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# MOVING AMERICA TOWARD A CLEAN ENERGY ECONOMY AND REDUCING GLOBAL WARMING POLLUTION: LEGISLATIVE TOOLS

## HEARING

BEFORE THE

## COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

JULY 7, 2009

Printed for the use of the Committee on Environment and Public Works

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ONE HUNDRED ELEVENTH CONGRESS
FIRST SESSION

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# MOVING AMERICA TOWARD A CLEAN ENERGY ECONOMY AND REDUCING GLOBAL WARMING POLLUTION: LEGISLATIVE TOOLS

**TUESDAY, JULY 7, 2009**

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

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

Present: Senators Boxer, Inhofe, Voinovich, Carper, Lautenberg, Bond, Cardin, Specter, Sanders, Alexander, Barrasso, Crapo, Klobuchar, Whitehouse, Udall, Merkley, and Gillibrand.

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

Senator BOXER. The hearing will come to order.

We want to welcome everybody here. I am very happy to see this excellent turnout. A couple of comments before we begin.

We received a letter, I guess we just received it, from the Republican side, asking for a number of hearings on a number of topics. I am happy to inform them that they are already scheduled and we have been working on this, particularly with Senator Voinovich because he asked for several of these. So, all of this that you have requested will be handled over the next 2 weeks, and we appreciate your interest.

I also am going to ask people if they can keep their opening statements to 2 minutes, if possible. But I understand that members on the other side of the aisle wanted to have 5, so you are welcome to take 5 if you need it. The reason I am trying to expedite things is we have four very important leaders of the Administration here and I would like to get to them. But if anyone needs to go 5 minutes, that is fine.

Senator INHOFE. How about 3 and a half?

Senator BOXER. You can go up to 5 minutes. It is fine.

Let me open this way. Today's hearing is the kickoff of a historic Senator effort to pass legislation that will reduce our dependence on foreign oil, create millions of clean energy jobs, and protect our children from pollution.

The central theme in Thomas Friedman's book, Hot, Flat and Crowded, is this: the nation that aggressively addresses the issue of climate change will be the nation that will thrive, the nation that will lead, and will be the nation that will prosper. Here is

what Friedman writes, in his own words: "The ability to develop clean power and energy efficient technologies is going to become the defining measure of a country's economic standing, environmental health, energy security and national security over the next 50 years."

We know that this premise is being borne out even in this recession. In California, which has been one of the hardest hit by the housing crisis, the financial crisis, and by a State budget crisis, the area that has outperformed every other has been the creation of clean energy jobs and businesses.

A recent report by the Pugh Charitable Trust found that more than 10,000 new clean energy businesses were launched in California from 1998 to 2007. During that period, clean energy investments created more than 125,000 jobs in California and generated jobs 15 percent faster than the economy in our State as a whole.

Our committee has held more than 40 hearings and briefings on global warming since January 2007, and we are going to hold many more, as I stated before. We are well aware of the work done on the dangers of global warming by the Bush administration and the Obama administration. A few weeks ago, this Administration released a sobering report on the impacts global warming is having across the United States and the devastating effects that will come if we do not take action: droughts, floods, fires, loss of species, damage to agriculture, worsening air pollution. These are examples.

Today, I am so pleased to welcome leaders of the Obama administration as they encourage us to act, to act on the heels of the passage of the Waxman-Markey Bill in the House. Today I expect you will hear fierce words of doubt and fear from the other side of the aisle regarding our legislative efforts. This is consistent with a pattern of no. No, we cannot. No, we will not. I believe that this committee, when the votes are eventually taken on our bill, will reflect our President's attitude which is yes, we can, and yes, we will.

Colleagues, this is the challenge to our generation that offers hope, not fear, and a way out of the environmental and economic challenges we face so that our children and our grandchildren will have a bright future.

Thank you very much.

Senator Inhofe.

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

Senator INHOFE. Thank you, Madam Chairman.

Despite the 77-seat majority in the House, Speaker Pelosi passed her cap-and-trade energy tax bill on June 26 by just one vote over the margin. In other words, the majority in the House is 218. She had 219 votes.

Against this backdrop, the Senate will begin the process of considering yet another cap-and-trade bill. I would like to note that the Senate is not new to this, like the House was. The Senate has actually debated this five times. We have had three votes in 2003, 2005 and 2008, each time defeating it, substantially, and a little bit more each time.

As I understand it, you intend to hold a series of hearings with the hope of marking up a bill before the August recess. Let me just

say, Madam Chairman, I commend you for holding the hearings. The minority jointly issued the letter that you referred to outlining our request for a series of legislative hearings that are based on legislation. Based on legislation. We have got to have something in front of us.

As I look at the calendar, it appears that we are going to be considering a massive bill in a very low and narrow window of time. So, the question arises: when will we see the bill that you intend to mark up? I hope we do not repeat the process of the House, and that is having a substitute appear at 3 a.m. of the very day that we are going to vote. That is totally unacceptable by, well, it should be by everyone.

The American people and their elected representatives deserve an open transfer and thorough review of any legislation that, as the Washington Post described it, "will reshape America's economy in dozens of ways that many people don't realize." You can be sure of this: once the American public realizes what this legislation will do to their wallets, they will resoundingly reject it. Perhaps that explains why we are rushing cap-and-trade through the Senate, the tack so fast.

The public is already on record rejecting energy taxes, considering a new poll, a Rasmussen poll. Madam Chairman, this was just issued 6 days ago. Fifty-six percent of Americans are not willing to pay anything to fight global warming. This includes higher utility costs, which, under cap-and-trade, as President Obama said, would necessarily skyrocket.

The bottom line is this. However you spin the debate, or whatever schemes we concoct to hide the higher costs consumers will pay, the public will find out. And when they do, they will reject those schemes and reject the spin and they will look instead for solutions that create jobs, strengthen energy security and increase our global competitiveness.

Now, Madam Chairman, when it comes to legislative tools, there is a better way. Whether it is reducing dependence on foreign oil or increasing access to clean, affordable and reliable sources of energy, we do have answers. You have stated that we are the party of no. Well, that is true. We say no to higher energy costs, no to subsidizing the East and West Coasts at the expense of the heartland, no to more bureaucracy and red tape, no to the largest tax increase in American history, and no to sending our manufacturing jobs to China and India.

And we yes to an all-of-the-above domestic energy policy, which includes nuclear, clean coal, natural gas, wind, solar, geothermal. We say yes to a greater access to all sources of clean and reliable energy we have right here at home. And if we did this, we could stop all reliance on the Middle East.

So, I am looking forward to the hearings, and I am most anxious to see what kind of a document we will have a chance to debate.

Thank you, Madam Chairman.

[The prepared statement of Senator Inhofe follows:]

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

Despite a 76-seat majority in the House, Speaker Pelosi passed her cap-and-trade energy tax bill on June 26 by just one vote over the majority required, 219–212.

Against this backdrop, the Senate will begin the process of considering yet another cap-and-trade bill. I would note that the Senate has voted on cap-and-trade three times: in 2003, in 2005, and in 2008. In each and every instance, we defeated it. Now, Madam Chairman, here we go again.

As I understand it, you intend to hold a series of hearings with the hope of marking up a bill before the August recess. Madam Chairman, let me say I commend you for holding hearings. The minority jointly issued a letter today outlining our requests for a series of legislative hearings that are based upon actual legislation.

In the letter, the Republican members of this committee express concern about the process involved in considering the most complex piece of legislation ever before this committee.

Madam Chairman, as I look at the calendar, it appears that we will consider a massive bill in a very narrow window of time. So the question arises: when will we see the bill that you intend to mark up? I hope we don't repeat the process in the House, when the majority released a 300-page manager's amendment at 3 a.m., the morning of the vote.

The American people and their elected representatives deserve an open, transparent, and thorough review of any legislation that, as the Washington Post described it, "will reshape America's economy in dozens of ways that many don't realize."

You can be sure of this: once the American public realizes what this legislation will do to their wallets, they will resoundingly reject it. Perhaps that explains why we are rushing cap-and-trade through the Senate.

The public is already on record rejecting energy taxes. Consider a new poll by Rasmussen, which found on July 1 that 56 percent of Americans are not willing to pay anything to fight global warming. This includes higher utility costs, which under cap-and-trade, as President Obama said, would "necessarily skyrocket."

The bottom line is this: However you spin this debate, or whatever schemes you concoct to hide the higher costs consumers will pay, the public will find out. And when they do, they will reject those schemes and reject the spin, and they will look instead for solutions that create jobs, strengthen energy security, and increase our global competitiveness.

When it comes to legislative tools, there is a better way. Whether it is reducing dependence on foreign oil or increasing access to clean, affordable and reliable sources of energy, Republicans have answers.

We have been accused of being the party of "no" for too long. Well, it's true that we say no to higher energy taxes, no to subsidizing the East and West coasts at the expense of the heartland, no to more bureaucracy and red tape, and no to sending our manufacturing jobs to China and India.

We say "yes" to an all-of-the-above domestic energy policy, which includes nuclear, clean coal, natural gas, wind, solar, and geothermal. We say "yes" to greater access to all sources of clean and reliable energy right here at home.

Finally, I welcome our witnesses before us today, including members of the Administration and the Governor of the great State of Mississippi. I look forward to questioning the panel, and in particular I look forward to hearing from Administrator Jackson regarding my letter sent last week on the Agency's commitment to transparency.

Senator BOXER. Senator, thank you for your constructive words, and I think our bill will reflect your yesses.

I just want to correct the record, and I would ask unanimous consent to place in the record, the Markey Bill, the portion which deals with the tax credit. There are no new taxes but there is a tax credit for consumers.

Senator INHOFE. Let me make an inquiry here, Madam Chairman.

Senator BOXER. Yes.

Senator INHOFE. Because, in the event that after each statement is made, you want to refute them, I think that we should have a chance to do the same thing and that would just be endless. So, if we start on that——

Senator BOXER. OK. Sure. That is fair enough.

Senator INHOFE. So, let us just watch it. Thank you.

Senator BOXER. That is fair enough. I do not mind if you want to refute it.

Senator INHOFE. Oh, OK.

Senator BOXER. Just go ahead.

[Laughter.]

Senator INHOFE. What we are dealing with here is going to be a large tax increase. I was interested in some of the CBO reports that said, well, what we are going to do is take this large sum of money that comes in under cap-and-trade and we will go ahead and return it to the people who are paying taxes.

Well, it is coming from them originally. So, I would certainly not want to give any credibility to any kind of an evaluation as to the cost to the American people if they are predicated on the assumption that we have a cap-and-trade tax raising huge amounts of money from the American people in the form of energy costs and then turning around and giving that energy back to them.

Senator BOXER. I stand by my words. Now, I am going to say who came here in order. If there is any dispute, let me know. Merkley, Klobuchar, Cardin, Lautenberg, Alexander, Barrasso, Crapo, Bond and Voinovich. Is there agreement on that? Oh, Senator Gillibrand. Is she at the end of the list? OK.

Senator Merkley.

**OPENING STATEMENT OF HON. JEFF MERKLEY, U.S. SENATOR FROM THE STATE OF OREGON**

Senator MERKLEY. Thank you very much, Madam Chair.

This is indeed a critical conversation for the future of our Nation. Transforming our energy economy is essential. The status quo is simply unacceptable, whether that be $3 to $4 a gallon for gas, a foreign balance of trade fiasco in which we are spending $1 billion to $2 billion a day on foreign oil, a historic connection of burning geological carbon to drive industrialization that we can break, and, certainly, our national insecurity that comes from dependence on just a few foreign nations for critical energy supplies.

This status quo must change to strengthen our Nation, in this generation and the next. We need to end our dependence on foreign oil and foreign energy. We need to take and break the connection between burning geological carbon and turning it into carbon dioxide pollutant in the atmosphere to drive industrialization.

We need to lead the world in renewable resources so that we can become a critical source of the strength of our economy, selling both the intellectual capital and products to the world. We certainly need to underwrite the innovation of our capitalist economy in surging ahead of the world and creating these products.

We can do all of this by restructuring energy economy through this bill. If we fail to do that, we will continue to be dependent upon a few small nations for a critical energy supply. We will continue to spend $1 billion to $2 billion or more every day overseas rather than spending it here in the United States on clean energy, creating jobs. And we certainly will continue to contribute to a planetary catastrophe in the form of global warming.

So, it is a critical debate. I am honored to be here and I look forward to your testimony. I do apologize in advance. I will be running back and forth to the health care mark up.

Thank you.

Senator BOXER. Thank you, Senator.

Before I call on Senator Alexander, if it is OK with the committee, Senator Inhofe and I thought that, as long as we have a quorum, we could approve a couple of nominees that have been waiting to be approved.

Why do we not hear from Senator Alexander and then we can go to that process, if it is OK.

Senator Alexander.

Senator ALEXANDER. Madam Chairman, thank you. Senator Bond has to leave, and I was going to ask if he could go before me. If that would be all right, it would be all right with me.

Senator BOXER. Absolutely.

Senator ALEXANDER. Thank you, Madam Chairman. Thank you very much.

**OPENING STATEMENT OF HON. CHRISTOPHER S. BOND, U.S. SENATOR FROM THE STATE OF MISSOURI**

Senator BOND. Thank you very much, Madam Chair. I am indebted to my colleagues.

I thank you for holding this hearing, and I thank you very much for the commitment to hold additional hearings on the very important legislative matters we will be marking up when we have an opportunity to learn about them.

I think the American people, and certainly my Missouri constituents, deserve to know how the legislation we consider will impose new energy taxes on them, kill their jobs, punish the Midwest and South, help China and India, and construct a new bureaucratic nightmare to implement a carbon cap-and-trade program.

Some say we should just look to the bill the House passed this month, and to that I would have to say, which one? We have the 648-page discussion draft. We have the 932-page introduced bill. We have the 946-page committee substitute. We have the 1,201-page floor-filed bill. We have a 500-page red lined version. We have a 743-page committee report. We have the 309-page manager's amendment filed at 3 a.m. the morning of the floor debate. And we have the 1,427-page House bill. In total, 6,706 pages of legislative material.

For those who say we should work off the House-passed bill, we have a prominent advocate for the environment here today who will testify that we should abandon the floor compromises benefiting agriculture and go back to the committee-passed version. And we have the fresh experience of the most recent legislation the committee considered, where the chair adopted a complete substitute the day of the mark up and then berated members for not reading the substitute. We deserve better. And the people of America deserve better.

The American people and my Missouri constituents deserve to know why it takes all of these pages to address energy issues. This past week, calls in my office ran 929 against cap-and-trade to 3 for. What needles are the majority trying to hide in the haystack? What back room deals were made to buy support? What provisions were added in the middle of the night? How will a bureaucratic nightmare create work?

And what a nightmare it will be with EPA at the center of a great web of Government mandates, programs and taxes. EPA will have help from nearly two dozen other Federal agencies. The black box is on the bottom, some represented here today and many not, implementing Government programs that will tax and spend trillions of dollars. The gray, green, purple and brown boxes are on the side and in the middle. All of this we will focus the costs on us through our power bills, cooling and heating bills, food prices, product prices, gasoline prices and jobs, threatening families with higher prices, farmers with higher prices, drivers with higher prices, and workers with lost jobs.

All of this is to ask, what are our Democratic colleagues afraid of? If they are not afraid of us knowing what this will do to our families, why do we not get into the hearing on the legislation itself?

I hope we will get these answers soon. I certainly appreciate the opportunity to show the concerns I have.

Thank you, Madam Chair.

Senator BOXER. Thank you, Senator.

So, we are going to take a quick break, if it is all right, and go to the nominations at the U.S. Environmental Protection Agency.

[Recess.]

Senator BOXER. I thank my colleagues very much for your cooperation.

Senator Klobuchar.

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

Senator KLOBUCHAR. Thank you very much, Madam Chairman.

I know that our distinguished panel here understands that new energy legislation is truly about creating jobs here in America. And it is about developing homegrown energy and breaking our reliance on foreign energy.

I spent the 4th of July week up north in Minnesota, meeting with people everywhere. I will tell you, up there the unemployment rate is at 20 percent. In Minnesota, our people want good paying jobs across the spectrum, miners to mine more iron ore, manufacturing workers to make wind turbines, workers to fill our barges with those turbines to ship them on Lake Superior to countries across the world, and scientists to develop fuel cells and new cellulosic ethanol technology.

But an energy bill has to take account not just the captains of the energy industry, but also the people who buy the energy. Middle class families need protection from a jolt in their electricity rates and they also need an energy bill to provide job opportunities.

I believe a new energy bill done right will mean new business, like retooling and reopening manufacturing facilities to make the nuts and bolts of new energy systems, electric car batteries, solar panels and geothermal heat pumps. It is also about our farmers, which I know Secretary Vilsack understands. A new energy bill can help our farmers grow our fuels right here in America and reward them for developing and adopting new farming methods that will capture carbon pollution from our atmosphere. It is time we invest

in the farmers of the Midwest instead of the oil cartels of the Mideast.

I believe the opportunities here are enormous and we cannot let them go to waste. After decades of delay, it is time for action. We know what happened when gas prices went up last year. They approached $5 per gallon. It is not acceptable. Our energy supply is extremely vulnerable to disruption. Domestic disputes in Africa, or a broken pipeline in Russia, result in massive price spikes at gas stations and heating bills right here in America.

We need an energy bill that allows America to lead the rest of the world in the production of energy and the development of new technology including wind, solar, geothermal, hydro, new techniques for coal and new development of nuclear power.

Legislative priorities for me with this bill is first, does the legislation protect the middle class from higher energy costs resulting from putting a cap on carbon emissions? Second, does the legislation take into account agriculture and community? I know there was some good work done in the House to acknowledge their contributions to this. Third, for traditional companies, industries that are not subject to the same carbon constraints, to make sure that they do not have an unfair advantage. And finally, does the legislation give a sufficient boost to renewable energy? I personally would like to see a more aggressive portfolio standard. I know that is being worked on more in the Energy Committee than we saw in the House bill.

But overall, I do not think we can stick with the status quo. I do not think we can just throw daggers at this bill. I think we have to work to improve it. I think the people of my State, and the people of our country, depend on it.

I thank you very much for all of your work and contribution.

Senator BOXER. Senator, thank you.

Senator Alexander.

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

Senator ALEXANDER. Thank you, Madam Chairman. I look forward to the hearings and to participating in them.

I would like to take a little different tack on this. The Chairman quoted Tom Friedman and the importance of a nation that hoped to lead addressing clean energy. I think you left out an adjective. I put the word cheap in there. Inexpensive, if you prefer. Because a nation that does not have cheap energy is not a nation that will lead the world. That is especially true of the United States, which uses 25 percent of all of the energy in the world.

Why is that? Well, if we want to build cars and trucks in Minnesota and Tennessee and Michigan and Ohio and Missouri, instead of Japan and Mexico, we have to have cheap electricity. I mean, the auto suppliers in my State are just like this, every little cost addition moves a job to Mexico, or to Japan, or to somewhere else. Even the new polysilicon plant, to make materials for solar, uses 120 megawatts and they are in Tennessee because they can have large amounts of cheap electricity.

So, the choice is really between a high cost clean energy plan and a low cost clean energy plan. So, my question to the committee, and

it will be throughout all of this, is why are we ignoring the cheap energy solution to global warming, which is nuclear power?

I mean, this is really fairly simple. If what we are really interested in is reducing carbon, which is the principle greenhouse gas, we could focus first on smokestacks and say, let us start building 100 new nuclear power plants. Increase nuclear power. Nuclear power is 70 percent of our carbon-free electricity. Solar, wind and all of these other things are 6 percent. Nuclear is 70 percent.

So, over the next 20 years, we want to do that. We could build 100 more nuclear power plants. And then, as we did that, we could begin to close dirty coal plants or find some new, I said to Dr. Chu before, let us reserve a Nobel Prize for the scientist who finds a way to deal with carbon from existing coal plants. We could either have clean coal plants or we could have much cleaner existing plants.

A second thing to do is to electrify half our cars and trucks. That is the fastest way to reduce dependence on foreign oil and the use of oil. The third thing we could do is to explore offshore for natural gas, which is low carbon, and oil, which we should use less of but use our own. And fourth, several mini-Manhattan Projects much like the ones Dr. Chu is beginning to do to find a way to make some of these newer forms of energy cost effective and more reliable.

But for the next 20 years, if we really want to deal with global warming, we really only have one option. And that is to double the number of nuclear power plants we have. There is no other technological way that we have to have a large amount of reliable, cheap electricity other than nuclear power.

So, if we are in the business of saying yes, we can, if the President would give the same kind of aggressive interest to building 100 new nuclear power plants that he does to building windmills, we could solve global warming in a generation. We keep beating around the bush.

And instead, the House has come up with this contraption, much like the one last year which Senator Bond had on the table, and which is $100 billion a year in new costs. Somebody is going to pay that. That works out to be about $900 per family the way my math figures it. It will begin to suffocate large sections of our economy and drive jobs overseas.

High pricers want mandates of taxes. Cheap energy advocates, who include almost all Republicans and a growing number of Democrats, say build nuclear plants, double research on renewable energy in the meantime to make it cheaper and reliable.

We must remember at a time of 10 percent unemployment that high priced energy sends jobs overseas, working for cheap energy. Cheap energy not only helps create jobs, Madam Chairman, it is the fastest way to reduce global warming. One hundred new nuclear plants would reduce global warming faster than taxes and mandates.

So, I intend during this debate to keep bringing this up. A low carbon fuel standard is a more effective way to deal with carbon from fuel than an economy-wide cap-and-trade which only raises prices and for years might not reduce the carbon. That is 30 percent of the carbon. Forty percent of the carbon is in smokestacks.

We could begin to build nuclear plants and then, as they come online, we could do something about the dirtiest coal plants.

So, I thank the Chair for her time and I urge our committee and the Senate to look at the cheap energy clean solution if we really want to keep jobs in this country.

Thank you.

Senator BOXER. Senator, we look forward to working with you on that.

Senator Cardin.

**OPENING STATEMENT OF HON. BENJAMIN L. CARDIN, U.S. SENATOR FROM THE STATE OF MARYLAND**

Senator CARDIN. Well, Madam Chair, thank you very much for this hearing.

Let me start by saying that there is much that what Senator Alexander said that I agree with, although I reach a different conclusion. I think the bill that we marked up last year, the Lieberman-Warner Bill, and I think much of the provisions included in the Waxman-Markey Bill, encourages the type of activities that Senator Alexander was talking about, including the expansion of nuclear power, which I also support and believe is necessary for us to meet our energy needs and to accomplish our other goals.

I think we can improve the bill that came over from the House, but I think we need to act on legislation. I think it is critically important for many reasons, the first of which is jobs. It is about keeping jobs here in America. It is about we have developed the technology, now let us use that technology, let us create the green jobs here in America that will not only help our economy, but will help our national security by less dependence on foreign energy sources. And it will certainly help our environment by dealing with the problems that we have on carbon emissions.

I think we can accomplish all of that. The bill we worked on last year, and the bill that came over from the House, will allow us to do exactly what I think Senator Alexander wants us to do, and that is to become less dependent upon foreign energy sources and to use more energy sources here in America and create jobs in this country.

Let me just mention that yesterday I was out in Frederick County where BP Solar is located. They strongly want to see the jobs created here in America. I went to Fort Detrick. Madam Administrator, thank you very much for the environmental clean up work and putting it on the National Priority List to clean up Fort Detrick. It is interesting that there can be a membrane on top of about 14 or 15 acres and one of the uses that you are looking at is to put solar panels there, which will create additional jobs in Frederick County.

The largest part of our economy in Maryland, and this might surprise you, is agriculture. If there is just a 2 degree increase in temperature in our State, it will have a devastating impact on our agricultural industry, including the spread of diseases. So, this bill is about keeping jobs and expanding jobs here in America. And I could go to any one of the Senators in my own State, and I hope that we can work together, Senator Alexander, and come up with

a bipartisan bill which I think would be in the interest of the American public.

But it needs to make us energy secure and keep jobs here in America. And I believe the bill we worked on last year, and the bill that has come over from the House, give us the framework in order to achieve those results.

Senator BOXER. Thank you, Senator.

Senator Barrasso.

**OPENING STATEMENT OF HON. JOHN BARRASSO, U.S. SENATOR FROM THE STATE OF WYOMING**

Senator BARRASSO. Thank you very much, Madam Chairman.

As we begin debating climate change, I believe we must first look at transparency. Because we must have transparency. Transparency on scientific data on climate change and transparency on economic data on climate change.

Madam Chairman, you said we would hear fierce words of doubt and fear but that the President says yes, we can and yes, we will. But what I have seen so far is an Administration which is saying yes, we can hide the truth, yes, we can ignore the facts, and yes, we will intimidate career Government employees. This has become a culture of secrecy and suppression.

You quote Thomas Friedman. I would like to go to article by Kim Strassel in the Weekend Issue of the Wall Street Journal, The EPA Silences a Climate Skeptic. I am going to read from this.

One of President Barack Obama's first acts was a memo to agencies demanding new transparency in government and science. The nominee to head the Environmental Protection Agency, Lisa Jackson, joined in, exclaiming, as Administrator, I will ensure EPA's efforts to address the environmental crisis of today are rooted in three fundamental values—science-based policies and programs, adherence to the rule of law, and overwhelming transparency.

In case anyone missed the point, Mr. Obama took another shot at his predecessor in April, vowing that the days of science taking a back seat to ideology are over. Except, that is, when it comes to Mr. Carlin, a Senior Analyst in the EPA's National Center for the Environmental Economics and a 35-year veteran of the Agency.

In March, the Obama EPA prepared to engage the global warming debate in an astounding new way: by issuing an endangerment finding on carbon. It established that carbon is a pollutant and, thereby, gives the EPA the authority to regulate it, even if Congress does not act.

Well, around this time, Mr. Carlin and a colleague presented a 98-page analysis, arguing that the Agency should take another look at the science behind manmade global warming, and they say that it is inconclusive at best. The analysis noted that global temperatures were on a downward trend. It pointed out problems with climate models. It highlighted new research that contradicts apocalyptic scenarios. We believe our concerns and reservations are sufficiently important to warrant a serious review of the science by the EPA, the report read.

The response to Mr. Carlin was an e-mail from his boss, Al McGartland, forbidding, forbidding him, from any direct communication with anyone outside his office with regard to his analysis.

When Mr. Carlin tried again to disseminate his analysis, Mr. McGartland decreed that the Administrator and the Administration have decided to move forward on endangerment and your comments do not help the legal or policy case for this decision. I can only see one impact of your comments given where we are in the process and that would be a very negative impact on our office.

Mr. McGartland blasted yet another email. With the endangerment finding nearly final, you need to move on to other issues, move on to other issues and subjects. I do not want you to spend any, any, additional EPA time on climate change. No papers, no research at least until we see what the EPA is going to do with climate.

Ideology? No, not here. Just us science folks. Honest. That is Kim Strassel in the Wall Street Journal.

Well, Madam Chairman, as the Ranking Member of this committee's Oversight Subcommittee, I believe we can no longer allow this type of behavior to go unchecked. Behavior where the best advice and counsel is ignored, or it is blocked, and where it is kept hidden from the public.

It is for this reason that I visited with Senator Whitehouse this morning, who is the Oversight Subcommittee Chairman, and I am requesting that the EPA Subcommittee launch our own investigation into these recent troubling events.

A culture of intimidation has no justification in any administration. This Administration has publicly promised to hold itself to a standard of openness, transparency and accepting of opinions from individuals with differing opinions. The Administration has so far failed to make the grade.

Thank you, Madam Chairman.

Senator BOXER. Thank you, Senator.

Senator Lautenberg.

## OPENING STATEMENT OF HON. FRANK R. LAUTENBERG, U.S. SENATOR FROM THE STATE OF NEW JERSEY

Senator LAUTENBERG. Thank you, Madam Chairman. Welcome to this panel of experts and people who are committed to improving the quality of our environment, and I thank you for taking the position, taking the let me call it darts that might be thrown along the way. Fear not. Stumble on. Whatever we have to do, we have got to do it.

What we saw on the wall here, on these plaques, were no. No, no, no. Saying no to the whole process. But at least we have come a long way, because was it not too long ago that we heard that this was all a hoax? That global warming was a hoax? That is no longer the case because our friends on the other side have finally agreed that things have to be changed. So, maybe the hoax issue went away. It was a bad joke and thank goodness that has disappeared.

What we are saying here now is, we are saying no, no to the fact that 26 million Americans, 9 million of them children, are asthmatic. The rates have doubled since 1980. Do we really want to say no, you really do not have asthma? Here is a physician, a distinguished physician here. I am sure that he would not say that there is no longer any asthma to worry about. The fact of the matter is,

we do not have an easy task. But our children and grandchildren are depending upon us.

We are taking the advice of a majority of members of the Union of Concerned Scientists. Well, these folks are willing to say no, coral is not really dying. No, species are not really declining. No, things are really not bad at all. Well, they are terrible. They are terrible. And States across the country finally have the right to decide what they want to do in their own States, and I congratulate California for having done what it has.

We are looking at legislation. It is pretty darn good. It has come over from the House. We have an opportunity to review it, to change it, to do what we want to do. We cannot measure the volume of paper that has gone into it as indicative of whether it is good or bad. What we have got to do is just not just use the trees, but plant more trees.

My friends, this, unfortunately, has disintegrated in some ways to either you are for a cleaner environment or you are not. We talk about things like transparency. Let us talk about what it is to protect our children in the future. And look at the facts in front of us and not deny that they exist.

Madam Chairman, I thank you for holding this hearing. Press on. We are going to work on it. And, hopefully, we will convince some of our friends on the other side of the aisle that this is a serious project and we have got to get on with it.

Senator BOXER. Thank you, Senator.

Senator Crapo.

**OPENING STATEMENT OF HON. MIKE CRAPO, U.S. SENATOR FROM THE STATE OF IDAHO**

Senator CRAPO. Thank you very much, Madam Chairman, and I also appreciate our witnesses being here with us today. This is a very critical issue to our country and to our people.

I do have to take exception to the argument that either side is simply saying no. You know, I guess I could look back to the times when the Republicans were in the majority and we had major energy legislation to try to move forward and the answer from the other side was no.

What we have is a debate about how we should best approach the national energy policy of our country. And we have very true and sincere and real concerns about how we should proceed. On both sides. And I think it is incumbent upon us in this committee to roll up our sleeves and get down to the kinds of solutions that will work for the American people. I believe these solutions can be found, and can be found in a way that does not generate unbelievably high costs or impacts to the America people and does not drive our industry offshore.

I want to share some of the concerns that were raised by Senator Alexander. In particular, as we look at the renewable energy alternatives that are discussed, and the renewable energy standards that are being discussed in both the House and the Senate, and I realize that the Senate Energy Committee is the one dealing primarily with that, I am very concerned that one of the most obvious sources of solution is largely untreated in the legislation that we expect to see coming before us. And that is nuclear power.

I do not think there is much debate among any of us here, on either side of the aisle, that our Nation is far too dependent on petroleum and carbon-based resources for our energy. And that we are far too dependent on foreign sources of that energy. And that we as a Nation need to become independent, much more independent in our own development of energy.

I look at it similar to how one would look at an investment portfolio. We would not, most people do not believe that it is a prudent thing to invest all of their assets or all of their energy or the largest portion of them, into one asset. And it is not prudent for America to have an energy policy that is so dependent on one type of energy.

We need to diversify. We need to develop wind and solar and geothermal and hydro. And we need to develop the opportunity for, frankly, expanded utilization of petroleum as we transition to these other sources of energy. But we cannot ignore what is probably the biggest piece of the answer, and that is nuclear power.

I do not believe there is that much disagreement across the aisle except that we do not seem to see the kind of provisions in proposed legislation that will truly help us expedite and move forward some of these very significant answers, like nuclear power.

I simply want to say that, as we move forward, there are very, very obvious solutions available. And there is agreement on the issues that we must deal with in regard to our national security and our national energy independence. What we have to find are ways to get past the partisan differences and reach those solutions.

I hope that this committee will seriously get down to that business.

Thank you very much, Madam Chairman.

Senator BOXER. Senator Crapo, thank you.

I just wanted to note for the record that we did pass an Energy Act in 2005, 2006 and 2007. We did work across the aisle. So I hope that you are right, that we can do it this time.

Senator CRAPO. Very much tamed down, but nevertheless——

Senator BOXER. Absolutely.

Senator Gillibrand.

**OPENING STATEMENT OF HON. KIRSTEN GILLIBRAND, U.S. SENATOR FROM THE STATE OF NEW YORK**

Senator GILLIBRAND. Thank you, Madam Chairwoman, for your leadership on this issue. I agree with you that we have an extraordinary opportunity here. I want to thank the panelists for joining us, and I will thank you in advance for your testimony.

The opportunity that we have in front of us is to address this economic crisis, and new energy markets are the greatest market opportunity of our generation. What this bill will be able to begin to address is how we can turn our economy around and how we create jobs in these new green sectors.

We have enormous opportunities in New York State, from wind to solar to biofuels to hydropower. There is an enormous amount of natural resources that we can draw upon. We have a very strong agricultural sector, a very strong manufacturing sector. And we have lost a lot of manufacturing jobs. We have lost over 160,000 manufacturing jobs in New York State alone.

The potential for growth in these new sectors, whether it is through new technologies or all the manufacturing that follows along from those new technologies, whether we are building new cars that use fuel cell technology or cellulosic ethanol, whether we are building new building materials that have carbon neutral abilities in terms of conservation, that is opportunities for growth for our economy and for New York.

So, I want to thank you, Madam Chairwoman, for your leadership. We have a number of issues that we must address as we look at the global climate change legislation. I think that we do need to look at the carbon market and make sure that we have a cap-and-trade policy that is going to be efficient, effective, and have proper oversight and accountability so that we can have a vibrant market.

