioned (approximately 8 billion short tons initially), and allowances prices under a federal program closely track RGGI allowance prices, then auction revenue would be as follows:

At $1 / allowance US revenue = $8 billion
At $5 / allowance US revenue = $40 billion
At $10 /allowance US revenue = $80 billion

Investing these funds strategically in energy efficiency would make the country more energy independent, lower bills across the economy, and help build a world-leading clean energy economy.

Q3 To what degree can investment of auction revenues in efficiency or other policies reduce the overall cost of the RGGI program?

Under the cap-and-trade program, generators will have incentives to increase the efficiency of their own generation units and to consider fuel-switching options. However, widespread market mechanisms for generation owners to invest in end-use energy efficiency are unlikely, especially under a restructured electricity sector.

With significant cost-effective end-use energy efficiency opportunities still untapped, facilitating investment in energy efficiency provides the least cost strategy to meet the carbon cap, reduce

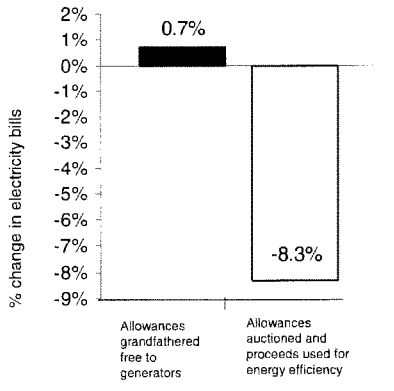
pressure on CO_2 allowance prices, and reduce electricity spending, while supporting a growing economy.

The modeling of the RGGI program with the IPM model specifically constructed an energy efficiency module to analyze this opportunity and the impact of expanding the states' energy efficiency programs through re-investment of auction revenues. Results of the modeling showed that a regional doubling of energy efficiency expenditures can reduce by approximately one-half the region's load growth and reduce the wholesale electric price impact of the RGGI program, while simultaneously reducing imports to the region (or leakage). If electricity bills are aggregated across commercial, industrial and residential sectors, spending auction proceeds on energy efficiency would result in small short-term costs (a total of less than 1% bill impacts in the first three to four years) but long-term savings (starting in year four or five and totaling over 5% average annual savings). This is due to the large amount of cost-effective energy efficiency investments available in our state – and across the country.

Additional modeling, translating the changes in wholesale electric prices predicted by the IPM model to end-use retail prices to consumers, revealed that the doubling of energy efficiency spending reduced the cost increase due to the RGGI program from $2.90 per year to $0.77 per year for a typical household in 2015. Further analysis showed that if the reduction in energy usage by the average household were also taken into account, the increased efficiency expenditure would result in a net savings to the household of $35 per year in 2015, compared with the RGGI program without the additional energy efficiency program. Analogous retail price savings and bill reductions were shown for the commercial and industrial sectors

This price mitigation is illustrated in Figure 1. The black bar on the left represents the percent increase in costs for consumers with RGGI if allowances are either given for free to generators or

Figure 1. If RGGI Auction Proceeds are Invested In Energy Efficiency, Electricity Bills, Aggregated across the Economy, will Decrease as Electricity Demand Drops (2020)



if auction proceeds are not used for demand reduction (for example, as straight rebates). The white bar shows that, by auctioning allowances and investing proceeds in energy efficiency, electricity bill increases would not only be mitigated, but could actually result in savings - consumers would save over 8% on their bills.

Energy efficiency programs reduce bills two ways. First, consumers who get efficiency upgrades in lighting, air conditioning, production equipment and appliances that use less electricity save the most, as their usage decreases. They save on bills directly because they are using less electricity. But all customers could save in the form of lower rates. Total electricity system energy costs decrease (benefiting all end users of the electric grid) because energy efficiency reduce the peak-hour demand, which is when the price of electricity is at its highest (up to $1000/MWh on the hottest day of the year). Energy efficiency pushes dispatch down the bid stack, lowering the clearing price for electricity in that hour.

Massachusetts will also use its auction revenue to further expand its demand response programs, which target reductions in peak loads that occur over a relatively few summer and winter hours. These programs will reduce pressure for new generation capacity investment and very high peak demand charges to end-use customers, and help to mitigate fuel (natural gas) peak supply constraints to the region. These programs are also of great importance to assure the regional reliability of our electric grid and reduce the probability of outages, which result in large costs to customers.

While energy efficiency and demand response will be the primary focus for investment of the auction revenues by Massachusetts, the state will also consider support of renewable energy development (as might be necessary to supplement on-going renewable programs), carbon emissions abatement technologies, and other strategic energy goals, such as plug-in hybrid technology, fuel cells and other efforts that are outside the electricity sector.

A national program will similarly need to consider that energy efficiency provides the most cost-effective short-term means of reducing CO_2 emissions from the electric sector and reducing compliance costs. Despite cost-effective efficiency measures being widely available in the market, only broad ratepayer funded programs have shown the full effectiveness of these measures by end users. CO_2 auction revenues from a national program can provide needed revenue for widespread promotion of energy efficiency and should be distributed through and administered by the states.

Q4 What lessons does Massachusetts's analysis and experience provide, with respect to allowance allocation and revenue recycling, for the design of a federal greenhouse gas cap-and-trade system?

Massachusetts's analysis shows that capping greenhouse gas emissions is sound economic policy and will provide opportunities to grow a new clean energy economy by reducing uncertainty and stimulating development of new profitable economic sectors. Our analysis also shows that auctioning allowances is a crucial component of transforming the economy, as auctions provide the most technology-neutral, market-driven mechanism for distributing allowances at the same time that they generate revenue that can be used to support public energy and environmental policies. These policies can drive down the program's cost to the public (e.g., through energy

efficiency). Importantly, we expect that consumers will see no difference in rates whether power sector allowances are auctioned or freely given to generators. In addition, through its efforts with the participating states to launch the RGGI system, Massachusetts has learned a number of specific lessons about cap-and-trade design and implementation that are worthy of federal consideration:

Retain a hard cap, but be adaptive and flexible.

As RGGI is a first-in-the-nation program, the states thought it was important to build into the program various cost control measures. Measures adopted by RGGI states provide temporal flexibility to stabilize the market by softening allowance price spikes that would otherwise result from extreme meteorological events (an unusually hot summer or cold winter), clean unit outages, and fuel price spikes. It is worth noting that the price impacts of the first two categories (meteorological events and clean unit outages) would be significantly smaller in a national program than in a regional program.

Multiple-year compliance period
RGGI employs a three-year compliance period, which can be extended to four years in the event that certain price triggers are met. Since the issue with climate change is cumulative load, and not annual emissions, long compliance periods were employed to provide regulated facilities more flexibility to adjust to variations in meteorology, fuel price spikes, clean unit outages, etc. A longer compliance period may also lead to administrative savings for the regulated facilities and the states implementing the program. It is not yet clear whether or not a multiple-year compliance period would be appropriate outside of the electric generating sector, as programs for other sectors are likely to be more experimental in nature, and may benefit from a more frequent program evaluation (i.e., a one-year compliance period).

Unlimited banking
Our approach also provides for unlimited banking of allowances, which gives facilities the ability to carry over unused allowances into future compliance periods. This allows facilities to create a "rainy day" fund that can be used to cover higher than expected emissions in future years. Banking should provide lower allowance prices and allowance price stability while providing an incentive to be frugal with current year allowances in order to hedge against uncertainty in future years' emissions. Banking is permitted under all existing federal cap-and-trade programs, including: the Federal Acid Rain Program, the NO_x SIP Call, and the Clean Air Interstate Rule (CAIR).

Borrowing
RGGI does not provide for borrowing of allowances. Borrowing is using allowances allocated for future years in the current year. While banking encourages early action, borrowing actively discourages it, by allowing regulated entities to put off making necessary changes. This reduces the transformative impact of the program, and ultimately jeopardizes the long-term goal of emissions reduction as allowance debts accrue. Furthermore, borrowing allowances from future years also carries a risk of default, which, if it were to occur, would undermine the environmental benefits of the program if the source in default fails to surrender allowances equal to its emissions.

Use of Emissions Offsets

Offsets can be an effective mechanism to provide energy producers additional flexibility without compromising environmental goals of GHG reductions. However, offsets should be limited and subject to proper verification. Generous offset provisions, such as those initially provided in Phase I of the European auction market and included in some other domestic proposals, can undermine the environmental and market goals of a cap and trade system. The first phase of the European auction system allowed enough "out-of-system" offsets to meet mandated targets, with little GHG reductions achieved from covered sources within the geographic area of the program. Further, most of the offsets were not subject to the uniform and rigorous verification process needed to provide environmental benefits. Europe is working to correct these problems in Phase II of its program. The use of offsets should be designed to provide flexibility to mitigate price impacts and create time to implement new energy options, but they should be limited in order to maximize local benefits and be required to be of high quality and verifiable.

Auction Mechanics

As we have made the case for auctions throughout this document, we would like to add several observations about auction mechanics we have learned preparing for our auctions, which will commence this year. These recommendations have grown out of our work with other RGGI states and a high caliber auction team based at the University of Virginia,[1] and we look forward to learning more as auctions get under way.

Frequency
We expect to hold four quarterly auctions of current and future-year allowances. Quarterly auctions seem to sufficiently balance the need for market liquidity and the cost of administering auctions. Forward auctions also enhance market liquidity and provide some indication of future allowance prices, which is necessary to facilitate planning and investment decisions by owners of affected RGGI facilities. Frequent and forward auctions help deter attempts to hoard allowances or collude in auctions. Because the total number of allowances available in each auction is relatively small, it is less profitable for firms to exercise market power. Also, frequent, smaller auctions allow regulators and other bidders to respond to market outcomes.

Participation
We expect to allow any qualified buyer to participate in the auctions. Open auctions should enhance competition by increasing the number of participants, which should limit opportunities for collusion. However, we believe that there is value to reserving the option to restrict auction participation in the future if malfeasance is observed.

Reserve Price
Allow for a reserve price if market data suggests it is warranted to ensure the integrity of the allowance markets. Massachusetts is currently exploring a number of options of how to address unsold allowances, and will share the outcomes of this research with this committee.

Market Monitoring

[1] Charles Holt & William Shobe from the University of Virginia, Dallas Burtraw & Karen Palmer from Resources for the Future, and Jacob Goeree from the California Institute of Technology. Their final report can be found at: http://rggi.org/docs/rggi_auction_final.pdf

We believe that it is important to actively monitor the market to ensure that participants are not behaving in a manner that would compromise the functionality of the market. We are actively researching this matter in conjunction with the RGGI states.

Additional Implementation Issues with a Federal Program

Use and Distribution of Federal Auction Proceeds

We believe that most auction revenue should flow to states for use in energy programs that will reduce greenhouse gases. States have a unique capacity to implement a portfolio of policies and measures that improve electric end-use energy efficiency and reduce electricity demand in ways that reflect local conditions. This model allows states to act as laboratories of innovation, facilitating the development of a new clean energy economy in the United States. States have consistently demonstrated this ability to tailor programs to meet their needs while achieving federal goals. In fact, most federal air programs over the last 20 years have provided states with flexibility regarding implementation (e.g., NO_x cap-and-trade). We believe that devoting proceeds to carefully tailored energy programs on the state level has the potential to magnify the transformative nature of the cap-and-trade program, particularly in early years.

Determining how to distribute auction proceeds between states (or allowances in the event that not 100% of allowances are auctioned) is a challenging issue that involves competing economic and political interests. Massachusetts strongly encourages Congress to avoid allocation schemes based solely on historic emissions, and instead consider utilizing other metrics, such as population, gross state product, or stringency and success of emission reduction programs. Such metrics could be used alone, or in combination. States like Massachusetts that obtain electricity from less greenhouse gas-intensive generating sources already pay a premium for that electricity, and are fully deserving of auction proceeds to help reduce energy consumption. Basing the distribution of proceeds on energy consumption or production has the potential to limit the success of the program by rewarding consumers and producers in high-emitting states where the price of electricity is currently low at the expense of states that conserve energy.

GHG Reduction Measures in Massachusetts

For additional background for the Committee, we have summarized the steps Governor Patrick has undertaken to curb Greenhouse Gas emissions and grow our clean energy economy.

- Combined Energy and Environmental Affairs into one Secretariat – Massachusetts is the first state to integrate energy and environment agencies and regulation.
- Brought GHG emissions into the core of our state environmental review process. This policy has already led to the first real estate development project with a legally binding cap on GHG emissions – Harvard University's new Allston campus.
- Initiated a far-reaching rate decoupling proceeding. Rate decoupling, done properly, will provide the incentives to make large-scale efficiency a reality.
- Worked closely with the Legislature on comprehensive energy legislation which will unleash energy efficiency, our cheapest source of power, provide long term certainty for renewable energy development, establish a new super energy-efficient building code and create large tax incentives for advanced biofuels.
- In addition, major new renewable energy initiatives are moving forward, including 3 new biomass power plants, the Cape Wind project and a new aggressive solar rebate program.

- Also, we continue to advocate for the federal government to give Massachusetts and 18 other states the right to adopt California's GHG reduction regulations for vehicles.
- We have also launched a project to develop a Climate Roadmap by this spring. The product of this analytic exercise will not be a glossy document but a continuously updated workbook of policies and initiatives, with rigorous calculations that show how far those actions take us toward meaningful GHG reductions.
- We are taking these steps in the context of Governor Patrick's commitment to make clean energy development a central part of our state's economic strategy. With a wealth of resources in our educated workforce, one of the global centers of venture capital, world-renowned institutions of higher education, and long tradition of entrepreneurship, we expect a clean energy future to be a prosperous future for Massachusetts, as it should be for the United States as a whole.

Conclusion

Since the early 1990s, Congress, successive Administrations and many states have implemented a variety of market-based approaches to environmental protection. This is an American innovation and experience shows market-based approaches encourage technology innovation and spur economic growth. We look forward to working with the Congress to assist in developing a national system for curbing carbon emissions, while also allowing the states to experiment with ways to take climate change policies further.

March 27, 2008

Dear Mr. Greenstein,
Following your appearance in front of the Select Committee on Energy Independence and Global Warming, members of the committee submitted additional questions for your attention. I have attached the document with those questions to this email. Please respond at your earliest convenience, or within 2 weeks. Responses may be submitted in electronic form, at aliya.brodsky@mail.house.gov. Please call with any questions or concerns.

Thank you,
Ali Brodsky

Ali Brodsky
Chief Clerk
Select Committee on Energy Independence and Global Warming
(202)225-4012
Aliya.Brodsky@mail.house.gov

1) Do you recognize that in states that are regulated by public service commissions or like entities, it is impossible for a utility to experience a windfall profit under the cap and trade scenario?

ANSWER: State public service commissions are unlikely to allow regulated utilities to put the value of any allowances they receive for free into the rate base. Hence those utilities are unlikely to receive any significant windfall profits from the allowances they receive for free. However, the generating affiliates of utilities in deregulated markets would receive windfall profits from allowances they receive for free. Those affiliates would be able to sell electricity to the local distribution utilities still subject to regulation at the higher market prices that reflect the value of the allowances.

2) The Congressional Budget Office's study in 2000, also noted that "the share of price increases would be borne by producers of carbon-intensive goods and services." They go on to say that "In addition, members of households might incur costs through their role as workers. Employees in carbon-intensive industries – such as the local coal industry – could lose their jobs as a result of lower demand for those products, and wages in those

industries could be temporarily depressed." Given the economic forecasts that have recently been in the news, does it make sense for you to push a program that could raise unemployment?

ANSWER: The higher energy prices associated with climate-change policy could impose transitional adjustment costs on specific industries such as coal and electricity generation, as well as on the people who work in those industries and the communities they live in. Although the implementation of climate-change policy could cause some short-run macroeconomic effects in the areas of inflation and overall employment, especially if it were done clumsily, there should be no significant long-run impact in those areas. Notwithstanding periodic business cycle downturns such as the one we are in now, macroeconomic policy over the past several decades has been largely successful at preventing persistent high inflation or persistent high unemployment. Climate change policies will lead to changes in the composition of output and employment among industries over the longer term compared with what they would be in the absence of such policy, but they should have little impact on aggregate unemployment and inflation over the longer run.

3) I am concerned about the ease of implementation and the cost effectiveness of proposed cap-and-trade programs. What certainty do we have that the price of allowances will not be so outrageous that inflation does not skyrocket?

ANSWER: Climate-change policy increases the price of energy relative to the price of other goods and services, but the overall inflation rate will be determined by the monetary policy actions of the Federal Reserve, which should be able to keep overall inflation within its target range. If policymakers are concerned with the risk that the costs of achieving legislated emissions targets will turn out to be unexpectedly and unacceptably high, they could legislate a "safety valve" price cap that would limit how high prices could go. A safety valve involves trade-offs, however, as it removes the certainty that the intended emissions reductions will be achieved.

4) The fundamental questions that must be asked about any cap-and-trade program are: who would have to hold the emission allowances, how would policy makers allocate the allowances and distribute their value, and would the government set a ceiling on the price of allowances?

ANSWER: An allowance must exist for each ton of carbon (or carbon equivalent) that is ultimately released into the atmosphere (subject to the coverage of any specific legislation). For practical reasons, it is usually easier to require that "upstream" energy producers have an allowance for each ton of carbon they introduce into the economy whether or not they are the ones that actually do the burning. There are too many "downstream" users for it to be practical to require them to he the holders. For example, an oil importer could be required to have an allowance even though most of the carbon in a barrel of oil is not released into the atmosphere until it is burned as gasoline or another fuel. In the case of electricity, current legislative proposals envision electricity generators being the ones required to hold permits, in part because they are easy to monitor and we have experience with the acid rain allowance program. The key point, however, is that the ultimate "incidence" of the economic effects of the allowances is largely unaffected by who is technically required to hold them. CBO and most other economic analysts assume that over time most of the cost of the allowances will be passed on to consumers.

The federal government should auction off as large a fraction of the emissions allowances as possible. If lawmakers capture the necessary revenue and make wise choices among competing claims in designing climate-change policy, they can achieve the economic and environmental benefits from reducing greenhouse-gas emissions while addressing the impact of higher prices on low-income consumers and other legitimate new claims on available resources. If, however, lawmakers give away too many emissions rights to existing emitters, they will fail to capture sufficient resources to meet these needs, while conferring windfall profits on energy companies and other emitters. This latter course would risk large increases in deficits and debt (already on course to reach unsustainable

levels in future decades), increases in poverty, and a further widening of the gap between rich and poor.

As discussed in the answer to question 3, a "safety valve" ceiling price mechanism is one way to insure against unacceptably high allowance prices if the costs of reducing emissions turn out to be unexpectedly and unacceptably high, but it gives up the certainty that the desired reduction in emissions will be achieved.

5) Do you think that the American public actually know how much a cap and trade system will cost them? Wouldn't it be more efficient to ask Americans to cut back on their own personal carbon footprint and not charge them for this service?

ANSWER: We do not know of public opinion polls that would allow us to answer the first question. Greenhouse gas emissions are a classic pollution "externality" where standard economic analysis shows that market prices based on the voluntary actions of consumers lead to an *inefficient* outcome. Well-designed government policies that bring market prices into line with the true costs of burning fossil fuel can produce a more efficient outcome than the market alone can achieve.

6) In Mr. Zapfel's testimony, he states that there is a "need to use part of the auction revenues to help developing countries adapt to the impacts of climate change" and the EU would dedicate funds to that purpose. Do you support a similar provision with which we should do with this windfall of tax revenue that cap and trade provides?

ANSWER: The Center on Budget and Policy Priorities has focused its attention on policies to address the impact on low-income populations in the United States and has not done its own independent analysis of the needs of developiong countries and, in particular, the needs of the very low-income countries or the populations of developing countries generally. But the Center recognizes the importance of this concern and is very sympathetic to the idea of using some of the auction proceeds for that purpose.

7) What are your specific assumptions about revenue recycling, particularly the role of the federal government vs. state government in the estimates of the percentage of auction proceeds needed to compensate low income consumers, middle income families, and small businesses?

ANSWER: The Center on Budget and Policy Priorities, drawing on and expanding on CBO's analysis, has focused on how low-income consumers would be affected by climate change policies, how much of the allowance value would be needed to offset those effects, and what would be the most effective delivery mechanisms. Based on our analysis, about 14 percent of the full allowance value would be sufficient to fund a well-designed rebate program to recycle enough money back to consumers to fully offset the average impact on people living in households in the bottom fifth of the population. In order to avoid an abrupt cut-off for household income just above any threshold level, the rebates should phase out at higher incomes, so that many consumers in the next-to-the-bottom fifth would also see at least some of their increased costs covered. The rebate program should be a federal program, but the delivery mechanism we think would work best would be a combination of rebates delivered through the existing electronic benefit transfer (EBT) system used by state human service agencies to provide assistance to many poor people and rebates delivered through the earned income tax credit (EITC) for low-income working families.

As stated in my testimony, if Congress wanted to assist middle-income consumers as well, that could be accomplished if a sufficient share of the allowance value from a cap-and-trade regime were set aside for that purpose. For example, with approximately half of the allowance value, Congress could fully compensate the first 60 percent of American households and provide significant compensation to the next 20 percent, leaving out only the wealthiest 20 percent of households, who have the most disposable income, consume the most energy, and are the most able to make adjustments to their own consumption patterns in order to reduce their carbon footprints.

8) Given that, as you state in your testimony that climate change policies "Will raise costs to consumers for a wide array of products and services, from gasoline and electricity to food, mass transit, and other products and services with significant energy inputs." Aren't you concerned that Congress is rushing to implement policy when we are in a delicate economic state and we do not fully know the extent of the cost of many of these policies?

ANSWER: The economy is currently experiencing a business cycle downturn, but climate-change policy is a long-term policy solution to a long-term problem. Current proposals do not call for an immediate implementation of the policy, and by the time emissions reductions are scheduled to begin the current period of economic weakness will have passed.

9) The federal Low Income Energy Assistance Program (LIHEAP) is constantly strained for funds. Do you support additional funds for this program?

ANSWER: The Center on Budget believes that LIHEAP has an important role to play in providing low-income energy assistance and that the current program would be able to serve more low-income households if it were better funded. We do not believe, however, that relying on an expanded LIHEAP would be a satisfactory approach to addressing the impact of climate change legislation on low-income households. Based on the principles outlined in my testimony, the low-income and EITC rebate mechanism would be far more effective and efficient, but we think that some expansion of LIHEAP would be helpful to help low-income consumers facing unusually high energy bills.

10) How many jobs do you estimate will be lost economy wide when climate policies are put into place? Besides traditional energy producers, what sectors do you think will be hardest hit? And what states do you think will have the hardest time recovering from job losses?

ANSWER: As discussed in the answer to question 2, climate change policy should not have any appreciable effect on aggregate employment in the economy in the longer run. The higher energy prices associated with climate-change policy could impose transitional adjustment costs on specific industries such as coal and electricity generation, as well as on the people who work in those industries and the communities they live in. Notwithstanding periodic business cycle downturns such as the one we are in now, macroeconomic policy over the past several decades has been largely successful at preventing persistent high inflation or persistent high unemployment. Climate change policies will lead to changes in the composition of output and employment among industries over the longer term compared with what they would be in the absence of such policy, but such policies should have little impact on aggregate unemployment and inflation over the longer run. Industries heavily dependent on fossil fuels and other activities will shrink as a share of overall employment and GDP, but a wide variety of other industries will expand in relative importance.

11) Do you recognize that your so called "well designed climate polices" are in principle a tax and spend proposal?

ANSWER: As discussed in the answer to question 5, there is a general recognition among economic analysts across the political spectrum that climate policies designed to lower emissions of greenhouse gases will work best by raising the relative price of products whose production or use results in the emission of greenhouse gases into the atmosphere. Policymakers have a choice of either 1) explicitly collecting the proceeds from those price increases as a carbon tax or auction proceeds in a cap-and-trade system and deciding how they should be used or recycled back into the economy, or 2) giving away allowances, and in effect conferring windfall profits on the recipients of the allowances.

As Greg Mankiw, former Chairman of the current President Bush's Council of Economic Advisers, has said, a cap-and-trade system in which the allowances are given away to energy companies and other energy emitters is the equivalent of a carbon tax combined with corporate welfare. Accordingly, the federal government should auction off

as large a fraction of the emissions allowances as possible. If lawmakers capture the necessary revenue and make wise choices among competing claims in designing climate-change policy, they can achieve the economic and environmental benefits from reducing greenhouse-gas emissions while addressing the impact of higher prices on low-income consumers and other legitimate new claims on available resources.

12) What is the cut off income for low-income in your analysis? And have you looked at the impact of climate policies on other classes, low-to-middle income families? The middle class?

ANSWER: The figure of $750 to $950 per year from a 15 percent reduction in emissions is our estimate of the average impact on households containing the poorest 20 percent of the population (about 60 million people). These are people living in households where the average income is just over $13,000 and the cut-off income for a family of three would be less than $27,000. The impact on higher-income consumers would be larger in dollar terms but smaller as a percentage of income.

The dollar amounts are less significant than the proportion of the allowance value that would be needed to offset those impacts, because when the emissions cap tightens, the price of the allowance goes up, simultaneously raising both the impact on consumers and the value of the allowance proceeds that would be available to offset that impact. As discussed in my testimony, about 14 percent of the allowance value would be sufficient to fund a well-designed, efficient program aimed at offsetting the impact on the bottom 20 percent (with some relief for consumers in the next 20 percent); about half the allowance value would be sufficient to offset the impact on the first 60 percent of consumers (with some relief for the next 20 percent here as well).

13) On page 5 of your testimony, you say "Governments at all levels would pay more for the energy and energy related products that they consume directly." So there is a good chance that in addition to energy bills, American taxpayers will also be paying more? Further, given that the economy is in need of a stimulus and the value of the U.S. dollar is

remarkably low, do you really think that embracing a high cost program that does not have a proven, tangible environmental benefit is a good idea for our citizens?

ANSWER: As CBO has stated, well-designed climate policies promise benefits that exceed their costs. My purpose in raising the point about the impact of climate policies on governments is simply to point out the importance of making sure that an appropriate portion of the allowance value is set aside to address those costs to government.

14) One of the primary problems in administration of any cap-and-trade program is going to be inefficiencies and administrative costs. The amount of funds spent on these items will only increase if a cap-and-trade scheme is developed that auctions permits, then must fund staff and agencies to disperse this revenue. In your five basic principles to guide an auction design you include the need to minimize red tape by keeping funds set aside to go to intended beneficiaries, "not to administrative costs or profits." In your best case scenario, what percentage of the revenue must be dedicated to overhead costs? When we are discussing a scenario that, by your estimate, could range in the area of hundreds of millions of dollars a year, is it realistic to believe that a program with such a scope not incur massive organizational costs and the creation of a new government agency?