The resources that we can create through those credits are extraordinary. And the billions of dollars that will be generated that we can then reinvest in this new economy and in these new technologies can be transformational. It is also very significant, as my colleague mentioned, for our national security. We very much have to wean ourselves from Middle Eastern oil in this new economy. And we can do that with homegrown, American industries.

So, I just want to thank my colleagues for their participation. I want to thank you, Madam Chairwoman, for your leadership, and I want to thank the participants today. I think we have so much potential, both through the agricultural sector, through the manufacturing sector, and through innovation and entrepreneurialism that we can truly drive our new economy and create jobs for decades to come.

Thank you for being here.

Senator BOXER. Senator, thank you. We are still to hear from Senators Carper, Sanders and then, if Senator Whitehouse comes back, we will hear from him and then we will get right to the panel. Thank you for your patience.

Senator Carper.

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

Senator CARPER. Thanks very much. To our panelists, it is great to see each of them. Thank you, not just for being here, but thank you for serving our country in the roles that you now play. I just wanted to add that we miss you very much here in the Senate. However, I am delighted to see you serving and contributing in this new role.

I want to reflect briefly on a couple of comments that were made. I thought Senator Crapo said a lot of things that I agreed with. It is not uncommon that that happens, but it gives me cause for some hope as we move forward.

Senator Alexander and I often agree on things, and I certainly agreed with the importance of nuclear as we go forward. It is not cheap. It costs us billions of dollars to build a new nuclear power plant. But they are pretty good in terms of how much carbon dioxide they put out and how much of any bad things that they put out and they are very helpful in terms of what they do not consume in terms of energy. So, I think there is a lot to be said. How about

4,000 people to build a nuclear power plant? How about 500 or 600 to run a nuclear power plant?

The applications are in, 17 applications to build 26 nuclear plants. The Nuclear Regulatory Commission is processing those, and we are pleased. To that, I want to say to Dr. Chu, thank you, I very much appreciate your perspective on nuclear power, and I just hope that, as time goes by, that my colleagues here in the Senate can better understand what your views are and the advice you give us.

We just finished a recess for the last week or so. I love recess. I did as kid when I was in elementary school. I still love recess.

[Laughter.]

Senator CARPER. I learned a lot in recess. And I just want to share briefly with you some of what I learned.

I learned, or I was at least reminded of this, that the cleanest, most affordable form of energy is the energy we never use. My wife and have been shopping for refrigerators this week and found ourselves buying the nicest refrigerator I have ever seen in my life. It is going to use a whole lot less electricity than the 20-year-old refrigerator that it is going to be replacing.

I spent part of a morning at a pharmacy in New Castle, Delaware, and in the back of the pharmacy they are putting on a new meter that will enable the folks in that pharmacy to actually use their electricity more wisely, more efficiently, more cost effectively and, similarly, through meeting the smart grid approach, enable the utility to be a lot wiser in the way that they do their business, too.

I spent some time out at the DuPont Company. They have introduced a new solar film. It is about one-1,000th of a thickness of a human hair. It is going to allow, among other things, for us to put out solar panels that do not weigh 40 pounds, but may weigh only a couple of pounds.

Our friend, the Secretary of the Interior, has been good enough to help move along regulations that will actually allow ocean-based wind power to go forward. We are grateful for that. And we expect to harness that wind starting about 3 years from now off of the coast of Rehoboth Beach, off of the coast of New Jersey, off the coast of Maryland, and other States up the northeast corridor.

We are going to, hopefully, build the foundations for the windmills at a steel mill in northern Delaware. A lot of the components for them will be built right there, shipping out down the Delaware River to Delaware Bay to 12 miles off of Rehoboth Beach. There are a lot of jobs that are going to be involved in doing that as well.

We are going to be running electric cars up and down the East Coast before long. They are going to be powering them with electricity that we harness from the wind off of our coast. That seems to make sense to me.

And the other thing that I learned is that the solar energy emitted by the Sun in 1 hour is enough to provide the power that we use on this earth for 1 year. I will say that again. The solar energy emitted by the Sun in 1 hour is enough to meet our power needs, or energy needs, on this planet for 1 year.

Einstein used to say, in adversity lies opportunity. God knows we have faced plenty of adversity in our lives and on our planet and

in this country. But boy, there are some terrific opportunities. We have to be smart enough to capture and make it happen and turn this adversity into not just cleaner air and arrested dependence on foreign oil and so forth. We have to turn it into jobs.

And we have a great opportunity to do that, whether building nuclear power plants or deploying windmill farms, or deploying these new lightweight solar energy panels, building those refrigerators that are so much more energy efficient than anything else we have ever seen before. There is great opportunity here.

We appreciate your helping us to find the path to that opportunity.

Thank you.

Senator BOXER. Thank you, Senator.

Senator Sanders.

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

Senator SANDERS. Thank you, Madam Chair. And let me thank all of our guest panelists for being here. What is important is that you are not just listening to all of these brilliant speeches, as important as that is. But more important, that was a joke actually——

[Laugher.]

Senator SANDERS. More important is your presence here together indicates your understanding that all of these agencies have got to work together. And that has not always been the case as we attempt to go forward tackling these important issues.

I think the issue that Chairwoman Boxer and others are attempting to bring us together on is, in fact, the most important issue facing not only this country but the world. It has everything to do with energy independence and the war in Iraq. We are now winding our way out of that war, which many people thought was involved in the need for oil. If we become energy independent, we do not need to be getting involved in wars like Iraq.

We are spending $350 billion every single year purchasing oil from abroad. Do you know what we could do with $350 billion investing in energy in the United States? We would transform our Nation.

In terms of global warming, I know some of my friends may not believe in the phenomenon of global warming. And they may pick up an individual here or a scientist there who has doubts. And that is fair enough. But the evidence is very clear. The overwhelming numbers of scientists who have studied this issue not only worry about global warming, but tell us that the situation today is far more dire than they thought a few years ago. That is what the overwhelming scientific evidence seems to suggest.

Last, but not least, is the issue of economics and jobs. I think, as others have suggested, we have the possibility over a period of years of creating millions and millions of good paying jobs as we transform our energy system.

Madam Chairman, it just seems to me that we want to focus on at least three areas. No. 1, we need to enact strong, near term targets for emissions reductions. No. 2, we have got to meet President Obama's renewable energy goal, which is passing legislation that

produces 25 percent renewable energy by 2025. Third, and very importantly, we must ensure rigorous and transparent market oversight. We need to ensure that we have legislation that does not simply become a windfall for speculators and traders. Let us not underestimate the importance of that.

Senator Carper talked about his vacation. This is like Show and Tell. I also was on a break and I went around Vermont, and let me tell you what I saw. I went to Middlebury College, which fairly shortly will be providing energy for their fairly large campus from both sustainable energy and energy efficiency, virtually, completely, 100 percent. I went to a plant that they have on campus which is using wood chips, replacing oil, and they are saving $700,000 a year and creating local jobs and cutting back on greenhouse gas emissions. They are not doing an experiment to plant willow trees, which will be used as part of that fuel.

I think the potential, as I mentioned to Ken Salazar and many others, for solar thermal in the southwest part of this country is extraordinary. There is evidence out there, Madam Chairman, that we could produce significant part of the electricity from solar thermal plants, and I congratulate Secretary Salazar for beginning to move us in that direction.

In terms of energy efficiency, Vermont has been a leader in the country in that area. Many of our major utilities are not producing any more electricity today than they did years ago, despite normal economic growth. And, in fact, if the rest of the country did what Vermont and California are doing in terms of energy efficiency, there would be a huge drop in energy use in America.

So, we are sitting on an enormous issue. The fate of the planet is at stake. We can transform our economy. We can break our dependence on foreign oil. Now is he time to be bold and to go forward. And I thank you all of our panelists for their efforts in that direction.

Thank you, Madam Chairman.

Senator BOXER. Yes. Colleagues, we have three more Senators in order of appearance originally, Whitehouse, Udall and Specter. And then we are, absolutely, going to get to you.

Thank you for your extreme patience. It just shows you the excitement on both sides of the aisle that there is on this issue.

So, I will ask for Senator Whitehouse at this time.

## OPENING STATEMENT OF HON. SHELDON WHITEHOUSE, U.S. SENATOR FROM THE STATE OF RHODE ISLAND

Senator WHITEHOUSE. Thank you, Chairman. I welcome the Administration officials, with a particularly warm welcome to our former colleague, Secretary Salazar, whose tenure here was brief but marked by great achievement and immense goodwill on both sides of the aisle. So, it is wonderful to see you back.

I would just make four simple points that I think are the crux of what we have to do going forward.

The first simple point is that the Earth's climate is being changed by carbon pollution, and if we do not do something about it, our children and our grandchildren will bear that cost, and it promises to be a very high cost, and it is simply wrong not to act.

The second point is that, right now, polluters are allowed to pollute for free. And, as long as they are allowed to pollute for free and take the costs of their pollution and put it on everybody else in America, they are going to keep doing it. That is the American way. And it is the American way of government to try to set things up so that those perverse incentives do not continue.

The third point is that behind that problem a new economy beckons, with clean energy jobs and a future of energy independence for this country. It is an enormously powerful strength that we can tap into if we do this right.

And the last thing is that we have the choice now to be on the front end or the tail end of progress. I saw in the newspaper the other day that Toyota has something like 2,000 patents that it has filed to protect its hybrid technology to keep people from competing. That is the privilege that you get when you are the frontrunner.

China and Japan and Europe, countries all over the place, are investing to put their industries at the front. And I do not want to see American industry at the back of that parade with a broom. I want to see us at the front, leading.

The four of you have the capacity to make, to solve those four problems, to solve those issues for our people. We look forward to supporting you. We know that this is probably, along with the ExxonMobil board room, the last place in which people, sober people, debate whether or not these problems are real. But we intend to work with you anyway and we hope to give you as strong legislative as we can.

We thank you for your efforts.

Senator BOXER. Thank you, Senator.

Senator Udall followed by Senator Specter.

**OPENING STATEMENT OF HON. TOM UDALL, U.S. SENATOR FROM THE STATE OF NEW MEXICO**

Senator UDALL. Thank you, Madam Chair, and I very much appreciate you holding this hearing today and appreciate having these four brilliant witnesses that I hope we will hear from very soon.

I would like to put my opening statement in the record. But I did want to——

Senator BOXER. Without objection.

Senator UDALL. But I did want to answer something that seems to be said over and over again by the other side and I hope the panel will focus on this.

When you put a price on carbon, you are, in fact, helping the nuclear power industry. As has been said in this hearing and other places, nuclear power is not being helped, nuclear power is eliminated from the equation, all of those kinds of things. Well, that, in fact, is not true. You put a price on carbon, what you end up doing is sending a very strong signal in the marketplace that carbon dioxide emissions, that these kinds of emissions are to be reduced in the future, and that you move in the direction of technologies which do not create carbon dioxide. Nuclear is one of those.

So, I hope that, when we focus on the idea of having a cap-and-trade system, we focus on the idea that we are encouraging all

sources, whether it is the renewables, wind and solar and biomass and geothermal, or whether it is nuclear power. We have to be really clear, I think, that our objective here is to do it all, to increase all the sources that are not contributing, and I think that is a very important point as part of all of this. And I hope that all of you that are here today on this panel will cover that side of it.

Thank you, Madam Chairman.

[The prepared statement of Senator Udall follows:]

STATEMENT OF HON. TOM UDALL,
U.S. SENATOR FROM THE STATE OF NEW MEXICO

Madam Chair, thank you for kicking off a thorough series of hearings to debate and consider legislation to promote clean energy economic growth and reduce greenhouse gas emissions.

Climate change legislation does not cost jobs, it creates them. If we do not act clean energy technology jobs will go to China, not our States. We often hear about China's coal use, but China is arguably ahead of the U.S. on clean energy.

Chinese fuel economy standards in 2008 are significantly higher than the new U.S. standards President Obama announced in May. Their combined average fuel economy is at almost 36 miles per gallon for 2008 and is set at over 42 miles per gallon by 2016. Our standards do not reach 35 mpg until 2020.

China already generates a greater share of their power from wind than we do in the U.S., and next year, the Chinese plan to have installed 10 gigawatts of wind power, reaching their goal 3 years ahead of schedule.

The Chinese have already set a 15 percent RES by 2020. Both the U.S. House and the U.S. Senate have separately passed a renewable electricity standard, but in different sessions. It is imperative that we get on the same page this year.

China is also the world's largest producer of solar power cells. New Mexico is also a leading producer of solar power equipment, but we have a weak domestic market.

China has also entered an agreement with the EU to demonstrate near-zero coal emissions technology by 2020, an area where the U.S. should be a technological leader instead.

Overall, China invests $12 billion per year in renewable energy, second only to $14 billion per year in Germany. From Silicon Valley, to Wall Street, to Main Street, U.S. investors want to join in, but they need Washington leadership.

During this debate, we should be afraid about U.S. jobs leaving to China, but we will lose those clean energy jobs if we fail to enact climate change legislation.

Senator BOXER. Thank you, Senator.

Senator Specter, welcome.

## OPENING STATEMENT OF HON. ARLEN SPECTER, U.S. SENATOR FROM THE STATE OF PENNSYLVANIA

Senator SPECTER. Thank you, Madam Chairwoman. I join my colleagues in welcoming this distinguished panel and also Mayor John Fetterman, who is here from Braddock, Pennsylvania.

I compliment you, Madam Chairwoman, for your vigor in pursuing this issue with many hearings and determination to get a consensus. There is no doubt of the great importance of this issue in many directions: cleaning up the environment, stopping this threat of carbon, reducing our dependence on OPEC oil, which has tremendous ramifications politically with Iran being strengthened by its oil revenues and Venezuela being strengthened.

We have a mammoth bill from the House of Representatives that has been cobbled together in the most extraordinary way. But that is part of the legislative process, and we know of the difficulties.

In order to reconcile a lot of very difficult interests on cleaning up the atmosphere, we have the important consideration of jobs and the ramifications from coal. Many of us have been trying for a long time to get clean coal technology to ease that issue. But, as

a Senator from a coal producing State, that is a factor that I have to take into account, along with the concerns I have for my four granddaughters and their grandchildren on cleaning up the atmosphere.

This committee is determined to do the job. The Senate is determined to do the job, and I am determined to end on time.

Thank you.

[Laughter.]

Senator BOXER. Thank you, Senator.

So, I think we have now heard from everybody, so it is time to call on our distinguished panel. Among yourselves, have you decided any particular order? So, why do we not start with Dr. Chu.

Welcome, Mr. Secretary.

**STATEMENT OF HON. STEVEN CHU, SECRETARY, U.S. DEPARTMENT OF ENERGY**

Mr. CHU. Thank you.

Chairman Boxer, Ranking Member Inhofe, members of the committee, thank you for the opportunity to testify on moving America forward toward a clean energy economy.

We face many serious and immediate challenges. American families and businesses are struggling in a recession and an increasingly competitive global economy. We have become deeply dependent on a single source of energy to power our cars, trucks and airplanes. We spend hundreds of billions of dollars a year to import 60 percent of the oil that we use. And we face an unprecedented threat to our way of life from climate change.

To solve these challenges, the Administration and Congress need to work together to spur a revolution in clean energy technologies. The President and I applaud the historic action in the House to pass a clean energy bill, and we look forward to working with the Senate to pass comprehensive energy legislation.

I want to speak today about the threat of climate change. Overwhelming scientific evidence shows that carbon dioxide from human activity has increased the atmospheric level of carbon dioxide by roughly 40 percent, a level one-third higher than at any time in the last 800,000 years.

There is also a strong consensus that human carbon dioxide and other greenhouse gases have caused our planet to change. Already, we have seen the loss of about half of the summer arctic polar ice cap, a dramatic accelerating rise in sea level, and a loss of over 2,000 cubic miles of glacial ice. And these changes are not occurring on a geological time scale, but in a time period of less than 100 years.

The Intergovernmental Panel on Climate Change (IPCC) projected in 2007 that, if we continue on this course, there is a 50 percent chance of a global average temperature increasing by more than 7 degrees Fahrenheit in this century. A more recent 2009 MIT study found a 50 percent chance of a 9 degree rise and a 17 percent chance of nearly an 11 degree increase.

Eleven degrees may not sound like much, but during the last ice age, when Canada and the United States down to Ohio and Pennsylvania were covered year round in a glacier, the world was only 11 degrees colder. A world 11 degrees warmer will be a very dif-

ferent place. Is this the legacy we want to leave our children and grandchildren?

Denial of the climate change problem will not change our destiny. A comprehensive energy and climate bill that caps and then reduces carbon emissions will.

America has the opportunity to lead a new industrial revolution by creating sustainable, clean energy. We can sit on the sidelines and deny the scientific facts. Or we can get in the game and play to win.

Opponents of this effort claim that the Nation cannot afford to act at this time. I disagree. And so does the Environmental Protection Agency and the Congressional Budget Office. These organizations estimate that meeting the greenhouse gas targets in the House bill can be achieved at an annual cost of somewhere between 22 and 48 cents per day per household in 2020. This is about the price of a postage stamp per day.

History suggests the actual cost could even be lower. The costs to save our ozone layer, to reduce smog with catalytic converters, to scrub the sulfur dioxide from power plants were all far less than estimated. For example, according to the EPA, the sulfur dioxide reductions that are being achieved are one-fifth of the original industry estimated costs. The right clean energy incentives will rev up the great American research and innovation machine, and I am confident that American ingenuity will lead to better and cheaper energy solutions.

We can make significant near-term carbon reductions through energy efficiency. We use 40 percent of our energy in buildings. I firmly believe that, with today's technologies, we can reduce our energy bills by 40 to 50 percent in new buildings. By developing a system integration approach, I believe we can eventually build buildings that use 80 percent less energy with investments that pay for themselves in less than 15 years through reduced energy bills. Similarly, we can retrofit existing buildings to achieve 50 percent energy savings with investments that pay for themselves.

A comprehensive energy and climate bill will drive American innovation to fuel efficient automobiles and development of advanced batteries for electric vehicles. It will offer incentives to re-start our nuclear power industry and encourage utilities to invest in carbon capture and sequestration. It will drive investments in wind and solar power and next generation biofuels from grasses and agricultural waste.

In addition to developing and deploying the technologies we have today, we must pursue truly transformative solutions. Climate experts tell us we must reduce our carbon emissions by 80 percent by mid-century to stabilize atmospheric greenhouse gas concentrations at a level that will avoid the worst consequences of climate change.

To achieve our long-term goals in the most cost effective way, we will need a sustained commitment to research and development. Only R&D can deliver a new generation of clean technologies.

Let me close with a quote from Martin Luther King. His words, spoken in 1967, seem so fitting in today's energy and climate crisis. He said, we are now faced with the fact, my friends, that tomorrow is today. We are confronted with the fierce urgency of now. In this

unfolding conundrum of life and history, there is such a thing as being too late.

Now if the time to take a comprehensive and sustained action. With the leadership of the President, the actions of this Congress, and the support and participation of the American people, I am confident that we will succeed.

Thank you. I would be glad to answer questions.

[The prepared statement of Mr. Chu follows:]

Statement of

Steven Chu
Secretary of Energy

Before the
Committee on Environment and Public Works
United States Senate
Washington, D.C.

July 7, 2009

Chairman Boxer, Ranking Member Inhofe, and Members of the Committee, thank you for the opportunity to testify on moving America toward a clean energy economy.

We face many serious and immediate challenges. American families and businesses are struggling in a recession and an increasingly competitive global economy. We have become deeply dependent on a single energy source to power our cars, trucks and airplanes, and spend hundreds of billions of dollars a year to import nearly 60 percent of the oil we use. We face an unprecedented threat to our very way of life from climate change.

To solve these challenges, the Administration and Congress need to work together to spur a revolution in clean energy technologies. The President and I applauded the historic action by the House to pass a clean energy bill, and we look forward to working with the Senate to pass comprehensive energy legislation.

I want to focus today on the threat of climate change. Overwhelming scientific evidence shows that carbon dioxide from human activity has increased the atmospheric level of $CO_2$ by roughly 40 percent, a level one- third higher than any time in the last 800,000 years. There is also a consensus that $CO_2$ and other greenhouse gas emissions have caused our planet to change. Already, we have seen the loss of about *half* of the summer arctic polar ice cap since the 1950s, a dramatically accelerating rise in sea level, and the loss of over two thousand cubic miles of glacial ice, not on geological time scales but over a mere hundred years.

The Intergovernmental Panel on Climate Change (IPCC) projected in 2007 that, if we continued on this course, there was a 50 percent chance of global average air temperature increasing by more than 7 degrees Fahrenheit in this century. A 2009 MIT study found a fifty percent chance of a 9 degree rise in this century and a 17 percent chance of a nearly 11 degree increase. 11 degrees may not sound like much, but, during the last ice age, when Canada and much of the United States were covered all year in a glacier, the world was only about 11 degrees colder. A world 11 degrees warmer will be very different as well. Is this the legacy we want to leave our children and grandchildren?

Denial of the climate change problem will not change our destiny; a comprehensive energy and climate bill that caps and then reduces carbon emissions will.

America has the opportunity to lead a new industrial revolution of creating sustainable, clean energy. We can sit on the sidelines and deny the scientific facts, or we can get in the game and play to win.

Opponents of this effort claim the nation cannot afford to act at this time. I disagree, and so do the Environmental Protection Agency and the Congressional Budget Office. These organizations estimate that meeting the greenhouse gas targets in the House bill can be achieved at an annual cost between 22 to 48 cents per day per household in 2020. That's about the price of a postage stamp per day.

History suggests that the actual costs could be even lower. The costs to save our ozone layer, to reduce smog with catalytic converters, and to scrub the sulfur dioxide from power plants were all far less than estimated. For example, according to the EPA, the $SO_2$ reductions will be achieved for one-quarter of the estimated cost.[1] The right clean energy incentives will start the great American research and innovation machine, and I am confident that American ingenuity will lead to better and cheaper climate solutions.

We can make significant near-term carbon reductions through energy efficiency. We use 40 percent of our energy in buildings. I firmly believe that, with today's technologies, we can build new homes and buildings that use 40 percent less energy than today's new buildings and therefore save money on energy bills. By developing a system integration approach, I believe we could eventually build buildings that use 80 percent less energy with investments that pay for themselves in less than 15 years through reduced energy bills. Similarly, we could retrofit existing buildings to achieve 50 percent energy savings with investments that will pay for themselves.

A comprehensive energy and climate bill will drive American innovation in fuel efficient automobiles and the development of advanced batteries for electric vehicles. It will offer incentives to re-start our nuclear power industry and encourage utilities to invest in carbon capture and sequestration. It will drive investments in wind and solar power and next generation biofuels from grasses and agricultural waste.

In addition to deploying the technologies we have today and can see on the horizon, we must pursue truly transformative solutions. Climate experts, such as the IPCC, tell us we must reduce our carbon emissions by 80 percent by mid-century to stabilize atmospheric greenhouse gas concentrations at a level that may avoid the worst consequences of climate change. To achieve our long-term goals in a more cost-effective way, we will need a sustained commitment to research and development. Only R & D can deliver a new generation of clean technologies.

Let me close with a quote from Dr. Martin Luther King. His words seem so fitting for today's climate crisis:

"We are now faced with the fact, my friends, that tomorrow is today. We are confronted with the fierce urgency of now. In this unfolding conundrum of life and history, there is such a thing as being too late."

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[1] http://www.epa.gov/airmarkets/cap-trade/docs/ctresults.pdf

Now is the time to take comprehensive and sustained action. With the leadership of the President, the actions of this Congress, and the support and participation of the American people, I am confident that we will succeed.

Thank you. I would be glad to answer your questions at this time.

QUESTION FROM SENATOR CARPER

Q1. In your statement you say that only R&D can deliver a new generation of clean technologies – how much investment should our nation be making every year in energy R&D just to meet our climate change goals and keep our nation on the leading edge of this new energy boom? Does Waxman-Markey make enough of an investment in energy R&D? Could we do better?

A1. The pace of advanced technology development and deployment significantly impacts[1] the projected cost of meeting both domestic and (comparable) international greenhouse gas (GHG) mitigation targets. This pace can be accelerated in many ways – through the establishment of a market price on GHG emissions to incentivize private investment in R&D; new management approaches to innovation within the Federal government, such as ARPA-E; increased global investment in R&D; and implementation of alternative policies and measures, promoting clean technologies' rapid market penetration. DOE strongly supports passage of the climate change bill, promising to price emissions, as key to meeting our climate goals. DOE also supports the Administration's review of the Federal R&D investment portfolio (pre- and post-ARRA), as well as the pledges of other countries to expand their own R&D portfolios. Ongoing international negotiations on climate change will facilitate cooperative action in this area.

[1] e.g., P. Kyle, *et al.*, *The Value of Advanced Technology in Meeting 2050 Greenhouse Gas Emissions Targets in the United States*, 2009 (publication pending), Joint Global Change Research Institute, Pacific Northwest National Laboratory, University of Maryland, College Park, MD; work sponsored by the Climate Change Technology Program, U.S. Department of Energy, Washington, DC.

QUESTION FROM SENATOR CARPER

Q2. I – like you – believe we have to have nuclear in the mix if we are going to meet our climate goals.

Over Memorial Day recess I held a roundtable at MIT addressing nuclear waste in the 21st century. We had some pretty smart people there – and although they had several different opinions – most of them agreed on three points: 1) it is not economical to do nuclear reprocessing for waste at this time; 2) we have time to develop a comprehensive national nuclear waste strategy; and 3) we need to be heavily investing in R&D for both current and future nuclear waste strategies.

Would you agree with these assessments?

A2. I do believe that reprocessing is not cost-effective and it is especially appropriate at this time to re-evaluate our Nation's options for nuclear waste. I will soon convene a blue ribbon panel to consider options for used fuel storage, reprocessing, and waste disposal. Results from this panel will be considered as the Administration develops its strategy and I hope that the recommendations of this expert panel will provide useful insights into potential paths forward to better manage the nuclear fuel cycle. In terms of R&D funding, the FY 2010 Budget reflects an appropriate level of investment and allocation of resources for nuclear R&D. Work will focus on answering the key technology questions on fuel cycle issues and new reactor technologies.

QUESTION FROM SENATOR CARPER

Q3. Will you commit to coming to the Senate in the next month to discuss nuclear energy issues in the context of climate with a bipartisan group of Senators?

A3. Yes, I would be happy to meet with you and the other senators.

QUESTION FROM SENATOR CARPER

Q4. What are some of your ideas with respect to nuclear energy's role in the clean energy economy and what could be helpful in a climate bill – such as investment in R&D for nuclear waste, and funds for manufacturing and training?

A4. Nuclear power currently generates nearly 20 percent of our Nation's electricity and approximately 70 percent of our greenhouse gas-free electricity. Nuclear power must play a role in our energy mix going forward.

We are in the process of evaluating climate bill provisions and options. In terms of R&D investment, the President's FY 2010 budget provides an appropriate distribution and level of funding - nearly $200 million for Fuel Cycle R&D to develop technologies that will enable a safer, secure, economic fuel cycle and options for the storage and disposal of nuclear waste.

QUESTION FROM SENATOR CARDIN

Q1a. Water resources are likely to be impacted first and the hardest by climate change. The Southeast and Southwest are already experiencing severe droughts and are facing water shortages. Energy production in this country uses million of gallons of water per day.

Coal fired power plants require up to 50,000 gallons of water per megawatt hour.

New coal plant projects could have serious implications on the water supply and the environment for the region, would seem to need more careful consideration.

Is the availability of water and water usage adequately taken into consideration for energy development projects?

A1a. Development projects, including energy facilities, require both air and water permits before they are licensed to operate in a given state. To this end, states are responsible for the proper management and utilization of water resources, and make determinations based upon available resources and current utilization.

QUESTION FROM SENATOR CARDIN

Q1b. Water resources are likely to be impacted first and the hardest by climate change. The Southeast and Southwest are already experiencing severe droughts and are facing water shortages. Energy production in this country uses million of gallons of water per day.

Coal fired power plants require up to 50,000 gallons of water per megawatt hour.

New coal plant projects could have serious implications on the water supply and the environment for the region, would seem to need more careful consideration.

Given that climate change has thrown all historical climate models, patterns and projections, including water availability in some cases, for a loop, should water usage component of energy projects be re-evaluated?

A1b. Since most energy-related projects require significant quantities of water to aid extraction or produce byproducts and wastes that can impact ground water and surface water resources, water should be evaluated as a key component of energy projects.

QUESTION FROM SENATOR CARDIN

Q2a. The time and energy Americans spend stuck in traffic is both detrimental to our economy and to families. In the DC metropolitan area alone the 15% of commuters take more than hour to commute to and from work every day. The fuel consumption associated with these long, or prolonged depending on the traffic, commutes is enormous, not to mention that this is valuable time that could otherwise be spent earning income or with their families. Increasing access to transit would help alleviate traffic congestion, save commuters time and money and use less energy. Secretary Chu, what are some of the energy savings associated with transit as compared with personal vehicle transport?

A2a. Using national average data reported in the Transportation Energy Data Book (Edition 28, Tables 2.13 and 2.14 at: http://cta.ornl.gov/data/index.shtml), there is an energy savings of about 22% for transit buses and 53% for rail transit versus a person riding alone in a car. Relative to a person riding alone in a light-duty truck, the transit bus and rail transit energy savings respectively are 38% and 63%. In addition, emissions reductions are much greater for transit vehicles with greater passenger loads. Relative to a single-occupancy trip in a light-duty vehicle, the savings are 83% for a full transit bus, and 89% for a full heavy-rail vehicle.

QUESTION FROM SENATOR CARDIN

Q2b. As we consider new climate change and energy legislation, how do you see public transit investments fitting in to the picture?

A2b. While the first impression of transit expansion is often for capital intensive rail systems, many regions across the country are coming forward with imaginative and relatively inexpensive plans to improve their transit systems using bus options. Expanded bus fleets are supporting new express routes, dedicated busways with traffic signal priority have been proposed, and even dedicated rights-of-way for bus-routes are under consideration. These bus strategies, and light-rail solutions, can be implemented faster and at lower cost than subways, and provide opportunities for faster relief from traffic woes while stretching available funds.

H.R. 2454 would require local transportation planning with emphasis on expanded transit, including alternate fuel buses, promote bicycle and walking options, and mixed land-use planning to reduce travel requirements. We believe this provision can yield significant savings. We are hopeful that the Senate measure will include many of these provisions as cost-effective ways to improve overall energy efficiency and reduce carbon emissions.

QUESTION FROM SENATOR CARDIN

Q3. Section 438 of the 2007 Energy Independence and Security Act required all new and redeveloped federal buildings to manage storm water runoff using site planning, design, construction, and maintenance strategies for the property to maintain or restore predevelopment hydrology, to the maximum extent technically feasible. Moving water, be it wastewater, drinking water or storm water through conventional infrastructure is incredibly energy intensive.

- Could you detail the energy savings we see from managing storm water in this way?

A3. Most of the best management practices (BMPs) for managing storm water identified in EPA's National Menu of Storm water Best Management Practices (http://cfpub.epa.gov/ npdes/stormwater/menuofbmps/index.cfm) are gravity driven systems. Examples of common BMPs include retention ponds, gradient terraces, pervious pavers, riparian buffers, and protecting storm drain inlets. Because these techniques are gravity driven, direct energy savings from managing storm water are limited.

Incorporating storm water management into the site planning for federal buildings does, however, decrease the use of natural resources and lower ecosystem impacts. This is one of the benefits of sustainable design noted in the *Business Case for Sustainable Design in Federal Facilities* report sponsored by DOE's Federal Energy Management Program.

This report notes that erosion and sediment control and storm water management can lead to: Decreased cost of storm drainage construction by using more natural methods;

- Reduced cost of landscaping after construction is completed (because topsoil is saved); and
- Reduced cost of stream cleanup and water treatment plants.

QUESTION FROM SENATOR CARDIN

Q4. Water efficiency be it through modern appliances or plumbing fixtures provide excellent water savings that equal energy savings as well. The Water Sense program is a great promotional tool for water efficiency. A lot of consideration has been given to consumer rebate programs, or tax breaks, for consumer purchases of energy efficient appliances or modifications to homes. Would you support a similar program for water efficiency given the energy, and water savings, associated with making these consumer purchases?

A4. Since the energy-water connection is synergistic, water savings should be valued as current and proposed energy efficiency incentives are valued. Incentives eligibility could be expanded to include domestic water efficiency technologies. In addition, incentives could provide extra credit for energy efficiency technologies that also demonstrably reduce domestic water consumption (e.g. high efficiency dishwashers, low water factor clothes washers). It would be administratively less costly to include water efficiency incentives alongside energy efficiency incentives as a single set of incentives, to avoid duplicative policy and program structures. Targeted educational and promotional materials placing additional emphasis on water saving technologies and the water saving aspects of energy efficiency technologies could be developed at relatively low incremental cost.

QUESTION FROM SENATOR WHITEHOUSE

Q1. The future role of nuclear energy has played a central role in the debate over setting energy policy for the United States. This debate has included determining the viability, both financially and technologically, of developing new advanced nuclear energy projects. One such advanced nuclear technology being discussed is the "traveling-wave" reactor. What is your analysis of "traveling-wave" reactor technology in terms of its viability as a future energy source in the United States? Has the Department of Energy tested the "traveling-wave" reactor model? If so, how was the testing done and what were the results? In your analysis of the viability of the "traveling-wave" reactor from a scientific and technological perspective, please also include in your response your analysis of the financial, environmental, and national security considerations related to developing this technology.

A1. The traveling-wave reactor has not been analyzed or tested by the Department, and so we have no views at this time on its viability.