ANSWER: Our analysis does not address the question of overhead in the design of the auction or the administration of the cap-and-trade program itself. The principles that I laid out in my testimony apply to the design of the low-income relief, and there the administrative burdens would be very small because it is possible to build off of existing programs without having to create new agencies or bureaucracies.

15) You discuss in your statement the costs of climate change legislation and its impact on various groups of people. What climate proposal did you analyze to come up with your cost estimates? How does it compare with the various bills that have been introduced?

ANSWER: We did not analyze a specific legislative proposal. We followed CBO's approach and examined the impact of a 15 percent reduction in carbon dioxide emissions

from business-as-usual levels. This would be the emissions reduction reached in the Lieberman-Warner proposal somewhere in the 2012 to 2020 period.

16) In your statement you admit that the average increase in energy bills for the low income will be 750 to 950 dollars a year but that only is from a 15 percent reduction in emissions. Some of the climate bills that have been introduced call for much more than that. In fact many call for a 60 to 80 percent reduction. Now if a 15 percent reduction is a 950 dollar annual hit to the poor (which I think will be a disaster to many people) how much would some of these other bills cost the energy paying public out there?

ANSWER: As discussed in the answer to question 15, we did not analyze a specific legislative proposal. But as discussed in the answer to question 12, the dollar amounts are less significant than the proportion of the allowance value that would be needed to offset those impacts, because when the emissions cap tightens, the price of the allowance goes up, simultaneously raising the impact on consumers *and* the value of the allowance proceeds that would be available to offset that impact. As discussed in my testimony, about 14 percent of the allowance value would be sufficient to fund a program aimed at offsetting the impact on the bottom 20 percent (with some relief for consumers in the next 20 percent); about half the allowance value would be sufficient to offset the impact on the first 60 percent of consumers (with some relief for the next 20 percent as well).

17) You say that beyond this 750-950 dollar a year hit to poor people that climate legislation would generate 50 to 300 billion dollars a year. Where does that money come from? Doesn't that just represent higher energy hills paid by all individuals and businesses across America?

ANSWER: The $50 to $300 billion per year is CBO's estimate of the range of what emissions allowances would be worth based on their analysis of a variety of legislative proposals. The range is wide because of the different degrees of strictness of emissions caps and other design issues. In all cases, the amount represents the extra costs to consumers of continuing to consume goods and services whose production involves the release of

greenhouse gases into the atmosphere. As CBO has said, analysis suggests that in a well-designed climate policy, the benefits from reduced emissions would exceed these costs.

18) It seems that you say that we don't need to worry about higher energy prices on the poor from climate legislation since you will take money from the auction of carbon allowances and give it to the poor to offset those higher costs. Are you going to offset the cost of electricity, natural gas and gasoline? What about the higher costs for food and any other service or good that will be higher because of this climate restriction? And how will you offset someone's job which gets moved to China or India which won't have the carbon limit that you are discussing here?

ANSWER: Our analysis of the impact of climate policy on low-income consumers includes the direct and indirect impact of higher energy prices. Less than half represents the cost of home heating, another 25 percent represents the cost of gasoline, and the rest (about 30 percent) represents the indirect cost of growing and transporting food, and making and transporting other goods and services. Our analysis does not directly address the last part of your question, but part of the design of climate change policy needs to involve addressing the kind of competitiveness concern raised in the question.

19) Your testimony indicates that low income consumers would face a $750-900 increase per year in energy costs for a 15% reduction from business as usual level targets. What is your estimate for a policy that requires the U.S. greenhouse gas reductions of 15% below 1990 levels by 2020? Would it be an order with magnitude greater than the figures cited in your testimony?

ANSWER: As discussed in the answer to questions 12 and 16, the dollar amounts are less significant than the proportion of the allowance value that would be needed to offset those impacts, because when the emissions cap tightens, the price of the allowance goes up, simultaneously raising the impact on consumers and the value of the allowance proceeds that would be available to offset that impact. As discussed in my testimony, about 14 percent of the allowance value would be sufficient to fund a program aimed at offsetting

the impact on the bottom 20 percent (with some relief for consumers in the next 20 percent); about half the allowance value would be sufficient to offset the impact on the first 60 percent of consumers (with some relief for the next 20 percent as well).

Testimony of Ian Bowles
Secretary of Energy and Environmental Affairs
Commonwealth of Massachusetts
Select Committee on Energy Independence and Global Warming
U.S. House of Representatives
January 23, 2008

APPENDIX

This appendix contains information Massachusetts would like to convey to the Select Committee regarding cap-and-trade programs for CO_2 and other important factors to consider in designing climate change programs. We first lay out some principles we feel should be contained in federal legislation. Then we address the questions posed by the committee and finally offer comments in some additional areas of concern.

Principles for Federal Legislation

Send clear market signals

Reducing greenhouse gas emissions will require the turnover of trillions of dollars of capital stock in power plants, transportation, building and industrial facilities. Done properly, a federal mandate can and should be a driver of economic opportunity for low carbon technologies. Effective investment of private capital requires long-term clarity. We urge the Congress to set long-term, technology neutral emissions requirements and let the markets work to find the least-cost solutions to reducing greenhouse gas emissions.

Reduce emissions 80% by 2050.

There is scientific consensus that worldwide greenhouse gas emissions must be reduced by 80% by 2050 in order to avoid the most dangerous effects of global climate change. We believe that any legislation should provide a mechanism to meet this target for all U.S. emissions. The legislation should also establish interim targets that can be revised as science may dictate.

Provide firm emissions caps to drive technology investments.

Provided with proper economic signals, the marketplace will react with technological solutions in areas such as carbon control and sequestration, energy efficiency, and renewable energy. For investors to commit capital to the clean energy technologies necessary to achieve the dramatic reductions in greenhouse gases that sound science is telling us are needed, we believe that the price signals of any carbon control market system should be firm. The use of verifiable offset markets should be the mechanism of choice to alleviate greater-than-anticipated economic impacts, but price-driven safety valve mechanisms may have benefits as well. As long as triggers are set high enough, safety valves can balance the need for market certainty (both for generators and clean technology development) and the need for mitigation of unforeseen economic shocks. However, such mechanisms should be used sparingly and only in ways that do not functionally undermine the emissions cap.

Support early acting states or corporations.

Massachusetts and several other states have been, and continue to be, leaders in reducing GHG emissions. We believe a federal greenhouse gas program must acknowledge and reward states or corporations that have taken early action on greenhouse gas reductions, and not penalize them for doing so. In practice, this will mean apportioning emissions reduction requirements and financial incentives based on commonly used factors such as population, gross state product and emission reduction performance, rather than just on historical emissions levels. Federal legislation should incorporate provisions that will smooth the transition from regional programs to a federal program.

Reserve the rights of states to implement more stringent regulations.

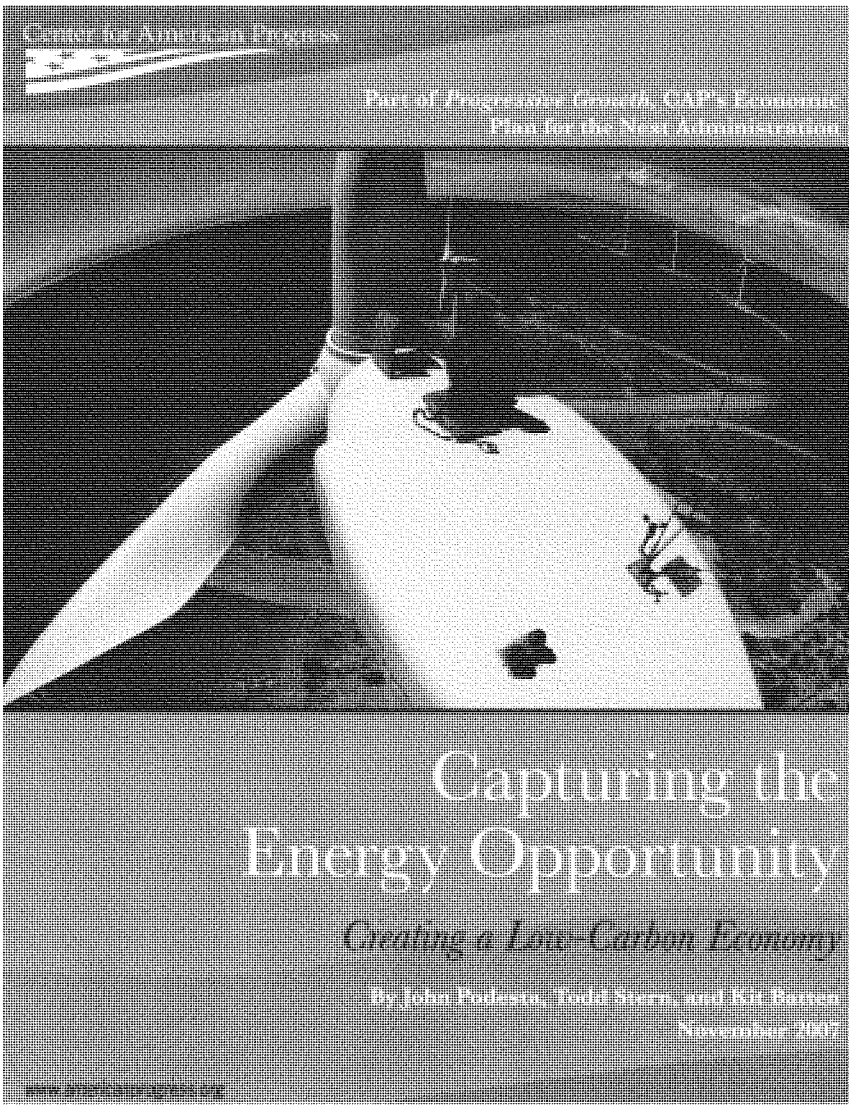
States are valuable laboratories for innovation, and their creativity and entrepreneurial efforts are necessary if we are to meet the climate challenge. States should be allowed and encouraged to implement more stringent greenhouse gas emission reductions should they so choose. Many of our best federal environmental laws and improvements to those laws have been due to successful innovation at the state level. Federal legislation should not preempt states from being the incubators of innovative technologies and policies that may help us as a nation meet the climate change challenge faster and in ways that we cannot now envision.

Auction allowances.

Auctioning allowances is an important opportunity to reduce costs, promote competition and maximize the development an effective carbon market. The European experience and the conclusion of many states, like MA, participating in RGGI is that most or all allowances should be auctioned. Auctions prevent windfall profits and create a level playing field for all generators. They also create funds to rebate consumers and accelerate the transition to clean energy alternatives. Importantly, we expect that electric consumers will see little difference in rates whether allowances are auctioned or given free to generators. Finally, auctioning allowances is consistent with other federal and state policies in which goods owned by the public at large are allocated in a fair, market-based approach that reaps value for the public. Broadband, FCC airwaves and timber are such examples.

Invest in energy efficiency and renewable energy.

Energy efficiency, renewable energy and clean energy technology innovation will represent the cornerstones of a carbon constrained energy sector economy. Energy efficiency represents the lowest cost option available today for reducing greenhouse gases. Energy efficiency yields emission and cost reduction benefits all the way up the supply chain, and reduces the need for costly infrastructure. Renewable energy and energy efficiency products represent potential job expansion and economic opportunity as the world moves toward sustainable technologies, and reduces our dependency on foreign fuel supplies. We believe energy efficiency and renewable energy should be promoted through the auctioning of allowances that would otherwise go to the electric generation sector, and directing the proceeds into these areas.


Center for American Progress
Part of Progress 2008: CAP's Ideas for the Next Administration
Capturing the Energy Opportunity
Creating a Low-Carbon Economy
By John Podesta, Todd Stern, and Rob Bonnie
November 2007
www.americanprogress.org

Contributors

The editors and authors of *Progressive Growth* thank their colleagues, the fellows, and staff of the Center for American Progress, listed below, who work on related issues and/or contributed to select portions of *Progressive Growth*. While the ideas and analyses of these experts inspired many of the recommendations in *Progressive Growth*, the recommendations in each report are those of that report's authors and the Center's leadership, and do not necessarily represent the views of all associated with the Center.

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A list of earlier reports published by the Center for American Progress describing policy incorporated into the *Progressive Growth* plan can be found on the inside back cover.

Cover photo: A man works atop a wind turbine at the Delaware Mountain Wind Farm in Culberson County, Texas. Residents of Houston can choose the non-polluting power generated at the farm as an alternative to traditional power. Image courtesy of Corbis.

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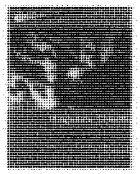
Center for American Progress

About Progressive Growth



The Center for American Progress offers a fiscally responsible investment plan to:

- *Grow our economy* through the transformation to a low-carbon economy and leadership in innovation, technology, and science.
- *Recreate a ladder of economic mobility* so that Americans may make a better life for themselves and their families, and America may be a land with a thriving and expanding middle class prospering in the global economy.

An overview of the entire plan can be found in:

Progressive Growth
Transforming America's Economy through Clean Energy, Innovation, and Opportunity
By John Podesta, Sarah Rosen Wartell, and David Madland

Other reports detailing aspects of the challenges and recommendations in the *Progressive Growth* plan are:

Capturing the Energy Opportunity
Creating a Low-Carbon Economy
By John Podesta, Todd Stern, and Kit Batten

A National Innovation Agenda
Progressive Policies for Economic Growth and Opportunity through Science and Technology
By Tom Kalil and John Irons

Opportunity and Security for Working Americans
Creating the Conditions for Success in the Global Economy
By Louis Soares, Andrew Jakabovics, and Tim Westrich *(forthcoming)*

Virtuous Circle
Strengthening Broad-Based Global Progress in Living Standards
By Richard Samans and Jonathan Jacoby *(forthcoming)*

Responsible Investment
A Budget and Fiscal Policy Plan for Progressive Growth
By David Madland and John Irons *(forthcoming)*

Other reports developing these and other new ideas will be published as part of the *Progressive Growth* series of economic policy proposals from the Center for American Progress. The first, ***Serving America: A National Service Agenda for the Next Decade***, by Shirley Sagawa, was published in September 2007. Future reports will include: ***New Strategies for the Education of Working Adults***, by Brian Bosworth *(forthcoming)*; and ***Social Entrepreneurship and Impact: Creating a Climate to Foster Social Innovation***, by Michele Jolin *(forthcoming)*.

Progressive Growth: A Summary

The American Dream has been a story of progressive policy establishing conditions in which individuals have been able to seize opportunities and make a better life for themselves, their children, their families, and their communities. It can be so again. The United States faces unprecedented challenges. Yet at the Center for American Progress, we are optimistic about America's economic future. We are confident that the ladder of economic mobility can be rebuilt with the right leadership and progressive policy.

Today, working Americans feel less and less secure, and their prospects for economic mobility seem more and more remote. People are working longer hours than ever before, change jobs more frequently, and have more volatile incomes. Forty-seven million live without health insurance. Few are represented by a union. Many face tough competition from lower-wage workers abroad. The land of the American Dream now has less inter-generational income mobility than many other developed countries. Family incomes have risen on average within generations only because the incomes of women have risen as their participation in the workforce has grown dramatically; incomes of men have stagnated. The additional income from the second earner is essential to cover the rising cost of healthcare, energy, and childcare, among other things.

Each of the traditional pathways to progress is littered with roadblocks. Incomes are not rising; the historical link between greater productivity and higher wages has broken down. Personal savings in the United States is near record lows. From pre-school through high school, we are failing to prepare many for college and the workplace. Those who begin degree or credential programs to improve earnings complete them at alarmingly low rates. Until recently, homeownership was a pathway to wealth accumulation, but many now see their equity slipping away. **American workers feel less secure with good reason. Their prospects for getting ahead are more limited. Working hard and playing by the rules is not enough.**

In recent years, economic growth has been relatively strong, but the economy has added jobs at a lackluster rate compared to similar times in the economic cycle. The share of the nation's income that goes to those in the middle is lower than it has been in 50 years. The benefits of economic growth have all flown to those at the very top.

Key Steps to *Progressive Growth*

Accelerate America's transformation to a low-carbon economy.

- Implement an economy-wide cap-and-trade program for greenhouse gases.
- Dedicate cap-and-trade revenues to, first, offset energy costs for low- and moderate-income consumers and support the employees and communities of carbon-intensive firms, and second, invest in innovation and the transformation to a low-carbon economy.
- Implement complementary policies to reduce emissions and increase energy efficiency in the transportation and electricity sectors.
- Create a White House National Energy Council to manage the transformation and ensure that the federal government leads the way.
- Exercise global leadership.

Spur innovation to sustain productivity growth and job creation.

- Make significant new investments to stimulate innovation to address our nation's grand challenges and emerging opportunities.
- Build a flexible, problem-solving workforce that includes more workers with world-class science, technology, engineering, and math skills.
- Restore the integrity of American science.

Rebuild the ladder of opportunity by restoring economic security and mobility.

- Guarantee quality, affordable health care regardless of employment or life circumstance.
- Expand access to effective education for our children and adult workers to ready the workforce for 21st century jobs in the global innovation economy.
- Make work pay and incomes keep pace with growth through the minimum wage, expansion of the Earned Income Tax Credit and Child Tax Credit, the right to organize, and reforms to unemployment insurance and adjustment assistance.
- Provide greater opportunities to build and secure *wealth* through work, retirement savings, affordable and safe financial services, and home ownership.

Create a virtuous circle of rising economic fortunes for a growing global middle class—future consumers of U.S. products and services.

- Refocus the three main elements of our international economic policy—trade, aid, and monetary policy—on achieving progressive growth around the globe.
- Enlist all the international institutions—the International Labor Organization, the International Monetary Fund, the World Bank, the World Trade Organization, and regional multilateral development banks—in a coordinated strategy to promote decent work: quality jobs, fundamental rights at work, social protection, and social dialogue.
- Support construction of the laws and institutions that will enable middle-income nations to share new growth widely within their populations.
- Support low-income nations in meeting basic human needs, advancing decent work, moving more workers into the formal economy, eliminating trade barriers to their exports, and supporting the creation of trade-related infrastructure.

Adopt a responsible fiscal policy to finance needed investments in national priorities.

- Make needed investments in economic growth and restoring economic mobility.
- Dedicate cap-and-trade revenues to ease the transition to a low-carbon economy and invest in policies to spur innovation and the energy transformation.
- Adopt a tax system that is fair and rewards human capital by:
  - Rewarding work and wealth equally.
  - Expanding the Earned Income Tax Credit and Child Tax Credit to help make work pay for low-income workers.
  - Providing tax breaks to employees and employers to encourage more investment in credentialed and portable education of adult workers.
  - Improving retirement security through matching contributions for lower-wage workers in a new Universal 401(k) plan.
  - Lifting the cap on which the employer pays social security taxes while maintaining the employee cap.
  - Permanently reforming the estate tax so that only a tiny fraction of the wealthiest heirs would be subject.
  - Closing loopholes and improving tax enforcement.
- Put America on course to reduce our debt as a share of our Gross Domestic Product.

The prospects for long-term growth are also weak. Our economy is increasingly reliant on unsustainable, debt-driven spending (by consumers and the federal government), instead of innovation and investment. Between March 2001 and March 2007, 84 percent of economic growth came from consumption spending, while less than 4 percent came from investment. The United States has fallen behind many countries when it comes to equipping the workforce with the education and training necessary for individual and national success, doing a mediocre job especially of preparing our children for careers in the innovation economy. Younger cohorts moving into the workforce in coming years will be smaller and have less education than the older generations leaving the workforce.

Globalization and technology have changed the rules of the game. Unsustainable appreciation in the housing market buoyed the economy for too long. And we face a clear and present danger to our economy and the earth itself from global warming. As Rajendra Pachauri, Chairman of the Intergovernmental Panel on Climate Change and recipient of the 2007 Nobel Peace Prize, said recently, "If there's no action before 2012, that's too late. What we do in the next two to three years will determine our future. This is the defining moment." America needs policymakers with a plan for restoring U.S. economic leadership in a global and carbon-constrained economy, making it possible, once again, to dream that our children can look forward to a better future.

The next administration can offer a new vision of America as an economic leader with a growing middle class in a vibrant global economy. America's economy could be driven by ongoing invention and the production of high value-added goods and services. America could lead a global energy transformation based on more efficient technologies and clean, renewable fuels. These forces could fuel the creation of good jobs and good prospects for workers at all skill levels. America's students and workers could be readied to meet the demands of the innovation economy. Moreover, we could ensure the economic security necessary, so that people can take risks and generate wealth for themselves and our country. America could put globalization and change to work for American workers and for millions around the globe.

At the center of this vision is a strategy to address the greatest moral and economic challenge of our time—climate change—and turn it into our greatest opportunity. Left unchecked, the economic disruption caused by climate change will sap our resources and dampen our growth. But with low-carbon technologies and clean, renewable energy, we can capture a new global market, drive American economic growth, and create green jobs for American workers, offering new skills and new earnings opportunities up and down the economic ladder.

CAP's economic blueprint for a new administration would also leverage our creativity, entrepreneurial culture, and a restored leadership in science and technology to create an innovation economy and spur economic growth. It would seek to enhance economic security and mobility for American workers by creating the conditions in which they could protect and improve their own health, education, incomes, and wealth. It would refocus our international economic policy on promoting decent work and higher living

standards around the globe, helping to generate additional demand for American products and services, restoring American leadership, and ensuring that the rising tide produced by economic integration lifts all boats. Finally, CAP's plan offers a responsible pro-growth fiscal policy that would value work and fairness and support necessary investments in our economic future while setting us on a course to reduce the debt as a share of GDP and ready ourselves for the additional demands of the aging baby boom generation.

Restoring economic mobility for Americans, sustaining economic growth in a global economy, and combating global warming are great challenges, but America is up to the task. From sweatshops to segregation to the space race, the progressive commitment to fairness, human dignity, and what FDR called "bold, persistent experimentation" has driven our country to overcome obstacles as great as these we face today.

Introduction

The energy challenge we face in this new century is extraordinary in its urgency, its stakes, its scope, and its opportunity. Of course, energy has long been at the intersection of the economy, environment, and national security, and its availability and price have always been important factors in economic performance. Because energy has been produced over the past two centuries mainly by burning fossil fuels, dirty byproducts soon threatened our air and water and spawned the modern environmental movement. Because critical elements of world energy supply come from unstable regions and hostile nations, energy has, for decades, played an important role in our national security.

But something different is afoot now. The realities of global warming and our growing dependence on oil, much of it imported, will make energy more pivotal than ever to our economic, environmental, and national security fortunes in the 21st century. The challenge we face is nothing short of the conversion of an economy sustained by high-carbon energy—putting both our national security and the health of our planet at serious risk—to one based on low-carbon, sustainable sources of energy. The scale of this undertaking is immense and its potential enormous.

The urgency of this issue demands a president willing to make the low-carbon energy challenge a top priority in the White House—a centerpiece not only of his or her energy policy but also of his or her economic program—to produce broad-based growth and sustain American economic leadership in the 21st century. This task is so encompassing it will demand that the incoming president in 2009 reorganize the mission and responsibility of all relevant government agencies—economic, national security, and environmental.

As part of this reorganization, the incoming president should create a new National Energy Council in the White House led by a National Energy Advisor whose missions will be the energy transformation of our economy and the promotion of these same steps abroad. Our challenge is huge, full of opportunity and risk. And time is working against us. So the president will need the kind of single-minded attention that a fully empowered National Energy Advisor can bring.

Our traditional understanding of energy security has been largely limited to assuring adequate supplies of energy to fuel our economy. That will remain a necessary concern, of course, but not a sufficient one. Going forward our leaders will have to act on an understanding of energy security that turns not just on the supply but on the carbon content of the energy we use. Otherwise, we will consign ourselves long-term to the mercy of international markets and an increasingly variable climate. We must act now

and act boldly to put ourselves on a sustainable footing, in the interest of our national, economic, environmental, and energy security. Simply put, energy will rapidly transform the world for good or ill. The question for the United States is whether we will participate as a leader in the global energy revolution.

This paper insists the United States must lead this revolution. Ours is a vision of an economy in which highly efficient vehicles dominate the roadways, service stations pump large quantities of low-carbon alternative fuels, incandescent light bulbs are entirely replaced by compact fluorescents, and all buildings employ day lighting, solar heating and cooling, as well as highly efficient appliances and air conditioning. In this economy, utility companies will increase their profits when customers *save* energy and draw more than a quarter of their feed stock from renewable sources of energy; coal-fired power plants will be built to capture CO_2 and pump it through a national network of pipelines for geologic storage; and businesses of all kinds will have to factor the cost of carbon into their bottom-line calculations and aggressively pursue low-energy options.

The scale of the change we need is daunting but achievable. In their well-known "wedges" analysis on how to stabilize atmospheric CO_2 at non-dangerous levels, Stephen Pacala and Robert Socolow of Princeton University describe 15 major energy initiatives, any 7 of which would allow us to bring emissions down to an acceptable level during the next 50 years—avoiding about a third of the total CO_2 emissions that would otherwise be released. Each of these wedges is formidable, including, for example, increasing the fuel efficiency of 2 billion cars from 30 miles per gallon to 60 mpg (the worldwide fleet of cars is currently 800 million, but that number is rapidly rising). Other wedges include improving the efficiency of buildings and appliances enough to cut their CO_2 emissions by 25 percent; increasing the efficiency of coal-fired power plants by 50 percent; introducing so-called carbon capture-and-storage capabilities at the equivalent of 1,600 large (500 megawatt) power plants; and dramatically increasing the use of renewables like wind, solar, and biomass in producing electricity.

Taking such action is not just good for our environment. Actions like these can provide a powerful charge to the economy. Our vision of a low-carbon economy includes vigorous private and public research pushing the envelope on technologies that will not only stabilize

U.S. Losing Competitive Edge in Green Technologies

Our foreign competitors are racing ahead of us in key environmental and energy technologies, in large part because of concerted government efforts abroad. Notably:

- Companies in the European Union control 70 percent of the world's production of wind turbines.
- Japan and Germany are world leaders in solar cell production.
- Brazil is the global leader in ethanol production for alternative automotive fuel.