QUESTION FROM SENATOR MERKLEY

Q1. Oregon has a 25% by 2025 renewable electricity standard. One benefit ratepayers have seen is that renewable energy results in lower rates: because of wind power investments, utilities have not raised rates as much as they otherwise would have, primarily because they needed to buy less natural gas, which as seen relatively volatile prices. Would you expect similar cost savings under a national program?

A1. The effect of a national renewable energy standard on electricity rates will depend on the exact standard under consideration, whether it is paired with an economy-wide carbon pricing approach, and could vary depending on the state or region of the ratepayer. Based on EIA's analysis[1], we do not estimate that the renewable energy standards included in H.R. 2454 or S. 1462 would raise national electricity rates because these standards are non-binding compared to existing state RPS and projected renewables growth due to the ARRA.

[1] Energy Information Administration, "Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009," August 2009, Report no. SR/OIAF/2009-05.

QUESTION FROM SENATOR MERKLEY

Q2. In your written testimony, you note that 40% of our energy is used in buildings and we could retrofit existing buildings to achieve 50% reductions in energy use with investments that pay for themselves in lowered energy bills. Crude math would suggest that means we could cut energy use by 20% just using energy efficiency strategies that pay for themselves. McKinsey and Company have concluded that the U.S. could reduce pollution by approximately 1.4 gigatons at no net cost to the economy, mostly through energy efficiency, by 2030. Don't these facts mean that a 17% reduction in greenhouse gas emissions by 2020 is a relativity low target given the range of cost-effective technologies at our disposal?

A2. A 17% reduction in U.S. greenhouse gas emissions by 2020 is an ambitious goal, achievable with appropriate and supporting policy. As history has shown, there are numerous barriers that inhibit cost-effective options from being fully realized in the buildings sector. Some of these barriers are mentioned below and described in more detail in a recent DOE report to congress, titled "Strategies for the Commercialization and Deployment of GHG Intensity-Reducing Technologies and Practices," and in a complementary publication by researchers at Oak Ridge National Laboratory and Georgia Tech, titled "Making Homes Part of the Climate Solution: Policy Options to Promote Energy Efficiency." In light of the barriers and historical experience of more than 30 years, we would not conclude that 17% is "is a relativity low target". Some of the barriers include:

- A fragmented ***industry structure***, which impedes the efficient diffusion and uptake of new technologies in the buildings sector. It also contributes to a low level of industry investment in buildings-related R&D.
- The cost-effectiveness or availability of energy-efficient measures can be hidden by ***incomplete and imperfect information***. For example, households receive a monthly electricity bill that provides no breakdown of individual end uses, making it difficult for consumers to identify and weigh the benefits of efficient

appliances, retrofit actions, or other measures. The complexity of design, construction, and operation of buildings make it difficult to characterize the nature and extent of the inefficiencies of a particular building.

- Realizing energy efficiency in buildings can be complicated and expensive, resulting in ***high (first) costs***. Consumers are reluctant to pay large upfront costs for renovating, or purchase more expensive products, even though they could lower their life cycle costs. When financing is needed, lenders typically do not credit borrowers with discounted lending costs for lower utility bills later.

QUESTION FROM SENATOR MERKLEY

Q3. A related question: two billion of offsets amounts to 28% of 2005 emissions by my calculation. That means the capped sectors could comply with the cap in the bill without using any clean energy technologies and relying solely on offsets. Would it make sense to adjust the limit on offsets in order to ensure that at least part of the reduction through 2020 is achieved by building a clean energy economy?

A3. The use of offsets is consistent with the objective of minimizing the costs of greenhouse gas (GHG) emissions reductions. Offsets can be expected to be used when the costs of such offsets are lower than the costs of mitigation measures that a covered source could otherwise implement within its own operations. Offsets may include the use of new technology. Regardless of the origin of the emissions reduction (covered source or offset), the reduction in GHGs will contribute to the improvement of the global environment. They can help move the country to a lower GHG emissions path, and spur a clean energy economy.

QUESTION FROM SENATOR MERKLEY

Q4. I appreciate you grounding your testimony in some of the basic science of climate change. You referred to the IPCC projections. Those projections also indicate that, to avoid 2 degrees Celsius of global warming, we need to reduce emissions at least 25% below 1990 levels by 2020. It is my understanding that the House-passed bill would result in emissions reductions of about 4% below 1990 in the capped sectors, potentially going as high as 17% when additional measures are considered. Do you agree that, given the potential for cost savings from readily available energy efficiency, we should be able to get into the range of pollution reductions that scientists recommend?

A4. The IPCC's underlying analysis supporting the two-degree global warming limit strongly suggests that currently rising global greenhouse gas (GHG) emissions should peak by 2015 and subsequently decline, falling 25-40% below 1990 levels by 2020, and continuing to decline by 50% by 2050. The House-passed American Clean Energy and Security Act (ACESA) would reduce capped domestic emissions 17% by 2020 (and 83% by 2050), relative to 2005. Mitigation from sources not under the cap, notably avoided deforestation abroad, could potentially afford an additional 8% reduction. Placed within the context of concerted international action, this level of domestic mitigation would put the U.S. on a path that is consistent with the IPCC's two-degree warming limit. Energy efficiency, which offers potential low-cost abatement opportunities, is projected to account for a relatively small share of total mitigation under the ACESA. Further progress in this regard could help reduce emissions at lower cost.

QUESTION FROM SENATOR INHOFE

Q1. Doesn't the Obama Administration's decision on Yucca Mountain raise major legal (lawsuits by NRDC, et.al.) questions about the prospect for new plants, extensions of existing plant operations, and on-site spent fuel storage?

A1. The Administration has decided to terminate work on the Yucca Mountain repository while developing disposal alternatives to fulfill its obligation for ultimately disposing of spent nuclear fuel. The Nuclear Regulatory Commission has determined that spent nuclear fuel can be safely stored at nuclear power reactors for up to a hundred years and although some hurdles may exist, we do not believe the decision on Yucca Mountain repository efforts raises significant issues in terms of licensing of new plants, license extensions of existing plant operation or on-site spent-fuel storage. However, this question can best be answered by the Nuclear Regulatory Commission, the independent regulatory agency responsible for new nuclear power plant licensing and operating plant license extensions as well as licensing on-site spent fuel storage.

QUESTION FROM SENATOR INHOFE

Q2. When can we expect the new transmission to be available for the remotely located wind and solar?

A2. In recent years, it has usually taken between 5 and 10 years to plan, gain regulatory approval for, and build a new transmission line. It may be possible to shorten that period to some degree, but new transmission lines will remain difficult to put in place. Several new transmission projects to connect remote wind and solar have already been planned.

QUESTION FROM SENATOR INHOFE

Q3. What will be the cost of the new transmission?

A3. Costs vary, depending on terrain, the value of real estate in the affected area, the voltage capacity of the line, and the distance from load centers. $1.5 million/mile is a reasonable starting assumption. As a data point – no endorsement intended – one recent estimate of total additional capacity needed is 20,000 to 30,000 new line-miles, which translates into a cost of $30 to $45 billion. (Fox-Penner, Brattle Group, July 2009) The cost estimate could go higher, if one includes the cost of associated transformers, substations, possible undergrounding of facilities in some areas, etc.

QUESTION FROM SENATOR INHOFE

Q4. How much new natural gas will be required to supplement the intermittent renewables projected by 2030?

A4. The interaction between intermittent generators, such as wind and solar facilities, and grid reliability is complex and can vary by region. In the Energy Information Administration's *Annual Energy Outlook 2009* (*AEO2009*) updated reference case, most new intermittent capacity (mostly wind) is added from 2009-2012, responding to Federal tax incentives in the American Recovery and Reinvestment Act (ARRA). This is a period when most regions (including most regions adding wind capacity) have surplus capacity, so additional new capacity is not necessary to ensure system reliability. In this context, new wind capacity backs out other available generation sources whenever it runs, reducing fuel use by those units. Therefore, while the addition of the new wind capacity affects the operation of generators fueled with natural gas and other dispatchable capacity, the new wind capacity will result in less total use of fossil fuels than if the wind capacity were not built. Looking to 2030, electricity market projections depend on both demand and supply factors. However, EIA still projects less natural gas-fired generation in its reference case than in its "no stimulus" case (i.e., projections without ARRA), where smaller amounts of renewable generating capacity are added.

QUESTION FROM SENATOR INHOFE

Q5. You stated in the hearing that you believe nuclear energy is going to be a very important factor in getting us to a low-carbon future. Presently there is $18.5 billion in loan guarantee volume available for new nuclear reactor development in the U.S. It is roughly enough to support 3 or 4 new plants depending upon the financing arrangements of those who apply. Will you advocate that provisions for new nuclear plants be included in climate change legislation to help increase current loan volume limitations? Will you advocate for other provisions to be included in climate change legislation that would help the U.S. recapture the lead internationally in nuclear energy.

A5. The Administration generally prefers a comprehensive, rather than technology-specific approach. Our approach to greenhouse gas emission mitigation should not narrowly focus on a single technology family, but reflect a full portfolio strategy including all forms of renewable and low carbon technologies to compete based on their emerging performance characteristics and costs. The 2010 Budget request does not propose any additional support for loan guarantees provided under Title XVII of the Energy Policy Act of 2005.

QUESTION FROM SENATOR VITTER

Nuclear Energy

Q1. Doesn't the Obama Administration's decision on Yucca Mountain raise major legal (lawsuits by Environmental NGO's, et al) questions about the prospect for new plants, extensions of existing plant operations, and on-site spent fuel storage?

A1. The Administration has decided to terminate work on the Yucca Mountain repository while developing disposal alternatives to fulfill its obligation for ultimately disposing of spent nuclear fuel. The Nuclear Regulatory Commission has determined that spent nuclear fuel can be safely stored at nuclear power reactors for up to a hundred years and although some hurdles may exist, we do not believe the decision on Yucca Mountain repository efforts raises significant issues in terms of licensing of new plants, license extensions of existing plant operation or on-site spent-fuel storage. However, this question can best be answered by the Nuclear Regulatory Commission, the independent regulatory agency responsible for new nuclear power plant licensing and operating plant license extensions as well as licensing on-site spent fuel storage.

QUESTION FROM SENATOR VITTER

Coal Power

Q1. When do you project a fully commercial and geographically diverse number of CO2 storage sites outside of an Enhanced Oil Recovery basin? How many power plants can these sites accommodate?

A1. Technology to pump CO2 into depleted oil reservoirs and unmineable coal seams has been developed to supply additional oil and methane gas. The economic incentives that would be created by a carbon cap-and-trade program would help to build out the infrastructure for $CO_2$ storage in different types of geologic formations, specifically saline formations. Economic, regulatory, or other legislative incentives will help to determine the speed at which additional storage sites are created. In many cases, the infrastructure developed at the location of a depleted oil reservoir or unmineable coal may also be utilized for storing $CO_2$ in a deep saline formation that may be beneath these economically-advantaged storage sites. The 2008 Carbon Storage Atlas (II) has projected potential storage capacity in the United States and parts of Canada at over several hundred years. These geologic storage opportunities could hypothetically accommodate the storage of all the $CO_2$ currently emitted from the coal fired power plants in the United States and those plants planned for construction over the next several decades. In some cases the storage site may be directly beneath the power plant and, if not, a pipeline may be required to transport the $CO_2$ to an available storage site. Consequently, there will be one to several plants per storage site, depending on the cost to transport the captured $CO_2$ to the storage sites. The United States is fortunate to have over 3600 miles of pipelines, which transport $CO_2$ across several regions of the United States. The pipeline represents an existing infrastructure,

which could be expanded as a carbon capture and storage industry develops in the United States.

QUESTION FROM SENATOR VITTER

Q2. When will we have a buildout of the CO2 pipeline transportation infrastructure to handle the CO2 for storage?

A2. Build out of the $CO_2$ pipeline infrastructure is contingent upon a market that drives the construction based on supply and demand of $CO_2$. Altogether in the United States, there are around 3,600 miles of $CO_2$ pipeline in operation today, which are dedicated to supply $CO_2$ for enhanced oil recovery. These pipelines were built based on market drivers and the economic incentives of oil production from depleted formations. Future pipeline development for $CO_2$ storage will depend on future regulations, a market price for $CO_2$, and incentives offered for project development.

QUESTIONS FROM SENATOR VITTER

Renewables (Wind and Solar)

Q1. When can we expect the new transmission to be available for the remotely located wind and solar? How many lawsuits or other legal challenges by Environmental NGO's are currently outstanding against proposed transmission?

A1. In recent years, it has usually taken between 5 and 10 years to plan, gain regulatory approval for, and build a new transmission line. It may be possible to shorten that period to some degree, but new transmission lines will remain difficult to put in place. Several new transmission projects to connect remote wind and solar have already been planned.

QUESTIONS FROM SENATOR VITTER

Renewables (Wind and Solar)

Q2. What will be the cost of the new transmission and who pays?

A2. Costs for new transmission facilities vary, depending on terrain, the value of real estate in the affected area, the voltage capacity of the line, and the distance from load centers. $1.5 million/mile is a reasonable starting assumption. As a data point – no endorsement intended – one recent estimate of total additional capacity needed is 20,000 to 30,000 new line-miles, which translates into a total cost of $30 to $45 billion. (Fox-Penner, Brattle Group, July 2009)

Who will pay for these lines is often uncertain. Some of these lines will be "merchant" lines, in which case the developer would pay the initial costs and then recover those costs from the wholesale electricity buyers and sellers who would use the line. Most of those costs would then be passed on by the wholesale buyers to their retail customers. In other cases, the costs could be allocated by the Federal Energy Regulatory Commission in various ways among the generators and wholesale buyers who would benefit from the availability of the line; most of these costs would also be passed on directly or indirectly to electricity consumers.

QUESTION FROM SENATOR VITTER

Nat Gas Supply/Demand

Q1. How much new natural gas will be required to supplement the intermittent renewables projected by 2030?

A1. The interaction between intermittent generators, such as wind and solar facilities, and grid reliability is complex and can vary by region. In the Energy Information Administration's *Annual Energy Outlook 2009* (*AEO2009*) updated reference case, most new intermittent capacity (mostly wind) is added from 2009-2012, responding to Federal tax incentives in the American Recovery and Reinvestment Act (ARRA). This is a period when most regions (including most regions adding wind capacity) have surplus capacity, so additional new capacity is not necessary to ensure system reliability. In this context, new wind capacity backs out other available generation sources whenever it runs, reducing fuel use by those units. Therefore, while the addition of the new wind capacity affects the operation of generators fueled with natural gas and other dispatchable capacity, the new wind capacity will result in less total use of fossil fuels than if the wind capacity were not built. Looking to 2030, electricity market projections depend on both demand and supply factors. However, EIA still projects less natural gas-fired generation in its reference case than in its "no stimulus" case (i.e., projections without ARRA), where smaller amounts of renewable generating capacity are added.

QUESTION FROM SENATOR VITTER

Nat Gas Supply/Demand

Q2. What percent of our natural gas portfolio do you anticipate LNG imports becoming by 2030?

A2. According to projections featured in the Energy Information Administration's (EIA) Annual Energy Outlook (i.e., *AEO2009* reference case), LNG imports to the United States in 2030 are approximately 0.81 trillion cubic feet (Tcf). That figure represents approximately 3.5 percent of natural gas supply available for U.S. consumption in 2030 (i.e., 23.47 Tcf).

QUESTION FROM SENATOR VITTER

Economic Forecast in EIA Models

Q1. The Annual Energy Outlook ran a case for high economic growth that is lower than the Administration's projections (3.0% v 3.3%). Does DoE have its own view of economic growth through 2019?

A1. The Energy Information Administration is an independent body within the Department of Energy (DOE). In order to respect and safeguard that independence, the Department does not direct EIA analysis or its economic assumptions. In fact, the 3 percent growth rate of the EIA high case is not dramatically different from 3.3%, and on that small difference like-minded analysts could settle on either choice and not be sharply at odds in their qualitative postures for the economy. The key feature of either growth assumption is that it would represent sharply better economic performance than that experienced during the last 18 months.

QUESTION FROM SENATOR VITTER

Climate Change

Q1. Can you cite any climate models in the late 90's or early portion of this decade that predicted the atmospheric cooling that has been occurring for the last several years? In your estimate, what percent of the climate change models predicted this period of cooling rather than warming?

A1. The current decade is on pace to be the warmest decade on record (since 1880). It is likely to be warmer than the 1990s by 0.19°C, and warmer than the 1980s by 0.33°C (Hansen, 2006, and updates). The current generation of Earth system climate models, with a few emerging exceptions, are not designed to predict sub-decadal temperature variations. These variations are induced by difficult-to-predict natural influences, such as ocean-atmosphere interactions (e.g., El Nino/La Nina oscillations), volcanic eruptions, and solar variations. In fact, the observed globally-averaged surface air temperature records of the last ten decades have all exhibited some sub-decadal periods of either no warming or cooling. Many climate models are able to reproduce these sorts of signals (Easterling, 2009). Low-frequency oscillations, however, do not invalidate the underlying reality that the longer-term global average temperature will continue to increase as a result of the increasing radiative forcing from increased GHG concentrations in the Earth's atmosphere. References are: Hansen, J., Mki. Sato, R. Ruedy, K. Lo, D.W. Lea, and M. Medina-Elizade, 2006 [updated 2009]: Global temperature change. *Proc. Nat. Acad. Sci.*, **103**, 14288-14293; and Easterling, D. R., and M. F. Wehner (2009), Is the climate warming or cooling?, Geophys. Res. Lett., 36, L08706, doi:10.1029/2009GL037810.

QUESTION FROM SENATOR CRAPO

Q1. As you move ahead with the loan guarantees for new nuclear power plants, it is equally important that you move ahead with loans to support the domestic supply of nuclear fuel. Companies like AREVA are planning to build this new domestic infrastructure and they cannot be left behind.

Do you believe the DOE loan guarantee program as currently constituted is workable? If not, what would you like to see the Congress consider that would help you do your job with regard to issuing loan guarantees for pending applications?

A1. Yes, we believe the loan guarantee program (LGP) as constituted is workable. As of today, a cadre of seasoned professionals with extensive energy experience, principally in project finance, has been hired. Currently, 38 full-time equivalent employees are on board and they are augmented by 16 contractors, and 7 detailees, for a total of 61 people. The LGP is continuing to recruit and hire qualified personnel of the highest caliber, as expeditiously as possible, to complete the project evaluation, environmental compliance with a focus on NEPA, due diligence, credit underwriting and monitoring and oversight activities. The Department is not seeking additional loan guarantee authority or additional appropriations for credit subsidy costs in FY 2010.

QUESTION FROM SENATOR CRAPO

Q2. As we know, capping emissions will lead to increased utilization of other reliable lower emitting electricity sources. The existing 104 nuclear reactors currently provide 20 percent of our electricity and 70 percent of all emission-free electricity making it an ideal technology to fill this role.

What sort of role do you see nuclear energy playing post cap-and-trade and do you support funding R&D efforts to improve the long-term, safe, economic operation of the existing reactor fleet to 80 years to assist in meeting climate targets?

A2. The Administration believes that nuclear power needs to play a role in America's energy mix. The FY 2010 Budget supports R&D in critical areas, such as materials, that we expect will be useful for extending the life of existing reactors and I recognize the importance of such extensions in keeping U.S. carbon dioxide emissions from increasing. I cannot, however, comment on an 80 year extension goal. Decisions about licensing and life extensions are the responsibility of the Nuclear Regulatory Commission. The NRC has already extended numerous plant licenses for an additional 20 years.

QUESTION FROM SENATOR CRAPO

Q3. If you were tasked with improving the nuclear provisions within Waxman-Markey to maximize its benefits to nuclear power, how would you go about doing so?

A3. The Waxman-Markey climate bill provides financing and credit for clean technologies that do not emit greenhouse gases. The Senate is considering various climate and energy legislation, some with financing and credit provisions for clean technologies similar to those in the American Clean Energy and Security Act of 2009. The Administration is following discussions on these bills closely and will consider effects on all energy technologies, including nuclear.

Senator BOXER. Thank you so much for your eloquent words.

Administrator Jackson, welcome again. You are a frequent visitor in this room, and we welcome you again.

**STATEMENT OF LISA P. JACKSON, ADMINISTRATOR, U.S. ENVIRONMENTAL PROTECTION AGENCY**

Ms. JACKSON. It is good to be home, Madam Chairman.

Thank you for having me. And to you, Ranking Member Inhofe and members of the committee, thanks first for the confirmation votes today. EPA appreciates the support. And thank you for inviting me to testify about new legislation to get America running on clean energy.

Let me begin by commending you for starting Senate hearings on this, the second legislative day after the House of Representatives passed the American Clean Energy and Security Act. Immediately after that historic vote on June 26th, President Obama called upon the Senate to demonstrate the same commitment, the same commitment that we saw in the House to build a clean energy foundation for a strong American economy. I am grateful that this committee has wasted no time in answering that call.

The House bill reflects the principles the President believes are essential for our Nation's energy future: decreasing our dependency on foreign oil, creating millions of new jobs in emerging clean energy technologies, and reducing the pollution that endangers our children.

I know there are a variety of proposals pending in the Senate that have the same goals. I look forward to working with all the committee members as you engage in this effort.

Clean energy is, to this decade and the next, what the Space Race was to the 1950s and 1960s. And America is behind. Governments in Asia and Europe are ahead of the United States in making aggressive investments in clean energy technology. American businesses need strong incentives and investments now in order for this Nation to lead the 21st century global economy.

We are also coming late to the task of leading the world's major greenhouse gas emitters to reverse our collective emissions' growth in time to avert catastrophic climactic changes that would severely harm America's economy and national security within our children's lifetimes. The necessary shared effort will not begin in earnest unless and until the United States leads the charge.

The advantage of the kind of legislation the President has called for is that it ramps up investment in developing new clean energy technologies while giving companies an effective incentive to use those technologies to reduce greenhouse gas pollution. It does so without raising taxes or increasing the deficit.

I do not mean to say that we can get something for nothing. But, according to the Congressional Budget Office's analysis of the American Clean Energy and Security Act, the net cost to the average American household in 2020 would be less than 50 cents a day. For the wealthiest fifth of American households, the net cost would be less than 70 cents a day. The poorest fifth would actually see a net gain of more than 10 cents a day. That is what your economists have reported to you.

People have pointed out that the per household impact would not be uniform across the country, that the costs would be higher in those States where people drive very long distances and rely almost exclusively on coal for electricity. Yet, even if the cost borne by the average family in such a State were double the national average, it still would be just a dollar a day.

That figure does not account for the economic benefits of saving our children from living with increased drought, fire, pests, flooding, and disease. Nor does it account for the benefit of decreasing our dependency on foreign oil.

Can anyone honestly say that the head of an American household would not spend a dollar a day to safeguard the well being of his or her children, to reduce the amount of money that we send overseas for oil, to place American entrepreneurs back in the lead of the global marketplace, and to create new American jobs that pay well and cannot be outsourced?

Labor unions support this kind of legislation because they know it will, indeed, create millions of high paying American jobs that cannot be exported. Manufacturing companies support it because they know it will provide needed investment in research and development while creating markets for the American clean energy technologies born from that investment. Electric utilities support it because they know it will expand our use of reliable domestic sources of energy like wind, solar, geothermal and yes, safer nuclear power, and yes, cleaner coal.

Consumer advocates support it because they know it will strengthen the long-term economic foundation for all Americans without imposing short-term economic hardship on any Americans. And environmental groups support it because they know it is our best chance of preventing catastrophic harm to public health and our natural environment.

Of course, there are still interest groups out there opposing this effort. But I think the tide is turning against the defenders of the status quo who want more of the same policies that made us dependent on foreign oil and that caused America to forfeit the lead in the burgeoning global competition to sell clean energy technology.

I think Americans want reform that harnesses the country's can do spirit. I think they want to fuel long-term economic recovery with a wise investment. This is what the President wants. That is what I want. I believe many Senators want the same thing.

Please consider the Environmental Protection Agency as a partner in this effort to get America running on clean energy. And please, please, keep up the momentum.

Thank you, and I look forward to questions.

[The prepared statement of Ms. Jackson follows:]

**Statement of Lisa P. Jackson**
**Administrator, U.S. Environmental Protection Agency**
**Hearing on Energy and Climate Legislation**
**Committee on Environment and Public Works**
**U.S. Senate**
**July 7, 2009**

Chairman Boxer, Ranking Minority Member Inhofe, and members of the Committee, thank you for inviting me to testify about new legislation to get America running on clean energy. Let me begin by commending you for starting Senate hearings on this, the second legislative day after the House of Representatives passed the American Clean Energy and Security Act. Immediately after that historic vote on June 26, President Obama called upon the Senate to demonstrate the same commitment we saw in the House to building a clean-energy foundation for a strong American economy. I am grateful that this Committee has wasted no time in answering that call.

The House bill reflects the principles the President believes are essential for our nation's energy future: decreasing our dependency on foreign oil, creating millions of new jobs in emerging clean-energy technologies, and reducing the pollution that is a danger to our children.

I know there are a variety of proposals pending in the Senate that have the same goals, and I am looking forward to working with all the Committee members as you move forward on this effort.

Clean energy is to this decade and the next what the Space Race was to the 1950s and '60s, and America is behind. Governments in Asia and Europe are ahead of the United States in making aggressive investments in clean-energy technology. American businesses need strong incentives and investments now in order for this nation to lead the 21st Century global economy.

We are also coming late to the task of leading the world's major greenhouse-gas emitters to reverse our collective emissions' growth in time to avert catastrophic climactic changes that would severely harm America's economy and national security within our children's lifetimes. The necessary shared effort will not begin in earnest unless and until the United States leads the charge.

The advantage of the kind of legislation the President has called for is that it ramps up investment in developing new clean-energy technologies while giving companies an effective incentive to use those technologies to reduce greenhouse-gas pollution. It does so without raising taxes or increasing the deficit.

I do not mean to say that we can get something for nothing. But according to the Congressional Budget Office's analysis of the American Clean Energy and Security Act, the net cost to the average American household in 2020 would be less than 50 cents a day. For the wealthiest fifth of American households, the net cost would be less than 70 cents a day. The poorest fifth would actually see a net gain of more than ten cents a day. That is what your economists have reported to you.

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That figure does not account for the economic benefits of saving our children from living with increased drought, fire, pests, flooding, and disease. It does not account for the benefit of decreasing our dependency on foreign oil. Can anyone honestly say that the head of an American household would not spend a dollar a day to safeguard the wellbeing of his or her children, to reduce the amount of money that we send overseas for oil, to place American entrepreneurs back in the lead of the global marketplace, and to create new American jobs that pay well and cannot be outsourced?

Labor unions support this kind of legislation because they know it will indeed create millions of high-paying American jobs that cannot be exported. Manufacturing companies support it because they know it will provide needed investment in research and development while creating markets for the American clean-energy technologies born from that investment. Electric utilities support it because they know it will expand our use of reliable, domestic sources of energy like wind, solar, geothermal – and, yes, safer nuclear power – and, yes, cleaner coal. Consumer advocates support it because they know it will strengthen the long-term economic foundation for all Americans without imposing short-term economic hardship on any Americans. And environmental groups support it because they know it is our best chance of preventing catastrophic harm to public health and our natural environment.

Of course, there are still interest groups out there opposing this effort. But I think the tide is turning against the defenders of the status quo, who want more of the same policies that made us dependent on foreign oil and that caused America to forfeit the lead in the burgeoning global competition to sell clean-energy technology. I think Americans want reform that harnesses the country's can-do spirit. I think they want to fuel long-term economic recovery with a wise investment that sparks a clean-energy transformation in our economy and that protects our children and grandchildren.

That is what the President wants. That is what I want. I believe many Senators want the same thing. Please consider the Environmental Protection Agency a partner in this effort to get America running on clean energy. And, please, keep up the momentum.

Thank you. I look forward to answering your questions.

**Environment and Public Works Committee Hearing**
**July 7, 2009**
**Follow-Up Questions for Written Submission**

Questions for Administrator Jackson

Questions from:
Senator Thomas R. Carper

1. Administrator Jackson, I read your opening statement with great interest. I noticed one omission in your statement: you did not give us your opinion of how the transportation sector can reduce greenhouse gas emissions. I am encouraged that the EPA recently joined the Partnership for Sustainable Communities that was previously created by the Department of Transportation and the Department of Housing and Urban Development. I believe that providing Americans with options for increased mobility is a vital component of addressing emissions from the transportation sector. Do you agree with me and how can we increase mobility and reduce emissions from the transportation sector?

> **ANSWER:** Yes, I agree that options like increased transit, carpooling, smart growth development, more biking and pedestrian infrastructure, and other travel efficiency strategies are important for addressing greenhouse gas emissions and local pollution from the transportation sector and other negative externalities associated with driving like congestion and accidents. The integration of greenhouse gas emission reduction strategies into the existing state and regional transportation planning process can also play an important role in helping to reduce greenhouse gas emissions. While a cap and trade system that covers petroleum-based fuel would encourage the use of transit and other transportation alternatives, the resulting price signal on transportation fuel would be small and would not likely overcome market failures that prevent shifts in existing travel patterns. Additional measures may therefore be needed to provide better alternatives to driving, reduce petroleum use, and protect Americans from gas price increases produced by global oil markets.
>
> EPA is very pleased to be a part of the Partnership for Sustainable Communities. In designing or improving our communities to be sustainable for the long term, mobility, housing, and environmental issues are entirely interconnected. Working across agencies gives us an opportunity to share knowledge, resources, and strategies that will improve public health and the environment, cut costs and harmful emissions from transportation, and build more affordable homes in communities all over the country. I know that investing in public transportation, making communities more walkable, and creating more housing near job centers results in less driving and fewer emissions—without reducing mobility.

2. Do you believe it is cost effective to implement a cap-and-trade program to address greenhouse gases from the power sector, while moving to a command-and-control approach for sulfur dioxide and nitrogen oxide emissions at the same time?

**ANSWER:** I believe that EPA can design regulatory approaches for significantly reducing SO2 and NOx emissions from the power sector that can work in concert with a greenhouse gas (GHG) trading program to reduce all of these pollutants. EPA's analysis of climate bills has shown that a GHG cap and trade program (particularly together with renewable energy requirements) leads to retirement of smaller, less efficient and less frequently operated coal-fired units. Because these units are operated infrequently, in many cases they face the highest per ton costs for reducing their SO2 and NOx emissions. Thus, a climate program can foster strategies that reduce both GHGs and criterion pollutants, whether it be from cap and trade, command and control or a hybrid approach. In developing regulatory approaches to reducing SO2 and NOx emissions, EPA intends to consider interactions with other important emission reduction requirements such as a GHG reduction program.

Senator Benjamin L. Cardin

1. The Clean Air Act has a number of successful programs to regulate power plant emissions. New Source Review program that requires pre-construction review for environmental controls on new facilities or modifications to existing facilities that produce more of a regulated pollutant is one in particular. Waxman-Markey, however, repeals certain aspects of New Source Review under the Clean Air Act.

• Will EPA have adequate statutory authority to protect clean air if these provisions are repealed?

ANSWER: GHG emissions would be primarily regulated under the cap and trade program the Waxman/Markey bill would establish. The New Source Review (NSR) provision in Waxman-Markey would exclude sources that might trigger NSR based on GHG emissions, so if a power plant (or any other source) constructs or modifies in a way that significantly increases conventional pollutants like particulate matter or sulfur dioxide, the NSR program would still apply to the source. Similarly, the program would still require offsets of any increases of a criteria air pollutant (or its precursors) that are occurring in areas that are designated as not meeting the National Ambient Air Quality Standards (i.e., nonattainment) for that pollutant. Thus the Clean Air Act programs for non-GHG pollutants would be unaffected.

2. Section 438 of the 2007 Energy Independence and Security Act required all new and redeveloped federal buildings to manage stormwater runoff using site planning, design, construction, and maintenance strategies for the property to maintain or restore predevelopment hydrology, to the maximum extent technically feasible. Moving water, be it wastewater, drinking water or stormwater through conventional infrastructure is incredibly energy intensive.

• Could you detail the energy savings we see from managing storm water in this way?

Green Infrastructure strategies and technologies used to manage stormwater runoff may help reduce energy needs. Green roofs and plantings around buildings can help shade and insulate buildings, decreasing energy needs for heating and cooling. For example, energy monitoring of a 1,600 square foot green roof on a new at University of Central Florida building showed that energy savings in the summer months jumped from 18.8 percent to 43.3 percent. In addition, diverting stormwater from conventional collection, conveyance and treatment systems reduces the amount of energy needed to pump and treat water.

Although EPA has not done any systematic work in this area, several projects are currently underway. A recent Philadelphia Water Department study includes some preliminary anecdotal evidence of energy savings: "For the 50% LID [Low Impact Development] option, our analysis indicates a net energy savings over the 40-year planning period of nearly 370 million kilowatt hours (kWh) of electricity and nearly 600 million British thermal units (Btus) of natural gas...The monetized present value of these changes from the 50% LID option amount to nearly $34 million for energy savings, over $21 million for reduced CO2 emissions, and over $46 million for reduced net damages from SO2 and NOx emissions."

3: Water efficiency - be it through modem appliances or plumbing fixtures - provides excellent water savings that equal energy savings as well. The Water Sense program is a great promotional tool for water efficiency. A lot of consideration has been given to consumer rebate programs, or tax breaks, for consumer purchases of energy efficient appliances or modifications to homes.

• Would you support a similar program for water efficiency given the energy, and water savings, associated with making these consumer purchases?