U.S. Business and Finance Leaders Recognize Green Opportunities

While venture capitalists pour money into new energy technologies, corporate business leaders are also demanding environmental protection. As evidence:

- Venture capitalists invested $2.4 billion in energy technologies in 2006 alone.
- Solar energy companies accounted for the three largest initial public offerings in 2005.
- The annual revenue of solar, wind, biofuels, and photovoltaic cell companies hit $55.4 billion in 2006, up nearly 30 percent over the total revenue in 2005.
- The U.S. Climate Action Partnership, which includes diverse business membership such as General Electric Co., Duke Energy, Alcoa Inc., and DuPont, has embraced mandatory cuts in greenhouse gases of 60 percent to 80 percent below current levels by 2050.

emissions at livable levels during the next 50 years but also create the clean-powered world that our grandchildren and their children will see at the dawn of the next century. Developing, deploying, and building at this scale recalls other great economic transformations in America's past, like the laying of our railroads and the construction of the interstate highway system. But in many ways our new challenge is even more complex since energy powers every part of the economy. Yet that's exactly why these advancements will drive economic growth and American leadership in a competitive global economy well into the 21st century.

The good news is that the technology we need to begin the transformation to a low-carbon economy exists and the investment dollars are available if the policy ground rules are properly established. A great deal of investment and effort will be needed to make this vision real, but the hard work of ushering it in can become a powerful engine for growth, competitive advantage and jobs.

Our competitors are figuring this out, while our national leaders have been asleep at the switch. Over the past 10 years, for example, our market share in producing solar cells has plummeted, while Japan, relying on government R&D and consumer subsidies, has become the world leader.[1] Germany, not known for its sunshine, has also become a solar leader, thanks to some well-placed incentives. European companies have also captured a dominant share, approximately 70 percent, of the world market for wind turbines.[2] And Brazil has vastly reduced its dependence on oil by ramping up its production of ethanol and transforming its auto fleet to run on such fuel.

Our nation has always thrived on its creativity, entrepreneurial character, flexible economic structure, resourcefulness, and can-do spirit. Over and over, in the face of large and difficult challenges—cleaning our air and water, repairing the ozone layer, making cars go farther on a gallon of gas (which we did 30 years ago before reversing direction)—the gloomy chorus has complained that we couldn't succeed, that the economy would fail, that jobs would disappear, that America's competitive edge would be blunted. Every time the naysayers have been proven wrong, and this will happen again when we rise to meet our new energy challenge.

Policies That Are Closer To Home

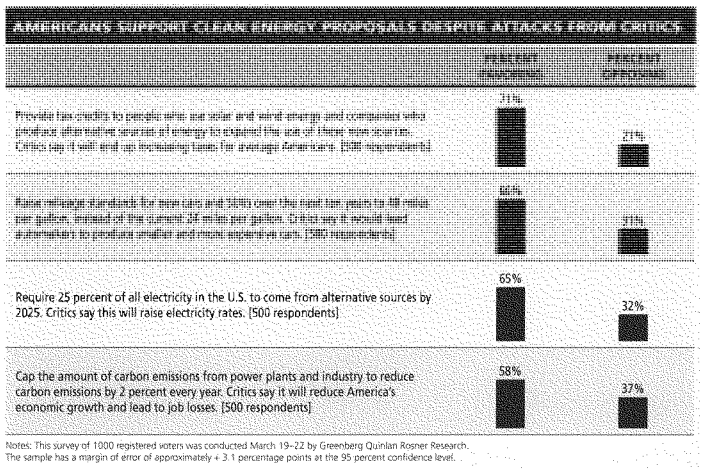
Voters across the country are empowering their state and local representatives to take action in their communities and be regional initiatives to combat global warming.

- As of the end of September 2007, 691 Mayors had signed the U.S. Conference of Mayors Climate Protection Agreement, in which they agree to encourage federal and state legislative action, in addition to committing to efforts to reduce their greenhouse gas emissions according to the Kyoto Protocol's targets – a 7 percent reduction below 1990 levels by 2012.
- In 2006 California passed the California Global Warming Solutions Act and became the first state to legislatively tied itself to a set of reduction targets, which aim to achieve 1990 emissions levels by 2020, or 15 percent below what is forecasted. While the state is still in the process of developing the specifics, the California Air Resources Board has released early action steps that will take effect in 2010, if not earlier, and state will mandate emissions reporting.
- In April 2007, Maryland joined at least eight other Northeastern and Mid-Atlantic states in formal discussions on how to design and implement a regional cap and trade carbon emissions credit program, known as the Regional Greenhouse Gas Initiative. As part of the agreement, several states have adopted climate strategies and action plans, and set tangible, statewide reduction targets.
- In February 2007, Arizona, California, New Mexico, Oregon, and Washington formed the Western Climate Initiative and were shortly thereafter joined by British Columbia, Utah, Manitoba, and several observers. Together, the region has agreed to a 15 percent emissions reduction below 2005 levels by 2020 and committed to reporting their emissions every two years.
- In September 2007, Minnesota Gov. Tim Pawlenty, currently chair of the National Governors Association, launched the initiative "Securing a Clean Energy Future," which made climate change and energy a central issue for the governors association and created a task force to unify all governors on a path to clean, secure energy.

At a gathering pace, Americans are recognizing and embracing this challenge. Chief executives, venture capitalists, state and local leaders, the general public—everyone, it seems, but the federal government, which keeps running far behind the curve—are taking action. A group of CEOs of major companies including General Electric Co., Duke Energy Corp., Alcoa Inc. and DuPont joined with major environmental groups, under the umbrella of the United States Climate Action Partnership, to call for a far-reaching, mandatory program to cut greenhouse gas emissions by 60 percent to 80 percent below current levels by 2050.

Venture capital has started pouring into clean energy. Solar-energy companies accounted for the three largest technology IPOs of 2005. In 2006, venture capital investments in energy technology tripled to $2.4 billion. Annual revenue for solar power, wind power, biofuels and fuel cells rose from $40 billion in 2005 to $55.4 billion in 2006, nearly a 39 percent increase in one year.[3] John Doerr, the leading Silicon Valley venture capitalist who helped finance Google Inc., Amazon.com, Inc., and Sun Microsystems, Inc., among many others, calls clean energy "the largest economic opportunity of the 21st century."[4] Another leading Silicon Valley financier, Vinod Khosla, is now betting heavily on biofuels and solar thermal.

Meanwhile, states, including long-time leader California and 10 Northeastern states that are implementing a regional carbon cap-and-trade program to cut CO_2 emissions, are also charging forward to produce low-carbon energy, unwilling to wait for our temporizing leaders in Washington. And they are doing this on a bi-

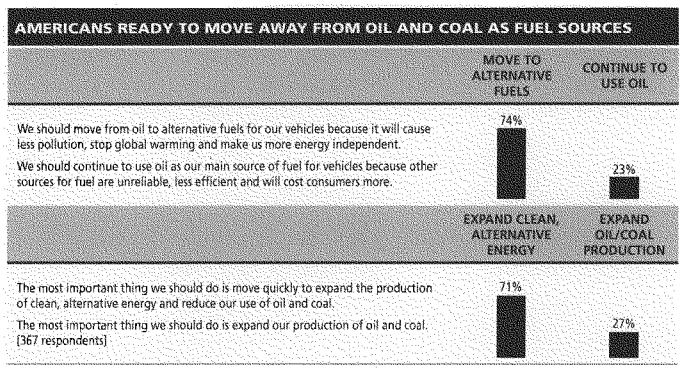


Notes: This survey of 1000 registered voters was conducted March 19–22 by Greenberg Quinlan Rosner Research. The sample has a margin of error of approximately + 3.1 percentage points at the 95 percent confidence level.

partisan basis, led by Republicans, such as Governors Arnold Schwarzenegger (CA), Charlie Crist (FL), and Tim Pawlenty (MN), and Democrats such as Governors Bill Richardson (NM), Eliot Spitzer (NY), Christine Gregoire (WA), and Edward Rendell (PA). In addition, under the auspices of the Clinton Foundation, 16 of the world's largest cities, including New York, Chicago, and Houston, have recently agreed to participate in an aggressive program to retrofit buildings—the source of 40 percent of CO_2 emissions—to lower their carbon footprint.

The general public, unsurprisingly, gets it. A recent Greenberg Quinlan Rosner poll, conducted for the Center for American Progress, asked respondents to choose between two alternative perspectives: that the country needs to tackle global warming even if it will cost businesses more to meet stronger regulations on pollution; or that we should not address global warming by putting more regulations on businesses that will cost us jobs and increase prices for consumers. Respondents favored the first by 65 percent to 32 percent.[5] Similarly, by a 79 percent to 17 percent margin, respondents endorsed the view that shifting to new, alternative energy production will help America's economy and create jobs, rather than costing America jobs and weakening the economy.

What has been missing to date is the political will in Washington to seize the energy moment, put in place a series of tough, mandatory rules of the road, back them up with targeted government investments, and begin the work of transforming our economy. The old way of addressing environmental issues apart from the main workings of the economy—as "externalities" or "amenities" in the language of economics—no longer applies. We are confronted now with an issue that is paramount to the preservation of our environment and the sustainability of our eco-



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systems as well as critical to our national security and central to our hope for a new era of economic growth and prosperity.

In this report, we will look at the urgent reasons why we need to make this low-carbon energy transformation—climate change and oil dependency—and then discuss the building blocks (see box on pages 8–9) of a low-carbon economy as well as some of the policy instruments we will need to put those building blocks in place. Specifically, this report will examine the five steps necessary to create this new energy opportunity:

- Implementing an economy-wide cap-and-trade program for greenhouse gases
- Transforming our transportation network by
  - Increasing vehicle fuel efficiency
  - Boosting the production and availability of low-carbon alternative fuels
  - Investing in a low-carbon transportation infrastructure
- Overhauling our electricity industry by
  - Improving the efficiency of energy production and use
  - Increasing production and consumption of renewable energy
  - Promoting the use of "advanced coal" through carbon capture-and-storage systems
- Requiring the federal government, coordinated by a new White House National Energy Council, to manage the energy transformation and structure its own operations to reduce global warming and create a low-carbon economy
- Advancing international global warming policies

A word about the international dimension is necessary. This report's focus is on what we must do at home to transform the energy foundation of our economy, and so the complex issues involved in devising global solutions are largely beyond its scope. But a few short points are in order.

All major carbon-emitting nations, including key developing countries such as China and India, will have to be part of the solution. In fact, most of the future emissions growth will be generated by developing countries who collectively will account for over 75 percent of global emissions growth by 2030.[6]

But far-reaching, mandatory U.S. action has to come first. Without that, the United States will have no credibility to argue for broader global participation.

American action will spur developing world action in two separate ways. First, the policy changes needed to cut carbon emissions in the United States are job-producing and growth-generating actions. Other countries will emulate them, just as China, Russia, Brazil, and other countries have adopted building energy codes and appliance efficiency standards based on U.S. models.

Second, the technologies needed to promote low-carbon economies are increasingly produced and sold in a global market. When America buys compact fluorescent lamps, most of them are made in China, so China automatically develops the manufacturing technology to use them domestically. When America requires that computers and TVs become more efficient, it affects the market in India and Africa. And conversely, when America lags in efficiency or renewable energy technology, either the rest of the world also lags or else other developed countries grab the market and control the export sales to the developing world.

Clearly there are many reasons why the United States needs to capture the energy opportunity by creating a low-carbon economy. So, too, do the rest of the nations of the world. American leadership is paramount, both at home and abroad.

The National Energy Council

Managing the Transition to a Low-Carbon Economy

Capturing the energy opportunity and making the rapid transition to a low-carbon economy will require fully committed presidential leadership and a reorganization of the missions and responsibilities of the economic, national security, and environmental agencies throughout the government.

To this end, the incoming president should create a new National Energy Council of all relevant Cabinet Agency heads, lead by a National Energy Advisor reporting directly to the president. The Council's mission will be to coordinate the relevant policy of all the agencies of the federal government, outreach with states, localities, and the private sector, and U.S. leadership and partnership in international efforts to reduce global emissions.

The Council's first task should be to support the president in preparing energy legislation for delivery to Capitol Hill within 60 days of the inauguration. Within 120 days, the Council should advise the president on an enhanced research and development program in consultation with the Energy Innovation Council, as well as on developing an international agenda for global reductions in carbon emissions. The president should promise on Inauguration Day to convene the Council personally each quarter for the first year to ensure that all of the president's cabinet understands the importance the president puts on this effort. Each agency also shall be charged with developing and reporting on its own plan for helping to achieve the national goals.

10 Steps to a Low-Carbon Economy

[illegible]

Create an economy-wide greenhouse-gas emissions cap-and-trade program

[illegible]

Eliminate federal tax breaks and subsidies for oil and gas

[illegible]

Increase vehicle fuel economy

To create low-carbon transportation across our country we propose a rapid increase in the fuel economy of our vehicle fleet to 40 mpg by 2020 and at least 55 mpg by 2030. This goal is read- [illegible]

Increase production and availability of alternative low-carbon fuels

[illegible]

Invest in low-carbon transportation infrastructure

Less fuel-intensive transportation options means less greenhouse gases. To boost greater use of alternative low-carbon transportation we propose new investment in more diverse and inter-modal transportation networks such as local mass-transit networks, regional and interstate long-distance high-speed rail systems, and green city programs to encourage the redevelopment of urban areas and reduce long commutes and suburban sprawl.

Improve efficiency in energy generation, transmission, and consumption

Energy efficiency is the cheapest, fastest way to reduce the carbon intensity of our economy. The United States currently uses nearly twice as much energy per dollar of GDP than other industrialized countries, so there is much we can do to reduce the inefficiencies of our energy generation, transmission, and consumption. To this end, we propose a National Energy Efficient Resource Standard to require electricity and natural gas distributors to meet a 10 percent energy savings threshold through efficiency upgrades by 2020, and a major upgrade of the U.S. electricity grid to increase energy and national security, encourage distributed generation, and increase the efficiency of transmission. Additional significant gains in efficiency can be made by requiring efficiency upgrades for our appliances and private, commercial, and federal buildings.

Increase the production of renewable electricity

We can lower the amount of greenhouse gases produced by electric power, which now generates 38 percent of our carbon emissions and will grow dramatically as the demand for electricity increases unless we significantly change the way we produce power through new investments in renewable energy sources and advanced coal energy production. Specifically, we propose a new national renewable electricity standard to require 25 percent of energy produced in the United States to come from renewable sources by 2025, increasing distributed renewable electricity generation and facilitating investment in renewable energy by improving the structure of production tax credits and low interest loans.

Use carbon capture-and-storage systems to capture and bury the carbon emissions from burning coal

The United States boasts 27 percent of the world's coal reserves, enough to last over 200 years, but coal-fired power plants today account for 80 percent of all carbon emissions from power plants. Our answer is the deployment of new carbon capture-and-storage technologies that allow power plants to burn coal for energy while sequestering carbon emissions in underground geologic reserves across the country. We recommend the establishment of an emission performance standard for all new coal-fired facilities equivalent to the best available capture-and-store technology, and the provision of federal funds to help offset additional costs of implementing carbon capture-and-storage technology.

Create a White House National Energy Council and make the federal government a low-carbon leader

The federal government must first create a White House National Energy Council to lead all other agencies in making energy and global warming top administration priorities. The new Council will ensure that the U.S. government leads the way on all of these fronts, not just by enacting these proposals but also by wielding the purchasing power of the federal government to promote low-carbon technologies, implementing new tax policies, and creating dedicated federal agencies to address global warming. The federal government must ensure that taxpayer investments reduce and withstand the effects of global warming. It must also create an Energy Innovation Council to spur interagency alternative energy-related research and development, an Energy Technology Corporation to demonstrate the efficacy of these new clean technologies, a Clean Energy Investment Administration to ensure these technologies make it to the marketplace, and a Clean Energy Jobs Corp to promote new "green collar" jobs in a new clean economy. We must also more than double currently existing federal investment in low-carbon energy R&D.

Lead efforts to advance international global warming policies

Global warming is obviously an international problem that requires concerted action by all countries. The United States needs to reclaim the lead in global efforts to combat climate change by getting our own house in order while simultaneously joining current international efforts to reduce greenhouse gas emissions. This means creating an E-8 of nations comprised of leading developed and developing countries devoted to addressing global ecological and resource issues. And it means taking the lead once again in the U.N. Framework Convention for Climate Change, where the Kyoto Protocol of 1997 on reducing greenhouse gas emissions was first enacted—without U.S. support. As a component of these efforts, the United States must also invest in the energy, environment, and infrastructure sectors in developing nations to alleviate energy poverty with low-carbon energy systems and to help these nations adapt to the effects of climate change.

Capturing the Energy Opportunity

The Urgent Need for a Low-Carbon Energy Transformation

Overview

There is no longer any real question that global warming is occurring as the result of the rapid build-up of greenhouse gases primarily caused by human activities. We are on a trajectory for global warming to become much more intense unless we begin a concerted, rapid shift toward a low-carbon economy. And the danger is increasingly clear and present. As Rajendra Pachauri, chairman of the Intergovernmental Panel on Climate Change and recipient of the 2007 Nobel Peace Prize, has said, "If there's no action before 2012, that's too late. What we do in the next two to three years will determine our future. This is the defining moment."

The Earth's average temperature has already increased by 0.8°C (about 1.4°F) over pre-industrial levels, increasing at a rate of 0.2°C per decade since 1975, and without changing our course, we will lock several more degrees of change into the system.[7] Such temperature shifts may sound small, but they are not. During the last ice age, average global temperature was only about 5.4°C (9.7°F) colder that it is now.[8]

Many of our leading climate scientists have warned that if we exceed 2.0°C (3.6°F) above pre-industrial times, we will enter a dangerous, uncharted territory. No one knows at what precise temperature the effects of global warming become intolerably large, whether as a result of gradual worsening of droughts, floods, hurricanes, and heat waves or as a result of abrupt, catastrophic change, such as the collapse of the Greenland or West Antarctic ice sheets and the accompanying global swell in sea levels. But we are conducting a dangerous uncontrolled experiment with the only home we have. This is why young people in increasing numbers are starting to see climate change as the challenge of their generation.

The Washington Post reported in April that, "For many children and young adults, global warming is the atomic bomb of today. Fears of an environmental crisis are defining their generation in ways that the Depression, World War II, Vietnam and the Cold War's lingering 'War Games' etched souls in the 20th century."[9]

Some of the dire projections may not occur, but in light of the warnings from our best scientists, it would be beyond irresponsible to take that bet. Scientists are telling us if we

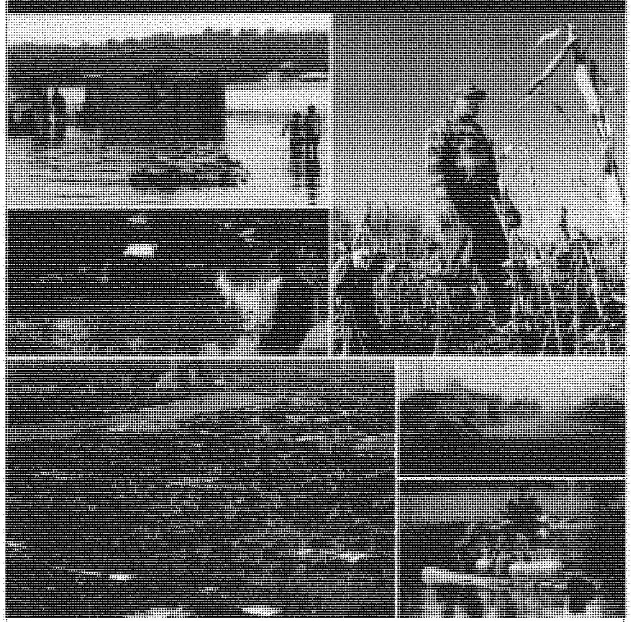
do not take action soon, it will be too late to avoid the most serious consequences of global warming.

Environmental Costs

The projected environmental consequences of climate change are well known. The only thing that keeps changing, with the steady drumbeat of new and better scientific data and analysis, is that the picture gets more and more serious. In the words of Harvard's John Holdren, one of our leading science policy thinkers, global climate change is the most dangerous of all environmental problems because climate represents the envelope within which all our natural systems operate. By badly disrupting that envelope, we "adversely affect every dimension of human well-being that is tied to the environment."[10]

The Fourth Assessment Report on Climate Change Impacts released in April 2007 by the IPCC, the official body of over 2,000 scientists acting under the auspices of the United Nations, presents

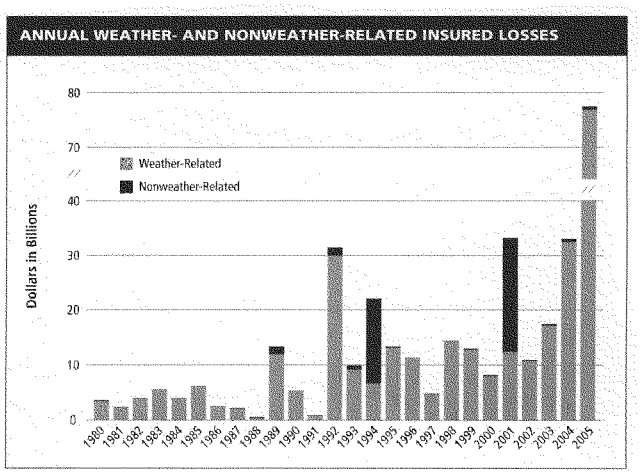
DAMAGE FROM EXTREME WEATHER EVENTS



Clockwise from top-left: flooding in Texas, July 2007; remnants of a drought-damaged crop in Minnesota; destruction from Hurricane [illegible] in Playa del Carmen, Mexico, October 2005; the result of two weeks of monsoon rain in Bangladesh, August 2007; flooded New Orleans following Hurricane Katrina, August 2005; floodwaters in Topeka, Kansas after [illegible] of rain fell overnight, May 2007. (AP)

a stark picture. The IPCC report says that "human induced climate change is already affecting physical and biological processes on all continents and some oceans." Among other impacts, the report warns of:

- Extreme weather events such as drought, floods, and severe storms, including hurricanes, becoming more intense and inflicting greater damage to life and property.
- Increasing hurricane intensity. (Other recent scientific findings suggest that not just the intensity but also the frequency of hurricanes is increasing with rising sea-surface temperatures).[11]
- Rising sea levels threatening the mega-delta regions of Asia, coastal cities in Europe, low-lying areas in North and Latin America, and small islands. The melting of the Greenland ice sheet alone could lead to a sea-level rise of seven meters.
- Increased water scarcity facing 1 billion to 2 billion people.
- Increased risk of heat- and flood-related mortality and of water- and food-borne diseases.
- Declining crop yields and increased hunger in some regions, including parts of Africa and Asia.
- Degrading fisheries.
- Declining coral reef systems.
- Extinction facing 20 percent to 30 percent of global plant and animal life.



Source: GAO analysis of PCS, NFIP, and FCIC data.

Key Facts about Global Warming

The projected effects of climate change on our environment, economy, national security, and energy security are serious. Here's a short breakdown of only a few of these consequences.

Our Environment

- The average global temperature is likely to increase by 2.0°F to 5.4°F (2°C to 3°C) above 2000 temperatures by the end of this century—an increase not seen in 3 million years.
- Anywhere from 20 percent to 30 percent of all animal and plant life on earth may go extinct from climate change.
- Islands and coastal communities, including large parts of Bangladesh and the state of Florida, face a serious threat from sea level rise.
- The IPCC predicts declining crop yields, increasing hunger in the dry tropics, and worsening water scarcity problems for 1 billion to 2 billion people.
- Already, scientists have concluded that global warming, which is increasing sea surface temperatures, is also increasing the intensity of severe storms and hurricanes. Some studies have even found a correlation between warmer temperatures and hurricane frequency.

Our Economy

- We face increased costs of damage from extreme weather events such as floods, droughts, hurricanes, heat waves, and major storms, and the risk that such events will affect global financial markets.
- Between the 1960s and the 1990s, the economic costs of major weather disasters jumped seven-fold and insured losses increased 11-fold. In the future, insurers say that costs, aggravated by climate change, could double from current levels to $150 billion a year in 10 years.
- Environmental and human health as well as economic growth and productivity will suffer under the weight of degrading environmental conditions.
- Oil and gas prices are becoming more volatile, harming consumers, business, and economic growth.

Our National Security

- According to a recent report by 11 former Army generals and Navy admirals, climate change is a "threat multiplier for instability" in volatile parts of the world.
- Coastal cities worldwide are vulnerable to sea level rise, even in the near future. For example, the IPCC identifies Nigeria's capital, Lagos, as one of the African coastal megacities at risk as soon as 2015. These conditions, coupled with rapid population growth projections, are likely to force significant human migration, precipitate economic collapse, and contribute to regional political and economic turmoil.
- In Darfur and elsewhere in Sudan, Ethiopia, and Kenya, water shortages have already led to the desertification of large tracts of farmland and grassland. Fierce competition between farmers and herdsmen over the remaining arable land, combined with simmering ethnic and religious tensions, helped ignite the first genocide of the 21st century.

Our Energy Security

- Our foreign oil deficit of $270.9 billion in 2006 accounted for 33 percent of our nation's total trade deficit.
- Nearly 40 percent of our foreign oil imports come from potentially unstable or hostile countries.
- Other nations are importing more oil from these same countries; world oil consumption is estimated to rise from 83 million barrels a day in 2004 to 118 million barrels a day in 2030, with North America and the developing nations of Asia, including China and India, accounting for the largest increases in consumption over this time period.

Economic Costs

There is substantial uncertainty about the precise economic costs of climate change, but if we continue on our current path there is little doubt that overall they would be very large. A look at trend lines from the insurance industry gives a hint of the kind of rising magnitude of damage we might see from just one projected effect of global warming— extreme weather events.

At the meeting of the U.N. Framework Convention on Climate Change in Morocco in 2001, large reinsurance companies (which offer insurance to other insurers) such as Swiss Re and Munich Re warned of the increase in extreme weather events. According to Munich Re, "The number of really big weather disasters has increased four-fold if we compare the last decade to the 1960s. The economic losses have leaped seven-fold and the insured losses are 11 times greater."[12] In 2004, Swiss Re warned in a report that the costs of natural disasters, aggravated by climate change, threatened to double to $150 billion a year in 10 years.[13]

More systematically, the much discussed Stern Review of the Economics of Climate Change, commissioned by the British government and authored by Sir Nicholas Stern, former Chief Economist for the World Bank, concludes that economic damages from climate change could be seismic:

> Our actions over the coming few decades could create risks of major disruption to economic and social activity, later in this century and in the next, on a scale similar to those associated with the great wars and economic depression of the first half of the twentieth century. And it will be difficult or impossible to reverse these changes.[14]

Stern sees the threat of this major disruption coming from a number of factors, including the increased costs of damage from extreme weather events such as floods, droughts, hurricanes, heat waves, and major storms; the risk that such events affect global financial markets through higher or more volatile insurance costs; and the risk of abrupt and large-scale climate change. Stern also points to the consequences of climate change on the environment and on human health as economic growth and productivity suffer under the weight of degrading environmental conditions.

National Security and Foreign Policy Challenges[15]

Climate change presents the United States with multiple foreign policy challenges quite apart from those directly connected to our nation's deepening dependence on imported oil, which we will detail shortly. These challenges include, for example, increased border stress resulting from the impact of climate change-induced storms and droughts in Mexico and the Caribbean. Or consider the complications posed by ever-scarcer water supplies to political progress in the Middle East.

Perhaps the greatest climate change-induced geopolitical challenge in the short-term, though, will arise in the developing countries in the earth's low latitudes. In these countries, even a relatively small climatic shift can trigger or exacerbate food shortages, water scarcity, the spread of disease, and natural resource competition. Such conditions fuel political turmoil, drive already weak states toward collapse, and threaten regional stability. According

to a recent report by 11 former Army generals and Navy admirals, climate change is a "threat multiplier for instability" in volatile parts of the world.[16]

Nigeria and East Africa pose particularly acute challenges. Nigeria, Africa's most populous country, will confront intense drought, desertification, and sea-level rise in the coming years. Already, approximately 1,350 square miles of Nigerian land turns to desert each year, forcing both farmers and herdsmen to abandon their homes.[17] Lagos, the largest Nigerian city, is one of the West African coastal megacities that the IPCC identifies as at risk from sea-level rise by 2015.[18] These conditions, coupled with rapid population growth projections, are likely to force significant human migration and contribute to regional political and economic turmoil.

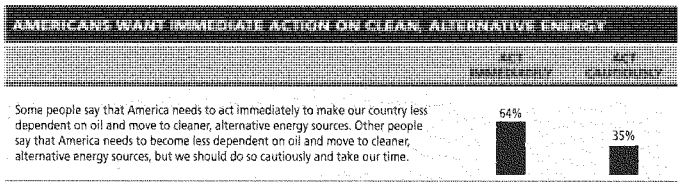
The threat of regional turmoil is higher yet in East Africa because of the concentration of weak or failing states, numerous unresolved political conflicts, and the severe effects of climate change. Climate change will likely create large fluctuations in the amount of rainfall in East Africa during the next 30 years—a 5 percent to 20 percent increase in rainfall during the winter months would cause flooding and soil erosion, while a 5 percent to 10 percent decrease in the summer months would cause severe droughts.[19] Such volatility will jeopardize the livelihoods of millions of people and the economic capacity of the region: Agriculture constitutes some 40 percent of East Africa's GDP and employs 80 percent of the population.[20]

In Darfur and elsewhere in Sudan, Ethiopia, and Kenya, water shortages have already led to the desertification of large tracts of farmland and grassland. Fierce competition between farmers and herdsmen over the remaining arable land, combined with simmering ethnic and religious tensions, helped ignite the first genocide of the 21st century.[21] This conflict has now spilled into Chad and the Central African Republic. Meanwhile, the entire Horn of Africa remains threatened by a failed Somalia and other weak states.

Beyond Africa, the IPCC warns that "coastal areas, especially heavily populated mega-delta regions in South, East and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers."[22] In South Asia, this will generate political tension as displaced people traverse the region's many contested borders and territories, such as those between Bangladesh, India, Pakistan, and China. In Bangladesh, for example, the combination of deteriorating socioeconomic conditions, radical Islamic political groups, and dire environmental insecurity brought on by climate change could prove a volatile mix, one with severe regional and potentially global consequences.[23]

Climate change will also pose a growing political and economic challenge to China, which could have significant national security implications for the United States. Unless China's pattern of energy consumption is altered, its carbon emissions will reinforce or accelerate several existing domestic environmental challenges—ranging from desertification to water shortages to unhealthy air in urban areas.

In the last few years, concerns over environmental issues have provoked tens of thousands of Chinese to demonstrate across the country. In April 2005, as many as 60,000 people rioted in Huaxi Village in Zhejiang Province over the pollution from a chemical plant, and just three months later, 15,000 people rioted for three days in the eastern fac-



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tory town of Xinchang (just 180 miles south of Shanghai) over the pollution from a pharmaceutical factory.[21] China's future—and U.S. foreign policy · will be shaped by how its leadership reacts to intensifying domestic and international pressure to address these challenges.

Oil Dependence and Energy Security Costs

The United States uses over 20 million barrels of oil a day, importing nearly 13 million of these barrels.[23] Our economy's dependence on oil, independent of whether it is domestic or imported, contributes significantly not just to global warming but also to our vulnerability to price shocks. If oil prices spike because of events in Saudi Arabia, Iran, or Venezuela, they will spike for oil pumped in West Texas or off the Louisiana coast as well as for oil pumped in an Arabian desert.

The oil market upheavals of the last 30 years (such as the 1973 Arab oil embargo) have cost the U.S. economy some $8 trillion.[26]

Then there are the economic consequences of our nation's rising dependence on imported oil. In 2006, the U.S. petroleum deficit reached $270.9 billion, an 18 percent increase over 2005, comprising 33 percent of our overall trade deficit.[27] In addition, nearly 40 percent of oil imports come from potentially hostile or unstable regimes,[28] and 92 percent of conventional oil reserves are in these nations.[29]

Oil and gas price volatility can hit low- and middle-income families and small businesses especially hard. Over 79 percent of American workers drive themselves to work, and most of these people cannot switch jobs, telecommute, or buy a new more fuel-efficient car to handle a spike in gas prices.[30] Americans with the lowest incomes spend at least 9 percent of their total income on gasoline.[31] Price volatility makes it impossible for many families to plan accurately for future expenditures.

The combination of oil imported from a number of potentially unstable countries and rising demand, especially from China, makes the prospect of future price shocks all too real. The so-called "reference projection" of the Department of Energy's Energy Information Agency for 2030 shows world oil consumption rising from 83 million barrels a day in 2004 to 118 million barrels a day in 2030, with North America and the developing nations of Asia, including China and India, accounting for the largest increases in consumption over this time period.[32]

Beyond the macroeconomic risk of price shocks, there are two other risks that flow from our reliance on imported oil. First, as noted, oil represents a large chunk of our balance of payments deficit. Second, our dependence on oil-producing countries inevitably affects the conduct of our foreign policy—both our perceived need to use military force to protect our access to overseas oil supplies and the freedom of action with which we pursue our foreign policy objectives. There is little doubt, for example, that the appetite of the international community to press Iran to forego its nuclear ambitions is tempered by the fear that if Iran withheld its oil supplies to retaliate, world oil prices could soar to well over $100 per barrel.

Building a Low-Carbon Economy

The Objective

To design policies aimed at creating a low-carbon economy, we need to understand first the extent to which global average temperatures can rise without triggering the dangerous consequences of global warming detailed in the first section of this report and, second, how low we need to keep the atmospheric concentration of greenhouse gases in order to stay within that temperature limit. Both of these questions (the temperature limit and the concentration limit) must be answered based on scientific analysis of historic climate data and projections of future conditions, and state-of-the-art computer models paint a stark picture of what is to come.

As noted, global mean temperature is about 0.8°C (1.4°F) above pre-industrial levels, and another 0.6°C (1.1°F) of further warming is probably built into the system already. Even if we cut off emissions tomorrow, the concentration of greenhouse gases in the atmosphere would continue rising since these gases persist in the atmosphere for a very long time—from decades to thousands of years after they are first emitted depending on the specific type of greenhouse gas.

The evidence is mounting for the need to maintain global average temperatures at no more than approximately 2.0°C (3.6°F) above pre-industrial levels, a level the Center for American Progress and others called for in 2005 in "Meeting the Climate Challenge," the report of the International Climate Change Task Force that was chaired by Sen. Olympia Snowe (R-ME) and U.K. Member of Parliament Stephen Byers. As John Holdren has discussed, the scientific view of an appropriate temperature target has evolved recently downward:

> Until a few years ago many analysts and groups were suggesting that stabilization of atmospheric concentrations at a level corresponding to a 3°C increase was in fact a suitable target…The last few years of accumulating evidence about impacts already being encountered at only 0.8°C above the pre-industrial average temperature, however, have led many analysts to argue for a more ambitious target, with some (including the European Union) settling on 2°C.[33]

If a temperature target in this range is not maintained, the planet faces serious risks. In a February 2007 statement to U.N. Secretary-General Ban Ki-moon, and the U.N. Commission on Sustainable Development, Holdren said:

> If the build-up of greenhouse gases pushes the global average surface temperature past 2 2.5°C above the

> pre-industrial level, the danger of intolerable and unmanageable impacts of climate change on human well-being becomes very high.[31]

Dr. James Hansen, the noted climate scientist at NASA's Goddard Institute for Space Studies, has issued similar warnings:

> We conclude that global warming of more than about 1°C, relative to 2000, will constitute "dangerous" climate change as judged from likely effects on sea level and extermination of species.[33]

The IPCC, in its Fourth Assessment Report on Mitigation of Climate Change, published in May 2007, analyzes the concentration levels that correspond to estimated increases in the global mean average temperature above pre-industrial levels. According to this analysis, keeping average temperature to an increase in the range of 2.0°C to 2.4°C would require a CO_2 equivalent concentration—or CO_2e, which is a measurement that expresses the global warming potential of all greenhouse gases compared to CO_2—in the range of 445 parts per million to 490 parts per million, a highly ambitious target.[36]

The challenge before us, then, is clear, and nothing is gained by delay. If we ignore the risks of climate change and oil dependence, or fail to mobilize the political will needed to address them, then we will ultimately be forced into a much more costly and much less effective crash program down the road. A short-sighted, business-as-usual approach to climate change will make it more difficult to cope with increased disaster-related damage in the future and force us to abandon existing infrastructure and equipment and any new physical capital we improvidently deploy without regard to global warming.

Moreover, we would incur a very large opportunity cost, having lost out on the chance to become the economic leader in developing alternative and more efficient uses of energy. Instead, we should seize the moment of challenge and opportunity now to start building the low-carbon economy.

Low-Carbon Economic Policies

To limit global temperature increase to approximately 2.0°C (3.6°F) above pre-industrial levels, we will need to put in

PROJECTED WORLD-WIDE CO_2 EMISSION INCREASES WITHOUT EMISSION CONTROLS (1990–2030, IN METRIC TONS OF CO_2)

	1990	2004	2010	2015	2030	2004–2030*
Power Generation	6,955	10,587	12,818	14,209	17,680	2.0%
Industry	4,474	4,742	5,679	6,213	7,255	1.6%
Transport	3,885	5,289	5,900	6,543	8,246	1.7%
Residential and Services**	3,353	3,297	3,573	3,815	4,298	1.0%
Other***	1,796	2,165	2,396	2,552	2,942	1.2%
Total	20,463	26,079	30,367	33,333	40,420	1.7%

* Average annual growth rate. ** Includes agriculture and public sector.
*** Includes international marine bunkers, other transformation and non-energy use.
Source: Int'l Energy Agency, *World Energy Outlook 2006*

place both a broad, economy-wide policy to limit carbon emissions and, because markets do not operate perfectly, a set of complementary policies to require emission reductions in all sectors of the economy, including such measures as performance standards, tax incentives, and targeted research, development, and demonstration, or RD&D projects. Our core emission-reduction focus should be on the transportation sector, which is powered almost entirely by oil, and the electric power sector, where over 80 percent of CO_2 emissions come from coal. Together, these sectors account for 72 percent of U.S. CO_2 emissions from energy.[37]

Economy-wide Greenhouse Gas Emissions Cap-and-Trade Program

Markets are essential to creating a low-carbon economy. Once businesses have to factor the cost of emitting CO_2 (and other greenhouse gases) into their bottom lines, the power of the marketplace will start to push toward efficiency, low-carbon fuels, renewable energy, and so-called carbon-capture-and-storage technologies for coal-fired power. Market-based pricing is a critical part of the equation but won't work to rapidly transform our economy to a low-carbon model without accompanying complementary policy mandates.

There are two ways to regulate carbon across the broad economy—through a cap-and-trade program and through a carbon tax. Both approaches can work, if designed correctly. Both are cost-effective, market-based mechanisms and both could be imposed at the same point in the supply chain, for example at the mine or refinery.

The distinct advantage of a cap-and-trade program, however, is that it provides greater certainty with respect to the objective of limiting emissions. Designing a carbon tax would require policymakers to make an educated guess about the tax rate needed to hold emissions to the desired level. And factors such as the rate of economic growth would affect how successful the tax was in meeting its objective.

In contrast, a cap-and-trade system would identify the necessary level of carbon reductions, and then allow the marketplace to price the cost of those emissions. Uncertainty about the price of carbon credits can be reduced through provisions that allow companies to borrow emissions permits from later years or "bank" permits they didn't need in a given year, giving businesses more flexibility in meeting low-carbon emission requirements. And, employment of new low- and zero-carbon technologies will help reduce the overall cost of this energy transformation.

Moreover, the cap-and-trade market model boasts a great track record in reducing acid rain. In fact, the United States actually "wrote the book" on cap and trade, creating the oldest and arguably most successful emissions trading system for sulfur dioxide under the acid rain program of the 1990 Clean Air Act Amendments, which has reduced SO_2 emissions at a fraction of anticipated costs and engendered health benefits exceeding program costs by more than 40 to 1.[38] U.S. financial markets are starting to develop nascent carbon markets, too. The voluntary Chicago Climate Exchange came online in 2003 and is currently North America's only greenhouse gas emission registry, reduction, and trading system.

Further, by adopting a market-based model for reducing greenhouse gas emissions, the United States can link up with the rapidly growing international marketplace for carbon credits. Partly for this reason, some of the world's leading banks, including Morgan Stanley, Citigroup, Lehman Brothers Holdings, Credit Suisse, and others are urging the United States and other industrialized nations to adopt cap-and-trade programs rather than enacting carbon taxes. These institutions also warn against over-allocating carbon credits—giving too many credits away for free to carbon-intensive industries rather than requiring those companies to purchase the credits on the open market. The over-allocation of carbon credits can lead to price volatility in the marketplace, as Europe has experienced over the past year and a half.[39]

Since February of 2005, when the Kyoto Protocol came into effect and set carbon caps in participating industrialized countries, carbon markets have taken off at a brisk pace, especially in Europe. In 2006, the carbon market tripled in value to reach $30 billion after the European Union Emissions Trading Scheme came online in early 2005.[40] The EU's cap-and-trade program, which includes all of its 27 member countries and accounts for roughly 45 percent of total EU CO_2 emissions,[41] experienced immediate price volatility as the European Union worked out its credit allocation parameters – a complex process that initially resulted in too many free credits (with immediate market value) being given away.

The United States can learn from these growing pains in the European carbon market in the design of our cap-and-trade system. First, auctioning 100 percent of the carbon credits will avoid windfall profits for polluting industries. Second, ensuring that the number of carbon credits available in the marketplace is linked to a strict emissions cap will help avoid carbon permit price volatility and achieve real emission reductions. And once the United States enacts its own carbon cap, without which a true trading system cannot develop, our cap-and-trade marketplace will integrate more fully into the emerging global marketplace, providing much more liquidity and allowing our highly competitive derivatives exchanges to deploy their proven trading prowess in a new and critical global marketplace for carbon credits.

There are other gains to be achieved with an internationally-linked carbon market. For instance, the demand for international carbon offsets will bring critical finance to developing countries by encouraging investment flows into their energy and environment sectors. In impoverished countries across Africa, Asia, and South America, faltering economies are put at a disadvantage today by antiquated fossil-based energy infrastructures and environmental degradation.

These problems will be exacerbated by climate change over the next 50 years. Through carefully tailored international offset provisions, a carbon market could work hand-in-hand with the U.S. international development agenda to address these problems and help build strong, resilient economies abroad.

The threshold question in constructing a cap-and-trade system is determining how tight the cap should be. We support setting the cap to limit the increase in average global temperature to approximately 2.0°C (3.6°F) above pre-industrial levels. With that objective in mind, legislation

such as that introduced by Rep. Henry Waxman (D-CA) and Sens. Barbara Boxer (D-CA) and Bernie Sanders (I-VT) would require a steadily declining cap on emissions that reaches 80 percent below 1990 levels by 2050.

The IPCC estimates that to meet a goal of keeping the average temperature increase in the range of 2.0 to 2.4°C, global emissions in 2050 would need to be between 50 percent and 85 percent lower than 2000 levels. Moreover, under the IPCC estimate, the global peak in emissions would have to occur very soon—by 2015—and then start to decline.[12]

Under a cap-and-trade plan, businesses would have to obtain permits entitling them to emit a certain quantity of CO_2 or its equivalent in other greenhouse gases. Companies unable to meet their emissions quotas could purchase permits from the federal government or on the open market from other companies which have acquired more permits than they need to account for their emissions.

We recommend auctioning all the carbon permits available under the cap-and-trade system, and allocating approximately 10 percent of the revenue to businesses operating in energy intensive sectors to compensate shareholders, employees, and communities in those sectors. More than that would lead to windfall profits, because companies would recoup most of their additional cost by passing it on to their consumers, as was observed in the first phase of the European Union Emissions Trading Scheme.[13]

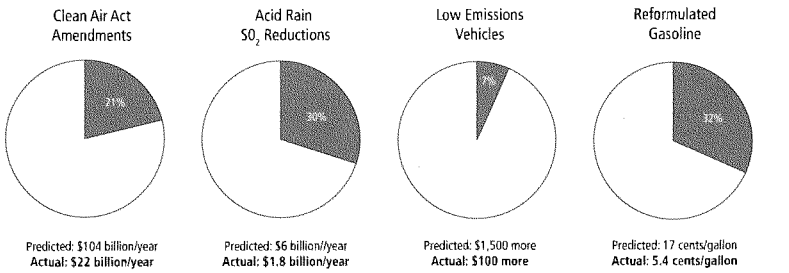
Based on studies that calculate projected auction revenue under different cap-and-trade legislative proposals, we estimate that an economy-wide cap-and-trade program would generate at least $75 billion per year, with the price of emissions permits in the near term likely to fall in the range of $10 to $15 per metric ton of CO_2e.[14] Thus, allocation of auction revenue involves a transfer of substantial wealth and must be handled wisely to ensure equitable and efficient distribution.

Consequently, we would devote half of the remaining revenues, after the initial 10 percent allocation to carbon-intensive companies, to low- and moderate-income Americans in order to help offset any energy price increases that may occur as a result of the transition to low-carbon energy sources. Distributing these revenues to low- and middle-income Americans efficiently will involve formulating ways in which to distribute revenue to all low- and middle-income Americans, including those with the lowest incomes who do not file tax returns.

Distributing these revenues would also require that the distribution system does not contain perverse incentives discouraging greater energy conservation and efficiency. Such an allocation of auction revenue will ensure that the average American consumer does not bear the brunt of paying for the transition to low-carbon energy sources.

We would then devote the other half of the revenue to spur science and technology innovation across the board and to drive our transition to a low-carbon economy by funding RD&D projects, tax incentives, and other initiatives. This entire effort would be self-financed, supported by the revenues generated by the cap-and-trade auction process and the elimination of federal tax breaks, subsidies, and other handouts to the oil and gas industry.

ACTUAL COSTS OF AIR POLLUTION REGULATION IN THE U.S. PROVED TO BE MUCH CHEAPER THAN ANTICIPATED



Source: Environmental Defense, "Air quality measures consistently cost less than predicted."

Eliminating Federal Tax Breaks and Subsidies for Oil and Gas

The federal government currently invests billions of dollars annually in tax breaks and other subsidies for oil and gas, including royalty relief, research and development subsidies, and "accounting gimmicks".[15] Given the high price of oil, oil companies are making record profits and do not need this government assistance. It is time to shift this federal investment—more than $6 billion per year—away from high-carbon dirty sources of energy and towards the clean energy necessary to power a low-carbon economy. Redirecting this investment towards policies to promote low-carbon energy alternatives will help the transform our economy and capture the energy opportunity this transformation provides.

The Costs of Mitigation

The doubters have long said that we cannot afford to tackle climate change, but the truth is we cannot afford not to. There will certainly be real costs involved in shifting to a low-carbon economy, but those costs should be altogether manageable. The price of gasoline and electricity will rise in the near term as the result of an economy-wide cap-and-trade program—putting a price on carbon is, after all, a key device for driving businesses and consumers toward greater efficiency and the use of low-carbon energy.

But the overall economics of transitioning to a low-carbon future are quite promising. As the Stern Review reports, "Tackling climate change is the pro-growth strategy for the longer term, and it can be done in a way that does not cap the aspirations for growth of rich or poor countries. The earlier effective action is taken, the less costly it will be."[16]

First, take a look at some relevant numbers from recent reports. For instance, The Stern Review estimates that a robust set of policies aimed at holding greenhouse gas concentrations to around 550

parts per million of CO_2e are likely to cost about 1 percent of global GDP per year by 2050. But the Review also makes clear that the economic costs of failing to act are likely to be many times higher.

Focusing in on the U.S. economy, the Energy Information Administration performed an analysis of legislation introduced by Sens. Joseph Lieberman (I-CT) and John McCain (R-AZ). S. 280, which calls for an economy-wide cap-and-trade program with gradually tightening caps so that, by 2050, emissions would be one-third of year 2000 levels. This analysis found that, under S. 280, GDP would be 0.3 percent to 0.5 percent lower than it otherwise would have been in 2030, or approximately 0.02 percentage points lower per year.[17]

The Environmental Protection Agency also recently published detailed results based on modeling the impact of the Lieberman-McCain bill. EPA estimates that overall U.S. emissions under S. 280, including both sources covered by the bill and those that were not, would be 44 percent lower than EPA's business-as-usual reference case in 2050.[18]

EPA considered a number of scenarios, making different assumptions about such variables as: the availability of domestic offsets and international credits; the extent of reductions by other countries, both developed and developing; and the extent to which carbon-capture-and-storage and nuclear technologies are available. Different assumptions about these variables obviously affect projected costs, but the base case EPA considered—its so-called S. 280 scenario—provides a useful indicator.[19] EPA used two economy-wide "general equilibrium" models to estimate the cost of carbon credits, the cost of gas and electricity prices, and the cost to GDP growth under its business-as-usual and S. 280 scenarios:[20]

- Carbon credits. One of the models shows carbon credit prices per ton of CO_2e at $13 in 2015, moving up to $27 in 2030 and $70 in 2050; the other model shows prices for the same years were $15, $32, $85.

- Gas and electricity prices. The models indicate that electricity prices would be 22 percent higher in 2030 and 25 percent higher in 2050 than in the business-as-usual case. The models indicate that gas prices would be about 26 cents a gallon more in 2030 than in the business-as-usual case.

- GDP. In the business-as-usual case, GDP is projected to increase 112 percent between 2005 and 2030, and 238 percent between 2005 and 2050. Under the S. 280 scenario, GDP is projected to be between 0.6 percent ($146 billion) and 1.6 percent ($419 billion) lower in 2030, and between 1.1 percent ($457 billion) and 3.2 percent ($1,332 billion) lower in 2050. What this means is that, in the worst case, GDP in 2030 would be 110.4 percent higher than 2005 rather than 112 percent and that GDP in 2050 would be 234.8 percent higher than 2005 rather than 238 percent higher.

Understood this way, it is hard to argue that we can't afford to do what it takes to avoid the serious and potentially catastrophic risks of climate change. These and other studies suggest that the cost of making the large changes needed to shift to a low-carbon economy is moderate.

But the news on cost is actually better than that for several reasons. First, studies like this do not account for complementary policies beyond the basic cap-and-trade

program itself. If supporting policies are implemented simultaneously, the modest negative economic effects are reduced or eliminated. As noted, for example, we would commit half the revenues derived from auctioning carbon credits under a cap-and-trade system to offset increases in energy prices as a result of the transition to a low-carbon economy for low- and moderate-income families.

In addition, the federal government should support "green collar" training to help supply displaced workers with the specialized skills needed to install, operate, and maintain new clean technology.

Beyond such direct assistance, supporting policies are likely to have positive effects on income growth in the longer term. For example, projections for job growth under a renewable electricity standard are sizeable.[51]

Greater efficiency and increased availability of alternative, low-carbon fuels and electricity are also likely to reduce the growth of energy prices over time. And the savings for consumers from efficiency and lower energy prices tend to be sufficient to defray the costs of the initial investments. For example, according to the Union of Concerned Scientists, higher vehicle mileage standards would result in more efficient engine technology, and these efficiency gains could provide consumers enough fuel savings to cover the higher costs of the new technology over the life of a car.[52]

Second, analyses such as those conducted by Energy Information Agency and EPA do not consider the supplemental benefits of reducing emissions. Those benefits are likely to include reduced health care costs and fewer sick days for employees due to respiratory illnesses linked to pollution. Economic benefits would also arise from avoiding the catastrophic and incremental costs of climate change, such as those analyzed in the Stern Report, and from growth in domestic low-carbon energy, fuel, and manufacturing sectors.

Finally, the example of the United States' first emissions trading system—to control acid rain—demonstrated that once the right rules were put in place, the results were better and the costs lower than anyone had predicted. Specifically, the annual cost of reducing sulfur dioxide only reached one-third to one-half of what was projected in 1990 by EPA and the Edison Electric Institute.[53] If we can get the right rules, complementary policies, and leadership in place, there is every reason to believe that American ingenuity and hard work will leave the model results in the dust.

Complementary Low-Carbon Economic Policies

Some economists argue that if we set the right price in a cap-and-trade system (or through a carbon tax), then we could dispense with a wide range of complementary policies such as vehicle fuel economy standards and emission performance standards for all new coal power facilities, since price signals are more economically efficient. That argument may be right in theory, but it is flawed in practice.

Because the energy component of overall cost is often not that high, the carbon price signal required to spur many of the changes we need—whether rapid market penetration of hybrid cars, the purchase of highly efficient appliances, or the development of a workable carbon-cap-

ture-and-storage system for our coal-fired power plants, would be too high as a matter of political reality. That's why we need an energy program that puts a price on carbon and then is accompanied by other complementary environmental and economic policies.

Transportation

To create a low-carbon transportation sector, we need to do three big things, and we need to do them simultaneously and in tandem with the introduction of a carbon cap-and-trade program. We must rapidly increase the fuel economy of our fleet of vehicles. We must push the development of low-carbon, alternative fuels alongside the requisite refueling infrastructure. And we must improve our public transportation infrastructure and city planning to reduce the number of miles we drive.

Highly efficient hybrid cars are becoming well-established and increasingly popular in the United States. J.D. Power and Associates estimates that in the first six months of 2007, hybrid vehicles accounted for 2.3 percent of all new vehicle sales, and projects that by the end of 2007, sales of hybrids will be up 36 percent over sales in 2006 (a record 256,000 hybrids were sold in 2006).[51] Transportation policy should now be aimed at delivering the right incentives to more consumers and especially to our domestic manufacturers in order to increase dramatically the penetration of these and other fuel-efficient vehicles in the U.S. fleet. Even more significant gains in creating a low-carbon fleet of vehicles will come as the next generation of hybrid cars, so-called plug-in hybrids, becomes widely available. Robust government incentives should be deployed to hurry these clean cars onto our roads and highways.