There are many tools for helping consumers save water in their homes. In addition to product labeling, rebates, tax breaks, and other incentive programs have proven very successful for both energy- and water-saving products. The WaterSense label makes these types of programs easier to implement, since a list of water efficient, high performance products is already available and backed by third-party certification. For example, the state of Georgia has recently included WaterSense labeled products in its statewide sales tax holiday that formerly only included Energy Star qualified products. It its first year of including water-saving products, Georgia estimates that consumers purchased products that will save the state over 4 million gallons per year.

Senator James M. Inhofe

1. Do you support including language in any comprehensive climate change legislation that preempts the regulation of greenhouse gas (GHG) emissions under the Endangered Species Act and the Clean Water Act? Isn't it preferable to have one law requiring controls of GHG emissions rather than multiple laws that could conflict?

> **ANSWER:** The Clean Water Act has no provision for regulating emissions of greenhouse gases. However the Act does allow EPA to consider indirect effects when establishing technology-based, effluent limitation guidelines to control point source discharges. Examples of the secondary aspects EPA evaluates that could have implications for greenhouse gas emissions are energy use and energy efficiency.
>
> I believe that is an appropriate role for EPA. If comprehensive climate change legislation were to preempt this consideration when developing effluent limitation guidelines for wastewater dischargers, it could have unintended consequences limiting the ability of EPA to set best available technology standards to control water pollutants.
>
> Concerning the Endangered Species Act, I defer to Secretary of the Interior Salazar.

2. Section 331 of H.R. 2454 (as passed by the House) proposes to limit the regulation of GHGs under specific provisions of the Clean Air Act (CAA) including Section 115, Section 112, the provisions of Part C of title I (relating to New Source Review) and title V permits for sources that would only be covered due to regulation of GHGs. The proposed provision affecting the application of Section 115 refers to "a pollutant's contribution to global warming" while the proposed provision affecting the application of Section 112 refers to "effects on global climate change." Are either of the terms "global warming" or "global climate change" defined in the legislation? How do these terms differ?

> • Would ocean acidification or coral bleaching be considered solely due to "global warming" or "global climate change"? If not, could GHGs that contribute to ocean acidification or coral bleaching still be regulated under these provisions?
>
> **ANSWER:** The bill does not define "global warming" or "global climate change," so I cannot say to what extent, if any, the terms differ in meaning in the context of this legislation. Ocean acidification and coral bleaching are two impacts of increased concentrations of greenhouse gases in the atmosphere. Those impacts, among others, are described in the technical support document that accompanied EPA's proposed endangerment finding issued earlier this year.

3. Section 331 also requires the Administrator to issue New Source Performance Standards (NSPS) for source categories that emit at least 20 percent annually of uncapped GHG emissions. Please provide a list of these sources. Would these sources be eligible to provide emission offsets up until the date of regulation if they made GHG emission reductions prior to being regulated?

> **ANSWER:** The language in Section 331 contains a requirement to list stationary sources that individually have uncapped GHG emissions greater than 10,000 tons CO2 equivalent and that in the aggregate are responsible for emitting at least 20 percent of the uncapped GHG

emissions. Based on the 2005 US GHG emissions inventory, only one category, landfills, exceeds the 20% threshold. However, section 331 also requires that EPA identify and set standards to ensure that, in combination with capped sources, at least 95% of industrial source emissions are subject to regulation for GHG. These are minimum requirements and do not preclude EPA from establishing standards for other source categories as well. We have not prepared a list of such categories, however, because the selection of source categories can be based on a variety of factors, including, but not limited to total quantity of emissions, potential effectiveness and cost of control technologies, expected growth within the particular source category, and other factors that might make one or more categories more attractive for the development of emission standards. We believe that it would be important for EPA to be able to select only those source categories where reductions in GHG emissions would be both efficient and cost effective, and not to regulate simply on the basis of numbers or size.

As currently drafted, the bill language neither prohibits EPA from allowing offsets for these source categories until such time as performance standards are established and implemented, nor requires EPA to do so.

4. Section 331 further requires the regulation of source categories that are responsible for at least 10 percent of uncapped methane emissions (excluding enteric fermentation). Please provide a list of these source categories. The provision further states that the list "under this paragraph" shall include industrial sources, the emissions from which when added to the capped emissions from industrial sources, constitute 95 percent of GHG emissions from the industrial sector. Please describe what additional industrial sources would be covered to meet the 95 percent mandate.

**ANSWER:** According to the 2005 US GHG emissions inventory, landfills, natural gas systems, and coal mines are each responsible for at least 10% of uncapped methane emissions. Based on that information, landfills, natural gas systems, and coal mines would likely need to be listed to meet the bill's mandate for 95% coverage of GHG emissions from the industrial sector and including them would likely satisfy the requirement.

5. Under H.R. 2454, covered electricity sources that burn renewable biomass or gas derived from renewable biomass are not required to surrender an allowance for each ton of CO2 equivalent GHG emissions produced from the biomass. Would these emissions be viewed as uncapped emissions and thus subject to New Source Performance Standards?

**ANSWER:** H.R. 2454 makes clear that covered electricity sources would not be required to hold allowances for emissions associated with their combustion of renewable biomass or gas derived from renewable biomass. I do not have a view as to whether those emissions could or would be subject to the NSPS provisions of the bill.

6. Please list all the sources beyond "covered entities" as that term is defined in H.R. 2454 that would be deemed a reporting entity under the Greenhouse Gas Registry proposed to be established in Section 311 of H.R. 2454. What would these sources have to do under the proposed registry provision? Under the provisions of the legislation, could the EPA require continuous emissions monitoring?

**ANSWER:** The registry provision in HR 2454 (section 311, establishing new Clean Air Act section 713) would cover facilities in the same categories as "covered entities" but establish a lower applicability threshold (e.g., 10,000 tpy in CO2-equivalent versus 25,000 tpy). It also would cover vehicle fleets over a certain size if the Administrator determined it was appropriate, and any entity that delivers electricity to an energy-intensive industry identified under section 764 of H2454. Finally, the registry provision in HR2454 also would allow EPA to require reporting by "any other entity that emits a greenhouse gas, produces, imports, manufactures, or delivers material whose use results or may result in greenhouse gas emissions if the Administrator determines that reporting under this section by such entity will help achieve the purposes of this title or title VIII." EPA has not fully evaluated what other sources the agency would need to include in a registry at this time. For an indication of the types of anthropogenic sources categories EPA deems appropriate for reporting under the Clean Air Act, please refer to the Final Greenhouse Gas Mandatory Reporting Rule (Signed September 22, 2009; available at http://www.epa.gov/climatechange/emissions/ghgrulemaking.htm).

The bill directs EPA to require the use of continuous emissions monitoring (CEMS) or the equivalent at entities that would be subject to the bill's cap and trade program and provides EPA flexibility to consider costs and technical feasibility of methods when developing monitoring requirements for those sources that are reporting entities only. To implement this provision, EPA would likely need to evaluate each source category on a case by case basis and determine the most appropriate monitoring method or methods.

7. Does H.R. 2454 as currently drafted preempt the GHG reporting rule recently proposed by the EPA? How do the two reporting provisions differ? Would you support preempting the existing GHG reporting now in development if comprehensive legislation passes in order to avoid duplication and conflicts?

**ANSWER:** The Greenhouse Gas Registry that would be established under H.R. 2454 is quite similar in scope to the Final Greenhouse Gas Mandatory Reporting Rule (Signed September 22, 2009 available at http://www.epa.gov/climatechange/emissions/ghgrulemaking.html)). While there are differences between the two reporting programs, they are largely overlapping and I expect the two programs could be effectively dovetailed together. That said, the passage of H.R. 2454 as currently drafted would necessitate some minor amendments to EPA's Greenhouse Gas Mandatory Reporting program. The changes are consistent with the shift that would occur from a reporting program to a Registry supporting emission reduction programs, such as moving from annual to quarterly reporting, and moving from calculation methodologies to continuous emissions monitoring where technically feasible.

8. In analyzing the costs of the H.R. 2454, how many domestic emission offsets did the EPA assume would be available per year, starting in 2012, for the first 25 years of the program? What is the basis for this assumption? Please provide a list of sources that would likely be eligible to provide domestic offsets in those years?

**ANSWER:** The following table lists the domestic offset use per year that are reflected in EPA's cost analysis of H.R. 2454 for the first 26 years of the climate program starting in 2012.

| (all units MMtCO2e) | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.R. 2454 Cap | 4627 | 4544 | 5099 | 5003 | 5482 | 5375 | 5269 | 5162 | 5056 | 4903 | 4751 | 4599 | 4446 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Domestic Offsets | 166.5 | 168.3 | 170.1 | 171.7 | 173.1 | 174.3 | 175.2 | 175.8 | 176.1 | 189.7 | 203.0 | 215.8 | 228.0 |

| *continued….* | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **2034** | **2035** | **2036** | **2037** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.R. 2454 Cap | 4294 | 4142 | 3990 | 3837 | 3685 | 3533 | 3408 | 3283 | 3158 | 3033 | 2908 | 2784 | 2659 |
| Total Domestic Offsets | 239.7 | 250.7 | 261.0 | 270.6 | 279.3 | 287.1 | 294.3 | 301.8 | 309.4 | 317.3 | 325.4 | 333.8 | 342.4 |

EPA modeled the following potential offset sources: domestic animal waste CH4, domestic afforestation, domestic other agricultural CH4 & N2O, agricultural soils, and domestic forest management. The sources of domestic offsets that EPA modeled represent sources that have significant supply in the FASOM model at the relevant allowance prices. The exclusion of other sources in the modeling results does not imply that those sources would not be eligible to receive offsets credits.

- **Please provide a list of sources that would likely be eligible to provide domestic offsets in those years?**

There are a number of categories of potential offset projects that have been the subject of substantial analysis, and that have established a track record already through the existing, voluntary offsets markets. EPA is in the process of evaluating those offset categories. Under HR 2454, determining eligibility for providing offsets would also depend on the analysis and findings of the USDA and EPA Offset Integrity Advisory Boards and consideration of those findings by EPA and USDA. Given the work that has been done to date, I expect that the government will be able to ensure eligibility of individual projects within a range of categories to help lower costs of the cap-and-trade system.

- **How long would it take develop an approved methodology for a domestic offset source? Please list the specific steps involved in developing the methodologies for each type of domestic offset source.**

The time required to develop a methodology depends on the extent of work already done. Some project types have been developed as part of existing voluntary and compliance markets, and the work done in those contexts would provide a foundation for developing robust US government methodologies to be used under a cap-and-trade system. For those project types, I expect that approved methodologies could be developed in under a year. Those project types requiring more initial assessment work would take longer. The principal tasks in developing an offsets methodology include: developing methods to determine baselines, establish additionality, and address permanence and leakage; determining monitoring requirements; and establishing the process to quantify eligible emissions reductions.

- **Please list the specific demonstrations project owners would have to make under the terms of the legislation before being approved as a domestic offset.**

A project owner would have to demonstrate that the project would meet all requirements laid out in the applicable offset protocol for that project type. That would include, in particular, a demonstration that emissions reduced or sequestered would be surplus to what is otherwise required by regulation and additional according to the standardized approach in the protocol.

9. How will the EPA determine additionality for purposes of approving offsets? For instance, if 5% of a given industry is already undertaking the proposed action for reasons other than climate change would that preclude a showing of additionality? Would reliance on other government subsidies preclude a showing of additionality?

**ANSWER:** Under HR 2454, EPA would be required to apply a standardized approach for determining additionality. Project owners would be required to demonstrate that their projects are additional by achieving a level of performance that is significantly better than business-as-usual. EPA would establish a business-as-usual baseline based on a thorough analysis of relevant existing measures and practices. While I cannot say at this time what the baseline would be for any particular project type, a penetration rate of 5% is very low and likely would not be considered common practice. Regarding whether reliance on government subsidies would preclude a showing of additionality, this issue would have to be evaluated as part of the data analysis involved in developing a standardized methodology for determining whether a project would meet the requirement for additionality.

10. In your analysis of H.R. 2454, you noted the importance of international offsets in affecting the price of allowances. What assumptions did your Agency make with regard to the annual supply and cost per ton of international offsets from 2012 to 2032? Please provide information describing the basis for these assumptions.

**ANSWER:** EPA did not assume a fixed supply or cost of international offsets. EPA's analysis relies on several detailed models that use data to estimate how international supply and demand of offsets would vary with changes in price. For more information on the assumptions see the following sources.

International forest CO2 reference:
Sohngen, B. and R. Mendelsohn. 2006. "A Sensitivity Analysis of Carbon Sequestration." In Human-Induced Climate Change: An Interdisciplinary Assessment. Edited by M. Schlesinger. Cambridge: Cambridge University Press.

International energy-related CO2 reference:
USCCSP, 2006, *Scenarios of Greenhouse Gas Emissions and Atmospheric Concentrations.* Report by the U.S. Climate Change Science Program and approved by the Climate Change Science Program Product Development Advisory Committee.

• In providing these estimates, did your Agency consider the international and regulatory hurdles involved in approving an international offset project, including the need for a bilateral agreement?

**ANSWER:** No. EPA did not estimate transactions costs associated with the use of offsets in this analysis. The bill includes a 5:4 turn-in ratio for international offsets that is reflected in the results.

• What other factors could significantly affect the supply and price of international offsets over this period?

**ANSWER:** A significant demand for international allowances from countries other than the United States could affect the supply and price of international offsets. A well-designed offset system, with clear rules for project development, monitoring and verification will help ensure a stable supply.

• Given the slow pace and the controversies surrounding projects approved under the Clean Development Mechanism, why does the EPA believe the approval process will move quickly?

**ANSWER:** EPA's understanding of H.R. 2454 is that international offsets would not need to go through the Clean Development Mechanism (CDM) process in order to be used in the US. Other approaches, including bilateral agreements, are available to provide for international offsets. In recent years several improvements have been made to the CDM to streamline the approval process. These improvements include consolidating methodologies for certain project types, clarifying rules, implementing initial checks on projects by the Secretariat, and setting deadlines for validators and the Secretariat. Further reform of the CDM to address the project approval process and other concerns is under discussion.

• How many full FTE and resources within the EPA, US Department of State and other relevant agencies will be required to meet this mandate under the legislation?

**ANSWER:** The Administration has not yet completed a precise estimate of federal government resources required to implement H.R. 2454.

11. Section 311 of H.R. 2454 requires the EPA to conduct a review of the program every four years, including an analysis of worldwide greenhouse gas reduction efforts to determine whether U.S. and international actions, commitments and trends are sufficient to avoid atmospheric GHG concentrations in excess of 450 parts per million. If the target is not met, the bill would further require the President to direct relevant Federal agencies to use existing statutory authorities to take appropriate actions to address any shortfalls. Please provide the Committee with estimates of current GHG atmospheric concentrations in CO2 equivalents that include all pollutants included in H.R. 2454 as greenhouse gases.

**ANSWER:** The National Oceanic and Atmospheric Administration (NOAA) collects periodic concentrations on a range of greenhouse gases in the atmosphere. The table below provides the concentration data requested.

**Global $CO_2$, $CH_4$, $N_2O$, and $SF_6$ concentrations 2008**

| Gas | Concentration | Radiative Forcing ($W/m^2$)[5] | $CO_2$ Equivalent (ppm)[6] |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Total | NA | 2.419 | 437 (159 above preindust.) |
| $CO_2$ [1] | 386 ppm | 1.756 | 115 above preindustrial |
| $CH_4$ [2] | 1799 ppb | 0.489 | 32 above preindustrial |
| $N_2O$ | 322 ppb[3] | 0.171 | 11 above preindustrial |
| $SF_6$ | 6 ppt[4] | 0.0031 | 0.2 above preindustrial |

[1] $CO_2$ data are a yearly average of monthly data from the NOAA Earth System Research Laboratory (ftp://ftp.cmdl.noaa.gov/ccg/co2/trends/co2_mm_gl.txt)

[2] $CH_4$ data are a yearly average of monthly data from NOAA/ESRL Mauna Loa local monitoring site (ftp://ftp.cmdl.noaa.gov/ccg/ch4/flask/month/mlo_01D0_mm.ch4).

[3] 2008 nitrous oxide global mean data are a yearly average of monthly data from the NOAA/ESRL halocarbons in situ program (ftp://ftp.cmdl.noaa.gov/hats/n2o/insituGCs/CATS/global/insitu_global_N2O)

[4] 2008 global mean data are a yearly average of monthly data from the from the NOAA/ESRL Chromatograph for Atmospheric Trace Species data from baseline observatories (ftp://ftp.cmdl.noaa.gov/hats/sf6/insituGCs/CATS/global/insitu_global_SF6)

[5] Radiative forcing calculated using simplified expressions from Ramaswamy et al. 2001 (IPCC TAR).

[6] $CO_2$ equivalent for total contribution refers to the $CO_2$ concentration (437 ppm) that would yield the same forcing as the combined radiative forcing of all GHGs. This concentration is 159 ppm greater than the preindustrial $CO_2$ concentration of 278 ppm. This 159 ppm increase above preindustrial is divided between the individual gases in proportion to their relative contribution to total radiative forcing. Because one ppm $CO_2$ out of 437 total contributes less to radiative forcing than one ppm of $CO_2$ out of 386 ppm total (due to the logarithmic nature of CO2 forcing) the sum of the $CO_2$ concentration in column four and the preindustrial concentration is larger than the $CO_2$ concentration in column two.

All data were obtained from the NOAA Earth System Research Laboratory. HFC and PFC data are not included in this table due to the number of species involved.

When does the EPA project that global concentrations of these GHGs will exceed 450 parts per million on a CO2 equivalent basis?

**ANSWER:** The IPCC Working Group III report stated that in 2005 "[t]he total $CO_2$-equivalent ... concentration of all long-lived GHGs is now about 455 ppm $CO_2$-eq"[1] (p. 27) – this number includes the Montreal Protocol gases. Updating $CO_2$, $CH_4$, and $N_2O$ concentrations to 2008 numbers, the total $CO_2$-equivalent concentration of all-long-lived gases is now about 465 ppm. If only the Kyoto gases were considered, then the total $CO_2$-equivalent concentration would be about 438 ppm.

- What additional statutory authorities are available to the President should concentrations exceed this threshold level?

[1] IPCC, 2007: *Climate Change 2007: Mitigation of Climate Change, Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA., p. 27.

**ANSWER:** EPA has not fully examined the statutory authorities that would be available should concentrations exceed 450 ppm. H.R. 2454 exempts greenhouse gases from regulation under a number of Clean Air Act programs, so those existing authorities would not be available to address greenhouse gases' global climate change effects.

- Could the President request the use of existing statutory authorities under the Endangered Species Act or the Clean Water Act to force additional emission reductions? Please provide a comprehensive list to allow a full evaluation of the impact of this provision.

**ANSWER:** We have not fully examined the authority that would be available under the Endangered Species Act or the Clean Water Act to obtain additional emission reductions.

12. On July 1, 2009, in a letter to the Kansas Department of Health and the Environment, your Agency specified a number of Clean Air Act requirements which must be met by the Sunflower Electric Power Corporation before the EPA will issue a permit. Included in this list is a statement that the Sunflower Electric Power Corporation "should consider the option of employing Integrated Gasification Combined Cycle (IGCC) technology." Please provide the basis for including this requirement. Please reference the pollutants emitted by the plant for which this control technology should be considered an option. Does the EPA now believe that IGCC must be routinely considered an option for the construction of any new coal fired power plant, regardless of the initial proposed design of the unit?

**ANSWER:** The Clean Air Act requires a case-by-case preconstruction review of major new sources of air pollution to ensure the application of the best available control technology. The term "best available control technology" is defined by the Act as an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through the application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. (Clean Air At section 169(3))

In the case of Sunflower Electric Power Corporation, the Kansas Department of Health and the Environment is the permitting authority that will determine whether to issue the permit and identify the best available control technology limitations for the power plant. EPA interprets the Clean Air Act to provide permitting authorities with the discretion to eliminate a control option from consideration in a BACT analysis for a particular source if the permitting record reflects that the option would fundamentally redefine the source proposed by the applicant. EPA has not altered this interpretation of the Clean Air Act. However, EPA believes that IGCC technology should be considered when permitting new coal-fired power plants because IGCC is a technology that can reduce criteria pollutant emissions (e.g., nitrogen oxides, sulfur dioxide, and particulate matter) in some applications. Thus, EPA encourages permitting authorities such as KDHE to exercise their discretion to evaluate IGCC technology as part of a BACT analysis for a coal-fired power plant, where appropriate. If a permitting authority does not believe such an analysis is appropriate, it should explain in the permit record its basis for such a decision.

13. In conducting an analysis of the impacts of H.R. 2454, your Agency relied upon two different models, the IPM model and the ADAGE model. Are either of these two models available to the public? Please provide a detailed analysis of the amount of public funds that have been used to develop and run these models since their creation. If the models are not available to the public, please explain why the Agency continues to rely on models for such significant public policy decisions that are not publicly available? What steps can your Agency take to increase transparency by transitioning now to models that are publicly available?

**ANSWER:** Extensive information and documentation on the inputs, model structure, and outputs of the IPM and the ADAGE models are available on EPA's website at http://www.epa.gov/climatechange/economics/modeling.html. Results and analyses from these models have been presented in the peer-reviewed economics literature.

For ADAGE, EPA has spent about $597,000 since 2006 to develop and apply the model for analyses of House and Senate legislation. An additional $132,000 has been spent on model development related to climate impacts and adaptation analysis.

EPA has used IPM for analyzing emissions policies affecting the U.S. power sector since 1996. Over the last 14 years approximately $1.7 million has been spent annually, totaling $24 million, for model development, updates, and operation.

IPM has been extensively used to analyze a wide range of federal legislative and regulatory programs as well as for state and regional air quality planning. This makes it critically important to keep model assumptions up-to-date. Besides ongoing updates, substantial investments have been made to develop detailed coal supply, natural gas, and fuel transportation inputs to the model that accurately depict U.S. production capacity, and to conduct in-depth peer and other external reviews of key elements of the model.

The model's extensive, detailed inputs and outputs and all of EPA's modeling assumptions are publicly available at www.epa.gov/airmarkets/progsregs/epa-ipm/index.html, linked websites, and in various rulemaking dockets. Public use of the model is available through EPA or the private contractor who maintains the model, and all stakeholder groups are allowed to use EPA's version of the model.

When EPA developed the Clean Air Interstate Rule, IPM was used by EPA, states, an environmental group, and industry to examine its costs and impacts. It continues to be used by those same groups today. This model was chosen by the Agency due to its technical superiority in providing the detailed inputs needed by EPA for air quality modeling and regulation development and due to the transparency and opportunities for public review afforded by its detailed fundamentals-based, bottom-up approach.

EPA's analytic results are capable of being substantially reproduced using a range of publicly available and proprietary models that the public may access. To that end, the agency provides extensive documentation, input assumptions, and model outputs on its website and devotes substantial efforts to responding to technical questions from industry, Congress, environmental groups, and others regarding our analyses. Finally, under EPA's Information Quality Guidelines, the agency has noted that there are a number of "factors that are appropriately considered when deciding whether to use proprietary models, including

feasibility and cost considerations (e.g., it may be more cost-effective for the Agency to use a proprietary model in some situations than to develop and maintain its own model)."

14. Do you believe emissions from biomass - either as a result of combustion from stationary sources or mobile - needs to be covered by any national cap?

**ANSWER:** Congressional committees are in the process of considering the proper coverage of any national cap. If requested, EPA can provide technical assistance to the Committee on the issue of addressing biomass emissions.

15. How many domestic non-agricultural sources do you believe will be eligible under the House bill for producing offsets to help lower the costs?

**ANSWER:** There are a number of non-agricultural categories of potential offset projects that have been the subject of enough analysis, and that have established enough of a track record through the existing, voluntary offsets markets, that the U.S. government should be able to move quickly to determine the eligibility of individual projects within those categories to help lower costs of the cap-and-trade system. While EPA is still evaluating a number of offset categories, and specific conclusions about those categories will also depend on any other policies put into place to address emissions from these sources, some non-agricultural sources that could be eligible for offsets include wastewater treatment systems, landfills, coal mines, and oil and natural gas systems. Although sources within many potential offsets categories could be subject to NSPS, some sources within those categories may not be subject to NSPS. For example, a landfill or a coal mine with emissions below an NSPS threshold may be eligible for offsets. Specific components of an oil or natural gas system, if not covered by NSPS, could be eligible for offsets.

16. In your opening statement, you acknowledge that climate legislation will expand our use of safer nuclear power. What does the Administration plan to do to encourage development of new nuclear plants?

**ANSWER:** President Obama recognizes the important role that nuclear power plays in the nation's transition to a clean energy future. EPA's role is to protect human health and the environment from unnecessary exposure to radiation. The Agency has considered several alternate scenarios that could arise if some form of climate legislation is passed. In many of these scenarios, carbon caps shift economic conditions in ways that favor construction of new nuclear plants.

Senator David Vitter

1. Doesn't the Obama Administration's decision on Yucca Mountain raise major legal (lawsuits by Environmental NGO's, et al) questions about the prospect for new plants, extensions of existing plant operations, and on-site spent fuel storage?

**ANSWER:** EPA's statutory authorities related to nuclear power are limited to the establishment of standards to protect public health and the environment. Questions regarding licensing actions are more appropriately directed to the U.S. Nuclear Regulatory Commission. My understanding is that NRC has undertaken a review of its waste confidence rule regarding the prospect of the availability of sufficient disposal capacity required to support current and future nuclear fleets.

2. Does EPA have a different view of the growth of nuclear than DOE?

**ANSWER:** EPA and DOE have similar views on the long-term growth of nuclear power. EPA's reference case projection of nuclear energy in the ADAGE model is calibrated to the DOE's forecast in the March release of the Annual Energy Outlook (AEO) 2009. The AEO forecast projects nuclear power to grow 12% from 2010 levels to 907 billion kWh of nuclear generation in 2030, and the ADAGE model used in EPA's analysis of H.R. 2454 projects nuclear power to grow 12% from 2010 levels to 905 billion kWh in 2030.

In the H.R. 2454 policy analyses by EPA and the Energy Information Administration (EIA), both agencies included multiple scenarios reflecting different possible nuclear power futures. In EPA's analysis of H.R. 2454, the ADAGE model showed 67% growth in nuclear power from 2010 to 2030 in the core policy scenario. In an alternative scenario that EPA analyzed using the ADAGE model, nuclear power growth under H.R. 2454 was restricted to the reference level of 12%. In EIA's analysis of H.R. 2454, their 'basic' scenario showed nuclear power increasing 91% from 2010 to 2030. In their 'high cost' scenario, EIA showed nuclear power increasing by 14%.

3. What did EPA assume for nuclear growth in its analysis of Waxman-Markey?

**ANSWER:** In the short term, there are limits to the number of nuclear power facilities that can be built due to technical and regulatory factors. EPA's analysis takes that into account, and the short-term (2020) projections for new nuclear power are taken from the Energy Information Administration's projections, which are based upon current projects that are underway. In the longer term, EPA's analysis places restrictions on the amount of new nuclear capacity that the model is allowed to build. Those restrictions are designed to reflect the technical and political feasibility of building new nuclear power plants. The assumed limitations on new nuclear capacity included in the ADAGE model reflect the U.S. Climate Change Science Program Synthesis and Assessment Product 2.1a (MiniCAM Level I Scenario), and the EPRI analysis, "The Power to Reduce $CO_2$ Emissions: The Full Portfolio" (August 2007). EPA also includes an alternate scenario for nuclear power, whereby nuclear is limited to the reference case projection.

<u>Coal plants with CCS</u>

1. When do you project a fully commercial and geographically diverse number of CO2 storage sites outside of an Enhanced Oil Recovery basin? How many power plants can these sites accommodate?

**ANSWER:** I expect that the commercialization of storage sites in geographically diverse areas will keep pace with the rate at which industrial facilities adopt carbon capture technologies. The US DOE has published an extensive atlas detailing the likely areas where subsurface geology may be suitable for CO2 sequestration and the probable CO2 capacity. It shows that the most significant capacity for CO2 geologic sequestration in the United States is in deep saline aquifers, and that these formations are regionally diverse. Determinations of whether these formations are suitable for a specific project will need to be made on a case by case basis.

Currently, experience with deep saline sequestration sites is being gained through DOE's Regional Carbon Sequestration Partnerships. There are numerous active enhanced oil and gas recovery projects in the United States that are injecting both CO2 captured from natural sources in petroleum basins and CO2 captured from industrial sources (e.g., from natural gas processing). It is reasonable to expect that the initial commercial large-scale projects capturing CO2 from anthropogenic sources, such as pulverized coal-fired power plants, may use active EOR/EGR projects to sequester CO2. Currently, EPA expects that the US will have adequate capacity to accommodate many years of power plants emissions in both deep saline aquifers and other types of formations.

2. Since EPA has not completed its rulemaking on CO2 injection, how can you assert the timing of storage sites for CO2?

**ANSWER:** EPA's rulemaking to create a new class of injection well – Class VI – under the Safe Drinking Water Act Underground Injection Control program is not a hindrance to developing storage sites for CO2 storage. In the rulemaking, EPA is tailoring the existing UIC regulations to appropriately address the injection of large volumes of CO2 for long term, permanent storage, assure national permitting consistency, and provide adequate protection of underground sources of drinking water. In the meantime, the UIC program can permit CO2 wells now using Class I (industrial) or Class V experimental technology well requirements, or Class II well requirements for EOR/EGR projects.

3. How long will it take EPA to resolve the expected legal challenges over its CO2 storage rule?

**ANSWER:** When EPA proposed the Class VI GS regulations in July 2008, an extensive outreach effort, including two public hearing, was provided for stakeholders. In addition, the public comment period was extended to 180 days. EPA has received over 384 comments from over 151 individual commenters and we are addressing all significant comments. The Agency is currently in the middle of the rulemaking process as required by the Administrative Procedures Act and the Safe Drinking Water Act. We are unable to speculate whether the final rule will be challenged, and how long litigation would last if it is challenged. As yet, no parties have come forward to indicate that they will challenge the GS rule.

4. When will we have a buildout of the CO2 pipeline transportation infrastructure to handle the CO2 for storage?

**ANSWER:** EPA does not regulate the pipelines for CO2 transportation in the United States. The Department of Transportation implements regulations for CO2 pipelines, and works closely with the states and regulated community. A 2008 study by Dooley et al (2008)[2] concluded that the need to expand the existing $CO_2$ pipeline system should not hinder commercial deployment of CCS technologies in the US. The analysis showed that though a significant increase over current capacity will be needed by 2050 (between 11,000 and 23,000 miles based on two hypothetical climate policy scenarios), this scale-up will most likely occur relatively slowly and will track with facilities adopting CCS. In comparison, more than 270,000 miles of large inter- and intrastate natural gas pipelines were constructed in the US over a 50-year period.

5. What did EPA assume for CCS deployment in its analysis of Waxman-Markey?

**ANSWER:** EPA's modeling of the power sector using IPM does not make CCS available as an economic option for power plant investments until 2020, but it does reflect various funding incentives included in H.R. 2454 and recently passed legislation that are expected to result in some deployment of CCS by 2020.[3] Specifically, EPA modeled the incentives contained in sections 114 and 115 of H.R, 2454. Section 114 funding was assumed to support new capacity with CCS, with deployment of 1 GW in 2015 and 4 GW in 2020. Section 115 provides bonus allowances for sequestration that would be awarded on a first-come, first-serve basis for either new capacity or retrofits. There is also about 2 GW of CCS in the baseline by 2017 (taken from EIA's AEO 2009, April version) driven by anticipated funding contained in the Energy Independence and Security Act of 2007, the Emergency Economic Stabilization Act of 2008, and the American Recovery and Reinvestment Act of 2009.

Renewables (wind and solar)

1. When can we expect the new transmission to be available for the remotely located wind and solar?

**ANSWER:** The earliest transmission projects for wind and solar are expected to be in service in Texas by 2013 as a result of that state's Competitive Renewable Energy Zones (CREZ) policy. Other states in the West are following Texas' policy approach to proactively determine where new transmission might be needed. In the East and Midwest, Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs) have added significant wind generation capacity and are actively planning additional transmission to

[2] Dooley JJ, RT Dahowski, and CL Davidson. 2008. "Comparing Existing Pipeline Networks with the Potential Scale of Future U.S. CO2 Pipeline Networks." In the Proceedings of the 9th International Conference on Greenhouse Gas Technologies. PNNL-SA-62187, Pacific Northwest National Laboratory, Richland, WA.

[3] H.R. 2454 contains considerable early deployment funding for CCS, which is assumed to drive 5 GW of capacity before 2020 in IPM. Some new CCS is also assumed to be built in the baseline, based upon EIA's AEO 2009 (updated version). After 2020, the deployment of CCS an endogenous model decision in IPM.

integrate large amounts of renewable capacity, through planning processes such at the Midwest ISO Transmission Expansion Plan.

2. What will be the cost of the new transmission? As well, who would pay that cost?

**ANSWER:** It is important to note that there is no single scenario analysis that can quantitatively answer this issue, but one estimate of the cost was evaluated in a report published by the Department of Energy (DOE). In its 2008 report, 20% Wind Energy by 2030, DOE concluded that, "an investment of approximately $60 billion (in undiscounted terms) in transmission between now and 2030" would likely be needed to meet the 20% wind energy by 2030 scenario. According to the report, the $60 billion would amount "to an expenditure of approximately $3 billion per year over the next 22 years." The report also stated, "[the] current transmission investment level is nearly $8 billion per year and growing." (DOE 2008, p. 98)

While the report looked at 20% Wind vs. No New Wind scenarios, the transmission investment mentioned would be needed to meet load growth regardless of the generation type. As the report notes, "Regardless of wind's role, most analysts believe that this figure will continue to increase as utilities make up for decades of underinvestment in the grid. As long as electricity demands grow, new transmission will be required to serve any new generation developed, and incremental transmission costs will be unavoidable." (DOE 2008, p. 98).