Clean fuels also offer great potential to reduce carbon. Here federal policy should require the rapid increase in the production and market availability of such fuels through both government mandates and intensive government-funded R&D needed to move our clean fuel mix from mostly corn-based to mostly cellulosic biofuels, which would vastly increase our biofuel stock. At the same time, we need to encourage through our transport policy the development of the service station infrastructure required to make alternative low-carbon fuels widely available.

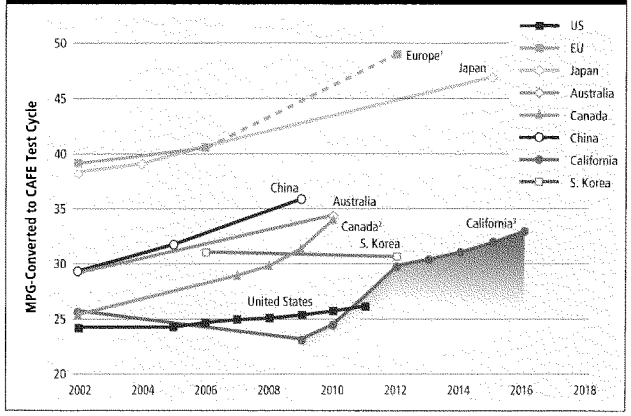
In addition, we must reduce the miles we travel in vehicles through smart transportation and land-use policy that seeks to improve accessibility and increase consumer choice in housing to reduce commuting miles, reduce congestion, and provide new, expanded transit, bus, and rail facilities, both intra- and inter-city.

Together, these steps will increase the number of low-carbon transportation choices available to Americans, reduce our dependence on oil, dramatically cut greenhouse gas emissions and other associated pollutants from this sector, invigorate the creation of new green transportation jobs, and strengthen the competitiveness of U.S. auto manufacturers in the global marketplace. But these critical environmental and economic gains will not happen unless the detailed transportation policies outlined below become part and parcel of overall U.S. low-carbon economic policy.

Increasing Vehicle Fuel Economy

The potential to reduce transportation emissions is large, precisely because the

ACTUAL AND PROJECTED FUEL ECONOMY FOR NEW PASSENGER VEHICLES BY COUNTRY, 2002–2018



Source: International Council on Clean Transportation, *Passenger Vehicle Greenhouse Gas and Fuel Economy Standards: A Global Update*, July 2007.

1 The relative stringency of Europe's CO_2-based standards is enhanced under a fuel economy standard because diesel vehicles achieve a boost in fuel economy ratings due to the higher energy content of diesel fuel.

2 For Canada, the program includes in-use vehicles. The resulting uncertainty of this impact on new vehicle emissions was not qualified.

3 Shaded areas under the California trend line represents the uncertain amount of non-fuel economy related GHG reductions (N_2O, CH_4, HFCs, and upstream emissions related to fuel production) that manufacturers will generate from measures such as low-leak, high efficiency air conditioners, alternative fuel vehicles, and plug-in hybrid electric vehicles.

U.S. auto industry has so scandalously underperformed in the past 20 years. In the aftermath of the 1973 to 1974 Arab oil embargo, Corporate Average Fuel Economy, or CAFE, standards were established to reduce U.S. oil consumption. Although our automakers warned of the dire economic impact of CAFE standards, they succeeded in substantially improving the efficiency of the entire motor vehicle fleet (including passenger vehicles and light trucks). These actions helped reduce U.S. oil consumption by 17 percent from 1977 to 1985, even as GDP grew over those years by 27 percent.[35]

By model-year 1985, new passenger vehicles and light trucks were required to meet fuel efficiency standards of 27.5 miles per gallon and 19.5 mpg, respectively.[36] But as fuel prices began falling after 1984, consumers became less interested in fuel economy and automakers started turning their focus from passenger vehicles to light-duty trucks, including minivans and, especially, sport utility vehicles. This undermined overall fuel economy, given the lower standard for light trucks.

Moreover, vehicles heavier than 8,500 pounds were exempted from CAFE standards altogether. And making matters worse, the government, under pressure from the auto industry, found itself unable to agree on any further increases in fuel economy standards, facilitating Detroit's love affair with the

2007 AUTO MANUFACTURER PROFITS ($ MILLIONS)	
U.S.	
General Motors	-1,978.00
Ford	-12,613.00
Daimler Chrysler	[illegible]
JAPANESE	
Toyota	[illegible]
Nissan	[illegible]
Honda	[illegible]
EUROPEAN	
Volkswagen	[illegible]
Volvo	2,205.50
Fiat	1,336.20
BMW	[illegible]
2007 PROFIT RANKING (HIGHEST TO LOWEST)	
Toyota Motor (Japan)	[illegible]
Honda (Japan)	[illegible]
Daimler Chrysler (U.S.)	[illegible]
Nissan (Japan)	[illegible]
BMW (Europe)	[illegible]
Volkswagen (Europe)	[illegible]
Volvo (Europe)	2,205.50
Fiat (Europe)	1,336.20
General Motors (U.S.)	-1,978.00
Ford Motor (U.S.)	-12,613.00

Source: FORTUNE Global 500 Revenue/Profit listings: http://money.cnn.com/magazines/fortune/global500/2007/full_list/index.html. Auto industry alone: http://money.cnn.com/magazines/fortune/global500/2007/industries/19/1.html

SUV. By 2005, light trucks (including SUVs) accounted for 52 percent of all motor vehicles sold in the United States, a huge increase from their 26 percent market share in 1985.[57]

Since then, CAFE standards for passenger vehicles have not changed, and light truck CAFE standards have increased a mere 2.7 mpg over the last 22 years.[58] Fleet-wide fuel efficiency actually dropped from 25.4 mpg in 1985 to a low of 24.5 mpg in 1999 and 2001.[59] It rebounded a bit in 2005 and 2006 to 25.4 mpg as a result of non-mandated fuel-efficiency improvements, especially in passenger vehicles.

The experience in the rest of the world makes it clear that the technology currently exists to vastly improve the efficiency of our cars, trucks, and SUVs. A recent comparison of passenger-vehicle fuel efficiency around the world found that, in 2006, Europe and Japan led the world with passenger vehicle fuel efficiencies of about 40 mpg while the United States came in last at below 25 mpg.[60]

Competitively, the U.S. auto industry finds itself in difficult straits. It made a bad long-term bet by ignoring fuel efficiency and held onto that bet too long, allowing its competitors in Japan to steal the march on developing and producing highly

efficient hybrid cars, whose market share is rising rapidly. Beginning in 1999, when fuel prices started to climb, U.S. automakers increasingly found it more difficult to sell the high numbers of profitable light trucks that were so important to their bottom lines, leading to significant job losses amid lackluster efforts by senior management to roll out more fuel-efficient cars Americans would want to buy. While high fuel prices and an excessive reliance on light trucks are not the only causes of Detroit's current difficulties, they are clearly significant contributors.[61]

With oil prices projected to remain high, U.S. automakers face a fundamental policy decision with regard to fuel economy. Either they can continue to lobby against fuel economy increases and, even if successful, watch their market share, profits, and jobs dwindle as consumers vote with their feet by purchasing cars that save them money at the pump. Or they can accept higher fuel economy standards and embrace the challenge of competing in the fuel-efficient market, seeking government help to develop the manufacturing capacity they need. The choice should be clear.

For policymakers, the choice should also be clear. We need to implement an aggressive program to revise and ramp up fuel economy standards to save jobs, increase consumer savings, lower our oil consumption, and possibly reduce the U.S. current account deficit. Smart policies that link mandated increases in fuel efficiency with manufacturer and consumer incentives will help Detroit build the production capacity it needs to compete and stimulate consumer purchases of highly fuel-efficient cars.

Fuel Economy Standards

First, we support increasing our nation's fleet-wide vehicle efficiency to 40 mpg by 2020 and at least 55 mpg by 2030.

Corporate Average Fuel Economy Standards

We must vastly improve the fuel efficiency of our nation's vehicle fleet

The U.S. government currently employs separate fuel economy standards for two different vehicle classes: passenger vehicles (27.5 mpg) and light trucks including SUVs less than 8,500 pounds (22.2 mpg). This two-standard system led to a fleet-wide fuel economy of 25.4 mpg in 2006.

We can do much better than 25 mpg. In fact, we should increase our nation's fleet-wide vehicle efficiency to 40 mpg by 2020, with continued improvements to reach at least 55 mpg by 2030. A 2005 Union of Concerned Scientists memo to the National Highway Traffic Safety Administration found that a fleet average fuel economy of 40 mpg is achievable within 10 years, even when only using existing (non-hybrid, gasoline) technologies.[62] Imagine what is possible using more advanced technologies such as plug-in hybrid vehicles—for example, the Chevy Volt will reach the marketplace in 2010 and could achieve 150 mpg.

In addition, the Union of Concerned Scientists has also recommended ways in which to close existing CAFE standard "loopholes," which decrease the overall efficiency of our vehicle fleet.[63] SUVs and minivans should be classified as passenger vehicles rather than light trucks. Fuel economy standards should be applied to vehicles over 8,500 pounds. Tax deductions for business purchases of luxury SUVs weighing over 6,000 lbs should be eliminated. And alternative fuel CAFE credits, so-called "dual-fuel" credits, should be tied to actual low-carbon alternative fuel usage rather than the mere ability to run on alternative fuels as well as traditional gasoline.

Increasing the efficiency of our vehicle fleet will not only dramatically reduce our consumption of oil and greenhouse gas emissions, but will also create jobs and save consumers money—more efficient vehicles could save their owners a net of more than $2,000 over the life of the vehicle.[64]

Establishing a fleet-wide fuel-efficiency standard would ensure that every vehicle on the road is contributing to a low-carbon economy. Such a fleet-wide average would be overseen by the National Highway Traffic Safety Administration, which would translate the mandated fleet-wide average into different corporate standards for U.S. auto manufacturers based on their current vehicle production fleet.

One current component of the CAFE system that should be preserved is a rule that requires manufacturers to separately average the fuel economy of their imported and domestically produced fleets to meet CAFE standards. This rule has ensured that the production of smaller, more fuel-efficient vehicles and advanced technology vehicles has remained in the United States. Without this measure, it is likely that a number of domestic plants manufacturing more efficient vehicles would be closed and the jobs moved off shore to cut labor costs. We should ensure that our system for guaranteeing greater fuel economy remains sensitive to the need to preserve a strong domestic manufacturing base in next-generation automotive technology.

Increasing vehicle fuel efficiency will sharply cut emissions while saving jobs. According to a report by the Union of Concerned Scientists, raising fleet-wide fuel efficiency to 35 miles per gallon in 2018 (based on a bill introduced by Rep. Edward Markey (D-MA)) would cut oil consumption by up to 1.6 million barrels per day (more than we currently import from Saudi Arabia) and reduce CO_2 emissions 260 million metric tons per year, akin to taking nearly 40 million of today's average cars and trucks off the road in 2020. Such increases would also save as many as 241,000 jobs, and save consumers $37 billion after accounting for the expenditures on new technology in the year 2020.[65]

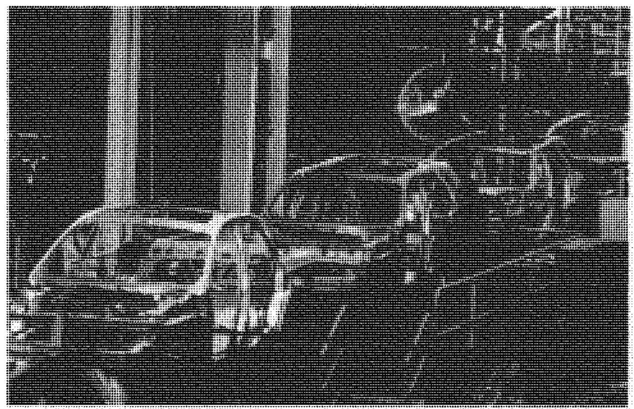
Feebates

We should also establish a feebate program for all new passenger vehicles sold in the United States. Feebates levy a surcharge on fuel-inefficient vehicles and allocate the money toward incentives or rebates for more efficient vehicles from the same class. They are a revenue-neutral means to spur the purchase of more efficient vehicles.

Manufacturer retooling incentives

Building a low-carbon transportation sector can and will make our domestic auto industry stronger and more competitive with the industry's more fuel-efficient Japanese and European rivals (See table, page 27). The University of Michigan Transportation Research Institute estimates that at gasoline prices between $2.00 and $3.10 per gallon, the profits of domestic automakers would rise considerably if they substantially increased the fuel economy of their cars.

Because a strong manufacturing economy has been a bedrock of the American middle class for generations, we should provide a variety of manufacturer incentives to give U.S. companies the capital they need to retool their production lines and become more globally competitive. This will become increasingly important in coming years, as the market for automobiles booms in countries such as China and India. Indeed, China already has higher fuel economy standards than the United States. If we hope to serve these growing global markets, we must begin immediately to retool our production.



The federal government should provide financial support for U.S. auto manufacturers to invest in new, more efficient vehicle technologies and vehicle assembly infrastructure. (AP Photo/Carlos Osorio)

The government should provide strong financial incentives and support for U.S. automakers manufacturing in the United States to invest in new, more efficient vehicle technologies and vehicle assembly infrastructure. Specifically, we need to create a federal revolving loan fund for manufacturer investments in efficiency or a facilities conversion investment tax credit.

In 2004, the University of Michigan Transportation Research Institute estimated that a facilities conversion investment tax credit of 67 percent to spur production of highly fuel-efficient vehicles in the United States would cost just under $1.1 billion from 2005 to 2009, and lead to switching half of all power trains and 25 percent of vehicle imports to U.S. production. Such a shift could provide the Treasury with over $7 billion in new tax revenues and preserve 59,500 jobs that would otherwise be lost over a 10 year period.[66]

Health Care for Hybrids

Because the private sector provides the bulk of health insurance in the United States, U.S. companies, and especially auto manufacturers, bear a large financial burden not shared by foreign competitors. In fact, U.S. car companies in recent years have spent more money on health care than they have on steel. Current labor negotiations are now resulting in the creation of private health care trust funds called Voluntary Employee Beneficiary Associations, which will help reduce the long-term cost of employee health care at the Big Three automakers. Yet U.S. companies still remain at a competitive disadvantage with foreign producers because of the magnitude of health care and legacy cost burdens, which divert significant capital away from new technology investments.

To boost production of more fuel-efficient vehicles, including but not limited

to hybrids, the federal government could offer relief for legacy health care costs and improved certainty in the long term stability of benefits for retirees — provided that the auto industry reinvests a large share of their financial savings in energy-efficient technology. Such a "Health Care for Hybrids" plan would free up capital for automakers to retool their R&D operations, their automotive designs and their assembly lines to produce highly efficient vehicles like hybrid cars and advanced diesels. The gains for the overall U.S. economy would be huge. We would burn over 1 million barrels of oil a day *fewer* in our automobiles while improving the competitiveness of the U.S. auto industry and the security of American workers.[67]

Fuel Efficiency Tax Credits

Tax credits for purchasing hybrid or other highly efficient vehicles can play an important role in rapidly transforming our nation's vehicles into a more efficient fleet. To encourage purchase of hybrid vehicles, current law provides a tax credit ranging between $250 and $3,400, depending on hybrid vehicle weight, technology, and fuel economy, with more fuel-efficient hybrids receiving higher tax credits.[68] This law should be strengthened in three ways. First, to make the most fuel-efficient vehicles more affordable, the tax credit should be increased to $4,000 per vehicle—the amount now available for vehicles powered by compressed natural gas—and this tax credit should be made refundable.

Second, the tax credit should be made available for the most fuel-efficient vehicles, regardless of vehicle technology. Some of the vehicles that qualify for the current hybrid tax credit are actually not very fuel efficient—the Chevy Silverado hybrid, for example—while others, such as the Ford Escape hybrid and the Toyota Prius, boast meaningful fuel-efficiency capabilities.

Third, the fuel efficiency tax credit should not phase out once a manufacturer has sold 60,000 eligible units, as is now the case with the hybrid tax credit. Under current policy, the credit is reduced 50 percent beginning in the second calendar quarter after the 60,000 limit is reached, reduced again to 25 percent of the initial credit in the fourth calendar quarter, and eventually terminates in the sixth calendar quarter after the limit is reached.

Toyota has already hit this ceiling due to the popularity of its hybrid Prius, which gets up to 60 mpg. Because of the current policy, Americans who chose to purchase a new Prius between April 1 and September 30, 2007, received a tax credit of only $787 compared with the $3,150 credit available before Toyota reached the 60,000 vehicle limit. This limit is an obstacle to achieving higher market penetration for the most efficient vehicles.

Incentives for Advanced Plug-In Hybrids

Plug-in hybrid vehicles hold particular promise for increasing vehicle efficiency, increasing the use of electricity to power our automobile fleet, and acting as a type of networked electricity storage system for our nation's larger power grid, by charging at night when the demand for power is lower and providing power back into the grid during peak power demand. New batteries are capable of powering a vehicle 20 miles to 60 miles on a single electric charge. Since a great many trips on America's roads are 25 miles a day or less, a plug-in with a minimum 25-mile battery range could

completely eliminate gasoline use in the daily commute of millions of Americans. A plug-in hybrid able to drive 20 miles on a single charge would get the equivalent of about 70 mpg on average; a plug-in capable of a 40-mile drive on a single charge would get the equivalent of about 134 mpg.[69]

Moreover, the cost of these "electric gallons" is dramatically less than the cost of actual gasoline. At an average cost of 9 cents per kilowatt-hour and on the assumption that the U.S. average fleet-wide fuel economy is 25 mpg, an "electric gallon" costs 75 cents compared with current average gasoline prices of approximately $3.00 per gallon.[70] Since plug-in vehicles are often charged at night when electricity rates are cheaper, the cost of an "electric gallon" of gas can be even less expensive.

Our electricity system could readily handle a large-scale addition of plug-in hybrids across the country. Overall electricity demand has been estimated to increase only 4 percent to 7 percent even if plug-ins made up half the fleet.[71] And because most cars would be recharged at night, consumers would be taking advantage of a large surplus of "off-peak" excess electric capacity in the grid that is cheaper than "peak-load" energy. The Pacific Northwest National Laboratory reports that idle capacity in the existing electric power grid could charge 84 percent of the 198 million-strong U.S. light-vehicle fleet if these vehicles were plug-in hybrid-electric vehicles.[72]

What's more, there are nationwide low-carbon gains because the production of electricity is more efficient than internal combustion, which in turn means that a plug-in hybrid produces fewer emissions than a gasoline-powered vehicle even if the electricity comes from coal. When the electricity is produced using low- or zero-carbon sources such as wind or solar, the CO_2 savings are even greater.

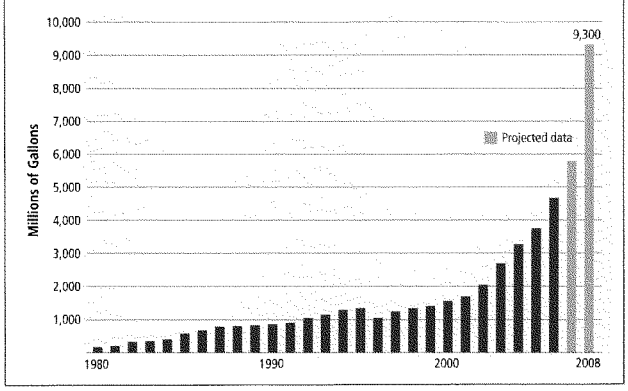
Spurring demand for plug-in hybrid vehicles will also give battery and vehicle manufacturers the market stability necessary for them to make investments in increased production capacity, which will ultimately facilitate economies of scale that will bring down the cost of the batteries needed to power plug-in hybrids and thus lower the retail cost of the vehicles for consumers. The Chevrolet Volt, a flex fuel plug-in hybrid, is predicted to reach the market in 2010. We recommend a refundable federal tax credit of $8,000 to purchasers of the first million plug-in hybrids to dramatically accelerate the production of these vehicles by all of our automakers.[73]

Additionally, plug-in hybrid vehicles would benefit enormously from our proposed feebate system. The reason: Revenue from feebates levied on gas guzzlers would be available in the form of rebates for consumers purchasing new plug-in hybrids, which initially will sport higher sticker prices because of the higher production costs of advanced battery technologies.

Increasing Production and Market Availability of Alternative Low-Carbon Fuels

Increasing our nation's use of low-carbon bio-based fuels, such as E85 (a mix of 85 percent ethanol and 15 percent gasoline), will play a large role in cutting greenhouse gas emissions and our consumption of oil. There are already 4.3 million flexible fuel vehicles on the road that can run on E85.[74] The number

HISTORIC U.S. FUEL ETHANOL PRODUCTION



Source: U.S. Energy Information Administration/Renewable Fuels Association; U.S. Department of Agriculture.

of vehicles that can run on E85 and other low-carbon alternative fuels, including electricity, should grow rapidly, which will require sustained federal support.

Brazil is a test case for what can be accomplished through the use of biofuels, the rapid introduction of FFVs, and the associated refueling infrastructure needed to create a marketplace for these vehicles. Brazil now relies on sugar-based ethanol for 40 percent of its transportation fuel.[75] In 2004, only 30 percent of its new car sales were FFVs.[76] Through the use of smart tax incentives, mandates for government vehicles, investments in distribution infrastructure, and sugar subsidies, Brazil transformed its auto fleet so that, by the end of 2005, 71 percent of its total vehicle sales were FFVs.[77]

The key for the United States to meet aggressive biofuel goals is to move from corn-based biofuels to cellulosic biofuels, the latter of which is produced from agricultural plant waste, such as rice straw or corn stover, or dedicated crops such as switchgrass, a fast-growing, drought-resistant perennial grass, or algae. Cellulosic feedstocks can potentially provide much greater quantities of biofuel with lower "lifecycle" CO_2 emissions—meaning the amount of CO_2 emitted during the production and transportation of the biofuel as well as during its use in automobiles—than corn-based ethanol. In addition, diversified sources of cellulosic ethanol would compete with corn-based ethanol in the marketplace, helping to stabilize the cost of corn as a key source of food and feed. Two early generation cellulosic ethanol plants are currently under construction in Georgia[78] and Louisiana,[79] signaling that this technology is making strides.

A recent University of Minnesota study suggests that mixed grasses grown on marginal land without fertilizers or pesticides would produce 51 percent more en-

LOWER CARBON BIOFUEL ALTERNATIVES COMPARED TO GASOLINE

	GASOLINE	BIODIESEL	CORN-DERIVED ETHANOL	CELLULOSIC ETHANOL
	BAD	GOOD	TRANSITIONAL	POTENTIALLY GREAT
Description	A non-renewable fossil fuel produced by refining crude oil; emits large quantities of CO_2 upon combustion.	A renewable alternative to petroleum diesel produced from animal fat or vegetable oil.	The main source of ethanol in the U.S. But growing corn is energy-intensive and requires large amounts of fertilizer made with fossil fuel.	Production results in the same ethanol that corn produces, but the feedstocks, especially switchgrass, are inexpensive and easy to grow and the process of refining them is environmentally friendly.
Net Energy Balance *	n/a	3.20	1.34	2.62
Reduction in Greenhouse Gas Emissions	None (1 gallon produces 19 lbs of CO_2)	67.7%	21.8%	91%
Cost (per gallon)	$3.10	$2.90 average	$2.55 (E85)	$2.55 (E85)
Gallons/Acre	n/a	Varies by feedstock Rapeseed: 127	328	Varies by feedstock Switchgrass: 1000
Current U.S. Production (gallons/year)	79 billion	75 million	4.9 billion	(no current production at commercial scale)
Availability	114,974 stations	1,485 stations	1,133 (E85)	1,133 (E85)

ergy per acre than corn grown on fertile land.[80] And fewer greenhouse gases are emitted during the cultivation of dedicated energy crops for cellulosic biofuel production because less petroleum-based fuel is used than in the cultivation of traditional crops.

Moreover, dedicated energy crops themselves can absorb CO_2 emissions through photosynthesis; perennial grasses can absorb 14 times the CO_2 that they produce after a decade of growth.[81] Additionally, a portion of the waste products generated during the production of the biofuel can become the biomass fuel needed to power biorefineries, further reducing emissions compared with coal-based power generation.

Nor is ethanol the only renewable biofuel. Biodiesel, produced from agricultural crops such as soybeans as well as waste cooking oils, currently comprises less than 1 percent of the transportation fuel consumed by Americans,[82] but it has the great advantage of requiring virtually no modifications to our automotive technology or fueling infrastructure to be used. A different experimental fuel, biobutanol, is attractive because it has an energy content almost as high as gasoline (ethanol contains only 67 percent of the energy content of gasoline per unit volume[83]) and because, unlike ethanol, biobutanol can be transported through the same fuel pipeline distribution infrastructure that currently transports gasoline.

The increased production and consumption of biofuels will provide a boon to our rural economy. Revenue earned from selling energy biomass and saved from not having to dispose of agricultural residue will remain in local rural communities. And rural bio-refineries will provide jobs in plant construction, operations, and maintenance.

The Renewable Fuels Association reports that in 2005, the ethanol industry created over 150,000 U.S. jobs, increasing household income by $5.7 billion and contributing about $3.5 billion in tax revenues at the local, state, and federal levels.[84] Given new goals to vastly increase renewable alternative fuel production over 2005 levels, these job and income numbers are likely to rise dramatically.

Biofuels and other types of bio-based energy will not solve all of the world's energy challenges. Nonetheless, as the recent increase in bioenergy investment worldwide suggests, in appropriate regions and with effective regulatory safeguards, bioenergy has a direct role to play in diversifying energy sources and contributing to economic growth and development, particularly in rural communities in both the developed and developing worlds.

As mentioned earlier (see page 31), advances in plug-in electric-hybrid vehicle technology point to electricity as another increasingly viable low-carbon alternative fuel. Our electricity system could readily handle a large-scale addition of plug-in hybrids to the fleet.

Finally, the development of hydrogen as an alternative fuel is also gaining ground, thanks in large degree to the major emphasis the Bush administration has placed on this technology. The use of hydrogen fuel cells as distributed sources of energy to power buildings and military installations is becoming more common. However, although hydrogen-powered vehicles are under development by a number of domestic and international auto manufacturers as well as the U.S. military, they currently are less efficient on a lifecycle basis than hybrid vehicles and are too expensive for commercial sales.[85] The majority of hydrogen produced today is made using fossil fuels, such as natural gas.[86] So, although the tailpipe emissions of a hydrogen vehicle consist of water vapor rather than CO_2, the lifecycle greenhouse gas emissions still remain large. Research into low-carbon means of producing hydrogen, such as through the use of solar energy to split water remains promising and should continue.