Under the Federal Power Act, the Federal Energy Regulatory Commission (FERC) has authority to review and approve plans to allocate transmission costs. According to the DOE report, "For regions with RTOs or ISOs, FERC has typically reviewed generic cost allocation plans proposed by these organizations and approved the plans with modifications the commission finds appropriate. In areas without RTOs or ISOs, prospective transmission developers propose cost allocation arrangements to FERC on a project-by-project basis. FERC reviews the proposals; calls for additional information if needed; and approves or rejects them, or approves them with certain conditions attached." (DOE 2008, p. 99)

As one example, the Texas CREZ policy is expected to result in 2,400 miles of new low voltage transmission lines at a cost of $4.9 billion. This cost will be broadly distributed across the territory among all ratepayers served by the Electric Reliability Council of Texas on a per-kWh basis.

It is important to note that EPA's recent analysis of House Bill 2454 indicated that climate and energy legislation would likely reduce electricity demand, which would likely impact the transmission planning processes both for new lines and upgrades to existing lines. However, transmission may also depend on the type of new generation that is built, and significant transmission additions will still be needed to provide access to remote generation.

3. Were the timetables for transmission included in the EPA analysis of Waxman-Markey? Where is all of the input data for the models?

**ANSWER:** Transmission network development is a complex process that includes highly localized decision-making and faces a broad spectrum of economic and physical constraints. EPA's modeling of the power sector with IPM assumes that power flows are constrained by current interregional transmission capacity using estimates from the North American Electric Reliability Corporation (NERC). These and other input parameters to EPA's use of the IPM model are documented and available to the public via EPA's website.

Nat Gas Supply/Demand

1. How much new natural gas will be required to supplement the intermittent renewables projected by 2030?

**ANSWER:** There is a wide variety of strategies that grid operators may employ to accommodate generation from intermittent resources, including both supply-side load balancing and demand-side management. EPA's modeling of the power sector with IPM assumes that system operators maintain grid reliability by capping each region's share of intermittent resource generation at 20%. Rather than require incremental generation from intermittent resources to be matched with specific developments like new natural gas generation, IPM models the cost-minimizing configuration of each region's generation profile that respects the reliability constraint.

The 20% Wind Scenario would require delivery of nearly 1.16 billion MWh of wind energy in 2030, altering U.S. electricity generation as shown in Figure 1-11 of DOE's 2008 report, 20% Wind Energy by 2030. In this scenario, wind would supply enough energy to displace about 50% of electric utility natural gas consumption and 18% of coal consumption by 2030. This amounts to an 11% reduction in natural gas across all industries. (Gas-fired generation would probably be displaced first, because it typically has a higher cost.)
The increased wind development in this scenario could reduce the need for new coal and combined cycle natural gas capacity, but would increase the need for additional combustion turbine natural gas capacity to maintain electric system reliability. These units, though, would be run only as needed[4].

2. How much LNG imports will be required by 2030?

**ANSWER:** EPA's modeling does not explicitly represent liquefied natural gas (LNG) imports. The IPM model utilizes a natural gas supply model that has similar assumptions and corresponding consumption to the AEO 2009 (April release) and also assumes growth in North American LNG imports consistent with EIA, based on projected growth in liquefaction capability and taking into account the expected growth in gas demand in other importing countries in Europe and Asia.

[4] Appendix A of the 20% by 2030 Report presents a full analysis of changes in the capacity mix and energy generation under the 20% Wind Scenario.

3. Where is the input data on natural gas for the models EPA used?

**ANSWER:** The reference scenario used in EPA's ADAGE model is calibrated to the Annual Energy Outlook (AEO) 2009 (March release), and the reference scenario used in EPA's IPM model relies upon a natural gas supply model that has similar assumptions and corresponding consumption to AEO 2009 (April release). Natural gas primary energy consumption in ADAGE is consistent with the AEO 2009 (March release) forecast, and electricity sector natural gas consumption in IPM is consistent with the forecast from the AEO 2009 (April release).

The natural gas supply curves used in IPM are based on the same assessment of available gas resource through the U.S. and Canada as used in ICF's Gas Market Model (GMM), including resources in Alaska and the Mackenzie Delta area of the Canadian arctic. The base case assumes that pipelines will be built to transport gas from these two areas to North American demand markets. The curves assumes a Mackenzie Delta gas pipeline is built in 2015 with a capacity of 1 Bcfd, and an Alaska pipeline is built in 2020 with an initial capacity of 4 Bcfd, which is expanded in 2023 to 6 Bcfd.

Economic Forecast in EPA Models

1. The Annual Energy Outlook ran a case for high economic growth that is lower than the Administration's projections (3.0% v 3.3%). Does EPA have its own view of economic growth through 2019?

**ANSWER:** No, we do not have our own view of economic growth through 2019. Instead, EPA's analyses have benchmarked our models for consistency with EIA's Annual Energy Outlook for long-term projections of energy demand and economic growth.

2. Has EPA analyzed Waxman-Markey for the official Obama Administration economic forecast?

**ANSWER:** As noted above, EPA's analyses have benchmarked our models to EIA's Annual Energy Outlook for long-term projections of energy demand and economic growth.

Climate Change

1. Can you cite any climate models in the late 90's or early portion of this decade that predicted the atmospheric cooling that has been occurring for the last several years? In your estimate, what percent of the climate change models predicted this period of cooling rather than warming?

**ANSWER:** According to the NOAA-led report, "State of the Climate in 2008" (Peterson and Baringer, 2009), a short-term slow down or even reversal of the long-term warming trend is consistent with climate change model simulations. After running a number of model simulations, the authors found: "Near-zero and even negative trends are common for intervals of a decade or less in the simulations, due to the model's internal climate variability" and "climate models possess internal mechanisms of variability capable of reproducing the current slowdown in global temperature rise." Variability in climate is

natural and does not negate the long-term greenhouse gas-driven warming trend. It is also important to note that time averaged (multi-year) temperatures have continued to rise.

The report concludes: "Given the likelihood that internal variability contributed to the slowing of global temperature rise in the last decade, we expect that warming will resume in the next few years, consistent with predictions from near-term climate forecasts..."

Reference: Peterson, T. C., and M. O. Baringer, Eds., 2009: State of the Climate in 2008. *Bull. Amer. Meteor. Soc.*, 90, S1-S196.

Downloadable at: http://lwf.ncdc.noaa.gov/oa/climate/research/2008/ann/bams/

Senator Jeff Merkley

1. You said in your testimony that the average household will see a cost under the House-passed American Clean Energy Security Act on the order of a postage stamp a day, with the wealthiest households only seeing a 70-cent per-day increase and the lowest-income seeing a net reduction in household costs. How does EPA's analysis quantify the benefits of energy efficiency?

> **ANSWER:** EPA's modeling of HR 2454 forecasts improvements in energy efficiency driven by two factors. First, EPA's modeling takes into account energy efficiency improvements that would be expected to occur in response to modest increases in energy prices resulting from the cap on GHG emissions. Energy price increases typically lead to some increased investment in more energy efficient technologies which then lead to reduced energy demand over time. Second, EPA's modeling reflects specific efficiency-related provisions contained within Titles I and II (Clean Energy and Energy Efficiency) of the bill, including effects of the Combined Efficiency and Renewable Electricity Standard, building codes, and allowance allocations to states and gas utilities for support of energy efficiency. The energy efficiency-related bill provisions are included in EPA's core analysis of HR 2454. In one of EPA's "side" scenarios, the effects of those provisions are removed in order to isolate their impacts from other aspects of the legislation. It is important to note, however, that none of the scenarios modeled take into account the transportation efficiency provisions included in Title II, Subsection C, Sections 221-224.

2. The American Council on an Energy-Efficient Economy has said that energy efficiency measures could save more than $1,000 per household by 2020 and $4,400 per household by 2030. Is that consistent with EPA's analysis?

> **ANSWER:** While EPA has included the impacts of many of the energy efficiency provisions within HR 2454 (see response to the previous question), we have not done a side scenario to isolate the cumulative impacts of all energy efficiency provisions.

3. McKinsey and Company have concluded that the U.S. could reduce pollution by approximately 1.4 gigatons at no net cost to the economy, mostly through energy efficiency, by 2030. Don't these facts mean that a 17% reduction in greenhouse gas emissions by 2020 is a relatively low target given the range of cost-effective technologies at our disposal?

> **ANSWER:** McKinsey's analysis highlights the technical potential for relatively low-cost greenhouse gas abatement through energy efficiency and other mitigation strategies. EPA's analysis of HR 2454 reflects the effects of many provisions that address opportunities in these areas including ones contained within the Clean Energy and Energy Efficiency titles of the legislation (see response to the two previous questions).

4. A related question: two billion tons of offsets amounts to 28% of 2005 emissions by my calculation. That means the capped sectors could comply with the cap in the bill without using any clean energy technologies and relying instead solely on offsets. Would it make sense to adjust the limit on offsets in order to ensure that at least part of the reduction through 2020 is achieved by building a clean energy economy?

**ANSWER:** Emissions targets can be met by changing the scale or output of production, changing production technology, or by use of offsets. What would be the best overall mix of these three factors is a matter of policy and economics. EPA's modeling does not assume a particular mix. In EPA's analysis, the degree of offsets use that occurs in response to different scenarios primarily reflects the benefit of banking emissions credits; if fewer offsets were available, it would mean less banking and higher overall costs. Cap and trade facilitates an economically efficient response by allowing flexibility over time and across allowance market participants and abatement strategies.

5. IPCC projections indicate that, to avoid 2 degrees Celsius of global warming, we need to reduce emissions at least 25% below 1990 levels by 2020. It is my understanding that the House-passed bill would result in emissions reductions of about 4% below 1990 in the capped sectors, potentially going as high as 17% when additional measures are considered. Do you agree that, given the potential for cost savings from readily available energy efficiency, we should be able to get into the range of pollution reductions that scientists recommend?

**ANSWER:** In addition to the 17% reduction in covered sector emissions specified by the cap, H.R. 2454 has a target of reducing total U.S. GHG emissions in 2020 to 20% below 2005 levels (which is equivalent to approximately 7% below 1990 levels). Because of the banking provisions in the bill, EPA's analysis projects that firms would over-comply before 2030 in order to build up a bank of allowances so that actual reductions would exceed the targets for 2020. EPA's analysis of H.R. 2454 also indicates that with banking and accounting for the reductions that would result from the bill's provisions for domestic and international offset usage, discounted international offsets, additional abatement from forestry set-asides, new source performance standards for uncapped emissions, and the separate HFC cap, H.R. 2454 would reduce the United States' contribution to global emissions to 27% below 1990 U.S. emissions levels in 2020.

Senator Mike Crapo

1. Just two years ago, the RFS was heralded as breakthrough legislation to increase the use of renewable fuel, reduce emissions and decrease our dependence on foreign sources of energy. Yet, within two years of passage, we are already debating environmental issues associated with indirect land use changes and environmental degradation associated with compliance with the RFS.

It seems that we are rushing into these mandates and regulations, and then we find out a short time later that they may not be as environmentally-friendly as we once thought. One estimate assumes that even if the U.S. enacts Waxman-Markey, the net effect on global temperature will be approximately .09 degrees by 2050.

What are the chances that we enact this legislation and then a short time and layers of bureaucracy later we wake up and realize we are doing little environmental good?

> **ANSWER:** President Obama has made clear that climate change is an urgent global problem in need of a vigorous international response over the next several decades. He supports the goals of H.R. 2454 because its provisions would address climate change in ways that would strengthen the U.S. economy, reduce U.S. dependence on oil, and create clean energy jobs that could not be moved overseas. The bill would create flexible, market-based mechanisms for achieving the lowest-cost emission reductions, and require periodic scientific, technology and programmatic reviews that would allow for mid-course corrections should any prove necessary. Congressional passage of strong climate change legislation with protections against emissions leakage to other counties would also provide a much-needed signal that all nations must accept responsibility for reducing greenhouse gases and that the U.S. is committed to developing and deploying the clean energy technologies that will define and safeguard the world's future.

2. Based on EPA's endangerment finding, it appears clear that EPA feels that it should regulate carbon dioxide. As you know, the Peterson-Vilsack language in Waxman-Markey exempts agriculture from regulation under the cap created by the legislation. Does EPA plan to regulate carbon dioxide and/or methane emissions from the agriculture sector in spite of the exemption in the legislation?

> **ANSWER:** The Agency understands that H.R. 2454 exempts agriculture from regulation under the cap and also exempts enteric fermentation (emissions directly from animals) from regulation under section 111 of the CAA. EPA further recognizes that the agricultural sector can contribute to reducing or avoiding GHG emissions in ways that have the potential to create offset credits for capped sources and additional income for farmers if they choose to participate.

3. Do you think that duplicative and overlapping mandates such as the Renewable Fuel Standard, Renewable Electricity Standard, and cap-and-trade will prove difficult for EPA to administer and monitor?

Wouldn't it be easier and perhaps just as environmentally beneficial to work to reduce emissions through the use of clean energy technologies like nuclear, hydropower, and other renewables?

**ANSWER:** EPA implements the Renewable Fuel Standard under existing Clean Air Act authority added by energy legislation passed by Congress in 2005 and 2007. Under H.R. 2454, EPA would be responsible for administering the cap-and-trade program, and the Federal Energy Regulatory Commission would be tasked with implementing the combined efficiency and renewable electricity standard. Clearly, development and deployment of clean energy technologies will be essential to reducing greenhouse gas emissions here and around the world. H.R. 2454 would effectively spur further, faster development and use of such technologies by establishing the price signal and regulatory certainty that businesses and individuals need to make investment decisions that enhance our nation's energy, economic and environmental security.

4. I seem to be hearing a lot about how we should be paying attention to the detrimental effects of GHG from indirect land use, but measuring GHG from indirect land use is very difficult.

However, I hear much less concern about increased emissions caused by carbon leakage if and when U.S. industry moves abroad to escape increased regulation from cap-and trade in the U.S Shouldn't we be more concerned when industry moves abroad and potentially pollutes in greater amounts in less regulated countries?

**ANSWER:** EPA's analysis of HR 2454 specifically considers the impacts of the bill on global trade and emissions. The analysis shows that, with the output-based rebates proposed in the legislation for energy- and trade-intensive U.S. manufacturing facilities, U.S. energy intensive manufacturing output *increases* by 0.04% in 2015 and decreases by 0.3% in 2020. Imports from other developed countries decline slightly in those years, while imports from developing countries increase by 0.8% in 2015 and 1.2% in 2020 (see slide 42 of EPA's analysis, attached).

Senator BOXER. Thank you.

And so we turn to Secretary of Agriculture Vilsack.

**STATEMENT OF HON. THOMAS VILSACK, SECRETARY, U.S. DEPARTMENT OF AGRICULTURE**

Mr. VILSACK. Thank you, Madam Chair, and members of the committee, I want to thank you for the opportunity to discuss the role of agriculture and forestry in addressing climate change and building our Nation's renewable energy capabilities.

I am pleased to be joined by my colleagues today, and I commit to them, and to you, that the USDA will maintain a close partnership in our work on climate change and renewable energy.

Climate change is indeed one of the great challenges facing the United States and the world. The science is clear that the planet is already warming. While climate change will affect all of us, there are particular vulnerabilities and challenges for farmers, ranchers and those who make a living off the land.

I would like to commend the House for its extraordinary efforts in developing historic, comprehensive energy and climate legislation that creates the framework for U.S. leadership on climate change.

I, along with Secretaries Chu, Salazar and Administrator Jackson, look forward to working with the Senate as you begin your deliberations. Our hope is that Congress enacts a bill that meets President Obama's objectives of creating an efficient, cost effective and comprehensive approach that leverages the Nation's capacity for innovation, creates jobs, reduces dependence on foreign oil, and protects our children and grandchildren from ills associated with pollution.

I believe it is crucial that we engage the participation of farmers, ranchers and forest landowners. This issue is too important for agriculture and forestry to sit on the sidelines. A viable carbon offsets market, one that rewards farmers, ranchers and forest landowners for stewardship activities, has the potential to play a very important role in helping America wean itself from foreign oil. It also represents a significant building block to revitalizing rural America. Landowners can also play an important role in providing low-carbon renewable energy.

The potential of our working lands to generate greenhouse gas reductions is significant. In fact today, our lands are a net sink of greenhouse gases. Based on the latest statistics from EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, forest and agricultural lands in the U.S. take up more greenhouse gases in the form of carbon dioxide than is released from all of our agricultural operations.

The situation is different in developing countries where agriculture and deforestation play a far greater role in emissions. In aggregate, land uses are responsible for over one-third of global greenhouse gas emissions. It is difficult to see how greenhouse gas concentrations in the atmosphere can be stabilized without policies that target emissions and carbon sequestration on agricultural and forestlands.

As a result, it is vital that America demonstrate how the inclusion of agriculture and forests in a domestic approach to climate

change can, in fact, produce real and lasting benefits to both landowners and the climate.

Under climate change legislation, the farm sector will experience both costs and benefits. Energy price increases can impact row crop production and other agricultural activities. For example, fertilizer and fuel costs account for 50 to 60 percent of variable costs of the production of corn. Because of the high personal transportation expenditures, rural households are more likely than urban households to feel the pinch of increased gas prices.

But, and this is an important but, I believe that there are significant opportunities for rural landowners in a cap-and-trade program that recognizes the contributions that farms, ranches, and forests can make in addressing climate change.

Rural landowners can benefit from incentives in climate and energy legislation that reward production of renewable energy such as wind and bioenergy. A number of renewable energy technologies, such as anaerobic digesters, geothermal and wind power in particular can reduce farmers' reliance on fossil fuels. In cooperation with the Department of Energy, USDA will continue to promote these technologies and our outreach and extension networks will help to make them available to farmers, ranchers and land managers.

These technologies and the promotion of a clean energy economy will also stimulate the creation of new jobs. As farmers, ranchers and land managers look to install these digesters or build a wind farm, people will be needed to build the machines and install the systems. And because many of these technologies will be utilized in rural areas, many of these jobs will be created in rural America. These farmers, ranchers and forest owners can also benefit from legislation that creates markets for greenhouse gas offset credits.

To be effective in addressing climate change, the offset market will need to accomplish two goals. First, the market will need to recognize the scale of the changes needed and the infrastructure that will be required to deliver information, manage data and resources, and maintain records and registries. Second, ensuring the environmental integrity of agricultural and forest offsets is critical to addressing climate change and maintaining public confidence in the carbon offset program.

To produce meaningful emissions reductions, an offsets program will likely require the participation of thousands of landowners. We look forward to partnering with our fellow agencies to work with the Senate in designing a credible offsets program. USDA is prepared, with its managing over 750,000 contracts with landowners under the NRCS program, to meet this challenge.

It is important that agriculture and forestry offsets have high standards of environmental integrity. Quantification and reporting systems need to be vigorous, verifiable and transparent, and review and auditing systems will need to be in place. Uncertainties must be accounted for and reduced, and greenhouse gas benefits accrued through carbon sequestration will need to be monitored over time to ensure that benefits are maintained and reversals are accounted for if they occur. If these principles are followed, the resulting offsets will be real, additional, verifiable and lasting.

USDA is prepared to support this effort through its scientific expertise, technical capabilities specific to greenhouse gases, carbon sequestration and offsets.

I would like to close again by thanking the committee for taking up this important issue for agriculture, rural lands and the environment. I believe that agriculture and forestry can play a vital role in addressing climate change and that, if done properly, there are significant opportunities for landowners to profit from doing right by the environment.

USDA is ready to help make this happen, and I am ready to answer questions, when appropriate.

Thank you, Madam Chair.

[The prepared statement of Mr. Vilsack follows:]

**STATEMENT OF THOMAS VILSACK**
**SECRETARY OF AGRICULTURE**
**BEFORE THE SENATE ENVIRONMENT AND PUBLIC WORKS COMMITTEE**

**JULY 7, 2009**

Madam Chairman and members of the Committee thank you for the opportunity to discuss the role of agriculture and forestry in addressing climate change and in building our Nation's renewable energy capabilities. I am pleased to be joined today by Secretaries Chu and Salazar and Administrator Jackson. USDA, the Department of Energy, and the Environmental Protection Agency maintain a close partnership in our work on climate change and renewable energy.

Climate change is one of the great challenges facing the United States and the world. The science is clear that the planet is already warming. While climate change will affect us all, there are particular vulnerabilities and challenges for farmers, ranchers, and those who make a living off the land. I would like to commend the House for its extraordinary efforts in developing historic, comprehensive energy and climate legislation that creates the framework for U.S. leadership on climate change. I, along with Secretary Chu, Administrator Jackson, and the Administration look forward to working with the Senate as you begin your deliberations. Our hope is that Congress enacts a bill that meets the President's objectives of creating an efficient, cost-effective, and comprehensive approach that leverages the Nation's capacity for innovation, creates jobs, reduces dependence on foreign oil, and protects our children from ills associated with pollution.

I believe it is crucial that we engage the participation of farmers, ranchers, and forest landowners. This issue is too important for agriculture and forestry to sit on the sidelines. A viable carbon offsets market – one that rewards farmers, ranchers, and forest landowners for stewardship activities – has the potential to play a very important role in helping America wean itself from foreign oil. It also represents a significant building block to revitalizing rural America. Landowners can also play an important role in providing low-carbon renewable energy.

The potential of our working lands to generate greenhouse gas reductions is significant. In fact today, our lands are a net sink of greenhouse gases. Based on the latest statistics from EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks, forest and agricultural lands in the U.S. take up more greenhouse gases in the form of carbon dioxide than is released from all of our agricultural operations[1]. The situation is different in developing countries, where agriculture and deforestation play a much greater role in emissions. In aggregate, land uses are responsible for over one-third of global greenhouse gas emissions. It is difficult to see how greenhouse gas concentrations in the atmosphere can be stabilized without policies that target emissions and carbon sequestration on agricultural and forestlands. As a result, it is vital that America demonstrate how the inclusion of agriculture and forests in our domestic approach to climate change can produce real and lasting benefits to both landowners and the climate.

[1] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 * 2007. U.S. Environmental Protection Agency, 2009. EPA 430-R-09-004. Pages ES-4-6

Under climate change legislation the farm sector will experience both costs and benefits. Energy price increases can impact row crop production and other agricultural activities. For example, fertilizer and fuel costs account for 50 to 60 percent of variable costs of production for corn. Because of higher personal transportation expenditures, rural households are more likely than urban households to feel the pinch of increased gas prices.

But, I believe that there are significant opportunities for rural landowners in a cap and trade program that recognizes the contribution that farms, ranches, and forests can make in addressing climate change. Rural landowners can benefit from incentives in climate and energy legislation that reward production of renewable energy such as wind and bioenergy. A number of renewable energy technologies such as anaerobic digesters, geothermal, and wind power can reduce farmers' reliance on fossil fuels. In cooperation with the Department of Energy, USDA will contribute to promoting these technologies and our outreach and extension networks will need to help make them available to farmers, ranchers, and land managers.

These technologies and promotion of a clean energy economy will also stimulate the creation of new jobs. As farmers, ranchers, and land managers look to install an anaerobic digester or build a wind farm – people will be needed to build the machines and install the systems. And, because many of these technologies will be utilized in rural areas – many of these jobs could be created in rural America. These farmers, ranchers,

and forest owners can also benefit from legislation that creates markets for greenhouse gas offset credits.

To be effective in addressing climate change, the offsets market will need to accomplish two goals. First, the market will need to recognize the scale of the changes needed and the infrastructure that will be required to deliver information, manage data and resources, and maintain records and registries. Second, ensuring the environmental integrity of agricultural and forest offsets is critical to addressing climate change and maintaining public confidence in the carbon offset program.

To produce meaningful emissions reductions, an offsets program will likely require the participation of thousands of landowners. I believe USDA, working with EPA, the Department of Energy, the Department of Interior, and other relevant agencies can play a very important role in getting offsets to scale while ensuring the integrity of the offsets program. We look forward to partnering with our fellow agencies to work with the Senate in designing a credible offsets program.

Let me give you a few examples of the scale of activities that USDA provides nation-wide. Under the Conservation Reserve Program, USDA manages over 750,000 contracts with landowners who have taken environmentally sensitive land out of production for at least 10 years. USDA's Natural Resources Conservation Service (NRCS) manages a network of over 1,300 registered technical service providers nationwide.

- The Climate Change Program Office, within the Office of the Chief Economist, conducts research on technical guidelines for quantifying the greenhouse gas benefits of conservation and land management activities. In doing this research, the Office works closely with our Office of Ecosystems Service Markets, NRCS, and the Forest Service, as well as other federal agencies.

- NRCS, Farm Service Agency (FSA), and the Forest Service have significant expertise in integrating greenhouse gas considerations into our conservation programs and landowner outreach;

- NRCS and our Extension System also educate farmers, ranchers, and rural landowners on how to improve energy and fertilizer use efficiency;

- State and Private Forestry provide rural landowners with the information they need to improve forest management;

It is important that agriculture and forestry offsets have high standards of environmental integrity. Quantification and reporting systems need to be rigorous, verifiable, and transparent – and review and auditing systems will need to be in place. Uncertainties must be accounted for and reduced. Greenhouse gas benefits accrued through carbon sequestration will need to be monitored over time to ensure that the benefits are maintained and that reversals are accounted for if they occur. If these principles are followed, the resulting offsets should be real, additional, verifiable, and lasting.

USDA can support this effort through its scientific expertise, and technical capabilities, specific to greenhouse gases, carbon sequestration, and offsets. For example, in 2006, USDA released guidance to farm and forest landowners to allow them to estimate their greenhouse gas footprints. We are developing user-friendly tools that can help farmers and landowners make these calculations.

I would like to close by again thanking the Committee for taking up this important issue for agriculture, rural lands, and the environment. I believe that agriculture and forestry can play a vital role in addressing climate change and that, if done properly, there are significant opportunities for landowners to profit from doing right by the environment. USDA is ready to help make this happen.

Environment and Public Works Committee Hearing

July 7, 2009

Follow-Up Questions for Written Submission

Questions for Secretary Vilsack

Questions from:

Senator Thomas R. Carper

**1. In the Waxman-Markey bill, the agriculture offsets are now being controlled and verified by the Department of Agriculture. How will your agency adapt to the role of regulator - a role USDA has tried to avoid over the years?**

Response: Participation in a greenhouse gas offsets program established under HR 2454 would be voluntary. Once enrolled in the program, participants would have obligations and commitments. This approach is similar to several programs presently administered by USDA. Producers who choose to participate in USDA conservation and commodity programs have responsibilities for abiding by the rules of the program and the specific conditions of contracts with the Department. Similarly, USDA understands that it has responsibilities for ensuring that these rules and conditions are followed. Procedures established under Title V of HR 2454 would set out rules for reporting, verification, and audits and inspections of activities and practices that receive offset credits. As under our conservation and commodity programs, if a participant fails to comply with the terms of agreements, a set of consequences would be triggered. The specific consequences would need to be determined in the program rules and consistent with the directives provided by Congress.

We anticipate that USDA, in collaboration with other agencies, as a part of compliance activities, would conduct periodic audits of a sample of projects to make sure they were in compliance. These audits could also be supplemented with satellite and aerial imagery which would enable the verification of producer records with respect to use of specific management practices.

**2. It is my understanding that the EPA has adopted - or is considering adopting – USDA conservation standards as a way for farmers to show they are meeting air quality requirements. Is this true? Could a similar partnership work between EPA and USDA for climate?**

Response: In the 2006 revision to the Particulate Matter National Ambient Air Quality Standard (and the PM Fine Implementation rule), EPA stated that USDA conservation systems and practices constitute Best Available Control Technology (BACT) and Reasonably Available Control Measures (RACM). Similar language is in the 2008 Ozone National Ambient Air Quality Standard (NAAQS):

> "Based on current ambient monitoring information, these USDA-approved conservation systems and activities have proven to be effective in controlling these emissions in areas where coarse particles emitted from agricultural activities have been identified as a contributor to violation of the NAAQS. The EPA concludes that where USDA-approved

> conservation systems and activities have been implemented, these systems and activities have satisfied the Agency's reasonably available control measure and best available control measure requirements. The EPA believes that in the future, when properly implemented, USDA-approved conservation systems and activities should satisfy the requirements for reasonably available control measures or best available control measures."

Regarding your question as to whether a similar partnership could work on climate change, we recognize that the broad spectrum of efforts needed to address this global challenge will require a full partnership of relevant Federal agencies including EPA, the Department of Interior, the Department of Energy, the Department of Commerce, and others that have expertise and assets that can contribute to the development and implementation of regulatory and non-regulatory programs, incentives for sequestration and emission reductions, and the development of a robust and appropriate offsets market. Indeed, we are already working with these other agencies on a variety of issues related to climate change.

Senator Benjamin L. Cardin

**1. Many people from the agricultural community have felt that they have not had a seat at the table during throughout the development of the current climate legislation.**

**• What is your sense of engagement from the agriculture community and what needs to be done to better engage farmers and agricultural producers?**

Response: An important part of USDA's mission is to communicate information to the agriculture and forestry communities that will aid them in understanding the challenges they face due to climate change, and in evaluating their options for mitigating emissions of greenhouse gases and adapting to changes in climate conditions. Farmers, ranchers, and rural landowners face a number of immediate challenges in carrying out day-to-day operations, and this may lead them to sometimes push their concerns about climate change to the future.

We are committed to helping rural communities not just adapt, but actually thrive, under changing climate conditions. One key way that we reach out to farmers and landowners is through the USDA Rural Tour:

http://www.usda.gov/wps/portal/ruraltour?navid=RURALTOUR

Since June 30, 2009, I have traveled to 23 cities (as of October 6, 2009) around the country to speak with residents of rural communities. So far we have held more than a dozen forums with Secretaries from the Departments of Education, Housing and Urban Development, Health and Human Services, as well as local elected officials from the areas to which we travelled. People came from all different parts of the area and represented the wide variety of interests that form the basis of America's rural communities.

During these stops, we have had a chance to engage in a more robust dialog with folks living in rural America and help share innovative ideas and problem-solving techniques from communities with the rest of the country. Audience members have asked about building local food networks, protecting the safety of our food supply, international trade of agriculture products, forest management, and the pending climate change legislation. We have conversed with people about these issues and more, ensuring that communities throughout the country are engaged in ongoing dialogue with the Department and with each other. Many farmers and ranchers are already acting to improve resource conditions, conserve energy, and produce renewable fuels and electricity, and the Rural Tour has provided many opportunities for people to learn from each other and to reach out to the USDA for more information.

We won't make it to every town in America, so we have created a space on the Rural Tour website to continue the conversation online (http://www.usda.gov/blog/conversation/). On this website people can find information about where we have been and are going, as well as ways they can communicate their

ideas to us and others visiting this site. The USDA Rural Tour is also on Twitter and Facebook, where people all over the world can join us virtually at each stop and interact with each other 24 hours a day, 7 days a week. Other agencies within the Department, including CSREES, ERS, NRCS, FSA, FNS, FSIS, and NASS, as well as the USDA People's Garden, have also joined social networking sites like Twitter, Facebook and YouTube to engage communities in conversation, share news and events, and alert people to newly released briefing papers, fact sheets, and other publications. These efforts complement the news and information posted on each of the agency websites so that we can keep our communities informed on the issues that matter to them.

**• How is USDA engaging its stakeholders and how are you promoting the opportunities that a climate bill would create for farmers?**

Response:

On issues specific to potential climate change legislation, USDA's Climate Change Program Office (CCPO) regularly meets with and provides formal and informal briefings to agricultural, forestry, environmental and industrial stakeholders. These meetings provide an opportunity to inform farmers, ranchers, and rural stakeholders of USDA's climate change program and activities, options being considered within the Administration and in Congress to address climate change, and to listen to ideas and concerns from these communities.

Senator Jeff Merkley

**1. I appreciate the emphasis in your testimony on the need for high-quality, high-integrity offsets and I am glad to hear you that want to work with EPA and other agencies to meet these goals. Can you talk more about how that might work?**

Response: To be effective in addressing climate change, the offsets market will need to accomplish three goals. First, we must ensure the integrity of agricultural and forest offsets to maintain public confidence in the carbon offset program and achieve environmental benefits. Second, the market will need to recognize the scale of the changes needed including the infrastructure that will be required to deliver information, manage data and resources, and maintain records and registries. Third the integrity of the emissions cap must be ensured, thus maintaining public confidence in the carbon offset program and achieving the full environmental benefits of the cap-and-trade system.

To ensure standards of environmental integrity, USDA will work with its partners on rules for activity baselines, additionality, and quantification and reporting systems, to ensure that systems are rigorous, verifiable, and transparent. In addition, we will establish review and auditing systems to ensure that greenhouse gas benefits accrued through carbon sequestration will be monitored over time to ensure that the benefits are maintained and that reversals are accounted for if they occur. If these principles are followed, the resulting offsets should be real, additional, verifiable, accurate, and permanent.

To address the issue of scale, we recognize that the development of an offsets market will require a full partnership of relevant federal agencies including EPA, the Department of Interior, the Department of Energy, the Department of Commerce, and others that have expertise and assets that can contribute to the development and implementation of an offsets market. Indeed, we are already working with these other agencies on a variety of issues related to climate change.

For example, USDA provides the greenhouse gas estimates for carbon sequestration on forest land and in forest products to EPA for the Official U.S. Greenhouse Gas Inventory. USDA also provides much of the raw data that EPA uses to estimate emissions from other land use, land-use change and forestry sources and sinks as well as agricultural sources to EPA each year. In the same way, USDA's greenhouse gas research and observations programs contribute to the broader suite of federal agency greenhouse gas research and observation systems, including programs administered by Department of Commerce's National Oceanic and Atmospheric Administration, Department of Energy, NASA, EPA, and others. Whatever role USDA is asked to play as part of an offsets program, we would look to partner with these and other agencies to ensure the program has environmental integrity and provides landowners with opportunities to address climate change.

**2. Do you agree that it could be problematic to have different agencies regulating different types of offsets that must all be held to consistent quality standards?**

Response: USDA believes that the comparability of offset credits will be critical to the viability and confidence in an offset system. This will be especially important in establishing rules to govern international offsets that can be used in U.S. markets. We anticipate that whoever is

ultimately responsible for the domestic agriculture and forestry offsets program, the program will have high standards of environmental integrity. The program will require that greenhouse gas benefits accrued through carbon sequestration be monitored over time to ensure that the benefits are credible are maintained and that reversals are determined and accounted for if they occur. As rules and procedures are established for international offsets, we will press for the need to follow comparable principles so that the resulting offsets will be accurate, real, additional, verifiable, and permanent.

Senator James M. Inhofe

**1. All of the economic analyses done to date on cap and trade legislation show farmers and ranchers incurring increased costs for fuel, fertilizer and energy. With many sectors of the agricultural economy suffering, how will these producers be able to absorb these higher costs and still stay in business?**

Response: USDA's preliminary analysis of costs and benefits on the agricultural sector uses energy price and other information contained in EPA's recent analysis of HR 2454. Let's first look at the cost side. Increases in fuel prices are expected to raise overall annual average farm expenses by about $700 million between 2012 and 2018, or about 0.3 percent (not taking into account possible revenues from offsets). Annual net farm income as a result of these higher energy prices is expected to fall by about 1 percent. These estimates assume that in the short term farmers are unable to make changes in input mix in response to higher fuel prices, so they likely overestimate the costs to farmers. Fertilizer prices will likely show little effect until at least 2025 because of the HR 2454's provision to help energy-intensive, trade exposed industries mitigate the burden that the emissions caps would impose.

The agriculture sector also will benefit directly from allowance revenues allocated to finance incentives for renewable energy and agricultural emissions reductions during the first five years of the HR 2454 cap-and-trade program. Funds for agricultural emissions reductions are estimated to range from about $75 million to $100 million annually from 2012-2016.

To evaluate the potential impact on the agricultural sector further out in time, we first examine a simple case that allows producers to change the crops they grow but not how they produce them. This approach is conservative given the observation that energy per unit of output has drastically declined over the last several decades. Nevertheless, the estimated impact of the cap-and-trade provision of HR 2454 implies a decline of annual net farm income of $2.4 billion, or 3.5 percent, in 2030 and $4.9 billion, or 7.2 percent, in 2048. These estimates are likely an upper bound on the costs because they fail to account for farmer's proven ability to innovate in response to changes in market conditions. Our analysis is also conservative because it doesn't account for revenues to farmers from biomass production for bioenergy.

A number of studies have examined the effects of higher energy costs with models that allow for expected changes in production management practices and switching to bioenergy crops. Based on the analysis of Schneider and McCarl (2003) for example, allowing for changes in input mix and revenues from biomass production but without accounting for income from offsets, annual net farm income would increase in 2030 by an estimated $0.6 billion, or less than 1 percent. By 2045, annual net farm income is estimated to increase by more than $2 billion, or 2.9 percent.

HR 2454's creation of an offset market will create opportunities for the agricultural sector to generate additional income. In particular, our analysis indicates that annual net returns to farmers range from about $1 billion per year in 2015-20 to almost $15-20 billion in 2040-50, not accounting for the costs of implementing offset practices.

In the short term, the economic benefits to agriculture from cap-and-trade legislation will likely outweigh the costs. In the long term, the economic benefits from offsets markets easily trump

increased input costs from cap-and-trade legislation. Let me also note that we believe these figures are conservative because we aren't able to model the types of technological change that are very likely to help farmers produce more crops and livestock with fewer inputs. Second, the analysis doesn't take into account the higher commodity prices that farmers will very likely receive as a result of enhanced renewable energy markets and retirement of environmentally sensitive lands domestically and abroad. Of course, any economic analysis such as ours has limitations. But, again, we believe our analysis is conservative – it's quite possible farmers will actually do better.

**2. Even with an agricultural offsets provision in the bill, economic analyses indicate that the possible revenues from these offsets will be enough to fully defray the increased costs that producers will incur as a result of this legislation. Do you agree with that view?**

Response: HR 2454's creation of an offset market will create opportunities for the agricultural sector. In particular, our analysis indicates that annual net returns to farmers range from about $1 billion per year in 2015-20 to almost $15-20 billion in 2040-50, not accounting for the costs of implementing offset practices. In the short term, the economic benefits to agriculture from cap-and-trade legislation will likely outweigh the costs. In the long term, the economic benefits from offsets markets according to the analysis easily trump increased input costs from cap-and-trade legislation.

**3. Even with an offsets provision in the bill, there are certain sectors of agriculture that will not be able to take advantage of these provisions, yet will still incur increased fuel, fertilizer and energy costs. This includes sectors like fruit and vegetable production, and Western livestock producers who graze livestock on federal lands. How can they defray their costs under a cap-and-trade system?**

Response: We recognize that climate legislation will affect different landowners in different ways. USDA can help smooth the transition by using our Farm Bill conservation programs to assist landowners in adopting new technologies and stewardship practices.

Specialty crop producers such as fruit and vegetable farmers could participate in cap-and-trade via practices to sequester carbon in ground cover, and strategies to increase soil organic matter through reduced tillage. Practices that reduce pruning and the incorporation of pruned material into the soil (versus removal and/or burning) are also potential avenues.

Farmers and ranchers may also participate in cap-and-trade via reduction of emissions of nitrous oxide. Precision fertilizer management including optimal timing of application, optimal amount for a specific position in a field, and new delivery mechanisms that enable more control offer potentials for reducing nitrous oxide emissions. The use of slow-release fertilizers shows promise for reduced greenhouse gas emissions from agricultural fields and appears to simultaneously offer opportunity for increased yields.

For western livestock producers, participation in carbon reduction efforts would entail improving the standards of management, including the development of prescribed grazing and drought plans. Grazing practices that enhance carbon sequestration could be implemented. The role that actions on Federal lands can play will require careful thought. A long-term benefit of carbon

sequestration to ranchers and the public alike is that soils with higher carbon tend to be more productive, hold more water, and are less prone to erosion.

On the issue of fertilizer costs, fertilizer prices will likely show little effect until at least 2025 because of HR 2454's provision to help energy-intensive, trade exposed industries mitigate the burden that the emissions caps would impose.

**4. You talk about innovation in agriculture as a means for producers to adapt to the changes that will result from this legislation. It may take several years for the types of innovation you mentioned to work through the bureaucratic approval process or to be fully recognized and accepted. Yet the cost increases that farmers and ranchers will incur as a result of this legislation will be felt much sooner. How do farmers and ranchers cope in the meantime?**

Response: We believe that the benefits of offsets markets will outweigh the costs to agriculture in the short-term. The reductions in emissions will be phased in over a long period and the analysis shows that the impacts in the short term will be small. In addition, a number of offset options will be available based on current technologies and practices. The incentives created by an offsets market under a cap-and-trade system have the potential to spur innovation in new technologies, products and processes. To enable this, the rules governing the offsets market will need to be able to accommodate new approaches to reduce emissions and increase carbon sequestration. For example, as new technologies to improve fertilizer utilization efficiencies or refine manure management systems are developed, the methods to quantify the benefits of these technologies will also be needed, and processes will need to be in place to ensure that innovative approaches are not discouraged.

**5. One of the critical inputs for production agriculture is fertilizer. The production of nitrogen fertilizer relies heavily on natural gas. When natural gas prices spiked several years ago, almost half of U.S. based fertilizer production shut down. Farmers and ranchers now import more than half their fertilizer. With natural gas prices anticipated to rise as a result of cap and trade legislation, what does that mean for the future of the domestic fertilizer industry, and what does that mean for fertilizer availability and costs for our farmers and ranchers?**

Response: The production of fertilizer is energy intensive, and thus, potentially vulnerable to the problem of greenhouse gas leakage. To address this problem, HR 2454 would provide domestic producers in sectors such as fertilizer with allowances to compensate for increased costs brought about by the implementation of the bill (referred to in the bill as emissions allowance rebates). These rebates are provided through at least 2034, and while the size of the rebate may be gradually reduced starting in 2026, depending on the facts at the time, this compensation could continue unchanged after 2025. Because of this provision, we do not expect nitrogen fertilizer prices to be affected by the greenhouse gas cap in the near term. This provision was included in the Preliminary Analysis provided to the Senate Agriculture Committee on July 22, 2009.

Greenhouse gas offsets will provide farmers with opportunities to improve fertilizer management and reduce emissions of nitrous oxide, a powerful greenhouse gas. Farmers can improve nutrient management by changing the form, timing, and method of fertilizer application and ensure that it

is being applied at appropriate rates. These practices will also save energy and money and improve water quality.

**6. Farmers and ranchers rely heavily on exports and the global marketplace. Costs of agricultural production will increase as a result of rising fuel, fertilizer and energy costs. Yet the costs for global competitors from China, India and other countries that do not impose similar restrictions will not rise. This will put our producers at a competitive disadvantage to these and other major competitors. How do we "level the playing field" in a way that will not violate WTO rules?**

Response: We expect other countries to act to reduce their emissions, thus reducing the potential for domestic producers being undercut on price in the long-term. Within the Administration, we are pressing major emerging economies to take significant actions that are consistent with what the science demands, but they will not agree to major reductions if the U.S. does not take robust action. So the critical first step must be to put our own house in order with a comprehensive, mandatory national program. We are working to craft a truly global agreement to address climate change by pushing forward on three related fronts: first, through the UN Framework Convention on Climate Change, second, through the Major Economies Forum, with the world's 17 largest economies, and third, through high-level bilateral engagement with China, the world's largest emitter.

**7. Agriculture is an energy-intensive industry. One of the primary purposes of cap and trade is to reduce the use of fossil fuels. Yet we do not anticipate a reduction in energy demand from agriculture, but hope that demand increases as our population grows. When fossil fuel use is reduced as a result of this program, what energy source will be available to fill the void?**

Response: The analysis of HR 2454 by the Environmental Protection Agency projects significant increases in biomass energy, wind, other renewable and nuclear power. We believe that there are opportunities to improve energy efficiency in the agricultural sector and increase the production and use of renewable energy on the farm.

USDA will have an important role in helping farmers improve efficiency and reduce energy and fertilizer use and will help farmers become self-reliant for their energy needs. A number of emerging renewable energy technologies such as anaerobic digesters, geothermal, wind, and solar power can reduce farmers' reliance on fossil fuels. USDA research will need to contribute to the development of these technologies and our outreach and extension networks will need to help make them available to farmers, ranchers, and land managers.

For example, many farmers already use passive solar energy to heat greenhouses and other buildings. They also use solar panels to generate energy to heat water, run generators for on-farm buildings and equipment and power well water pumps for animals in pastures and ranges. Wind energy generated on the farm can also provide electricity for buildings, equipment, and generators. In the 2003 Farm and Ranch Irrigation Survey from the 2002 Census of Agriculture, 360 farms used solar- and other renewable energy-powered pumps to irrigate a total of 16,430 acres. Farmers and ranchers can also apply for conservation innovation grants through the NRCS to install and use renewable energy generation units on their farms and ranches.

Senator Mike Crapo

**1. Does USDA have comprehensive data to demonstrate the sequestration potential of different areas of the country and of different crops? Additionally, how much production agriculture nation-wide would qualify for the proposed cap-and-trade program, and are certain crops better suited than others?**

Response: USDA developed highly detailed greenhouse gas estimation and reporting tools for the Department of Energy's 1605b Voluntary Greenhouse Gas Registry. The CarbOn Management Evaluation Tool (COMET-VR) was released to coordinate with the Department of Energy's 1605(b) revised guidelines for the voluntary reporting of greenhouse gas emissions and emission reductions. COMET-VR is a web-based decision support calculation tool that allows users to estimate changes in soil carbon storage from agricultural management history on cultivated lands for most regions and cropping systems prevalent in the United States. This tool delivers an estimate of annual soil carbon fluxes along with fuel and fertilizer use, which can be reported to the 1605(b) voluntary greenhouse gas reporting system. Producers input their current and alternative farming and grazing practices into COMET-VR, which then estimates changes in fuel use, fertilizer and carbon storage from each alternative. This helps farmers and ranchers make management decisions by using the tool to compare the effectiveness of adopting different land management changes in sequestering soil carbon.

For afforestation practices, the Forest Service has developed several options for estimating and reporting carbon stocks and fluxes. For most purposes, standard look-up tables provide estimates of average carbon stocks and fluxes for every major forest type by region. In addition, the Forest Service has developed computer models that can provide more detailed estimates. These tools include the COLE model and the Forest Vegetation Simulator (FVS). Finally, USDA has published guidelines for conducting site measurements and sampling to determine carbon stocks and fluxes at a highly detailed level and for stands with trees of multiple ages.

**2. Based on the Waxman-Markey legislation, could you explain how USDA and EPA will work together on the administration of offsets? Moreover, could you verify that USDA will have the duty of farm field inspections?**

Response: We recognize that the development and administration of an offsets market will require a full partnership of relevant federal agencies including EPA, the Department of Interior, the Department of Energy, the Department of Commerce, and others that have expertise and assets that can contribute in the development and implementation of an offsets market. For example, HR 2454 requires that the Administrator of EPA provide unique accounting information to track and register greenhouse gas offsets created under Title V. We are confident that we can establish the mechanisms to ensure seamless information exchange. Indeed, we are already working with these other agencies on a variety of issues related to climate change.

For example, USDA provides the greenhouse gas estimates for carbon sequestration on forest land and in forest products to EPA for the Official U.S. Greenhouse Gas Inventory. USDA also provides much of the raw data that EPA uses to estimate emissions from agricultural sources to EPA each year, based on production practices and on-farm activities, including the number of acres planted in each crop and the number of livestock raised. USDA periodically produces a

focused report on the greenhouse gas emissions and carbon sequestration in the agriculture and forestry sectors, drawing on and consistent with the official U.S. inventory prepared by EPA. This detailed inventory provides users at the State and local levels with detailed information about agriculture and forest greenhouse gas sources and sinks.

As drafted, HR 2454 directs the Secretary of Agriculture to establish a domestic greenhouse gas offsets program for agriculture and forestry. Specific duties include the responsibility for conducting audits. We would anticipate that this duty would encompass field inspections.

**3. Are there other ways that Waxman-Markey could have improved upon USDA's role in offset administration?**

Response: We do not wish to prejudge the deliberations occurring in the Senate. The Administration is committed to working closely with the Senate to ensure offset provisions are well-designed.

**4. Can you verify that Waxman-Markey will exempt farms, ranches and forests from regulation of carbon dioxide and methane?**

Response: Section 501 (b) states the following:

> (b) AGRICULTURAL AND FORESTRY EXCEPTION TO DEFINITION OF CAPPED SECTOR.— For purposes of this title and title III of this Act, and amendments made by such titles, the term "capped sector" means a sector of economic activity that directly emits capped emissions, including the industrial sector, the electricity generation sector, the transportation sector, and the residential and commercial sectors (to the extent they burn oil or natural gas), but not including the agricultural or forestry sectors.

We believe that this language clearly exempts the direct emissions of carbon dioxide, methane, and nitrous oxide and other greenhouse gases from farms, ranches, and forests. An open question regarding this provision is whether emissions associated with the use end-use fuels used in the agriculture and forestry sectors are exempted. These emissions are capped at the refinery or point of distribution. It is unclear to USDA whether this is the intent of Congress and could be clarified.

**5. Cap-and-trade will cause fuel prices to increase, and spur demand for natural gas, meaning higher prices for diesel and fertilizer for farmers. How will producers be able to absorb these costs? Summarize response for Secretary and provide citation to USDA study.**

Response: USDA's preliminary analysis of costs and benefits in the agricultural sector uses energy price and other information contained in EPA's recent analysis of HR 2454. Let's first look at the cost side. Increases in fuel prices are expected to raise annual average farm expenses by about $700 million between 2012 and 2018, or about 0.3 percent. Annual net farm income as a result of these higher energy prices is expected to fall by about 1 percent, on average. These estimates assume that in the short term farmers are unable to make changes in input mix in response to higher fuel prices, so they likely overestimate the costs to farmers. Fertilizer prices will likely show little effect until 2025 because of the HR 2454's provision to help energy-

intensive, trade exposed industries mitigate the burden that the emissions caps would impose through free allocation of allowances to such energy-intensive manufacturers.

The agriculture sector also will benefit directly from allowance revenues allocated to finance incentives for renewable energy and agricultural emissions reductions during the first five years of the HR 2454 cap-and-trade program. Funds for agricultural emissions reductions are estimated to range from about $75 million to $100 million annually from 2012-2016.

To evaluate the potential impact on the agricultural sector further out in time, we first examine a simple case that allows producers to change the crops they grow but not how they produce them. This approach is conservative given the observation that energy per unit of output has drastically declined over the last several decades. Nevertheless, the estimated impact of the cap-and-trade provision of HR2454 implies a decline of annual net farm income of $2.4 billion, or 3.5 percent, in 2030 and $4.9 billion, or 7.2 percent, in 2048.

These estimates are likely an upper bound on the costs, because they fail to account for farmers' proven ability to innovate in response to changes in market conditions. Our analysis is also conservative because it doesn't account for revenues to farmers from biomass production for bioenergy. A number of studies have examined the effects of higher energy costs with models that allow for expected changes in production management practices and switching to bioenergy crops. Based on the analysis of Schneider and McCarl (2003) for example, allowing for changes in input mix and revenues from biomass production - but without accounting for income from offsets, annual net farm income is estimated to increase in 2030 by about $0.6 billion or less than 1 percent. By 2045, annual net farm income is estimated to increase by more than $2 billion or 2.9 percent.

HR 2454's creation of an offset market will create opportunities for the agricultural sector. In particular, our analysis indicates that annual net returns to farmers range from about $1 billion per year in 2015-20 to almost $15-20 billion in 2040-50, not accounting for the costs of implementing offset practices.

In the short term, the economic benefits to agriculture from cap-and-trade legislation will likely outweigh the costs. In the long term, the economic benefits from offsets markets easily trump increased input costs from cap-and-trade legislation. Let me also note that we believe these figures are conservative because we aren't able to model the types of technological change that are very likely to help farmers produce more crops and livestock with fewer inputs. Second, the analysis doesn't take into account the higher commodity prices that farmers will very likely receive as a result of enhanced renewable energy markets and retirement of environmentally sensitive lands domestically and abroad. Of course, any economic analysis such as ours has limitations. But, again, we believe our analysis is conservative – it's quite possible farmers will actually do better.

**6. I am concerned about agricultural sectors that will not qualify for offsets. Even with an offsets provision in the bill, there are certain sectors of agriculture that will not be able to take advantage of these provisions, yet will still incur increased fuel, fertilizer and energy costs. This includes sectors like fruit and vegetable production, Western livestock producers who graze livestock on federal lands, and potato growers.**

**What do you tell these producers?**

Response: We recognize that climate legislation will affect different landowners in different ways. USDA can help smooth the transition by using our Farm Bill conservation programs to assist landowners in adopting new technologies and stewardship practices.

Specialty crop producers such as fruit and vegetable farmers could participate in cap-and-trade via practices to sequester carbon in ground cover, and strategies to increase soil organic matter through reduced tillage. Practices that reduce pruning and the incorporation of pruned material into the soil (versus removal and/or burning) are also potential avenues.

Farmers and ranchers may also participate in cap-and-trade via reduction of emissions of nitrous oxide. Precision fertilizer management including optimal timing of application, optimal amount for a specific position in a field, and new delivery mechanisms that enable more control offer potentials for reducing nitrous oxide emissions. The use of slow-release fertilizers shows promise for reduced greenhouse gas emissions from agricultural fields, and appears to simultaneously offer opportunity for increased yields.

For western livestock producers, participation in carbon reduction efforts would entail improving the standards of management, including the development of prescribed grazing and drought plans. Grazing practices that enhance carbon sequestration could be implemented. The role that actions on Federal lands can play will require careful thought. A long-term benefit of carbon sequestration to ranchers and the public alike is that soils with higher carbon tend to be more productive, hold more water, and are less prone to erosion.

On the issue of fertilizer costs, fertilizer prices will likely show little effect until at least 2025 because of the HR 2454's provision to help energy-intensive, trade exposed industries mitigate the burden that the emissions caps would impose.

**7. Farmers and ranchers rely heavily on exports and the global marketplace. Cost of agricultural production will increase under cap-and-trade. Yet, the costs for global competitors from China, India and other countries that do not impose similar restrictions will not rise. This will put our producers at a competitive disadvantage vis-à-vis producers from these other major competitors. How do we "level the playing field" in a way that will not violate WTO rules?**

Response: We expect other countries to act to reduce their emissions, thus reducing the potential for domestic producers being undercut on price in the long-term. Within the Administration, we are pressing major emerging economies to take significant actions that are consistent with what the science demands, but they will not agree to major reductions if the U.S. does not take robust action. So the critical first step must be to put our own house in order with a comprehensive, mandatory national program. We are working to craft a truly global agreement to address climate change by pushing forward on three related fronts: first, through the UN Framework Convention on Climate Change, second, through the Major Economies Forum, with the world's 17 largest economies, and third, through high-level bilateral engagement with China, the world's largest emitter.

**8. EPA estimates that U.S. forests can sequester and store roughly 20% of our annual emissions, supply roughly 81 % of domestic offsets under the House-passed bill. Do you think these goals are achievable with the current structure on the House-passed bill? If not, what improvements are needed?**

Response: Achieving these goals may be possible as long as rules are written that allow small, as well as large, forest landowners to participate in the offset program. One critical component of this is developing baselines that match the project type.

U.S. forest and forest products currently sequester 910 Tg CO2eq, or around 12 percent of domestic CO2 emissions (US EPA 2009 GHG Inventory). This percent has been relatively steady since the first GHG Inventory in 1990 and it is not expected to start decreasing for at least two more decades. Increasing this rate to 20 percent thus represents an additional 8 percentage points, or an additional 520 Tg CO2 per year, over the projected baseline. Several major economic analyses [Lewandrowski et al. (2004)[1], US EPA (2005)[2], Lubowski et al. (2006)[3]] have concluded that it is possible to as much as double the rate of U.S. forest sequestration for a value of CO2 between $25 and $75 per ton. Based on Forest Service evaluation of these analyses, there do not seem to be any significant biological or economic barriers if these carbon prices are reached. Nor do there appear to be any major barriers in HR 2454 – the initial list of eligible offset projects includes afforestation and improved forest management, which are the activities comprising most of the offsets in the economic studies. Eligible offset projects also include avoided deforestation, which has not been included in past studies.

**9. The House-passed bill requires USDA to develop rules for forest management products, including appropriate crediting for harvested wood products. Do you think this is a necessary component of the offset markets?**

Response: Significant research has been done that would warrant inclusion of harvested wood products. It is important to include accounting for carbon in harvested wood products; otherwise, offsets will be underestimated for managed forests. The details will need to be determined in accordance with developed protocols. Actual comprehensive greenhouse gas accounting systems such as the 1605(b) Voluntary Greenhouse Reduction Reporting[4] and the IPCC Guidelines for Greenhouse Gas Inventories[5] consider carbon at time t+1 minus carbon at time t, in essence looking at changes only. The accounting rules and practices provided in these peer-reviewed guidelines include wood products. In a sustainably managed forest and one that is essentially carbon neutral, a long-term wood product or substitute for a fossil-fuel intensive product may be a viable way to sequester additional carbon or reduce net emissions.

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[1] Lewandrowski, J., M. Peters, C. Jones, R. House, M. Sperow, M. WEve, and K. Paustian. 2004. Economics of Sequestering Carbon in the Agricultural Sector. USDA ERS Technical Bulletin no 1909. (April).

[2] US EPA. 2005. Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture. EPA 430-R-05-006. November.

[3] Lubowski, R.N., A.J. Plantinga, and R.N. Stavins. 2006. Land-use change and carbon sinks: Econometric estimation of the carbon sequestration supply function. Journal of Environmental Economics Management. Vol. 51(2006): pp. 135-152

[4] http://www.cia.doe.gov/oiaf/1605/January2007_1605bTechnicalGuidelines.pdf
[5] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

Senator BOXER. Thank you.

Senator Salazar. I mean, Senator Salazar, is that wishful thinking on my part? Secretary Salazar. We miss you, and we welcome you.

**STATEMENT OF HON. KEN SALAZAR, SECRETARY, U.S. DEPARTMENT OF THE INTERIOR**

Mr. SALAZAR. I miss you as well, Madam Chairman, and Ranking Member Inhofe, and members of the committee on both sides of the aisle. Thank you for your distinguished service and the opportunity to come before you today and speak about the energy issues facing our country,

Let me first say that the energy and climate change legislation that is before you that you will be dealing with really, in so many ways, is a signature issue of the 21st century and for our world. And embedded in that legislation and the debate that you will have, it seems to me that there is huge agreement, frankly, between Democrats and Republicans on some of the key principles. And those key principles are, as President Obama has often said, first of all reducing our dangerous dependence on foreign oil, second of all, creating millions of new energy jobs here in the United States of America, and third, safeguarding our children from the dangers of pollution.

Those are three areas where it seems to me there could be significant agreement between Democrats and Republicans in an effort to move legislation forward that really addresses one of the signature issues of our time. So, it is my hope that you will find ways of coming together and moving this legislation forward.

Let me say a word about the Department of the Interior and our role with respect to energy independence and climate change. First, the Department oversees about 20 percent of the land mass of the United States of America. We have thousands of units in our National Park Service, Fish and Wildlife Service, BLM units and Bureau of Indian Affairs and reservation lands across this country. As the stewards of 20 percent of the Nation's land mass, we have a significant role to play with respect to addressing the issues of energy as well as climate change.

Within the Department we have 6,000 scientists that work with USGA, the Fish and Wildlife Service and other agencies, as well as 14,000 land managers who can help us address the issues of climate change adaptation. It is my hope that as we move forward with this signature issue of our time that the expertise of the Department of the Interior will be fully utilized in addressing the challenges that we face.

Now, as we look at energy and moving forward with energy independence, it is also important to note that we are producers of a large part of the energy that America currently consumes. We produce over 50 percent of the coal that comes into electrical generation, comes from the public lands of America overseen by the Department. We also produce more than 25 percent of the oil and gas resources for the country, including both onshore as well as offshore.

And we have, in very recent times, opened up a new chapter for renewable energy. It is our hope that the renewable energy agenda

will be one in which we can participate fully on behalf of President Obama.

Let me say just a word about renewable energy and its importance to our country. We have, in the last several months, opened up renewable energy permitting offices in places across the Southwest and have ushered in what will hopefully be a new era of wind energy production off the Atlantic and the Outer Continental Shelf.

We can talk about a lot of statistics relative to the potential of renewable energy from the public lands, but I would just like to point out one. Just from the Southwestern sun, it is our belief that we can produce, just on the pending applications that have been filed with the Bureau of Land Management, we can produce 29 percent of the Nation's electrical energy needs just from the power of the Sun. That goes to the point that both Senator Carper and Senator Sanders were referring to. So, I think the whole effort on renewable energy is one that we are just beginning to get underway and there is huge potential there.

Let me finally say that, within the Department of the Interior in the U.S. Geological Survey, they have produced, through the National Academy of Sciences, the National Academy of Engineering, the Institute of Medicine and the National Research Council, a booklet which I would ask to be entered as part of the record and it is on the ecological impacts of climate change.

In this booklet, Madam Chairman, as you go through that booklet, you will find why it is that this issue is so important to our country. First, look at the impacts in Alaska. We are looking at the fast defrosting arctic ice, which is very important to ice-dependent animals.

If you look at the Western mountains from where I come from and Senator Udall and Senator Crapo and others, we are looking at wildfires, drought, bark infestation beetles that are attacking many of our forests. You look at the Pacific coastline, the ravaging wildfires and the problems we are having there with fisheries.

If you look at the Southwestern desserts, the wildfires and invasive species issues, the pinion pine devastation that we are seeing in places like New Mexico. In the Central United States, agricultural shifts that are being seen because of the warming of the temperature. The migratory waterways in places like the prairie potholes in the Dakotas, and in the Southeast the Florida Everglades and the northward movement of tropical species. Those are all the kinds of issues that are being impacted by climate change.

So I would commend this document to all of you, which has been looked at and produced by the National Academy of Sciences and other partners.

In summary, Madam Chairman and Senator Inhofe, I look very much forward to working with the members of this committee of the U.S. Senate and with my colleagues, Steven Chu, Lisa Jackson and Tom Vilsack as we address this signature issue for our times. And again, at the heart of this, this is about reducing our dangerous dependence on foreign oil. It is about making sure that we save our children from the dangers of pollution and that we create jobs right here in the America.

[The prepared statement of Mr. Salazar and the referenced booklet follow:]

**Statement of Kenneth L. Salazar**
**Secretary, Department of the Interior**
**Hearing on Energy and Climate Legislation**
**Committee on Environment and Public Works**
**U.S. Senate**
**July 7, 2009**

Chairman Boxer, Ranking Senator Inhofe and members of the Committee, thank you for your work on this important challenge facing our Nation.

I am here today to urge this committee to join with the Administration in seeking strong and effective legislation that will steer our nation toward a new energy economy that brings new jobs to our nation and improves our energy security . As the President has said, there is a choice before us: we can remain the world's leading importer of oil, or we can become the world's leading exporter of clean energy.

Interior is our nation's largest landowner with jurisdiction over 20% of the land mass of the United States and 1.75 billion acres of the Outer Continental Shelf (OCS). As America's largest water provider and land and wildlife manager, Interior is already faced with the impacts of climate change on land, water and wildlife. Interior will thus play a key role in how the U.S. Government addresses and adapt to these climate change issues. Interior's 6,000 scientists and 14,000 land managers are already documenting these impacts and developing systems to respond to them on and across public lands.

Interior's land base includes some of the most productive renewable energy resources: solar in the Southwest; wind in the Atlantic, on the Great Plains and in the West; and geothermal in the West. We are working to develop these assets to help power President Obama's vision for a new energy economy. Interior's vast land ownership also gives it an important role in siting the new transmission lines needed to bring stranded renewable energy assets to load centers.

As the Secretary of the Interior, I can see the economic opportunity presented by the new energy economy. Since coming into office, we have prioritized the development of renewable energy on our public lands and our offshore waters. American business is responding. Companies are investing in wind farms off the Atlantic seacoast, solar facilities in the Southwest, and geothermal energy projects throughout the west. These new energy sources produce no greenhouse gases and, once installed, they harness abundant, renewable energy that nature itself provides.

The Senate Energy and Natural Resources Committee recently reported out legislation that will help to promote the development of this renewable energy opportunity. But we will not fully unleash the potential of the clean energy economy unless this committee, and the Senate, put an upper limit on the emissions of heat-trapping gases that are damaging our environment. Doing so will level the playing field and demonstrate that our nation is serious about building a new, clean energy economy. It will trigger even more massive investment in new clean energy projects throughout our nation.

In addition to seeing the potential economic opportunity presented by addressing climate change, the Interior Department is in a unique position to see the negative impacts that climate change is having on our land, water and wildlife resources. Our land managers are confronting longer and hotter fire seasons, new incursions of invasive species, and the early impacts of sea rise; our wildlife managers are dealing with climate change-induced impacts on wildlife mating and migration habits and species interactions; and our water managers are factoring new precipitation patterns into their planning decisions, as snow packs diminish and more extreme wet and dry periods challenge long-standing water management practices.

The Interior Department is participating actively in the interagency process on adaptation policy being led by the White House, and I look forward to working with your committee as well as you consider adaptation strategies that address the impact that climate change is having on our resources. We have been developing a unified approach to adaptation challenges through the Department of the Interior, and we look forward to providing the committee with the benefit of the expertise that our land, wildlife and water managers can provide on this subject. Our Department's developing experience with adaptive management strategies for resource management can provide a template for future efforts. For example, snowpack declines in the Northwest and Mountain-West have been accompanied by earlier annual peaks in river run-off as documented in stream gage monitoring and analyses across the lower 48 States and throughout Alaska. Land managers facing this reality are analyzing potentially substantial changes in management requirements for fish and wildlife and water resources. Interior managers are also learning to be strategic in rebuilding facilities that are lost to such natural disasters as Hurricanes Katrina and Rita. The Fish and Wildlife Service has repaired or replaced dozens of facilities at refuges along the coast damaged by these storms. In the process of rebuilding facilities for people across the region to enjoy, the Service decided not to replace some facilities judged to be too vulnerable and has relocated others to more secure locations.