To boost low-carbon, alternative fuels, we should take the following steps:

Alternative Fuel Standard

First, we should significantly ramp up U.S. production of alternative low-carbon fuels with an aggressive alternative fuel standard: low-carbon, alternative fuels, including electricity, should supply 25 percent of our transportation fuels by 2025. Current legislative efforts are a good start but do not go far enough to ensure necessary quantities of sustainably produced alternative low-carbon fuels. Renewable fuel standards such as those recently called for by President Bush and the U.S. Senate focus on increasing the volume of domestic biofuel production. The president called for 35 billion gallons per year of renewable and alternative fuels by 2017 in his 2007 State of the Union Address. The recently passed Senate Energy Bill requires an increase in renewable and alternative fuel production to 36 billion gallons per year by 2022, with two-thirds of this volume produced from something other than corn.

But according to an Energy Information Agency reference-case projection, the Senate's 36 billion gallon renewable fuel mandate would be equivalent to only 13 percent of fuel consumption in 2025. EIA's projection, however, assumes very

WHAT DOES IT DO?	ENVIRONMENTAL BENEFITS	ECONOMIC/JOB BENEFITS
ECONOMY-WIDE GREENHOUSE GAS EMISSIONS CAP-AND-TRADE PROGRAM		
• Cap U.S. greenhouse gas emissions to achieve an 80% reduction in emissions by 2050. • Auction 100% of carbon permits	• Works to stabilize global average temperatures at no more than 3.6 degrees F above pre-industrial temperatures, avoiding the worst projected impacts of global warming.	• Generates at least $75 billion annually in auction revenue, for the first 10 years of the program. • Stimulates investment in RD&D, consumption of low-carbon technologies, and creates green jobs. • Helps offset energy costs for low- and middle-income Americans during the transition to a low-carbon economy.
ELIMINATE FEDERAL TAX BREAKS AND SUBSIDIES FOR OIL AND GAS		
• Eliminate tax breaks, royalty relief, research and development subsidies, and accounting "gimmicks" for the oil and gas industry.	• Shifts federal investment in oil and gas toward low-carbon energy alternatives.	• Generates more than $6 billion annually over 10 years for investment in the low-carbon policies described below.
TRANSPORTATION		
Increasing Vehicle Fuel Economy		
• Mandate an increase our nation's fleet-wide fuel efficiency to 40 mpg by 2020, and at least 55 mpg by 2030. • Establish a feebate program for all new passenger vehicles sold in the U.S.to levy a surcharge on fuel inefficient vehicles and allocate the money towards incentives or rebates for more efficient vehicles in the same class. • Provide manufacturer retooling incentives to support the production more fuel efficient vehicles. • Establish a "Healthcare for Hybrids" program where the federal government offers relief for legacy health care costs in return for auto industry investment in and production of more fuel-efficient vehicles. • Establish federal fuel efficiency tax credit of $4,000 per vehicle for the most fuel efficient vehicles, regardless of vehicle technology. • Create a refundable federal $8,000 tax credit to purchasers of the first 1 million plug-in electric hybrid vehicles.	• Cuts gasoline consumption and reduces tailpipe CO_2 emissions by driving the marketplace towards more fuel efficient vehicles. • Reduces greenhouse gas emissions through adoption of plug-in hybrid vehicle technology because production of electricity is more efficient than internal combustion, even if the electricity is produced by dirty coal.	• Drives consumer demand for more fuel efficient vehicles. • Creates more low-carbon technology auto manufacturing jobs. • Improves the competitiveness of U.S. auto industry in the global marketplace and improves the security of American workers.
Increasing Production and Availability of Alternative Low-Carbon Fuels		
• Establish an Alternative Fuel Standard to require low-carbon alternative fuels (including electricity) supply 25% of our transportation fuels by 2025. • Update the Volumetric Ethanol Excise Tax Credit (VEETC) by making it a variable credit, based on the price of oil. • Establish a Low-Carbon Fuel Standard to reduce the lifecycle emissions from transportation fuels by 10% by 2020 to ensure investment in alternative fuels serves both to enhance energy independence and combat global warming. • Establish a Renewable Fuels Certification Program to ensure the sustainable production of these fuels though a transparent certification and labeling program. • Mandate that 15% of fuel "pumps" (including dedicated electricity charging stations for plug-in electric hybrid vehicles) provide low-carbon alternative fuels in any county in the U.S. where 15% of vehicles can run on these alternative fuels.	• Spurs investment in low-carbon alternative fuels, reducing gasoline consumption and reducing greenhouse gas emissions. • Helps avoid sharp increases in food and feed prices. • Ensures sustainable biofuel production methods that maximize lifecycle greenhouse gas reductions, conserve land and water resources, maintain biodiversity, and avoid the introduction of invasive species.	• Helps ensure stable a stable marketplace and supply of low-carbon alternative fuels. • Creates more jobs in the low-carbon fuel industry.
Investing Low-Carbon Transportation Infrastructure		
• Invest in a wide range of federal policies and incentives to improve public transportation and reduce the number of miles Americans drive in personal vehicles, including investing in smart growth, promoting mass transit ridership, and investing in high-speed rail corridors.	• Cuts gasoline consumption and reduces CO_2 emissions through decreasing the need for Americans to drive personal vehicles on a daily basis.	• Increases investment and green job growth in land-use planning and transit construction.

WHAT DOES IT DO?	ENVIRONMENTAL BENEFITS	ECONOMIC/JOB BENEFITS
ELECTRICITY		
Improving Energy Efficiency		
• Create a National Energy Efficient Resource Standard to require electricity and natural gas distributors meet a 10% energy savings through efficiency upgrades by 2020. • Decouple utility sales from profits to make it easier for utilities to make efficiency upgrades. • Upgrade the U.S. electricity grid to increase energy security, encourage distributed generation, and increase the efficiency of transmission. • Require appliance energy efficiency improvements. • Increase building efficiency through improving building codes, retrofitting public buildings to higher standards, incentivizing deployment of distributed energy technology, and providing energy efficient housing energy grants and mortgages.	• Reduces greenhouse gas emissions by increasing efficiency of electricity production and transmission, decreasing electricity consumption, and reducing projected growth in electricity and natural gas sales.	• Saves consumers and businesses money through efficiency and conservation measures. • Increases investment in energy efficient technologies and green construction and increases job growth in these sectors.
Increasing Production and Consumption of Renewable Electricity		
• Establish a Renewable Electricity Standard to require 25% of electricity produced in the U.S. to come from renewable sources including distributed sources by 2025. • Improve the structure of production tax credits and low interest loans to facilitate investment in renewable energy generation.	• Increases the proportion of electricity produced from low and zero carbon sources and increases the efficiency of electricity distribution, reducing greenhouse gas emissions.	• Increases investment in the renewable electricity sector and creates jobs in this sector.
Using Carbon Capture-and-Storage Systems to Capture and Bury the Carbon Emissions from Burning Coal		
• Invest in commercial demonstration projects that include CO_2 sequestration, transport through pipelines and storage in different geologic settings. • Require all new coal fired facilities to meet an emission performance standard equivalent to the best available control technology, and provide federal funds to help offset additional costs of implementing carbon capture and storage technology.	• Reduces greenhouse gas emissions from the power sector by preventing emissions from coal-fired electricity facilities from reaching the atmosphere.	• Provides certainty for future investments in new coal fired power plants, and creates jobs in this sector.
CREATE A WHITE HOUSE NATIONAL ENERGY COUNCIL AND MAKE THE FEDERAL GOVERNMENT A LOW-CARBON LEADER		
• Fully deploy the purchasing power of the federal government to help spur the market for fuel efficient vehicles, alternative low-carbon fuels, energy efficiency, and renewable energy. • Ensure that taxpayer investments reduce and withstand the effects of global warming. • Require the federal government to work in partnership with state and local governments, businesses, non-profit organizations, and other community members to develop adaptation strategies to climate change. • Establish a White House National Energy Council to prioritize energy and global warming as top Administration priorities. • Create a new interagency group, the Energy Innovation Council, responsible for developing a multi-year National Energy RD&D Strategy for the U.S. • Create an Energy Technology Corporation to finance and execute large-scale, commercially credible demonstration projects. • Create a Clean Energy Investment Administration to reduce investment risk in clean energy projects with loan guarantees. • Create a Clean Energy Jobs Corps to provide training for "green collar" workers in clean energy industries. • More than double currently existing federal investment in low-carbon energy RD&D.	• Reduces fuel consumption, increases energy efficiency, and reduces emissions across the Executive Branch. • Ensures smart federal investments in projects in the lowest-greenhouse gas emitting projects that are the most resilient to the projected impacts of climate change. • Provides for better hazard preparedness and disaster response and recovery plans to help U.S. communities and our natural environment adapt to a changing climate. • Reduces emissions and improves energy security across all sectors of the economy.	• Provides a large market for and increases investment in low-carbon energy technologies. • Increases green job growth in low-carbon sectors. • The mission of these new federal agencies and entities and the goal of increased investment in federal low-carbon RD&D will be the energy transformation of our economy.
ADVANCING INTERNATIONAL GLOBAL WARMING POLICY		
• Create an E-8 (modeled after the G-8, but comprised of the world's leading developed and developing countries) devoted to the key ecological and resource issues confronting the world. • Invest in the energy and environment sectors in developing nations to alleviate energy poverty with low-carbon energy systems and to adapt to the effects of climate change.	• Devotes specific international attention to solving key ecological and resource issues. • Reduces emissions and growth in emissions globally by investing in low-carbon international assistance. • Improves global resiliency of communities and ecosystems to climate change through investment in adaptation measures.	• Spurs the global market for low-carbon and energy efficient technologies and increases green job growth.

Misplaced Enthusiasm

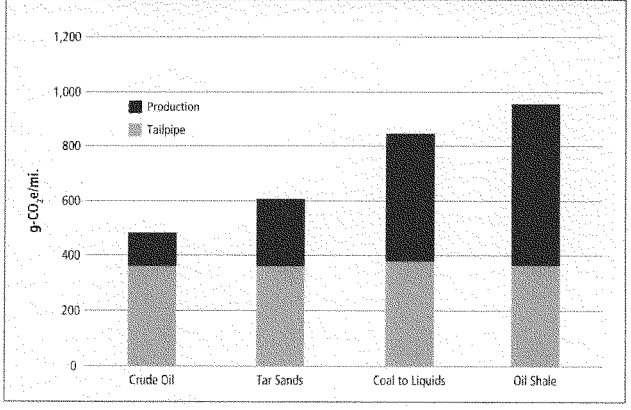
Coal-to-liquid technology is no alternative

The enthusiasm surrounding coal-to-liquid technology is misplaced. If carbon capture and storage technologies (see page 54 for the details) are developed and widely commercialized, then coal will be able to continue playing a large role in the production of electricity, but not in transportation. All told, coal-to-liquid fuels produce twice as many global warming emissions as gasoline. Even if the carbon associated with liquid coal production is captured and stored, liquid coal produces 4 percent to 8 percent greater global warming emissions than gasoline. We need to be encouraging the production of cleaner alternative fuels, not taking a step backward to produce fuels that are dirtier than the status quo.

modest improvements in fuel efficiency and little impact on projected increases in consumer demand for fuel. If the United States moves to significantly improve the fuel efficiency of our fleet, as we call for, then fuel consumption will decline, and the Senate mandate would represent a greater percentage of this future consumption.

That's why we need to ensure that the sustainable production of alternative transportation fuels, including electricity for plug-in hybrids, lowers the lifecycle

HIGH-POLLUTION FUEL ALTERNATIVES ARE NOT THE ANSWER
Lifecycle GHG Emissions



Note: Values shown are averages and ignore considerable uncertainties in some cases.
Source: Natural Resources Defense Council, *Driving It Home: Choosing the Right Path for Fueling North America's Transportation Future*, 2007.

greenhouse gas footprint of the entire transportation sector. Some policy measures to achieve this end have already been detailed, and others follow below.

Updating the Volumetric Ethanol Excise Tax Credit

Because the alternative fuel standard described above will provide more market certainty and increase investment in production of biofuels, we recommend extending and updating the existing volumetric ethanol excise tax credit, or VEETC. The current VEETC is a flat $0.51 per gallon of ethanol and is set to expire in 2010. As the volume of ethanol used as transportation fuel increases and greater investment certainty is established, we should ensure that the cost of this tax credit to the federal government remains acceptable. How? By making the VEETC variable, based on the price of oil; the VEETC would increase as the price of oil decreases, and vice versa.

Low-Carbon Fuel Standard

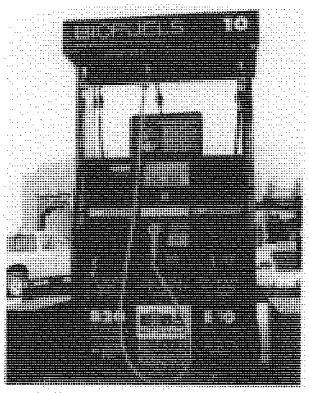
Our pursuit of alternative fuels must serve both to enhance energy independence and to combat global warming. Not all alternative fuels are created equal in terms of their lifecycle greenhouse gas emissions or other effects on the environment. That's why it is important to couple any alternative fuel standard with a low-carbon fuel standard that requires reductions in the lifecycle emissions of the fuels sold in the United States so that we are encouraging the production of the cleanest fuels possible moving forward.

Alternative fuels that reduce our dependence on oil but worsen climate change, such as coal-to-liquid technology (see sidebar, page 38), are a fool's bargain. But truly sound alternative fuel standards are imperative. That's why we support legislative proposals in the House and Senate that would replicate California's low-carbon fuel standard nationwide, requiring fuel providers to reduce by 10 percent the lifecycle emissions from the transportation fuels they refine and sell by 2020. On a national scale, this low-carbon fuel standard could cut greenhouse gas emissions by 265 million metric tons by 2020.[87] This low-carbon fuel standard, however, should not "pick winners" or specify which alternative fuels may be used to meet this mandate. It should instead allow the marketplace and fuel providers to drive the choice of alternative low-carbon fuels.

Renewable Fuels Certification Program

Some have raised concerns about the potentially negative consequences of intensive biofuel production, such as the increased conversion of land for energy-producing crop production. Clearly, we must be careful that pursuing biofuel production does not create competition that would sharply boost food and feed prices. Many preliminary studies are encouraging. For example, one study indicated that a 50 percent increase in crop production in Africa is possible without incurring trade-offs between food and energy.[88]

But we will need to take great care to develop an appropriate regulatory framework to ensure that increased biofuel production does not compete with food production or lead to widespread deforestation and excessive use of water. We must also ensure the use of sustainable biofuel production methods that maximize lifecycle greenhouse gas reduction methods, maintain biodiversity, and avoid the introduction of invasive species.



Example of low-carbon alternative fuel pump. There are currently only 1,133 public service stations that sell E85—this number must be dramatically increased. (Charles Bensinger and Renewable Energy Partners of New Mexico, DOE/NREL)

Consequently, we propose a voluntary Renewable Fuels Certification Program to establish transparent certification and labeling criteria in order to encourage sustainable production of biofuels. Such a program will allow farmers to grow a "green" renewable biofuel crop according to broad-based and widely accepted standards and verified by an independent third-party certifier. With such a program, we can encourage sustainable biofuel production and at the same time promote local farmer-owned biorefineries and processing facilities, and give farmers the opportunity to contribute their know-how and resources to combat climate change.

Pump or Plug Mandate

Shifting to a low-carbon transportation system requires not just the alternative low-carbon fuels and the vehicles that can run on these fuels, but also a new refueling infrastructure. Drivers of highly fuel-efficient vehicles have to be able to fill up at accessible, convenient service stations. However, of the 4.3 million vehicles currently on the road that can run on E85, 99 percent run on regular gasoline because E85 is rarely available to the everyday driving public.[89] The National Ethanol Vehicle Coalition reports that there are only 1,133 public service stations that sell E85, out of 170,000 service stations—and more than one-third of these stations are in Illinois and Minnesota.[90]

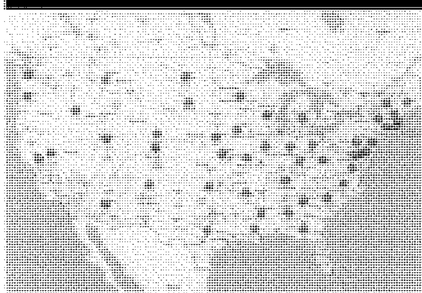
To correct this problem, we should institute a low-carbon alternative fuel "pump or plug mandate" to ensure that low-carbon alternative fuel pumps and dedicated electricity sources for plug-in hybrids are built where there is demand. Specifically, in any counties in the nation where 15 percent of registered vehicles can run on low-carbon alternative fuels, we should require that 15 percent of pumps provide such fuels. To protect locally owned "mom and pop" gas stations without the capital necessary to fund the conversion, the 15 percent pump requirement should be limited only to owners of 10 or more gas stations.

Investing in Low-Carbon Transportation Infrastructure

Besides investing in more fuel-efficient vehicles and low-carbon alternative fuels, the third way to reduce greenhouse gas emissions from the transportation sector is simply to drive less, reducing the number of vehicle miles that American commuters travel. Like energy efficiency, the fuel we avoid burning to meet our transportation needs is the cheapest and cleanest alternative available.

In addition to reducing our carbon emissions, investing in new infrastructure for smart growth and transportation

FLEX-FUEL VEHICLES AND PUBLIC E85 STATIONS IN EACH STATE



STATE	# FLEX FUEL CARS/ STATE	# OF PUBLIC E85 STATIONS
Alabama	[illegible]	[illegible]
Alaska	[illegible]	[illegible]
Arizona	[illegible]	[illegible]
Arkansas	[illegible]	[illegible]
California	[illegible]	[illegible]
Colorado	[illegible]	[illegible]
Connecticut	[illegible]	[illegible]
Delaware	[illegible]	[illegible]
Florida	[illegible]	[illegible]
Georgia	[illegible]	[illegible]
Hawaii	[illegible]	[illegible]
Idaho	[illegible]	[illegible]
Illinois	[illegible]	[illegible]
Indiana	[illegible]	[illegible]
Iowa	[illegible]	[illegible]
Kansas	[illegible]	[illegible]
Kentucky	[illegible]	[illegible]
Louisiana	[illegible]	[illegible]
Maine	[illegible]	[illegible]
Maryland	[illegible]	[illegible]
Massachusetts	[illegible]	[illegible]
Michigan	[illegible]	[illegible]
Minnesota	[illegible]	[illegible]
Mississippi	[illegible]	[illegible]
Missouri	[illegible]	[illegible]
Montana	[illegible]	[illegible]
Nebraska	[illegible]	[illegible]
Nevada	[illegible]	[illegible]
New Hampshire	[illegible]	[illegible]
New Jersey	[illegible]	[illegible]
New Mexico	[illegible]	[illegible]
New York	[illegible]	[illegible]
North Carolina	[illegible]	[illegible]
North Dakota	[illegible]	[illegible]
Ohio	[illegible]	[illegible]
Oklahoma	[illegible]	[illegible]
Oregon	[illegible]	[illegible]
Pennsylvania	[illegible]	[illegible]
Rhode Island	[illegible]	[illegible]
South Carolina	[illegible]	[illegible]
South Dakota	[illegible]	[illegible]
Tennessee	[illegible]	[illegible]
Texas	[illegible]	[illegible]
Utah	[illegible]	[illegible]
Vermont	[illegible]	[illegible]
Virginia	[illegible]	[illegible]
Washington	[illegible]	[illegible]
Washington DC	[illegible]	[illegible]
West Virginia	[illegible]	[illegible]
Wisconsin	[illegible]	[illegible]
Wyoming	[illegible]	[illegible]

alternatives has many spin-off benefits, increasing property values (especially near transit networks), creating high-skill construction jobs, providing real transportation choices for commuters, investing in more livable communities, and increasing job access for low-income workers. Investing in a more diverse and inter-modal transportation network is a long-term strategy for meeting climate challenges and a critical part of an integrated approach to reducing our nation's carbon footprint.

A wide range of federal policies and incentives shape America's transportation and land-use decisions. Chief among these is the federal transportation bill, which has long placed undue emphasis on highway construction as the primary investment in the mobility of our citizens. As we face the challenge of building a robust economy in a carbon-constrained world, we will by necessity build a more diverse, efficient, and inter-modal transportation network. This will be driven by a host of mutually reinforcing policies.

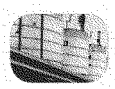
VOLUNTARY RENEWABLE FUELS CERTIFICATION PROGRAM
How It Works

STEP 1
Growing Crops with Standards

When a farmer decides to grow a crop to sell as a "green" renewable energy crop, he or she must follow standards to attain certification that ensures the biofuels are being grown in a sustainable manner.

STEP 2
Certification

As the crop is grown, the farmer has the crop inspected by an independent third-party certifier. If the crop passes the tests conducted by the inspector, the crop will be certified and the appropriate documentation will be issued to the farmer.



STEP 3
Delivery and Payment

The farmer takes the crop to a nearby biorefinery or processing facility along with the crop's certification and other documentation. The farmer is paid a contract rate plus an agreed-upon premium for the crop.

STEP 4
Processing

The biorefinery processes the "green" energy crop and blends it with conventionally grown biofuel according to a specific formula. Over time, the proportion of "green" crop to conventional crop should be increased to create a more sustainable biofuel.

STEP 5
Sale

The resulting product is sold as a premium "green" product.

First of all, we must dedicate more funds for mass transit: for new construction, for the expansion of existing services, and for operation and maintenance. Currently, demand for federal funds to initiate mass transit construction projects far outstrips federal budget allocations. We must help our cities meet smart growth demands. We can also increase incentives for communities to build better and more effective transit systems by increasing the percentage of the federal match for new mass transit rail networks and high speed bus systems, and by strengthening federal programs that promote mass transit ridership through workplace and other incentives. At the state and regional level, we can also have great impact on reducing long-distance automobile travel by promoting the construction of new high-speed rail corridors in the Midwest, South, and West Coast, and by upgrading the already successful rail projects in the Northeast.

In our cities, too, we can promote denser, more desirable, and pedestrian-friendly neighborhoods by funding programs that redevelop abandoned and polluted urban lands close to transit networks—specifically by funding the expansion of the highly successful Brownfields program, which has brought much blighted urban land into vibrant and productive use. The low-carbon benefits of restructuring our cities are both short- and long-term. For example, if we construct over a million new homes every year based on new green home building standards, then the carbon impact could be profoundly long-lasting. Additionally, a recent study found that two-thirds of the development in the United States by 2050 —homes, offices, and other non-residential buildings—will be built between now and then.[91] If 60 percent of this new growth were built using new compact land development patterns, this would reduce the need to drive by 30 percent and could save 85 million metric tons of CO_2 annually by 2030.[92] Rebuilding our metropolitan regions to promote new modes of transportation that in turn promote shorter commutes is ultimately a critical step toward creating a low-carbon economy.

Transportation Research, Development, & Deployment

To create the most fuel-efficient transportation solutions, we recommend that overall federal funding for low-carbon energy research should be more than doubled over what we currently spend. Alongside research, development, and deployment incentives for low-carbon vehicles and transportation infrastructure, the federal government must ramp up funding for RD&D of advanced battery technologies. The benefit of these technologies is that they have multiple applications outside the automotive sector —from space exploration to military operations— and thus represent a valuable investment for federal research dollars.

Federal research programs should not only increase support for the development of vehicles built to run on low-carbon alternative fuels but also the development of low-emitting fuels. We already are experienced in producing and marketing ethanol made from corn. Now, we should direct federal research dollars toward scientific breakthroughs to enable large-scale, cost-effective production of cellulosic ethanol, biodiesel, and other low-carbon fuels. Greater resources must also be dedicated toward the development of drought-resistant, non-invasive energy crops that produce more energy on an energy-input, water-input, and land-acreage basis.

The Nuclear Non-Alternative

The uncertainties remain problematic

Expanding nuclear power provides a valuable low-carbon energy source, yet nuclear waste storage, and the dangers of proliferation remain serious unresolved concerns. Nuclear power is expensive and likely to remain so if we ever try to construct enough new capacity fast enough to make a difference in carbon emissions. For these reasons, our low-carbon economic policies call for investment in renewable energy sources and advanced coal rather than new nuclear facilities.

Electricity

Electricity powers our homes, offices, and factories.[93] Electricity for all purposes accounts for 36 percent of U.S. CO_2 emissions.[94] Burning coal produces 50 percent of our overall electricity, but 82 percent of CO_2 emissions from electricity. Natural gas and petroleum combustion account for the remaining 18 percent of emissions from electricity production.

As in the case of transportation, the road to low-carbon electricity is conceptually clear and consists of three basic elements: efficiency, renewable energy, and advanced coal technologies. While none of these steps is easy to implement, they also represent great opportunities for our economy and are far safer that another source of "clean" energy: nuclear power (see sidebar above).

There are enormous opportunities to save energy through efficiency, with measures aimed at deploying the technology we have on the shelf as well as developing still better alternatives. Consider that in states where there has been a commitment to efficiency over the past 30 years, electricity use per capita has been cut by 40 percent compared to the national average without beginning to exhaust the potential and at a lower cost than constructing new conventional electricity resources. But also note that renewable energy boasts great potential right now, as is clear from the 11 percent of electricity produced in California from renewable energy resources, compared with 2 percent production levels nationwide, due to renewable energy policies in place in that state since 1980.[95, 96]

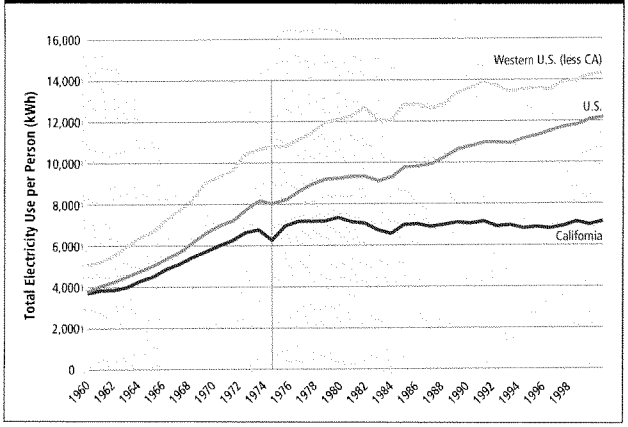
Advanced coal technology, including the capture, transport, and geologic storage of CO_2 from coal-fired power plants, is a much newer concept, but is absolutely vital. Scaling up an advanced coal system is an immense endeavor, requiring full-scale demonstration projects, the promulgation of new rules for geologic repositories, and RD&D to perfect the system. But unless we conquer the coal challenge—not only in the United States but globally, especially in China and India—our efforts to control global warming will likely fail.