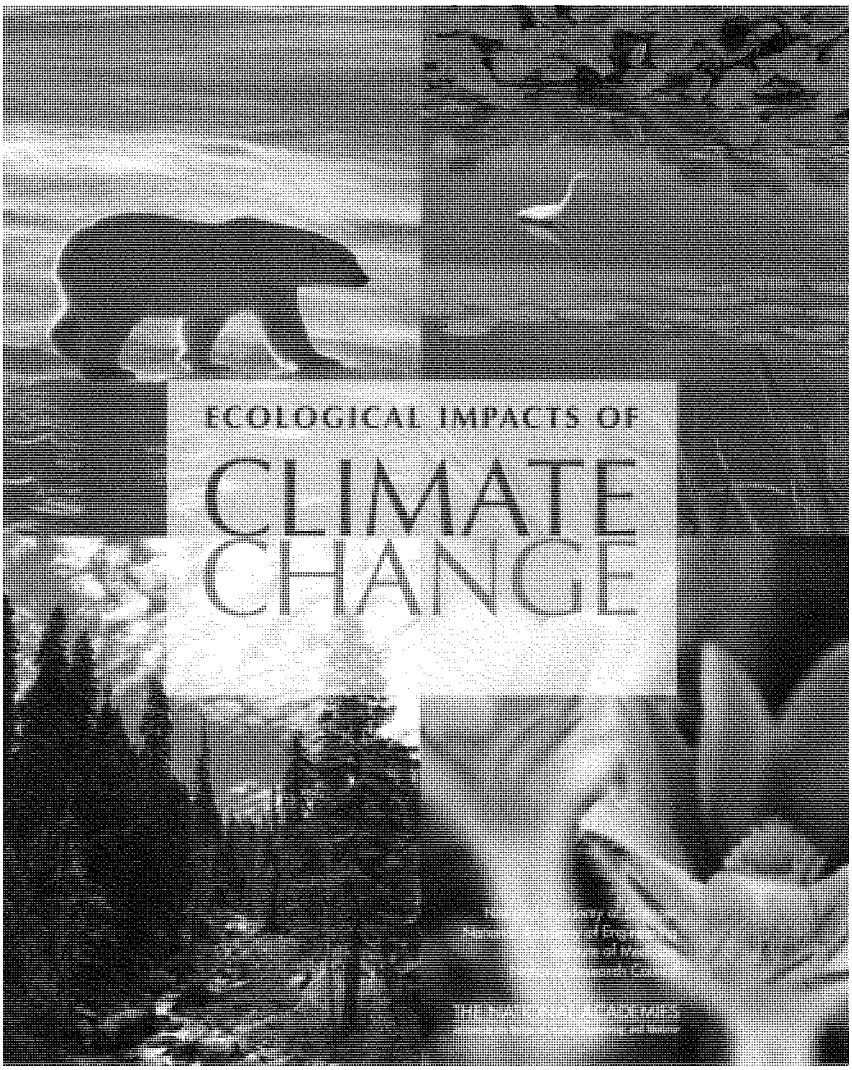
In all of these activities, the Department of the Interior is putting a premium on integrating our dual science and land management roles. Scientists in our United States Geological Survey (USGS), the Fish & Wildlife Service, and the National Park Service, for example, are working hand-in-glove with our land, wildlife and water managers who are responsible for the more than 500 million acres of public lands that we oversee. We are focused on ensuring that our USGS and other agency scientists are collecting and analyzing data that are providing relevant scientific information about natural resource conditions, issues, and problems to decision-makers in the Department, at all levels of government, and the general public. This is, and needs to be, an interactive process, as our land, wildlife and water managers work with our scientists and help focus the nature of their research and analysis on the reality of on-the-ground changes. This information – baseline scientific information, trends detection, modeling and forecasting, together with the effective dissemination of information and decision support tools – is key to understanding and addressing climate change and its effects.

Finally, I look forward to working with the committee as you address the opportunities for carbon reduction provided by the "biological sequestration" of carbon in our Federal lands. As you know, pursuant to section 712 of the Energy Independence and Security Act of 2007 (P.L. 110-140), the USGS has the responsibility, in consultation with the Secretary of Energy and others, to conduct national assessments of biologic carbon sequestration, ecosystem greenhouse gas fluxes, and potential effects of management practices and policies on ecosystem carbon sequestration and greenhouse gas emissions. The USGS is well underway with this work. Combined with the work of other agencies, it will help to enhance the scientific underpinning needed for a domestic offsets program that focuses on carbon reductions from land use practices.

I also would like to point out that the Interior Department has been engaged in a variety of projects that will teach us a great deal about biological sequestration, ranging from wetlands restoration projects in the mid-Atlantic and southeast, to afforestation projects in the lower Mississippi Valley, and habitat restoration projects in the west. The methodologies that USGS is developing at the direction of Congress, and the experience of our land managers in pursuing these projects as part of our broader ecosystem responsibilities, should be useful to the committee as you develop an offsets program that credits verifiable carbon reductions that are associated additional and with environmentally sound land management practices.

Madame Chairman, a problem as complex as climate change takes the coordinated efforts between all the branches of the government and all the governments of the world. The Department of the Interior stands ready with our shoulder to the wheel to contribute to this effort.

Thank you. I look forward to answering your questions.


ECOLOGICAL IMPACTS OF
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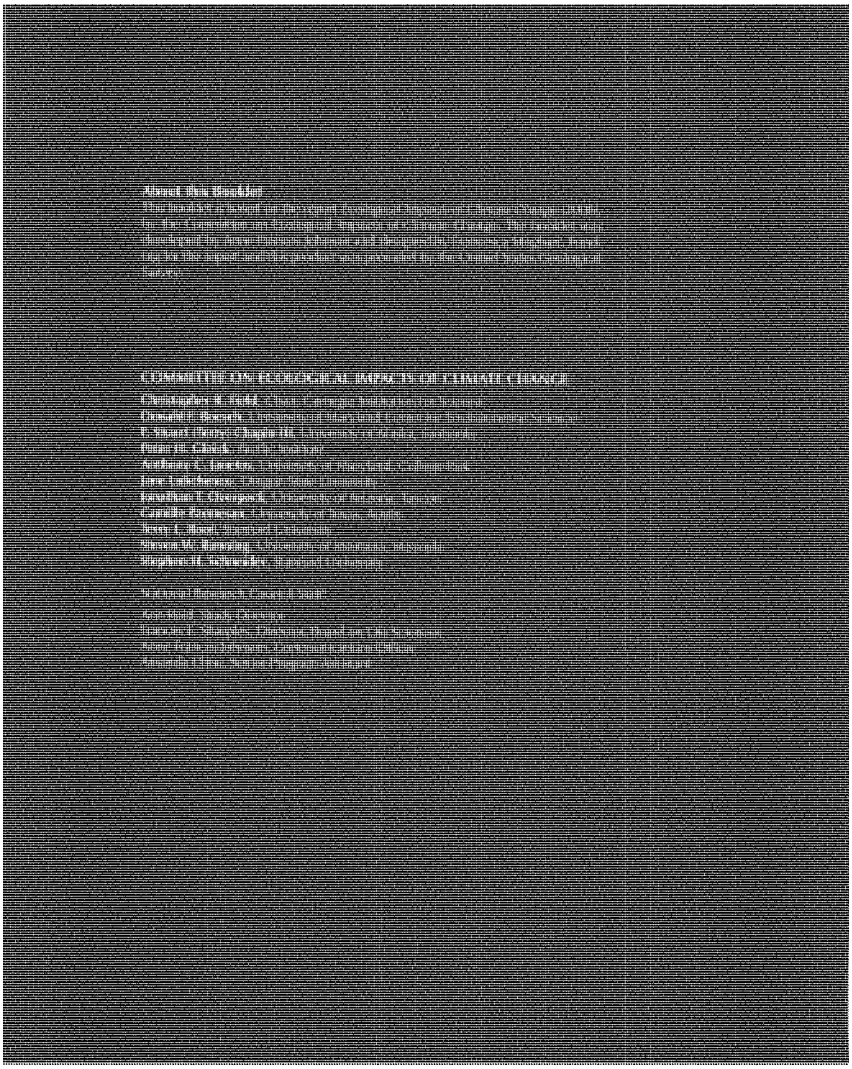

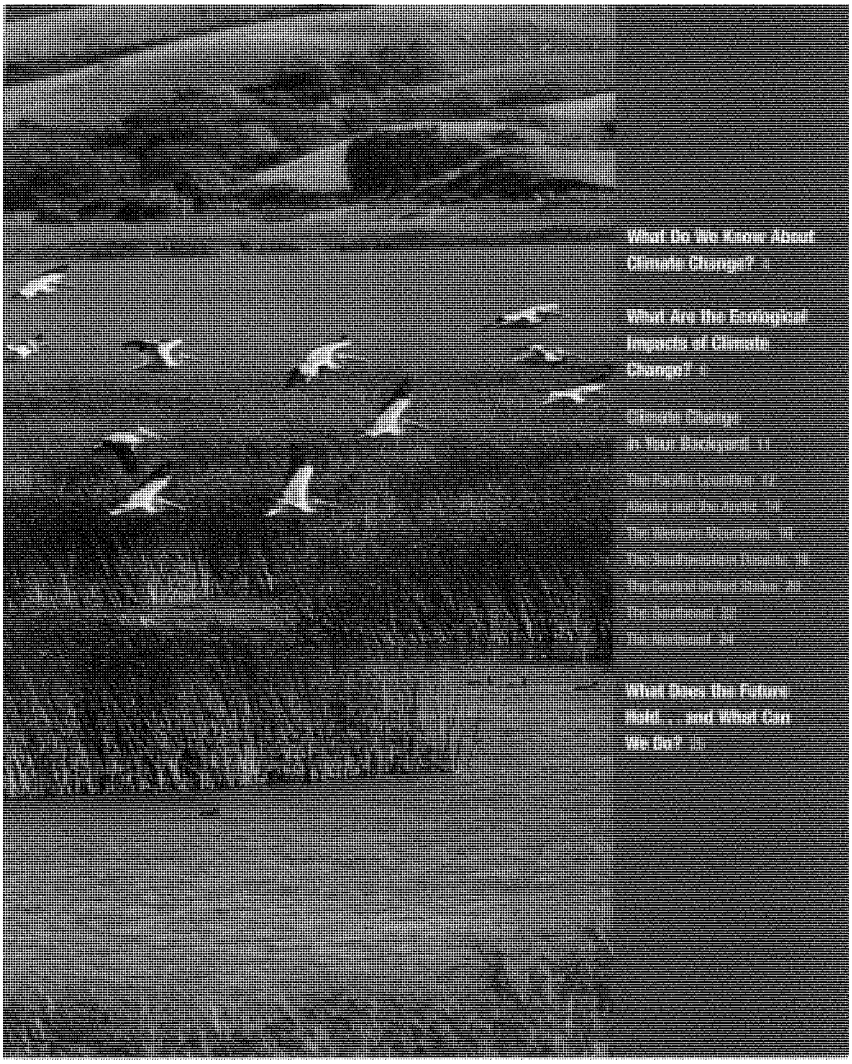

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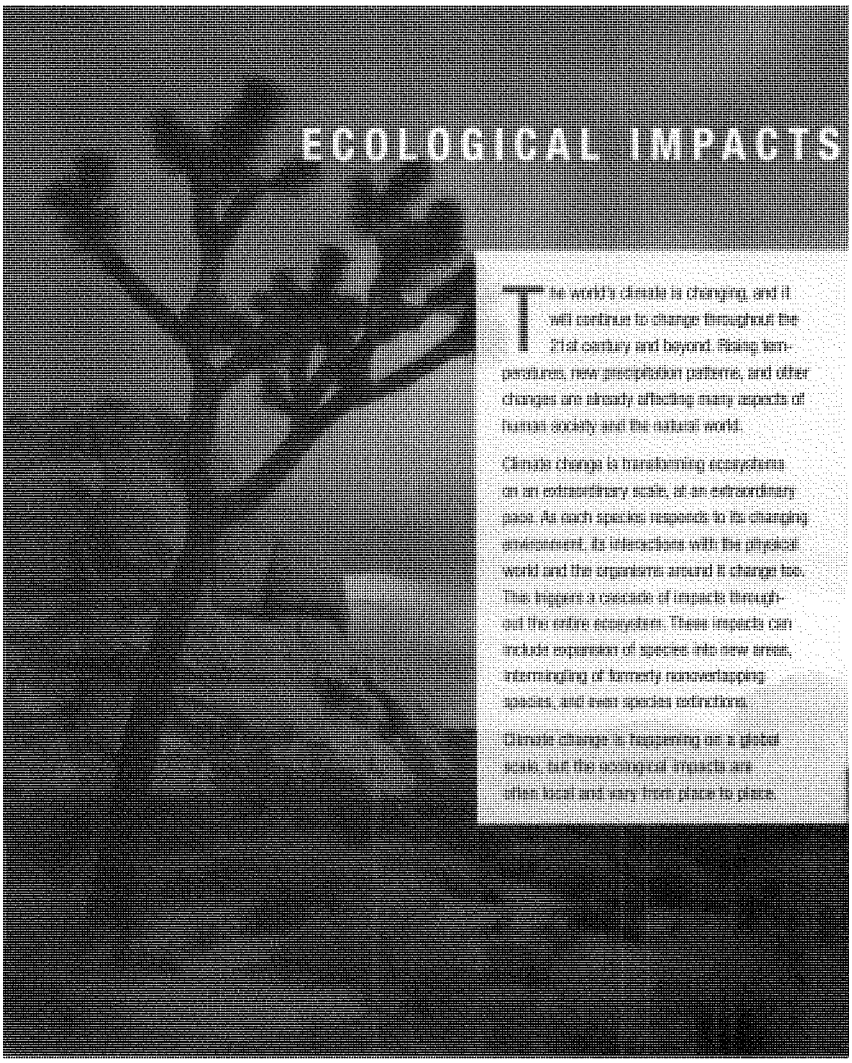
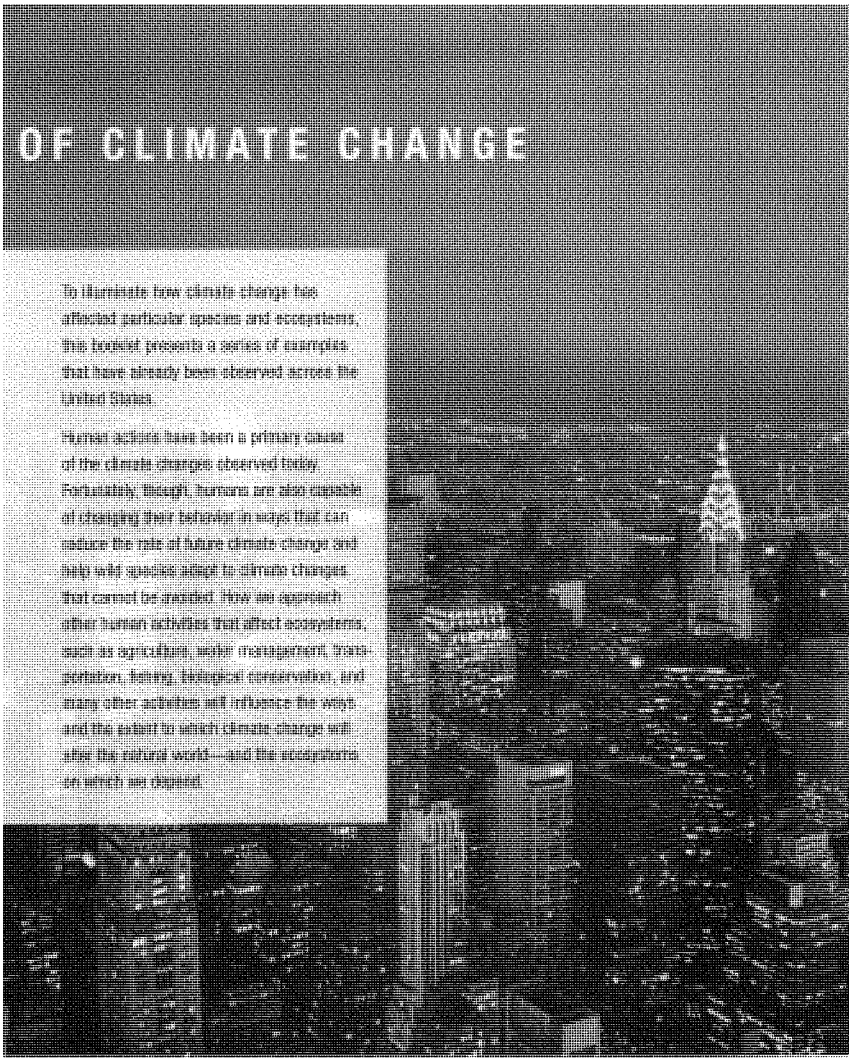


# ECOLOGICAL IMPACTS

The world's climate is changing, and it will continue to change throughout the 21st century and beyond. Rising temperatures, new precipitation patterns, and other changes are already affecting many aspects of human society and the natural world.

Climate change is transforming ecosystems on an extraordinary scale, at an extraordinary pace. As each species responds to its changing environment, its interactions with the physical world and the organisms around it change too. This triggers a cascade of impacts throughout the entire ecosystem. These impacts can include expansion of species into new areas, intermingling of formerly nonoverlapping species, and even species extinctions.

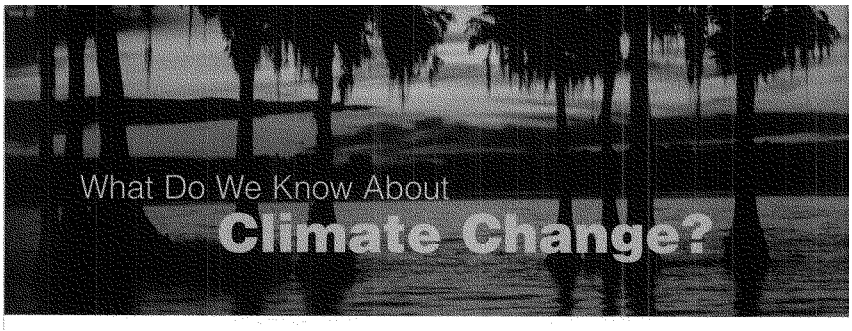
Climate change is happening on a global scale, but the ecological impacts are often local and vary from place to place.



# OF CLIMATE CHANGE

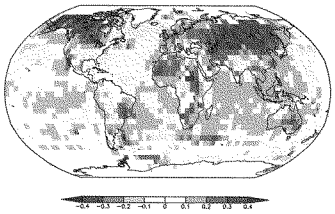
To illuminate how climate change has affected particular species and ecosystems, this booklet presents a series of examples that have already been observed across the United States.

Human actions have been a primary cause of the climate changes observed today. Fortunately, though, humans are also capable of changing their behavior in ways that can reduce the rate of future climate change and help wild species adapt to climate changes that cannot be avoided. How we approach other human activities that affect ecosystems, such as agriculture, water management, transportation, fishing, biological conservation, and many other activities will influence the ways and the extent to which climate change will alter the natural world—and the ecosystems on which we depend.

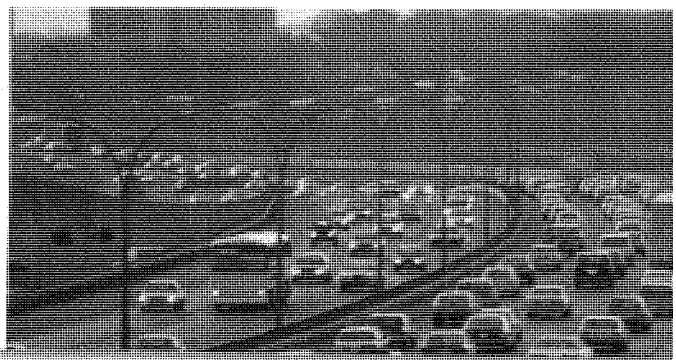



## The Earth Is Getting Warmer

A relatively rapid increase in temperature has been documented during the past century, both at Earth's surface and in the oceans. The average surface temperature for Earth as a whole has risen some 1.3°Fahrenheit since 1850, the starting point for a global network of thermometers. If emission rates for greenhouse gases (which trap heat inside Earth's atmosphere) continue on their current track, models indicate that the globe will be 4.3 to 11.5°F warmer by 2100 than it was in 1990.

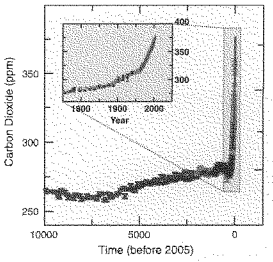



**The average change in temperature per decade from 1950 to 2005, in degrees Celsius. (If the scale were in °F, it would go from −.72 to .72.)**
Image courtesy of the Joint Institute for the Study of the Atmosphere and Ocean, University of Washington.



# Human Activities Are Contributing to Climate Change

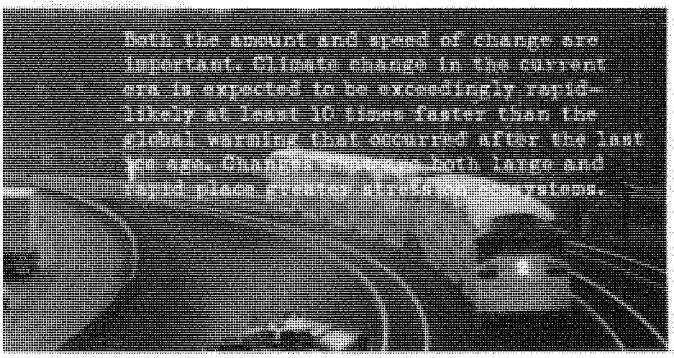
The physical processes that cause climate change are scientifically well documented: both human activities and natural variability are contributing to global and regional warming. According to the Intergovernmental Panel on Climate Change, whose documents are considered the most authoritative source for information on the "state of the science" on climate change, it is very likely that *most* of the observed warming over the past 50 years is the result of increased greenhouse gases generated by human activities. Numerous expert reports from the National Research Council have supported this conclusion as well.

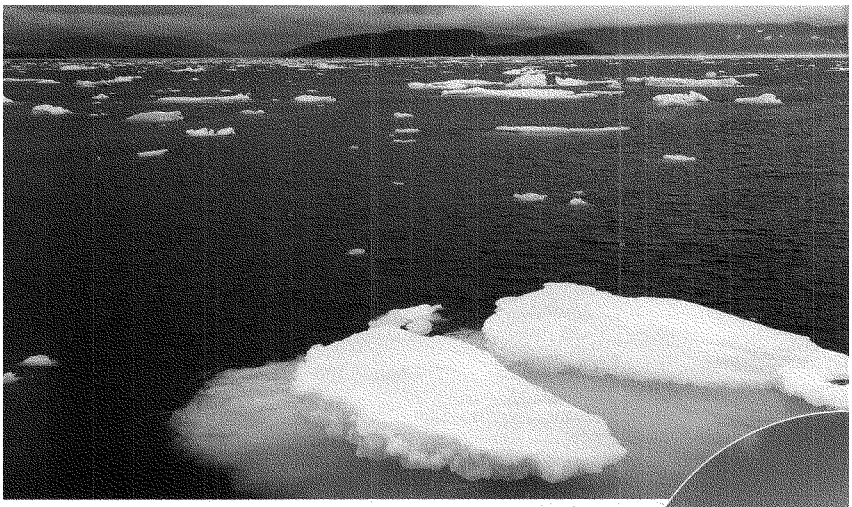


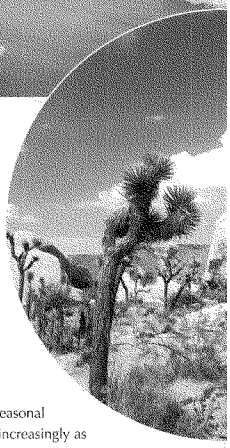

**Carbon dioxide and other greenhouse gases, which trap heat inside Earth's atmosphere, have increased dramatically since the Industrial Revolution compared to relatively stable concentrations over the past 10,000 years.**
Adapted from Climate Change 2007: The Physical Science Basis. Working Group 1 Contribution to the 4th Assessment Report of the Intergovernmental Panel on Climate Change. Figure SPM.5. Cambridge University Press.

The release of greenhouse gases has increased significantly since the Industrial Revolution, mostly from the burning of fossil fuels for energy, agriculture, industrial processes, and transportation. Carbon dioxide, a major greenhouse gas, is increasing in the atmosphere faster than at any time measured in the past, having grown by about 35 percent since 1850. Two other greenhouse gases, methane and nitrous oxide, are present in the atmosphere at much lower concentrations than carbon dioxide but have increased rapidly. Methane has increased by 150 percent; in addition, it is 25 times more effective per molecule at trapping heat than carbon dioxide. Nitrous oxide, nearly 300 times more effective, has increased by more than 20 percent.

Much remains to be learned about the factors that control the sensitivity of climate to increases in greenhouse gases, rates of change, and the regional outcomes of the global changes. Although scientific knowledge of climate is far from complete, the uncertainties concern the details: the scientific community is highly confident in the basic conclusions.





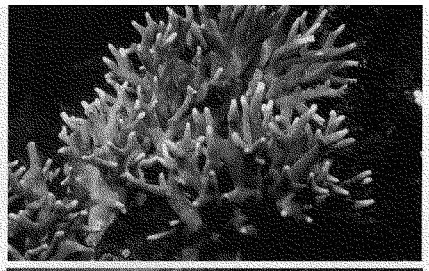


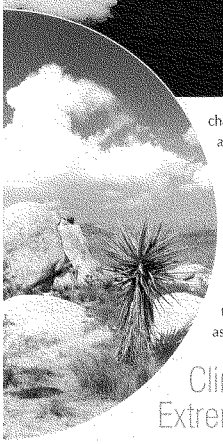
## Sea Levels Are Rising

Warmer temperatures not only cause glaciers and land ice to melt (adding more volume to oceans) but also cause seawater to expand in volume as it warms. The global average sea level rose by just under .07 inches per year during the 20th century, but that number has risen to .12 inches per year since the early 1990s. Under a "business-as-usual" greenhouse gas emissions scenario, models indicate that sea levels could rise 2 feet or more by 2100 compared to 1990 levels.

## Changes Are Rippling Through the Water Cycle

Climate change has complex effects on water supply and demand. The seasonal rhythms of streams and rivers have changed as winter precipitation falls increasingly as rain instead of snow, and as earlier spring temperatures cause snow in the mountains to melt earlier and faster. Climate change may mean that some places will experience more days with very heavy rain; other places may see more frequent, intense, and long-lasting droughts. Warmer temperatures also mean higher evaporation rates and thirstier plants and people, increasing demands for water. A warmer world will experience more precipitation on a global scale, but the





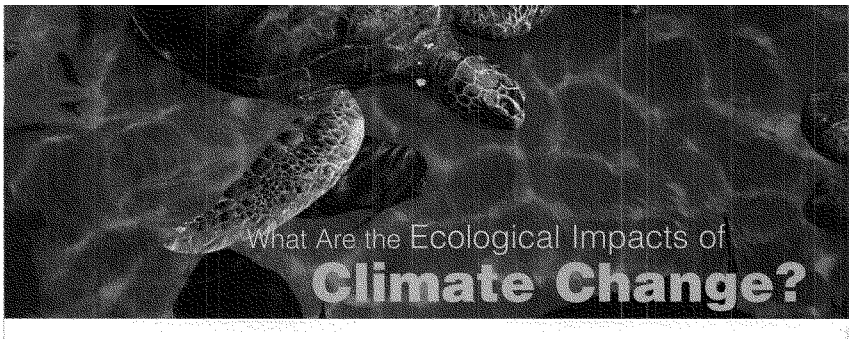
changes will not be the same everywhere. Projections indicate that on average dry areas will tend to get drier, and wet areas will tend to get wetter.

## The Ocean Is Acidifying

Much of the carbon dioxide emitted by human activity has already been taken up by the ocean, thus moderating the increase of carbon dioxide in the atmosphere. However, as carbon dioxide dissolves in seawater, it forms carbonic acid, acidifying the ocean. Ocean acidification will likely cause serious harm to such treasured marine organisms as corals, lobsters, and sea urchins.

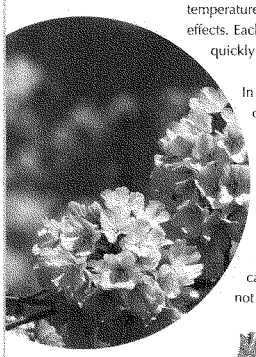
## Climate Change Is Reflected in Extreme Weather

It is considered very likely that increasing global temperatures will lead to higher maximum temperatures, more heat waves, and fewer cold days over most land areas. More severe drought in some areas, combined with other factors, has contributed to larger and more frequent wildfires.



# What Are the Ecological Impacts of Climate Change?

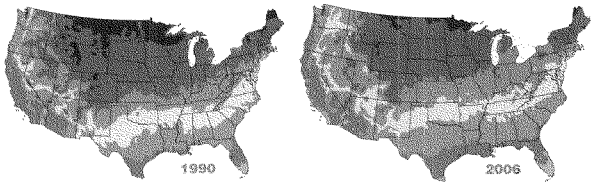
Living things are intimately connected to their physical surroundings. Even small changes in the temperature of the air, the moisture in the soil, or the salinity of the water can have significant effects. Each species is affected by such changes individually, but those individual impacts can quickly reverberate through the intricate web of life that makes up an ecosystem.



Many trees are now blooming earlier than they did several decades ago.

In particular, two important types of ecological impacts of climate change have been observed across the United States: shifts in species' *ranges* (the locations in which they can survive and reproduce), and shifts in *phenology* (the timing of biological activities that take place seasonally). Examples of these types of impacts have been observed in many species, in many regions, and over long periods of time.

As Earth warms, many species are shifting their ranges to areas with more tolerable climate conditions, in terms of temperature, precipitation, and other factors. About 40 percent of wild plants and animals that have been studied over decades are relocating to stay within their tolerable climate ranges. Some organisms—those that cannot move fast enough or those whose ranges are actually shrinking—are being left with




**Plant hardiness zone maps, used by gardeners to determine which areas are suitable for certain plants. Warmer colors indicate warmer zones. A new map was created in 2006 to reflect changes in climate since the 1990 map was created. Most of the zones shifted northward in this period.**
Map courtesy of the National Arbor Day Foundation.

**The European pied flycatcher. Its chicks, now born later than the caterpillars on which they feed, are missing the peak of food availability, causing a decline in the bird's population.**
Images used under the terms of the GNU Free Documentation License.

no place to go. For example, as arctic sea ice shrinks, so too shrink the habitats of animals that call this ice home, such as polar bears and seals. As these habitats contract toward the North and South poles, the animals that depend on them will reach the end of the Earth as they know it.

Climate change is also driving changes in the timing of seasonal biological activities. Many biological events, especially those in the spring and fall, are based on seasonal cues. Studies have found that the seasonal behaviors of many species now happen 15–20 days earlier than several decades ago. Migrant birds are arriving earlier, butterflies are emerging sooner, and plants are budding and blooming earlier.

If all of the species in an ecosystem shifted their seasonal behavior in exactly the same way, these shifts might not create problems. But when a species depends upon another for survival and only one changes its timing, these shifts can disrupt important ecological interactions, such as that between predators and their prey. For example, a small black-and-white bird called the European pied flycatcher has not changed the time it arrives on its breeding grounds even though the caterpillars it feeds its young are emerging earlier. Missing the peak of food availability means fewer chicks are surviving, in turn causing the flycatcher's population to decline.

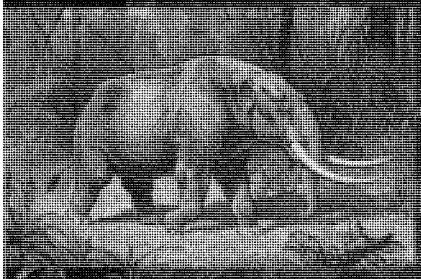
In addition to shifting ranges and seasonal behaviors, other ecological impacts of climate change—some of which will appear in the examples described in this booklet—include changes in growth rates, in the relative abundance of species, in processes like water and nutrient cycling, and in the risk of disturbance from fire, insects, and invasive species.

## WINNERS AND LOSERS?

The ecological impacts of climate change are not inherently "bad" or "good." The concept that a change is beneficial or detrimental has meaning mainly from the human perspective. For an ecosystem, responses to climate change are simply shifts away from the system's prior state.

# BIODIVERSITY AND THE PERMANENCE OF EXTINCTION

Ecological processes—even those that seem to represent the activities of a single species—depend on interactions among an interconnected web of vital and unique species. Honey, for example, is produced in a beehive, but the bees depend on pollen and nectar from the plants they pollinate. Some plants, in turn, depend on the bees that pollinate them, the worms that aerate the soil, the microbes that release nutrients, and many other organisms. This diverse array of creatures is key to the functioning of the entire system.

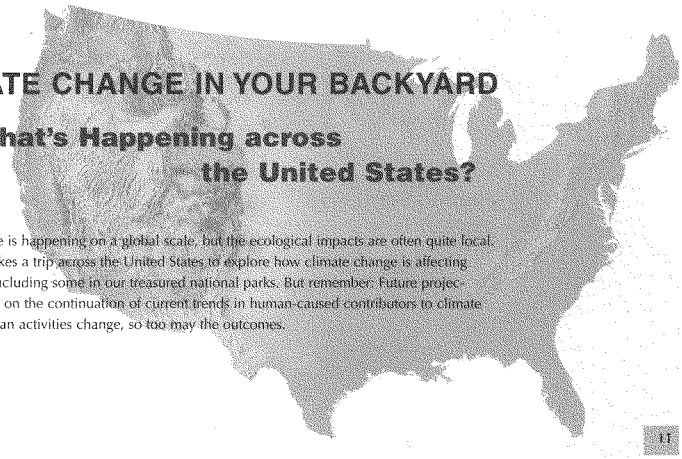


Among all the possible impacts of climate change on ecosystems, the most permanent is extinction. Once a species is lost, it cannot be recovered. And since no species lives in isolation, its entire ecosystem can be affected. The number of extinctions caused by climate change so far may be small, but if a level of warming occurs in the range of 2.5 to 5.5 Fahrenheit in the low-to-mid projected range—it is estimated that about 20 to 30 percent of studied species could risk extinction in the next one hundred years. Given that there are approximately 1.7 million identified species on the globe, this ratio would suggest that some 300,000 to 400,000 species could be committed to extinction—primarily as a result of human activities.