Improving Energy Efficiency

Energy efficiency may seem unexciting, but it is the cheapest, fastest, and cleanest way to reduce the carbon intensity of the economy, and it has huge potential. In a May 2007 report on energy efficiency titled "Curbing Global Energy Demand: The Energy Productivity Opportunity," the McKinsey Global Institute says:

U.S. PER CAPITA ELECTRICITY USE

California Electricity Use Per Person Is Not Increasing Because of Efficiency Measures



Source: California Energy Commission, *2002–2012 Electricity Outlook Report*, February 2002

A concerted global effort to boost energy productivity—or the level of output we achieve from the energy we consume—would have spectacular results. By capturing the potential available from existing technologies with an internal rate of return of 10 percent or more – an extremely robust rate—we could cut global energy demand growth by half or more over the next 15 years.

The easiest-saved ton of CO_2 emissions comes from the oil or coal you didn't burn in the first place because you were able to get the job done using less energy. The energy guru Amory Lovins has even coined a term for these savings, "negawatts." Efficiency works. It avoids emissions and saves money.

Look at what has occurred already. The total energy use per dollar of GNP in the United States has declined by nearly half since the 1970s.[97] Compared to a 1973 baseline, we save more energy than we produce from any single source. Appliance standards already have had a potent impact on reducing the demand for energy. For example, refrigerator efficiency more than quadrupled from 1972 to 2005, and dishwasher efficiency has doubled since 1998.

California has led the way. Since 1975, California's energy efficiency programs have kept the state's per capita energy consumption flat at around 7 megawatt hours per person, while the rest of the nation's energy consumption has increased by almost 50 percent.[98] During this same time period, California per

capita CO_2 emissions have decreased by 30 percent, while national per capita CO_2 emissions have remained level.

Moreover, implementing these energy efficiency programs has cost less than half what it would cost to increase electricity generation in the absence of such programs and has added over $4 billion to California's economy.[99]

As the McKinsey report says, there is enormous potential to do much more. The United States uses nearly twice as much energy per dollar of GNP as other industrialized countries.[100] More than two-thirds of the fossil fuels we burn in power plants is lost as waste heat.[101] Three of Pacala and Socolow's 15 "wedges" are based on efficiency, one for fuel efficiency in vehicles, but two more for efficiency in electricity generation or use: getting the efficiency of coal-fired plants up to 60 percent; and improving end-use efficiency in the building sector by 25 percent.

Our capacity to realize the potential of energy efficiency depends on smart and aggressive federal policy. Right now, because of anemic national policy, we are leaving enormous energy savings on the table. We are producing emissions and losing money. We need to reverse the equation—make money and lose the emissions. The following are the key steps we need to take.

National Energy Efficiency Resource Standard

Following the lead of states such as Texas, Hawaii, Nevada, Connecticut, and at least five others, we should establish a national energy efficiency resource standard. A national EERS would require utilities to meet energy savings targets, which they could do by offering efficiency programs to their customers, improving the efficiency of energy distribution, and implementing combined heat and power generation systems. Texas, for example, now requires utilities to offset 10 percent of their demand growth through end-use energy efficiency, or in plain English to improve the efficient use of energy in industry, agriculture, households, and other energy users.[102] A national EERS that required 10 percent efficiency savings for electricity and natural gas by 2020 would save approximately one-quarter of the projected growth in electricity sales by 2020.[103] What's more, a national EERS would save consumers and businesses $170 billion.

Decoupling Utility Sales from Profits

In order to effectively implement national energy efficiency upgrades, we must decouple utility sales from profits. As long as utilities make money based on how much electricity they sell, they have an obvious disincentive to promote end-use efficiency. Decoupling busts that disincentive. California, Idaho, and New York have shown leadership in decoupling this way, and six additional states are considering decoupling.

If we pursued decoupling and instituted a profit incentive to save rather than use energy (as demonstrated by these leading states) across the country, then we could make enormous efficiency improvements.

Grid Improvements

The Northeast Blackout of 2003 exposed the fragility of our electricity infrastructure. Passenger rail transportation shut

down, gas stations were unable to pump fuel, and airports were unable to carry out screenings, causing international and regional air transportation to cease.

The blackout revealed that our electrical grid is ill-equipped to deal with the large increases in congestion caused by high energy demand. We are relying on outdated, impractical, polluting technologies that impose both environmental risk and security liabilities on our nation. The Electric Power Research Institute estimates that outages and quality fluctuations cost U.S. businesses more than $120 billion a year. And as our demand for electricity increases, the problem will only get worse unless we take action.

Updating our electric grid can improve our economic and national security, even as it cuts carbon. A modern grid will increase efficiency and lower emissions by reducing congestion and making the best use of the energy we already produce. It will encourage distributed generation that not only improves reliability but increases the efficiency of transmission by reducing the waste of electrical line loss and generating energy close to the point of use. A modern grid will also encourage energy efficiency by improving the flow of information through strategies such as real-time pricing that establish strong market signals to promote conservation of electricity.

We need to provide incentives to create a smart grid, making it more efficient, reliable, and capable of drawing on sometimes intermittent renewable resources. To move toward deployment of a revamped, "smart" electricity grid, we support the recommendations of the non-partisan Energy Future Coalition, a group that seeks to change U.S. energy policy to address the economic, security, and environmental challenges related to the production and use of fossil fuels and to explore economic opportunities created by the transition to a low-carbon economy. The EFC recommendations would establish a set of national performance standards for future investments in the electricity grid. And they would create a "21st Century Electricity System Security and Modernization Fund" to support investments in smart grid technologies.[104]

Moreover, utilities already have planned expenditures in their capital project budget pipelines that, with the proper regulations and incentives, could be leveraged to finance smart grid technology. As Steven Pullins writes in the Smart Grid Newsletter, the projected costs of developing a smart grid should not be more than 6 percent above current business-as-usual capital projects budgets and may be a good deal less.[105]

Appliance Efficiency Standards

It is time to reinvigorate the process of setting efficiency standards for appliances. The Bush administration has dropped the ball here, not issuing any standards, despite the impressive record of appliance efficiency improvements in the 1980s and 1990s and the statutory deadlines for more than two dozen rules.

As a result of a recent court settlement in a case brought by a number of states and environmental groups, the Energy Department has finally agreed to issue 22 overdue appliance standards during the next four years. Congress needs to conduct vigilant oversight to make sure this commitment is addressed in a way that meets national policy goals as well as statutory requirements. At a minimum,

Congress needs to ensure the program is adequately funded and produces robust results. And if that fails, then Congress should shift the standards-setting responsibility to an agency that can better discharge it.

Upgrade Efficiency Standards for Residential, Commercial, and Federal Buildings

We need to boost efficiency in the building sector, which accounted for 39 percent of U.S. carbon emissions in 2005, approximately equivalent to the combined total emissions of Japan, France and the United Kingdom.[108] A combination of building codes, energy efficiency, and green building recognition programs such as Energy Star or Leadership in Energy and Environmental Design, or LEED, standards, financial incentives such as those offered by utilities, and tax incentives can accomplish this.

Once again, California has set the pace with a building code that has allowed the state to avoid building thousands of megawatts of new generating capacity. The federal Energy Policy Act of 2005 authorized $125 million over five years for states that adopt and implement energy-efficient building codes for both residential and commercial structures, but the money has never been appropriated. It should be, promptly. That same federal legislation also included tax incentives for efficient buildings and equipment. Legislation has been proposed to expand and extend those incentives, and that legislation makes good sense.

Global cities are also leading the way. The Clinton Foundation recently announced a pilot program through its Clinton Climate Initiative with 15 of the world's largest cities—from Johannesburg, Karachi, and Tokyo, to Houston, Chicago, and New York—that is designed to spur a massive increase in investment in energy efficiency retrofits of existing buildings. This public-private partnership brought together five of the world's largest banks, each pledging $1 billion toward energy efficiency retrofits.

Additionally, the four largest energy service companies in the world—Honeywell, Johnson Controls, Siemens, and Trane—will provide new financing and expanded capacity in the private sector to undertake energy audits, conduct building retrofit projects, and guarantee those energy savings that would result. This public-private partnership demonstrates clearly how political leadership with bold vision can create new markets and new investment, in this case literally doubling the market for energy efficiency in buildings overnight.

Sound policies that promote efficiency, encourage new markets, and foster both public and private investment in climate solutions can be a major source of economic growth. Such policies can include improved building codes, retrofitting public buildings to higher standards, establishing new incentives for deploying low-carbon, distributed energy technology, and for low-income and public housing, including energy efficiency housing grants, public housing vouchers, and energy-efficient home mortgages. All of these efforts, meanwhile, can create new industries and construction jobs for American workers.

RD&D on Energy Efficiency

Here, as in many other areas, we are hurt by a weak federal RD&D effort.

U.S. RENEWABLE ELECTRICITY GENERATION

Source	[illegible]	[illegible]
Conventional Hydropower	[illegible]	[illegible]
Geothermal	[illegible]	[illegible]
Wood and Other Biomass	2.22	0.24
Solar Thermal	0.51	[illegible]
Solar Photovoltaic	0.04	[illegible]
Wind	[illegible]	1.74
Total Non-Hydropower Renewable Electricity	[illegible]	2.3
Total Renewable Electric Power Sector	[illegible]	[illegible]

Source: Energy Information Administration.

The Bush administration energy efficiency request for 2008 is more than a third down from 2002 budget levels. More broadly, the federal government spent less than $2 billion on energy R&D last year, a third of what it spent 25 years ago.[107] During that period, government spending on medical research jumped almost 300 percent to $28 billion, and government military research climbed 250 percent to $75 billion.[108] When John F. Kennedy proposed to put a man on the moon and return him safely home again within the decade, he marshaled the resources of a nation to accomplish the task. At a minimum, expenditures on energy R&D must be more than doubled to respond to our current climate crisis.

Increasing Production and Consumption of Renewable Electricity

While non-hydro renewable energy is a very small part of our energy equation right now, providing only about 2 percent of total U.S. electricity capacity, it has great potential to play an important role in a low-carbon economy. The policy framework, however, is critical.

The Energy Information Agency reference case—essentially a business-as-usual projection that takes into account projected technology improvements, but not improvements that are the result of new policies—still shows non-hydro renewable energy accounting for only about 2 percent of electricity by 2030.[109] To move off that tepid path, we need a smart set of polices to propel the sector forward.

This makes sense for both environmental and economic reasons. Renewable sources such as wind, solar, biomass, and geothermal produce not just very few greenhouse gas emissions but more jobs, too. A 2007 analysis by the Union of Concerned Scientists suggests that a 20 percent national renewable electricity standard by 2020 would create 185,000 jobs, save consumers $10.5 billion on energy bills through 2020, and reduce CO_2 by 223 million metric tons a year.[110]

In the past decade, our competitors, using smart policies, have made great progress on renewable technologies, seizing leadership in both wind and solar technology. The United States has wind and solar sources far greater than those in Europe or Japan. The missing

KEY RENEWABLE ELECTRICITY SOURCES

WIND

Wind is an abundant resource in the United States, and is well distributed across the country. Wind farms on good sites can generate electricity at 3 cents to 5 cents per kilowatt hour, or about as cheaply as coal or natural gas at today's prices. Wind is also a job creator. Every 100 MW of new wind power has been estimated to create 200 construction jobs and as much as $1 million in local property taxes.

But wind is also a greatly underused resource and underdeveloped industry in this country. In Germany and in some parts of Spain and Denmark, wind supplies more than 20 percent of electricity, while in the United States, wind provides less than one percent. While U.S. government support for wind power has been erratic, marked by short-term extensions of the federal production tax credit, in other countries where wind power has taken off at a faster rate, renewable power producers get the benefit of long-term purchase agreements at adequate prices.

Wind power still faces challenges—it is an intermittent resource and some have protested over the aesthetics of wind farms and potential hazards posed to birds and bats—but these are challenges that can and should be met, given the cheap, plentiful and emission-free qualities of wind power.

SOLAR AND SOLAR-THERMAL ENERGY

Energy from the sun, converted by photovoltaic cells or by concentrated solar technologies such as parabolic trough technology, provides a very small share of our electricity, but is rapidly growing. Global production of solar cells increased by 500 percent between 2000 and 2005, and while costs are still substantially above those of fossil fuels, they have fallen by 90 percent since 1970 and are still dropping.

Solar-thermal technology—using solar energy to convert water into steam which turns turbines—is also gaining ground. A major benefit to this technology is that steam can be stored, allowing these facilities to provide power at all hours of the day, not just when the sun is out.

Once again, though, the United States is missing out where it could be capitalizing on opportunities. In the last 10 years, our market share in producing solar cells has dropped from 44 percent to 10 percent, while Japan and Germany have become solar leaders. German firms that make photovoltaic panels and other components now employ 40,000 people, and 15,000 more work in the solar thermal business, which makes systems for homes and businesses.

BIOMASS

Biomass is another encouraging source of renewable energy, and can generate electricity through various processes. The most common use of biomass for electricity production is through co-firing in power plants along with coal; over 100 such co-firing operations are up and running in the U.S. Co-firing provides a host of environmental benefits, including reducing sulfur and nitrogen oxides, key components of acid rain and smog, as well as reducing lifecycle CO_2 emissions.

Combusting methane captured from landfills, sewage treatment plants, and livestock operations is also a form of bio-power. Combusting methane converts it into carbon dioxide; this practice is doubly beneficial because it produces energy and keeps methane (a greenhouse gas 21 times more potent than CO_2) from reaching the atmosphere. Biomass gasification is yet another technique for converting biomass to electricity, and can be used in combined-cycle generation systems which reach efficiencies close to 60 percent. In comparison, modern supercritical coal-fired power plants currently achieve efficiencies around 40 percent.

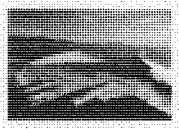
Further deployment of biomass for energy is hindered by the same inconsistent policy framework that plagues other renewable energy technologies such as wind and solar. Long-term subsidies or tax incentives would allow the nascent industry to attract necessary new investments.

GEOTHERMAL

Geothermal energy is harvested from heat that percolates up from the Earth's mantle to the surface. It is a renewable zero-emission resource that holds enormous potential for deployment in the U.S. and internationally. Geothermal energy can be used both for electricity production and for home heating (through geothermal heat pumps). At the end of 2005, the U.S had 2,828 MW of grid-connected geothermal power, satisfying the electricity needs of roughly 4 million people. Furthermore, over 600,000 geothermal heat pump units are installed nationwide, and between 50,000 to 60,000 additional units are installed every year, which is the highest installation rate in the world.

Geothermal energy has a lot of untapped potential. The Geothermal Energy Association projects that by 2025 geothermal resources could provide 30,000 MW of electricity nationwide. The capacity to bring this promising renewable energy resource to market depends partially on continued federal R&D, but the administration's FY 2007 and FY 2008 DOE budget requests contained no money for geothermal R&D.

MARINE



Marine energy can be harvested from waves and tides. Wave energy is harvested from the sea surface, where moving water creates kinetic energy that is captured by floating buoys connected to pistons. Tidal power, in contrast, originates from the gravitational pull of the moon on the Earth's oceans, and can power underwater turbines. The Electric Power Research Institute estimates that wave resources alone could generate 2.3 trillion kWh of electricity per year, which is over eight times the output of current U.S. hydropower facilities.

While this technology is still being fine-tuned, it is close to commercialization, and a few pilot projects are already up and running, including a project in New York's East River. Additionally, Pacific Gas and Electric recently announced a $1.5 million research project to study the energy potential and associated costs of developing tidal energy in the San Francisco Bay.

To facilitate deployment of marine energy, the Federal government must increase funding for research and development, which up to this point has been negligible, and must streamline the regulatory process to allow private developers to test and ultimately install marine energy projects around U.S. coastlines.

ingredient here is willpower and a set of clear, predictable rules.

Wind Power

Wind is an abundant resource in the United States, well distributed across the country and with particular power in the Great Plains, a region that has been described as the "Persian Gulf" of wind power. Wind farms on good sites can generate electricity at 3 cents to 5 cents per kilowatt hour, or about as cheaply as coal or natural gas at today's prices.[111]

But wind is also a greatly underused resource and underdeveloped industry in this country. Europe currently controls approximately 70 percent of the world's market share of wind turbines.[112] In Germany and in some parts of Spain and Denmark, wind supplies more than 20 percent of electricity, while in the United States, wind provides less than 1 percent.[113]

A good part of that difference can be traced to government policy. In those countries, renewable power producers get the benefit of long-term purchase agreements at adequate prices. Here, by contrast, government support has been erratic, marked by short-term extensions of the federal production tax credit, often after substantial delays. This kind of approach obviously makes it very difficult for businesses to plan.

Wind power, however, still faces challenges. Because wind is an intermittent source, utility managers need to learn how to integrate it into their power grids. And some local residents have protested over the aesthetics of wind farms, while others have expressed concerns over the hazards posed to birds and bats. But these are challenges that can and should be met, given the cheap, plentiful, and emission-free qualities of wind power.

Moreover, wind is a job creator. Every 100 MW of new wind power has been estimated to create 200 construction jobs and as much as $1 million in local property taxes.[114]

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Solar-thermal technology—using solar energy to convert water into steam which turns turbines—is also gaining ground. A major benefit to this technology is that steam can be stored, allowing these facilities to provide power at all hours of the day, not just when the sun is out. Vinod Khosla has made solar-thermal energy one of the key technologies he is pursuing. And at the September 2007 Clinton Global Initiative meeting, Florida Power & Light officials unveiled plans to build Florida's first large-scale solar thermal power plant, a 500-megawatt facility.[119]

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on opportunities. In the last 10 years, our market share in producing solar cells has dropped from 44 percent to 10 percent, while Japan, relying on government R&D and consumer subsidies, has become the world leader.[120] Germany has also become a solar leader, thanks to some well-placed incentives. German firms that make photovoltaic panels and other components now employ 40,000 people, and 15,000 more work in the solar-thermal business, which makes systems for homes and businesses.[121]

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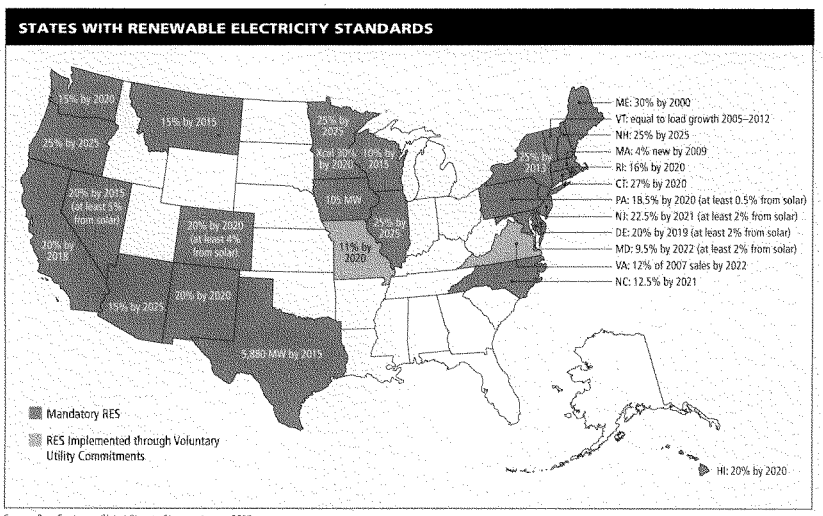


Source: Pew Center on Global Climate Change, August 2007.

Marine Energy

Marine energy can be harvested from waves and tides. First, wave energy is harvested from the sea surface, where moving water creates kinetic energy that is captured by floating buoys connected to pistons. Tidal power, in contrast, originates from the gravitational pull of the moon on the Earth's oceans, and can power underwater turbines. The Electric Power Research Institute estimates that wave resources alone could generate 2.3 trillion kWh of electricity per year, which is over eight times the output of current U.S. hydropower facilities.

While this technology is still being fine-tuned, it is close to commercialization, and a few pilot projects are already up and running, including a project in New York's East River.[126] Additionally, Pacific Gas and Electric recently announced a $1.5 million research project to study the energy potential and associated costs of developing tidal energy in the San Francisco Bay.

To facilitate deployment of marine energy, the federal government must increase funding for research and development, which up to this point has been negligible, and must streamline the regulatory process to allow private developers to test and ultimately install marine energy projects around U.S. coastlines.

Renewable Electricity Standard

Twenty-five states and the District of Colombia require that electric utilities generate a specified amount of electricity

from renewable energy sources, including levels as high as 25 percent. The House-passed energy bill (H.R. 3221) would set a national renewable electricity standard of 15 percent by 2020, a good start. We support a more ambitious renewable electricity standard of 25 percent by 2025, but in addition call for a national standard that also includes so-called distributed electricity mandates. Distributed electricity is the creation of small amounts of energy close to where it is consumed, for example, by solar cells on roofs or hydrogen fuel cells.

Around the country, from New Jersey to Arizona, a number of states require that a portion of new renewable energy capacity that is brought online must come either specifically from solar energy or from other sources of distributed generation.

Requiring a certain percentage of renewable electricity to come from distributed sources would have several benefits. First, requiring more of our electricity to come from distributed sources would help prevent electricity disruptions. Our large centralized power plants and electricity transmission infrastructure makes our energy supply vulnerable to equipment failures, weather, and also acts of terrorism. For example, an analysis of the 2003 Northeast blackout suggested that distributed solar power generation representing just a small percentage of peak electricity, located at key spots in the region, would have significantly reduced the extent of the power outages.

Second, as our nation's demand for electricity grows, so does the demand to build more electricity generation and transmission infrastructure. Long-distance transmission of electricity from centralized facilities raises concerns over the citing of new transmission lines and efficiency concerns owing to the electricity line loss that results from long-distance power transportation. Distributed renewable energy would avoid both these concerns.

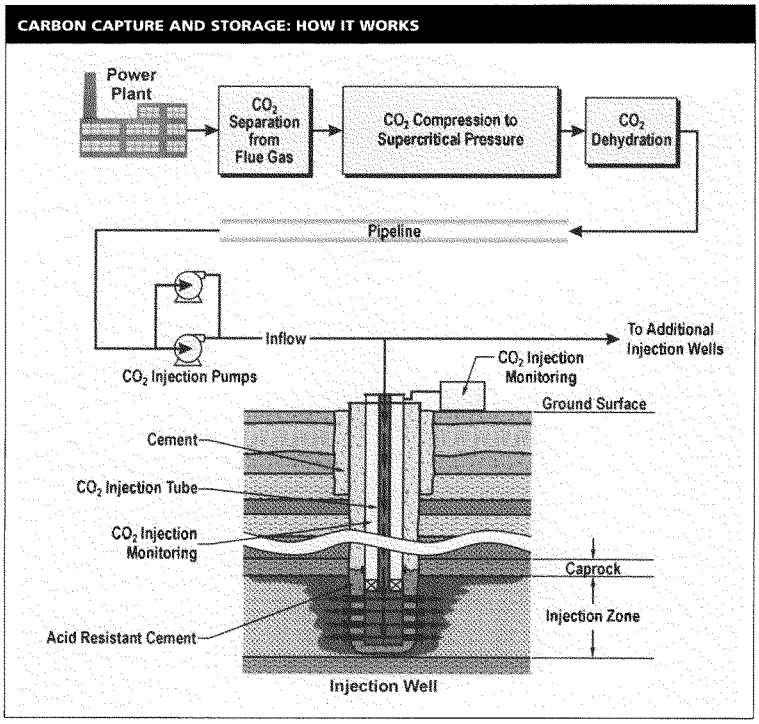
Finally, establishing a new distributed renewable energy infrastructure would ensure that the market for these new and innovative technologies grows in a rapid and cost-effective manner, bringing new technology, skills, and services to market to meet the demand. To make distributed energy production cost effective, however, the federal government needs to remove barriers to customer investments in distributed energy products.

In states where distributed energy generation (including solar) has grown most effectively, four key policies have been put in place to facilitate consumer installations. First, net metering allows rate payers to supply energy back into the electrical grid when they are not using all of the energy they generate, actually running their electrical meters backwards. Second, fair rate design ensures that electricity pricing does not penalize homeowners who become producers of clean energy.

Third, establishing interconnection standards guarantees that renewable energy-generating customers can connect to the utility without undue delay and expense. And finally, long-term declining financial incentives stimulate near-term customer investment in renewable electricity, and help drive the price of technology down without establishing a permanent dependence on subsidy.

Tax Credits and Low-Interest Loans

We need to provide consistent, long-term production tax credits for renewable energy sources. Combined with state-level renewable energy standard regulation,



Source: Battelle Climate Research Institute, *Carbon Dioxide Capture and Geological Storage*, April 2006.

production tax credits have been a major driver of wind power development over the past six years.[127] However, lapses in federal production tax credits, occasional one- to two-year extensions, and uncertainty about the future of these credits have led to a "boom and bust" cycle in the development of wind power over the same time period.[128]

Thus, production tax credits for all types of renewable energy should last long enough so that businesses can make sound investment decisions. The Geothermal Energy Association, for example, states that geothermal production tax credits must last for at least three to five years to aid in the construction of these capital-intensive facilities, which can take several years to bring online even after securing all necessary permits.[129] The federal government should also provide financing assistance through mechanisms such as low-interest loans, loan guar-

antees, or bonds to help deal with high upfront costs and reduce investor risk.

Use carbon capture-and-storage systems to capture and bury the carbon emissions from burning coal

Coal represents a critical part of the challenge in building a low-carbon economy. Because it is cheap, plentiful, and widely distributed around the world, it plays a large role in the production of energy and is projected to continue doing so for decades. And the quantities of recoverable coal are enormous. The United States, with the world's largest reserves (27 percent of the world's total) has enough to last over 200 years at current production rates.[130] And sizable reserves can also be found in Russia, China, India, and Australia, among other places.

Coal accounts for 50 percent of U.S. electricity generation,[131] and that number is projected to rise slightly by 2030 according to the EIA."[132] Worldwide, coal accounted for about 41 percent of electricity supply in 2004, and that number is projected to increase to 45 percent in 2030.[133] According to the International Energy Agency, between now and 2030, 1400 gigawatts of new coal capacity will be added globally. China is adding the equivalent of more than one major coal plant per week—an added capacity equal to the entire U.K. power grid every year.[134]

Projections like these do not take into account the kind of new policies that can and should be put in place in the near future. But even assuming a substantial reduction in demand owing to new policies, coal is likely to play an important part in our energy mix for decades to come.

The trouble is that coal is also the most carbon-intensive of the fossil fuels. As noted earlier, coal accounts for over 80 percent of CO_2 emissions from electricity in the United States, nearly 36 percent of U.S. CO_2 emissions from energy, and some 37 percent of worldwide CO_2 emissions from energy. If the new capacity expected to be built by 2030 is built without CO_2 controls, it would produce about 8.4 billion tons of CO_2 per year, a 30 percent increase over *total* current worldwide CO_2 emissions from the consumption of fossil fuels.[135] Fareed Zakaria put it starkly in *Newsweek*: "Coal is the cheapest and dirtiest source of energy around and is being used in the world's fastest-growing countries. If we cannot get a handle on the coal problem, nothing else matters."[136]

Fortunately, there appears to be a way to reconcile coal's ongoing use as a major energy source with the imperative of cutting CO_2 emissions, namely carbon capture-and-storage technologies. CCS technologies capture the CO_2 emitted during coal combustion and then store this CO_2 underground in geologic reservoirs. Given the scale of existing and projected coal use and the scope of its carbon impact, a full-tilt effort to demonstrate and deploy CCS technology has to be a first-order priority for developing a low-carbon economy.

In fact, advancing the deployment of CCS technology will pave the way for coal to continue to be an important part of the electricity production mix in the new low-carbon economy. Without CCS, coal is far too carbon intensive to remain a viable energy source.

The components of CCS—carbon capture, transport via pipelines, and geologic storage—are all commercially in use. In the United States, 35 million metric

tons of CO_2 annually are captured and injected for enhanced oil recovery.[137] Still, this is small-scale compared to what would be needed to deploy full-scale CCS, which will be a huge undertaking. The largest of the existing projects injects only 1 million metric tons of CO_2 a year, while a single 500 MW power plant can produce around 3 million metric tons of CO_2 a year. The United States alone produces around 1.5 billion metric tons of CO_2 a year from coal-burning power plants.

According to the recent Massachusetts Institute of Technology report on "The Future of Coal," if 60 percent of the CO_2 from U.S. coal plants were captured and compressed to a liquid for geologic storage, its volume would equal the total U.S. daily consumption of oil, or about 20 million barrels a day.[138] Thus, capturing and sequestering the 1.5 billion metric tons of CO_2 produced annually by U.S. coal-burning power plants represents a substantial challenge.

There is already a high level of confidence that geologic storage of very large quantities of CO_2 is practical and will work. A 2005 report by the IPCC on *Carbon Dioxide Capture and Storage* concluded that, based on both actual observation and models, more than 99 percent of sequestered CO_2 would be retained in geologic reservoirs for over 1,000 years. And the MIT study said that "no knowledge gaps today appear to cast doubt on the fundamental likelihood of the feasibility of CCS. Our overall judgment is that the prospect for geologic CO_2 sequestration is excellent."[139]

The cost of CCS is significant. Estimates suggest it could add 40 percent to the production cost of coal. But the overall impact on electricity prices is likely to be modest for several reasons: production costs account for only 60 percent of the cost of electricity; coal accounts for only 50 percent of electricity; and CCS, even if rapidly adopted, will apply to only a fraction of U.S. coal capacity for a substantial period, since CCS is suitable for new plants, but not necessarily for retrofitting existing capacity.

Demonstration Projects

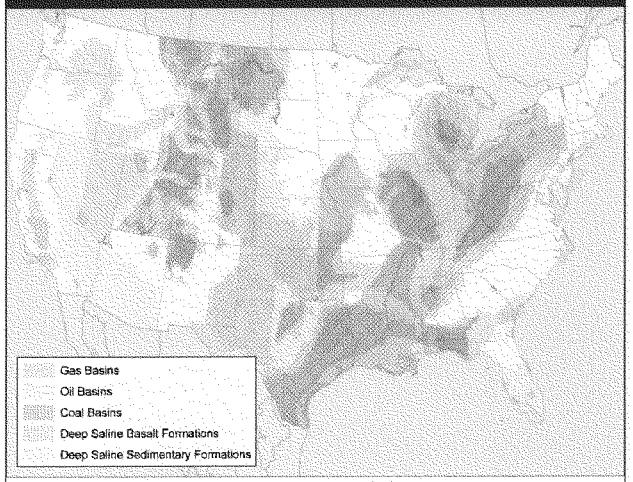
We need to provide significant government support for several full-scale, integrated commercial projects that include CO_2 sequestration, transport of CO_2 through pipelines, and storage in different geologic settings. These should not be conceived of in a sequential manner as projects that need to demonstrate feasibility before other aspects of the policy agenda move forward. Given how quickly new coal-fired power plants are being built and how long coal facilities last (50 years or more), we do not have the luxury to build demonstration plants first and enact a program later. Nor do we need to do that. We have existing knowledge to begin this process immediately.[140]

Emission Performance Standard

One approach to promoting the adoption of CCS would be to set tight cap-and-trade limits on CO_2 so that CO_2 emissions would be costly enough to make CCS an attractive alternative for power generators. A politically feasible cap-and-trade program, however, probably won't result right away in a high enough price for CO_2 credits (estimated to be around $30 per ton)[141] to spur the adoption of CCS. And the adverse consequences of constructing new coal plants without CCS are significant and long-lasting.

Two recent Center for American Progress and Center for American Progress Action Fund analyses, "Global Warming and

POTENTIAL GEOLOGIC CO_2 STORAGE RESERVOIRS IN THE U.S.



The United States is fortunate to have an abundance of theoretical CO_2 storage potential, well distributed across most of the country. Our preliminary and ongoing assessment of candidate geologic CO_2 storage formations reveals that the formations studied to date contain an estimated storage capacity of 3,900+ gigatons of CO_2 within some 230 candidate geologic CO_2 storage reservoirs.

- 2,730 gigatons in onshore deep saline formations, with perhaps close to another 900 gigatons of storage capacity in offshore deep saline formations
- 240 gigatons in onshore saline-filled basalt formations
- 35 gigatons in depleted gas fields
- 30 gigatons in deep unmineable coal seams with potential for enhanced coalbed methane recovery
- 12 gigatons in depleted oil fields with potential for enhanced oil recovery

Source: Battelle Climate Research Institute, *Carbon Dioxide Capture and Geological Storage*, April 2006

the Future of Coal: The Path to Carbon Capture and Storage" and "The Path to Cleaner Coal: Performance Standard More Effective Than Bonus Allowances," indicate that the adoption of an emission performance standard for all new coal-fired electricity plants is the best policy tool to achieve accelerated adoption of CCS technologies. This emission performance standard would require, in effect, that new coal capacity be built to meet a CO_2 emissions standard achievable with the best available CCS technology.

Lead time of several years would have to be provided to permit utilities to learn from the operational experience of demonstration projects and to give the government time to establish the new regulatory framework that would be needed to

govern and monitor the whole system. But time is of the essence. Given how long power plants last, it is vital that they be built with the right, low-carbon technology. While all new coal-fired power would be subject to these emission performance standards, existing power plants would be subject to a declining cap on emissions under a cap-and-trade system that would create incentives for emission reductions through efficiency measures.

Congress should promptly pass legislation declaring that, going forward, no new coal plants would be grandfathered out of having to meet CCS obligations. Additionally, establishing a national CCS system will require not only large-scale R&D and demonstration projects, but also the development of new rules to govern design and operation of geologic repositories, a process that the EPA has only recently begun to explore.[112] Numerous issues will arise based on the need to ensure that the system is safe, that leaks are avoided, that sequestration sites are properly selected and monitored, and that liability is assigned, in the event that there are problems.

There will also be complicated issues with regard to property rights for pipelines and storage sites. This regulatory project should be commenced promptly so that by the time full-scale CCS deployment is ready to go, the legal and regulatory framework will be in place.

Requiring Federal Action to Reduce Global Warming

Led by the new White House National Energy Council, the federal government should play several roles in promoting energy efficiency and reducing greenhouse gas emissions. Not only should the government create policies to promote the development and adoption of energy-efficient and low-carbon technologies, it should also use its own purchasing power to spur consumption of low-carbon technologies and make sure that its own investments go only toward low-emitting projects. The federal government must start investing in our capacity to adapt to the climate change we will face even if we cut emissions dramatically.

Separately, the next presidential administration needs to create four new federal agencies and entities to help support the development and advancement of technologies to fund our nation's low-carbon energy future. These agencies and entities can speed the development of clean energy technology and provide financial and technical support to industries, workers, and consumers of the future.

Federal Purchasing Power

To show real leadership, national law makers should begin by fully deploying the purchasing power of the federal government to help spur the market for fuel efficient vehicles, alternative low-carbon fuels, energy efficiency, and renewable energy.

The government, and the Executive Branch in particular, operates an enormous fleet of vehicles. In 2000, President Clinton signed Executive Order 13149, which required federal agencies operating 20 or more motor vehicles in the United States to reduce their entire vehicle fleet's annual petroleum consumption—primarily through the use of alternative fuels and more fuel-efficient vehicles—by at least 20 percent below 1999 levels by the end of 2005.

On January 24, 2007, President Bush issued an executive order revoking

E.O. 13149 and several others issued by President Clinton that reduced federal petroleum use, increased federal energy efficiency, and reduced federal greenhouse gas emissions. President Bush's January executive order focuses on reducing energy intensity rather than meeting a specific emission reduction target and reducing petroleum consumption without mandating any increase in the fuel efficiency of the federal fleet.

The federal government needs to be moving forward, not backward. If the government made a commitment to require a percentage of all its vehicle purchases to be the most fuel-efficient vehicles available, including those that can run on alternative low-carbon fuels, then this would help boost demand for these vehicles, especially those in the early stages of technological development, such as plug-in hybrids.

The federal government is also an enormous electricity consumer and could take far more aggressive measures to reduce electricity consumption at its various facilities by updating federal building energy targets, adopting green building standards, and expanding the Federal Energy Management Program, which allows building managers to benefit from upfront energy efficiency investments. The General Services Administration is the largest landlord in the United States, owning and operating approximately 500,000 buildings. So the federal government's own management choices can play a major role in transforming the market for green and more energy-efficient construction practices.

President Bush's recent executive order also revoked President Clinton's E.O. 13123, which among other measures, required reductions in greenhouse gas emissions, improved energy efficiency, increased use of renewable energy, and reduced petroleum use in federally owned buildings. To achieve significant improvements in federal buildings, we need the government to adopt a serious plan to cut emissions and increase efficiency, not to revert to weak goals and reductions based on emissions intensity.

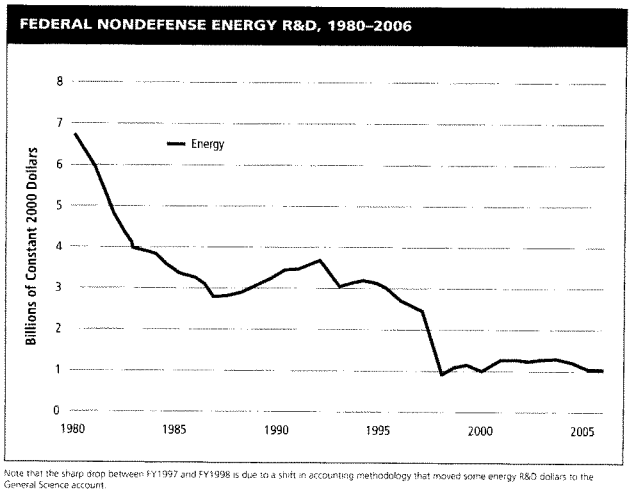
Ensuring Taxpayer Investments Reduce and Withstand the Effects of Global Warming

The federal government currently makes no systematic effort to evaluate emissions or performance risks associated with government-funded programs or projects. Without requiring these assessments, we do not know how federal spending affects U.S. emissions or how vulnerable taxpayer investments are to changing climatic conditions. American taxpayer dollars should only be funding projects and programs that take carbon emissions and resilience to climate change squarely into account.

Adaptation to the Effects of Global Warming

Even if all greenhouse gas emissions were eliminated today, the concentration of gases already in the atmosphere is high enough to produce the global warming effects we are now experiencing and will continue to experience for years to come.

As outlined in the CAP report, "Forecast: Storm Warning," the federal government must work in partnership with state and local governments, businesses, non-profit organizations, and other community members to develop adaptation strategies to climate change, including community-based hazard preparedness, coordinated disaster response, and post-disaster recovery plans.



Note that the sharp drop between FY1997 and FY1998 is due to a shift in accounting methodology that moved some energy R&D dollars to the General Science account.

Source: Science and Energy Indicators (2006).

The need for such planning in the face of the projected increase in the severity and number of hurricanes is especially important given current demographic shifts: Over 50 percent of the U.S. population currently lives on our coastlines.

It is not only our built environment that will need help in adapting to the effects of climate change; our natural ecosystems, including federal landholdings, will also require investments to ensure conservation of important ecosystem services and the preservation of biodiversity.

Energy Innovation Council[143]

The United States needs a fresh approach to energy RD&D that successfully integrates the efforts of the numerous departments and agencies that are engaged in energy-related work, including the Department of Energy, the U.S. Department of Agriculture, the Department of Commerce, the Department of Defense, the National Science Foundation, and the EPA. This new approach will need to address the shortcomings that have frequently plagued energy RD&D efforts, such as the practice of spending significant resources on demonstration projects that provide little useful information to the private sector.

The Apollo and Manhattan Projects are sometimes held up as models of innovation to be emulated, but the energy innovation challenge is fundamentally different because it requires the private sector to adopt new technologies that can succeed in the competitive marketplace. These were not considerations in

our country's efforts to put a man on the moon or to build a nuclear weapon.

Consequently, we recommend at least doubling the size of the federal energy RD&D budget and creating a new interagency group, the Energy Innovation Council, or EIC, that will be responsible for developing a multi-year National Energy RD&D Strategy for the United States. The mandate of the EIC would be to construct a plan that integrates the RD&D programs of the involved federal agencies over a multi-year period. The National Energy RD&D Strategy would provide direct expenditures to support technology development and demonstration and indirect financial incentives or regulations to promote new technology.

Energy Technology Corporation[114]

The government should also establish a quasi-public Energy Technology Corporation to manage large scale energy demonstration projects in alternative, low-carbon technologies. The ETC would finance and execute select large-scale, commercially-credible demonstration projects. This new organization would be governed by an independent board nominated by the President and confirmed by the Senate, composed of individuals with expertise in market forecasting and industry requirements.

Due to its quasi-public status, ETC projects would be free from the federal procurement regulations and mandated production targets that currently make it difficult to demonstrate the commercial viability of new technologies under real market conditions. In order to limit the influence that Congress and special interest groups would have on its decision-making, the ETC should be funded in a single appropriation.

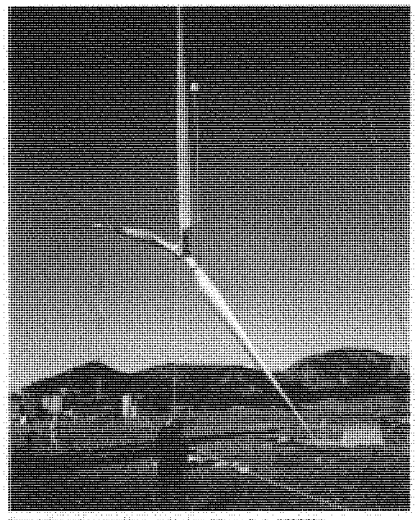
Clean Energy Investment Administration

We support the Apollo Alliance recommendation to create a Clean Energy Investment Administration modeled on the Small Business Administration to reduce investment risk in clean energy projects with loan guarantees. The CEIA would provide up to $25 billion in federal loan guarantees over 10 years, directed toward both commercial prototypes and mass-market deployment of proven technologies. In addition, CEIA would authorize up to $2 billion to cover the high risks associated with commercialization projects. This entity would help create jobs, reduce emissions, and diversify production by fostering successful private commercial ventures that promote energy efficiency and renewable energy technologies.

Clean Energy Jobs Corps

The federal government should create a new Clean Energy Jobs Corps that can provide new pathways out of poverty, service learning, and support for training and apprenticeship programs to help workers move into "green collar" jobs and clean energy industries that provide family-supporting wages and benefits. To do this, the federal government should marshal the resources of agencies like the Corporation for National and Community Service that has run the highly successful AmeriCorps program, along with job training resources administered by the Department of Labor under the Workforce Investment Act. This new agency will ready a workforce with new skills and assist in the transition of any workers displaced from high-carbon industries.

A significant shift is needed in our workforce in order to transition to a low-carbon economy. Specialized skills will be



needed to install, operate, and maintain many of the new clean technologies and advanced energy systems. A 2006 study by the National Renewable Energy Lab identified the shortage of skills and training as a leading non-technical barrier causing a bottleneck in the future growth of the renewable-energy and energy-efficiency industries.[115] This growing skills shortage is occurring even as the American Public Power Association reports that half of current utility workers will retire within the next decade. As a nation we are simply not training enough new workers to fill these jobs.

A workforce investment program in clean energy could increase funding for low-income home weatherization and couple it with a job-training program focused on energy efficiency and renewable energy trade skills. These newly trained workers could serve the growth industries of wind and solar power, with 26 percent and 40 percent annual growth, respectively. The trainees could include veterans and those displaced due to energy industry changes, among others.

This approach is currently being tried in pilot programs in a number of cities, but it is time for a national commitment to meeting the workforce needs of a low-carbon economy.

Federal agencies must also employ individuals who have the technical, financial, and management skills necessary for successful energy innovation.[116]

Creating this elite career service and a successful RD&D program will require integration of a number of energy innovation disciplines. A career service that provides the opportunity (or even the requirement) that an individual have experience working in a number of different agencies will strengthen the capability of the country to manage energy innovation successfully.

Advancing International Global Warming Policy

Climate change is a global phenomenon, and the shift to a low-carbon economy can serve America's interests at home and abroad. The focus of this report in the *Progressive Growth* series of economic policies has been on what the United States should do to hasten the advent of a low-carbon economy, and thus the complicated set of questions concerning the policies and diplomacy needed to

The Energy Transformation in Practice

How would our Progressive Growth energy and climate policies affect American businesses and individuals? Here are several hypothetical examples.

Oil Industry Worker

[illegible]

[illegible]

[illegible]

[illegible]

Small Farm Owner

As the new presidential administration enacted a raft of low-carbon energy policies, a part-time graduate student came to inherit her parents' small farm, leaving her in sole custody of the family's now third-generation homestead. Yet her financial situation was tenuous as she struggled to make a living off the small farm amid agricultural price uncertainties due to the introduction of a new nationwide market-based cap-and-trade system.

[illegible]

[illegible]

[illegible]

Clean Energy Entrepreneurs

In the early 21st century, the outsourcing of jobs overseas became an increasingly common occurrence in high-tech manufacturing and information technology services, raising profound questions about the competitiveness of even highly skilled American workers amid rapid globalization. Compounding the problem was the unwillingness of venture capitalists to invest their risk capital outside the traditional high-tech centers on the East and West Coasts, which, alas, was not where two alternative energy entrepreneurs residing in a rust belt state had opted to launch their new start-up company.

With funding from friends and family and a few local investors, the two partners managed to launch their new thin-film solar photovoltaic manufacturing company, and within a few years they began to profit from a host of federal and state-level policies that

[illegible]

Mid-Sized City Commuter

The transition to a low-carbon economy in this mid-sized city created over 20,000 new jobs over the next decade as a new "Green Collar" workforce emerged out of new government training programs to fill positions in the rapidly growing, high-wage, clean-tech companies.

[illegible]

Volatility and uncertainty would make it difficult for the tractor company to plan for the future. But thankfully, U.S. officials charged with developing the cap-and-trade regime *did* learn lessons from the EU experience. They managed to design a system that was accurate and transparent, creating a stable and predictable carbon emissions market.

The Energy Transformation in Practice [illegible]

Still, industrial centers like the tractor company experienced growing pains under the new system. Costs of production rose slightly over the course of the next several years as energy generators and industrial carbon emitters began to internalize the costs of their greenhouse gas pollution. Profits slipped, followed by a round of layoffs.

Yet the CEO noticed, after several tough years, that electricity and natural gas price volatility that had so bedeviled her in the first decade of the 21st century was declining as federal policies took hold that were designed to diversify the nation's sources of energy, specifically renewable and low-carbon alternatives, and to reward utilities that promoted efficiency and conservation.

Moreover, sustained federal investment in the research and development of energy-efficient industrial machinery helped commercialize a new line of efficient manufacturing equipment. Once installed, the energy intensity (goods per unit of energy) of the company's product line fell sharply, reducing the cost of production and improving its competitiveness in the marketplace.

Customer demand for the company's new line of energy-efficient farm equipment capable of running on biodiesel also picked up as farmers turned to cheaper low-carbon fuels produced locally or on-site, and as orders from abroad picked up as more nations moved toward climate-friendly policies. The layoffs and profit shrinkages that did occur during the few years of company contraction were more than offset by new hires and increased revenues as the company adapted and prospered in the new American low-carbon economy.

Union Electrician

The sub-prime mortgage crisis and housing market backslide continued to ripple throughout the building industry, hitting blue-collar trade workers particularly hard as the new administration enacted its package of low-carbon policies. One union electrician struggling to put two kids through college saw little connection between the government's new "Green Building" initiatives and her livelihood, in which demand for her services was decreasing steadily until she was struggling to make ends meet at the end of each month.

As the administration's new policies were enacted, however, the green building industry began to grow exponentially—and along with it demand for craftspeople knowledgeable of so-called Leadership in Energy and Environmental Design, or LEED standards, and skilled in the various components of energy and resource-efficient new construction and building retrofits. The electrician's union, seeking to capitalize on this growing market, offered job training seminars in electrical installation and retrofits for low-carbon and energy efficient technologies such as solar photovoltaic panels and lighting timers.

The union electricians participated in the training, which required only minor adjustments to her existing skill set, and immediately found herself at a competitive advantage for jobs in the green building industry. Soon, those end-of-the-month money crunches were a thing of the past. In fact, in time she was able to junk her gas-guzzling 1980s-era truck and with the help of a new federal tax incentive she purchased a highly efficient American flex-fuel pickup.

bring about a low-carbon economy globally are beyond its scope. But a few broad points should be made.

By taking the lead in transforming our own economy, we can lead in the creation of a global market that can benefit countries and communities around the world. Just as important, we can provide the global leadership that is desperately needed to manage the impact of climate change in the developing world—as a matter of principle, as a measure of our commitment to a more equitable world, and for practical reasons given the high costs and widespread instability that climate change will trigger in the world's poorest countries.

The solution to climate change must be a global one. The United States is a large part of the problem, with only 5 percent of the world's population yet responsible for 23 percent of worldwide emissions.[137] At the same time, most of the growth in emissions going forward will be generated by developing countries whose collective increase in emissions will account

for over 75 percent of global emissions growth by 2030.[118]

Indeed, in 2006 (well ahead of even recent forecasts) China surpassed the United States as the world's leading emitter of greenhouse gases, although U.S. per capita emissions remain higher than China's.[119] It is thus clear that rapidly industrializing countries—China chief among them—will have a big role to play in containing climate change.

The United States will simply have no credibility with other nations unless we have vigorously addressed the problem at home. As we are putting our own mandatory system in place, we will need to re-engage vigorously in the diplomatic arena. The principal forum for climate change negotiations to date has been the U.N. Framework Convention on Climate Change under which the Kyoto Protocol was negotiated. The UNFCCC process is the one that President Bush walked away from shortly after he took office. We must reverse course and reassert constructive U.S. leadership.

But we should also recognize that the UNFCCC process, with over 190 nations, is inevitably slow and bureaucratic. The Kyoto Protocol was first agreed to in 1997, but did not enter into force until 2005. The urgency of this problem means that the global community simply must pick up the pace. To this end, we support the formation of a small forum that we have previously described as an E-8 in which the leaders of key developed and developing nations can meet annually to seek agreement both on concrete actions within the group itself, which would account for around 70 percent of global emissions, and on the architecture of a new global agreement to succeed Kyoto.

We will also need to pay particular attention to the need to bring financial support and encourage investment flows to the energy and environment sectors of poor countries. In impoverished nations across Africa, Asia, and South America, faltering economies are already at a disadvantage on account of antiquated energy systems and environmental degradation, and these problems are likely to worsen as climate change takes its toll over the next 50 years, according to the IPCC's recent report. As a high priority, we will need to engage with our international partners and direct a portion of cap-and-trade auction revenue to help poor countries both alleviate energy poverty by developing modern, low-carbon energy systems and adapt to the effects of climate change that are already unavoidable.

Conclusion

The case for reestablishing the energy base of our economy on a low-carbon foundation could scarcely be more compelling. The failure to meet the energy challenge that is upon us will have severe—and potentially catastrophic—consequences for our environment, economy, and national security. Nothing short of nuclear war poses a greater long-term threat to civilization than the ecological dangers that confront us, and none of these ecological threats is as profound as climate change. The United States must either take upon itself the task of fundamentally transforming its approach to energy or endure the consequences.

On the opportunity side, the explosive innovation that the right set of low-carbon policies and rules could propel the United States and world economy to its next great leap forward.

And fortunately, there is still time to act; nothing stands in our way except a lack of political will.

The costs inherent in this economic transformation are real but entirely manageable. Recall the EPA worst-case economic projections based on the Lieberman-McCain bill: that in 2050 our economic growth compared with 2005 would be 234.8 percent, rather than 238 percent, higher. If the right policies and rules of the road are put in place, with business aggressively pursuing the new opportunity of low-carbon energy, the actual economy should leave worst-case scenarios like that in the dust and instead produce a virtuous cycle of invention, innovation, new business development, job creation, and economic growth.

At any rate, the idea that costs, even of the kind in the EPA scenario, would cause us to shrink from doing what manifestly needs to be done, as an insurance policy at the very least, is difficult to comprehend. It would testify to a profound failure to recognize our historical moment.

Every great change in the nature of economic or social arrangements produces great resistance, and this is sure to happen now as well. But that is the challenge of leadership—to mobilize the potent forces of change, to instruct and teach those who are prepared to help, to persuade those who are unsure, and to overcome those who are frozen in unyielding opposition.

The course ahead is clear, and the responsibility is upon us all to do our part.

Endnotes

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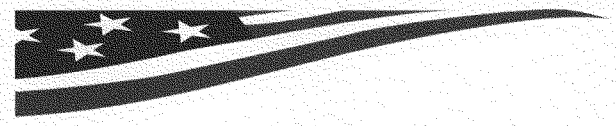

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