## Other Human Activities Compound the Effects of Climate Change

Plants and animals are simultaneously coping with climate change and many other human-created stresses. Rivers—many of which are polluted by fertilizers or other chemicals—are dammed to provide water for crops or for people. Roads, cities, and farms break up habitats and migration routes, and human activities carry nonnative species into new ecosystems. Many of the species and ecosystems described in this booklet are being affected by these other human influences in addition to those related to climate change.

Ecosystems are generally resilient to some changes. For example, they can often cope with a drought or an unusually hot summer in ways that alter some aspects of the ecosystem but do not cause it to change in a fundamental way. When such changes remain within the limits of an ecosystem's resilience, the ecosystem may not appear to be affected. There is often a threshold point, however, that results in dramatic transformations. Such threshold points are like the moment when water overtops a levee. As long as the water level is even slightly below the top, functioning is normal. But once it rises above the levee, there is a flood—permanently transitioning the ecosystem into a new state. The many ways humans have altered the planet could act as compounding factors that make it harder, or even impossible, for already stressed species to adjust to climate change.



# CLIMATE CHANGE IN YOUR BACKYARD

## What's Happening across the United States?

Climate change is happening on a global scale, but the ecological impacts are often quite local. This booklet takes a trip across the United States to explore how climate change is affecting ecosystems—including some in our treasured national parks. But remember: Future projections are based on the continuation of current trends in human-caused contributors to climate change. If human activities change, so too may the outcomes.

# The Pacific Coastline

## Edith's and Quino Checkerspot Butterflies

Visitors to California's Yosemite National Park might keep an eye out for a medium-sized butterfly with black, orange, and white patches on its wings flitting among the mountain wildflowers. What makes this species, known as the Edith's checkerspot butterfly, special is its extreme sensitivity to weather and climate, a quality that has turned it into an early warning indicator of climate change in North America.

For more than 40 years, researchers have been tracking Edith's checkerspot butterflies, even dusting off old museum records to determine where the species lived long ago. These investigations have revealed a large-scale shift of the butterfly's range both northward and upward in elevation—in concert with increasing temperature associated with climate change. Although the individual butterflies aren't migrating (they tend to stay in a small area their entire lives), the species' range has shifted as separate populations, one by one, go extinct—four times faster on the southern boundary of their range (Baja, Mexico) than on the northern boundary (in Canada), and nearly three times faster at lower elevations than at higher elevations.

**Quino checkerspot, the first endangered species for which climate change is officially listed as both a current threat and a factor to be considered in the plan for its recovery.**
Image courtesy of Dr. Gordon Pratt, www.quinocheckerspot.com.

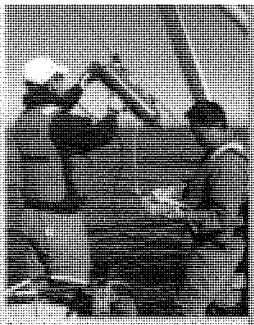
The butterfly's sensitivity to climate is also threatening its survival. A subspecies, the Quino checkerspot, is a federally listed endangered species. Although the primary cause of its decline is habitat destruction, climate change poses problems for its recovery. The southern edge of its range, in Mexico, has the least amount of human development and would offer the best habitat for its recovery, but as a result of climate change, the area is becoming too hot and dry. The Quino checkerspot is the first endangered species for which climate change is officially listed as both a current threat and a factor to be considered in the plan for its recovery.

## Pacific Fisheries

Seafood is the primary source of protein for more than 1 billion people worldwide. With demand for seafood growing dramatically, the future of the world's fisheries is of critical importance. Currently, however, there is very limited understanding of how global climate change might affect whole ocean ecosystems.

One effect that has already been observed is a shift in the types of species that are found in certain locations. Among the creatures that inhabit the rocky shorelines of central California, for example, formerly "southern" species have become more abundant since the mid-20th century, while many "northern" species have decreased as the shoreline warms.

Another abnormality that has been linked to climate change is a new "dead zone"—an area of seawater with insufficient oxygen to support most marine life—that has appeared off the coasts of Washington and Oregon. Dead zones suffocate and kill marine organisms that cannot swim or scuttle away fast enough. This dead zone, which has appeared every summer since 2002, is different from most of the other ones around the world because it is not caused by excess nutrients from fertilizer runoff or sewage discharges. Its ultimate cause is still under investigation, but several potential causes are linked to climate change. One possibility is that warmer ocean waters have directly altered the water's ability to hold oxygen at the surface and scrubbed oxygen to deeper waters. Climate-related changes in coastal winds and ocean circulation may also be responsible.



Scientists involved in a survey project for research on a recurring "dead zone" off the coasts of Washington and Oregon. The potential causes of the dead zone are linked to climate change.
Image courtesy of Oregon State University

## Wine Quality in California

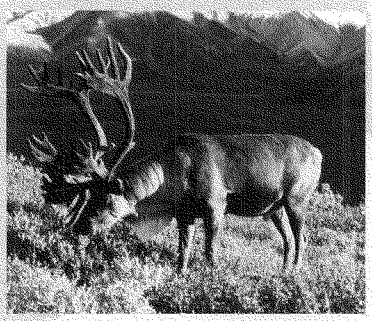
Some know California as the "Land of Wine and Food," but its premium vineyards could be facing a difficult future. Climate change affects managed ecosystems like vineyards just as it affects natural ecosystems, with more spending major economic and social implications.

Wine is one of California's most important agricultural products. The industry earns billions of dollars per year and is a critical part of the state's cultural fabric. Wine grapes can grow in a wide range of climates, but the quality of each crop depends on a subtle balance of climate, soils, and locations. Climate changes during the second half of the 20th century generally improved conditions in California's premium wine regions as the incidence of frost decreased and the growing season began earlier. Further warming, however, would be unlikely to help wine growers in the area. One study concluded that if current greenhouse gas emissions continued, the projected warming would degrade the state's premium wine regions from "optimal" to "marginal" by the end of the 21st century. Another study concluded that the area with the potential to produce premium wines would decrease by up to 81 percent.

Climate change affects managed ecosystems, such as vineyards, just as it affects natural ecosystems—with consequences for economic and social health.

## The Changing Arctic Food Chain

In the Arctic, shrubs are slowly infiltrating territory where once there was only ice, snow, and lichens. Although these unassuming, stunted plants may not seem like much of a threat, their expansion—driven by warming temperatures across the Arctic—is causing a cascade of ecological impacts through the region's food chain.



Caribou—or wild reindeer—are a key species in the arctic ecosystem. They are a critical food source for bears, wolves, and a range of carrion feeders, as well as for indigenous peoples across the region. A warmer climate may help caribou in some ways: Warmer arctic summers tend to increase food availability and, as a consequence, survival of caribou calves. But these advantages are countered by other effects of climate change. Shrubs are crowding out lichens, a key winter food for caribou, and the deep snowdrifts that collect in the shrubs make it harder for caribou to reach the lichens hidden underneath. Additionally, cycles of thawing and refreezing are happening more and more throughout the winter, producing a buildup of ice on top of the snow that makes it difficult for caribou to access the food beneath.

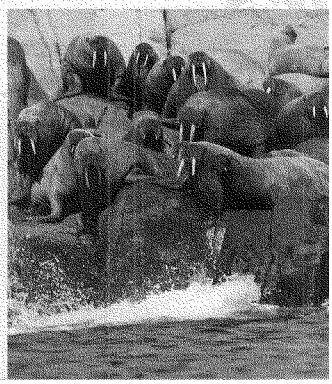
**Climate change is affecting caribou (wild reindeer). Although they are enjoying more abundant food in summer, increased shrub growth makes it harder for them to find and reach lichens, their main food source during winter.**
Image courtesy of Dean Briggins, U.S. Fish and Wildlife Service.

The increasing number of shrubs is also speeding up the region's rate of warming. Snow trapped by shrubs creates a thick blanket that insulates the soil, keeping it relatively warm over much of the winter. In response, arctic microbes increase their processing of organic matter in the soil, making the soil even more suitable for shrubs to grow, thus further increasing the shrubs' capacity to warm the soil.

## Ice-Dependent Animals

Sea ice is a critical resource for some of the world's most beloved animals. Walruses, for example, use sea ice as nursing platforms for their young and as a hunting base from which they feed on clams and other bottom-dwellers. Each spring, walruses follow their sea ice perches northward as the ice melts off in the south.

Because of climate change, the range of year-round sea ice is shrinking, leading walruses to move farther north each year. In 2007, the ice moved beyond the edge of the continental shelf, where the water becomes too deep for the walruses to feed. For the first time



**Melting sea ice threatens ice-dependent animals, such as walruses and polar bears.**

This map shows the average winter sea ice area in the Northern Hemisphere (white) and the average from 1979 to 2000 (blue) added together. Blue areas show where sea ice has been lost.

It recorded in oral history, thousands of mammoths—working on alternate places on and between feeding grounds—set up camp along the beaches near the village of Barrowright, Alaska. The dense aggregation of animals crushed many calves or adults caught in and from the ocean to feed, over time, such a disaster, so hard pop-ulations could also deplete bottom food resources along the coast.

Polar bears also rely on sea ice for hunting. When the sea is covered with ice, bears can wait at openings in the ice for their favorite prey—ringed seals—to surface for air. Where sea ice has melted, leaving little open sea, seals can surface anywhere making it difficult for the polar bears to catch them.

## A Fast Defrosting Arctic

The Arctic is heating up about twice as rapidly as the rest of the planet. This is due in part to several "feedback loops" in which the disappearance of arctic sheeting drive temperatures even higher. For example, as sea ice and snowcap melt, previously reflective white surfaces are exposed to darker ocean water or vegetation, respectively. These dark surfaces absorb more solar radiation, leading to higher air temperatures which leads to even more rapid melting, and so on.




Thawing permafrost represents another poten-tial feedback loop. Permafrost, the perma-nently frozen ground found throughout cold regions, contains a great deal of carbon in the form of partially decomposed organic matter. As permafrost warms, the microbes that decompose this material become more active, releasing carbon dioxide and methane into the atmosphere.

The Arctic is warming almost twice as fast as the rest of the planet as shown by the large area of dark red. If the month were a "5", it would go from −1.8 to 5.4. Maps created with data from Goddard Institute for Space Studies.

# The Western Mountains

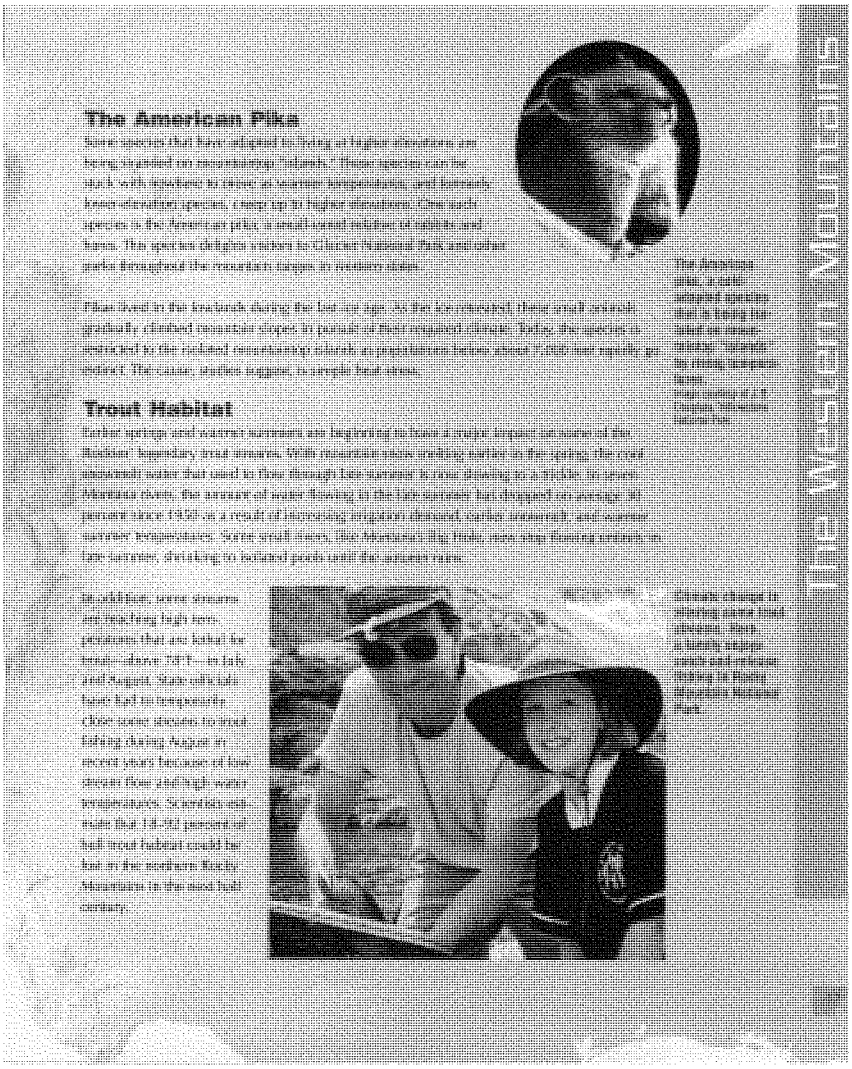
**A wildfire sweeps through Bitterroot National Forest in Montana.**
Image courtesy of John McColgan, USDA Forest Service.

## Wildfire, Drought, and Insects

In recent years, visitors to several National Parks, including Zion in Utah and Yosemite in California, have been turned away by nearby wildfires. In addition to their effects on treasured natural areas, wildfires put people, homes, livestock, and businesses at risk. Wildfire is nothing new, but it is dramatically escalating in frequency and extent in western forests, among other areas. There are now four times as many wildfires exceeding 1 ½ square miles as there were 30 years ago, and these frequent large fires are burning six times as much forest area. In the last 20 years, the western fire season has expanded by more than ten weeks.

This increase in wildfire is a legacy of both a changing climate and decades of total fire suppression that has resulted in a buildup of dead fuels. One important factor is drought. Wintertime precipitation is increasingly falling as rain instead of snow, and the snow that does accumulate is melting earlier in the spring—decreasing the amount of water available in the late summer months and contributing to longer and more intense droughts. Compounding the effects of these droughts is the increased susceptibility of drought-stressed trees to attacking insects. In the last decade, a bark beetle epidemic has exploded across 18,000 square miles of western mountain forests. Milder winter temperatures kill fewer beetles in their budworm phase than the colder winters of the past, helping to increase the bark beetle population, with devastating effects. As the beetles kill vast areas of forest, they leave standing dead wood, fueling even larger wildfires.

The climate is becoming too dry to support some of our nation's forests. Ecologists expect that some drought- and wildfire-stricken areas will not recover as forests but will instead regrow as open savannah or grassland ecosystems.



THE WESTERN MOUNTAINS

## The American Pika

Some species that have adapted to life at higher elevations are being pushed up mountainsides. These species can be stuck with nowhere to move as warmer temperatures and formerly lower elevation species, creep up to higher elevations. One such species is the American pika, a small wooly relative of rabbits and hares. The species delights visitors to Glacier National Park and other parks throughout the mountain ranges in western states.

Pikas lived in the lowlands during the last ice age. As the ice receded these small animals gradually climbed mountain slopes in pursuit of their required climate. Today the species is restricted to the isolated mountaintop islands, populations below about 7,000 feet rapidly go extinct. The cause, studies suggest, is simple heat stress.

## Trout Habitat

Earlier springs and warmer summers are beginning to have a major impact on some of the Rockies' legendary trout streams. With mountain snow melting earlier in the spring, the cool snowmelt water that used to flow through late summer is now flowing in a trickle. In parts Montana alone, the amount of water flowing in the late summer has dropped on average 30 percent since 1950 as a result of increasing irrigation demand, earlier snowmelt, and warmer summer temperatures. Some small rivers, like Montana's Big Hole, now stop flowing entirely in late summer, shrinking to isolated pools until the autumn rains.

In addition, some streams are reaching high temperatures that are lethal for trout—above 70°F—in July and August. Many cold-water fish have had to temporarily close some streams to trout fishing during August in recent years because of low stream flow and high water temperatures. Scientists estimate that 14-92 percent of bull trout habitat could be lost in the northern Rocky Mountains in the next half century.



Climate change is affecting many land species, such as bighorn sheep, pika and bighorn sheep in Glacier National Park, Montana.

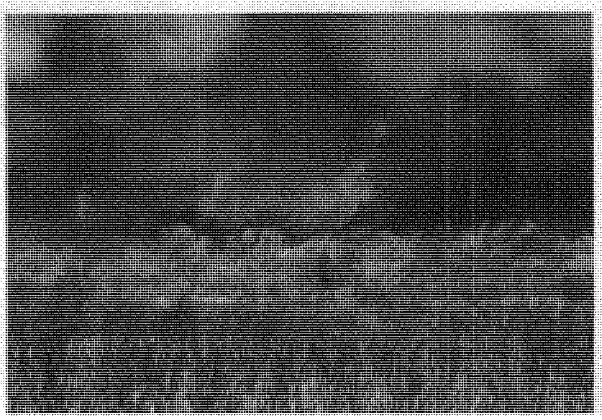
# The Southwestern Deserts

## Wildfire and Invasive Species

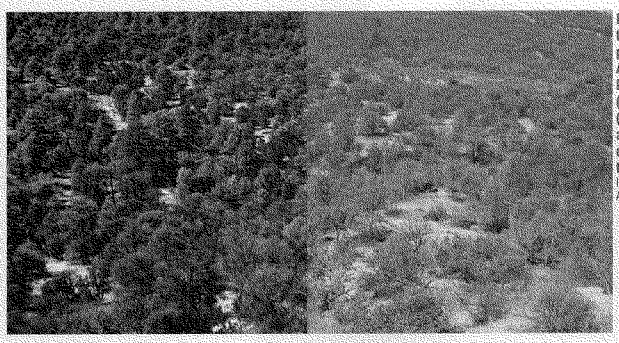
In the past, the stunning Mojave and Sonoran deserts of the southwestern United States were generally fire-indeed fugitive. There simply was not enough fuel to carry a fire through the sparse shrubs and cacti in these arrayed ecosystems.

Recently, however, some nonnative grasses have become established in these deserts, transforming fugitive desert into highly flammable grassland. For example, buffelgrass, which hails originally from Africa, is spreading rapidly over large parts of the Sonoran Desert. Another grass, known as red brome, is spreading through the Mojave.

These grasses are adapted to fire, spreading again quickly and densely after a fire sweeps through. Unfortunately, their rapid return pushes out the native species, including the iconic saguaro, or giant, cactus, which is not adapted to frequent fire. While climate change is not directly implicated in the spread of these grasses, scientists are concerned that warming temperatures will allow invasive grasses to spread farther in the desert Southwest and to extend into higher elevations.



**Invasive grasses are making desert and forests more prone to fire. Warming temperatures may help these grasses continue to thrive and expand in the American Southwest.**
Image courtesy of Tom Lloyd



**Photos taken from the same vantage point near Los Alamos, New Mexico, in 2002 (left) and in 2004 (right), during and after a major drought devastated the area.**
Images courtesy of D. Allen, USGS.

## The Piñon Pine

Large swaths of the American Southwest are covered with piñon-juniper woodlands—a vegetation type too scrubby to be called a forest but with too many trees to be called a shrubland. As its name implies, it is characterized by two types of evergreens: piñon pines and junipers. Although these plants can typically tolerate drought, extreme conditions can push even these tough species past their limits.

The "Four Corners" region where New Mexico, Arizona, Colorado, and Utah meet is not known for being particularly wet. But the drought that descended on the region from 2000 to 2003 was abnormally severe because it combined low precipitation—25–50 percent less than the long-term average—with unusually high temperatures. By the end of 2003, a large number of the piñons in the region were dead. The main cause of death was infestation by the pine bark beetle, which often targets trees that have been weakened by other stresses—in this case, heat and drought. The widespread loss of these pine trees caused a major ecological change over a large area.

In general, we do not know the thresholds for such major changes before they occur. This example highlights the threat that a stressful event that would not normally trigger a dramatic ecological change may do so when an ecosystem is subject to many interacting stresses.

# The Central United States

## Agricultural Shifts

The central part of the United States is one of the world's great agricultural regions. Its rich soils and favorable climate produce high yields of corn, soybeans, and wheat. As farming techniques have advanced, farmers have shifted the mixture of crops grown in the last century. These continuing efforts to increase yields make it difficult to determine whether or how climate change has affected crop yields thus far. Yet studies of past climate variability offer insights into what farmers might expect from future climate change.

In general, plants grow faster in warmer climates, which could be good news for some farmers, especially in temperate and cold areas. But this applies only up to a point. When it gets too warm, crops tend to mature too early, and under extreme conditions, high temperatures can kill crops. Although there are varieties are bred to withstand certain conditions, each crop ultimately has a limited temperature range.

Plants are also affected by the amount of carbon dioxide in the atmosphere. Yields of some crops, such as soybeans and wheat, increase with higher levels of carbon dioxide in the atmosphere, while yields of others, such as sugarcane and corn, do not. Unfortunately for some farmers who spend time and exploring, some pest plants—for example, poison ivy—grow faster and produce more toxicant when atmospheric carbon dioxide is higher.

Most models conclude that if warming does reflect the new normal temperature range of climates having particular crop yields will probably increase in the United States by 5 to 20 percent. But the balance between the effects of warming and the effects of increased carbon dioxide will likely mean increased yields for some crops and decreases in others. Climate change may also alter the distribution of weeds and other pests, and affect the frequency of severe weather events.

How farmers adapt to a changing climate will be a critical factor in future yields. Aggressive action to adjust farming methods, planting dates, and selection of which crops or varieties to grow in response to changing climate conditions can play a large role in future crop yields. Good information about future changes and adaptive measures will be crucial to helping farmers cope effectively with climate change.

and the natural ecosystems, managed ecosystems such as farmland could face changes associated with shifts in temperature, carbon dioxide concentrations, and many other factors. How farmers adapt to a changing climate will be a critical factor in future crop yields.

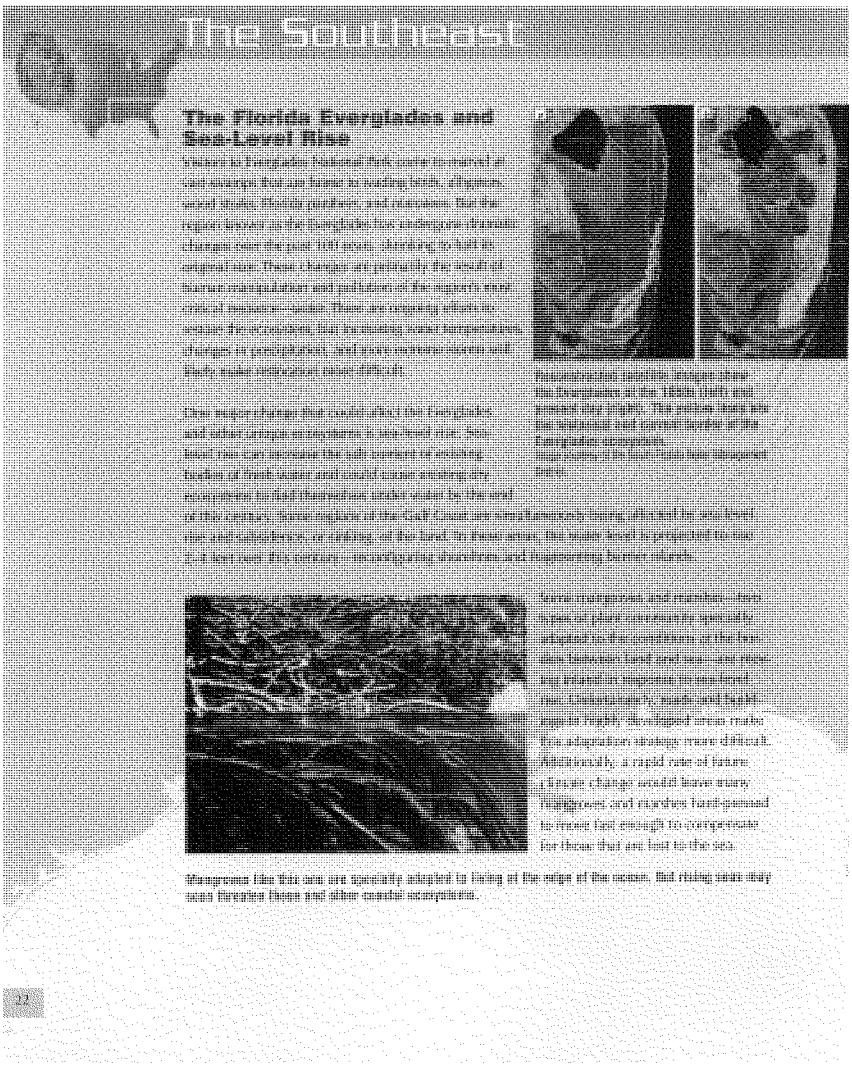
## Migratory Waterways

Did you know that the central United States is a critical corridor for millions of migrating birds? During spring and returning migration, these birds use, rest, and feed in a straight line that has been called "birds' highway" or "flyway corridor." The migration route is especially critical for national ducks and other waterfowl, whose yearly population totals correspond to the number of eggs laid that are available at the beginning of the breeding season.

These birds are seeking safe suitable areas and go with changing seasons and geographical patterns. Already under pressure from climate change and other factors, bird species rely on them to be in their nest sites in origin or breeds, and have interdependent needs of each other and protection. These essential bird habitats are expected to face increased stress due to climate change. A combination of fewer wetlands and lower rainfall could hinder the ability of these birds to find water, prolong migration, disrupt the food they need on their journey, and reduce the number of birds that survive to breed.



These shallow, temporary lakes scattered throughout the Midwest provide critical places for migrating birds to rest, feed, and nesting.
Image courtesy of Ducks Unlimited Canada.



# The Southeast

## The Florida Everglades and Sea-Level Rise

Nature in Everglades National Park contains natural habitat and energy for use by humans in cooling, food, shelter, wood, water, fishing, gardening, and recreation. But the region known as the Everglades has undergone dramatic changes over the past 100 years, shifting to half its original size. These changes are primarily the result of human manipulation and pollution of the region's water, which impacts water. These are ongoing efforts to restore the ecosystem, but increasing water temperatures, changes in precipitation, and land-use patterns (urban and farm) make restoration more difficult.

This region's large size means that the Everglades and other coastal ecosystems are vulnerable to sea level rise. Sea level rise can increase the salt content of existing bodies of fresh water and could cause saltwater to encroach into freshwater under water by the end of this century. Some regions of the Gulf Coast are naturally losing land to the sea (land rise and subsidence, or sinking, of the land in these areas, the water level is projected to rise 2–4 feet over the coming century, mainly due to human-induced global warming).

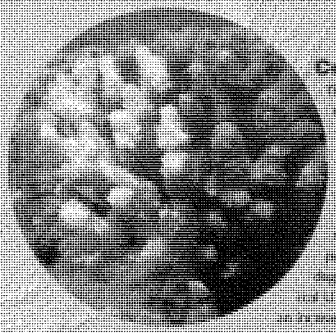


Mangroves (the trees in the foreground) have adapted to the tidal flux and protect the shore. The mature trees are in the background and spread inside of the Everglades ecosystem.

Mangroves are salinity-tolerant trees that can survive in saltwater and freshwater. They have a lot of plant and animal life associated with them, including land and sea, and they are important in protecting coastal areas from hurricanes, storms, and tidal surges in highly developed areas make this adaptation strategy more difficult. Additionally, a rapid rate of future climate change would leave many mangroves and marshes hard-pressed to move fast enough to compensate for those that are lost to the sea.



Mangroves like this one are specially adapted to living at the edge of the ocean. But rising seas may soon threaten them and other coastal ecosystems.



## Coral Reefs

[illegible] Coral Reef Park, just miles from Southernmost Point, Florida, attract more than [illegible] million visitors per year. In addition to drawing crowds to their dazzling natural beauty, coral reefs play very important roles in the marine ecosystem. For example, they provide [illegible] and act as a protective barrier for the marine shores. Unfortunately, overfishing, pollution, and coastal development are already damaging reefs off the Florida Keys and in other hotspots. [illegible] and associated changes pose an [illegible] threat to reef survival.

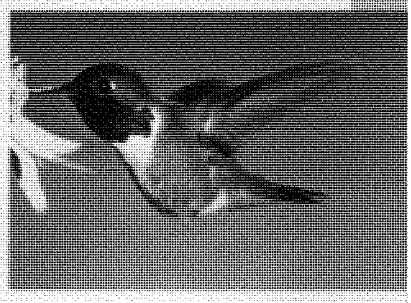
The Pacific tropical waters in which coral reefs are found are warming. Heat stress causes reef-building corals to expel the symbiotic algae that provide their primary source of nutrition, leaving only the white "bones" of the corals behind. This process, called coral bleaching, can be lethal to the coral if it lasts too long. Coral bleaching, which has increased in recent decades, becomes more or less inevitable as the ocean gets hotter and hotter.

Corals are also being affected by ocean acidification, which is caused by the increase in carbon dioxide in the atmosphere. This affects the ability of marine organisms to build their shells and skeletons. Ocean acidification is likely to slow, or even stop, the growth of coral reefs this century. This would not only affect the corals themselves but also put in jeopardy the survival of the several species found only on coral reefs.

A partially bleached coral. Coral bleaching, which results from water [illegible] temperatures being too high, can be deadly to the corals if it lasts too long.
Photo courtesy of NOAA

## Northward Movement of Tropical Species

Tropical species are moving northward into the southern United States, changing bird and butterfly watchers' allies. Former migrants like the white-faced ibis and the Mexican green jay have become year-round residents in Alabama and Texas, respectively. Florida has five new species of tropical dragonfly, and many tropical butterflies now really continued to thrive are starting to breed as far north as Austin, Texas.



Some tropical species, like the white-faced ibis, are moving northward in the wake of hot and butterfly watchers to the heartland.
Photo courtesy of David Hogan, via Wikimedia Commons

# The Northeast

## Northeast Fisheries

Fisheries are a major part of New England's economy, history, and culture, but some species are under pressure from overfishing. Some of the region's most important fish species are known to be affected by water temperature. Atlantic cod, for example, require bottom water temperatures cooler than 50°F for their young, remaining water cooler than 60°. Substantial ocean warming could cause cod to bring only to smaller grounds in northern areas and Georges Bank.

Lobsters, another key species for northeast fisheries, exhibit a wide range of water temperatures than do cod, to survive water temperatures cooler than 60°F. Lobsters need more oxygen to survive. This requirement, combined with the fact that warmer water holds less oxygen, makes the recommended oxygen in the water more difficult to obtain at about 70°F. Since the late 1990s, lobster population in Long Island Sound has other concerns. While many factors may have contributed to this decline, warming is probably part of the cause. Water temperatures have increased 7°F with increasing frequency. On the other hand, northward, in the Gulf of Maine, warmer conditions could increase lobster habitat, supporting a longer growing season, faster lobster growth, and larger area suitable for lobsters to grow in.

Some temperate coastal parasites are moving northward in response to warming waters, with potentially major impacts on fisheries. One example is the oyster parasite *Perkinsus marinus*, which will cause mass oyster deaths. This parasite has extended its range northward from Chesapeake Bay to Maine—a 10-mile shift that tends to follow average winter temperatures.

Lobsters, which die if they get too warm, need cooler water than most other species to survive.

## Predicting the Future: Lessons from the Distant Past

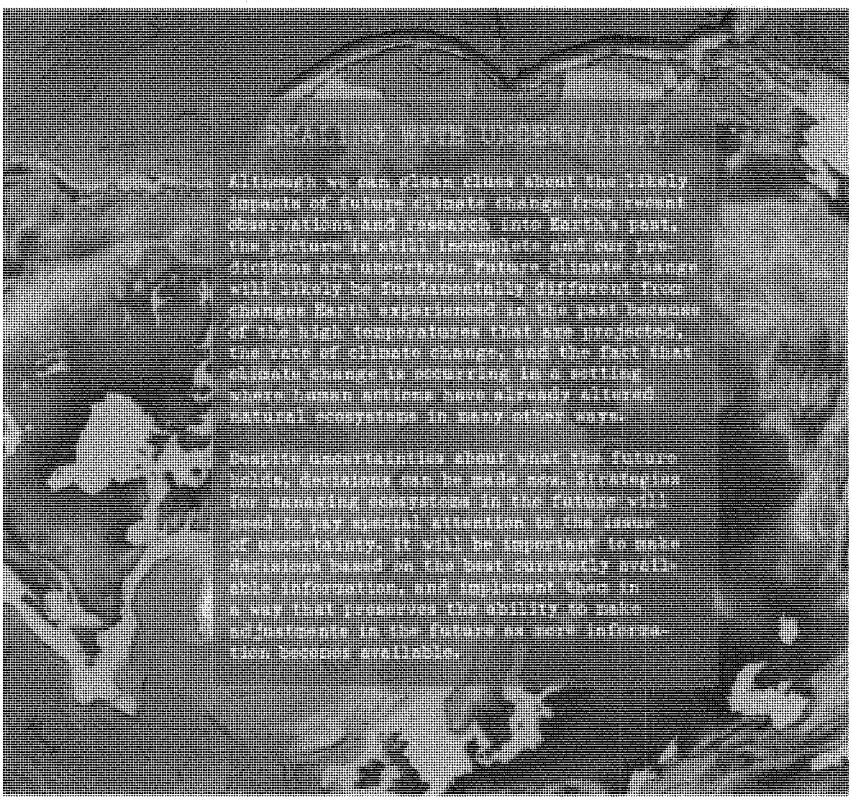
Our ability to predict future ecological impacts of climate change stems largely from what we know about the past. Rocks, ice cores, cave formations, tree rings, sediments, and other natural "climate recorders" have offered clues about how ecosystems respond to major climate shifts.

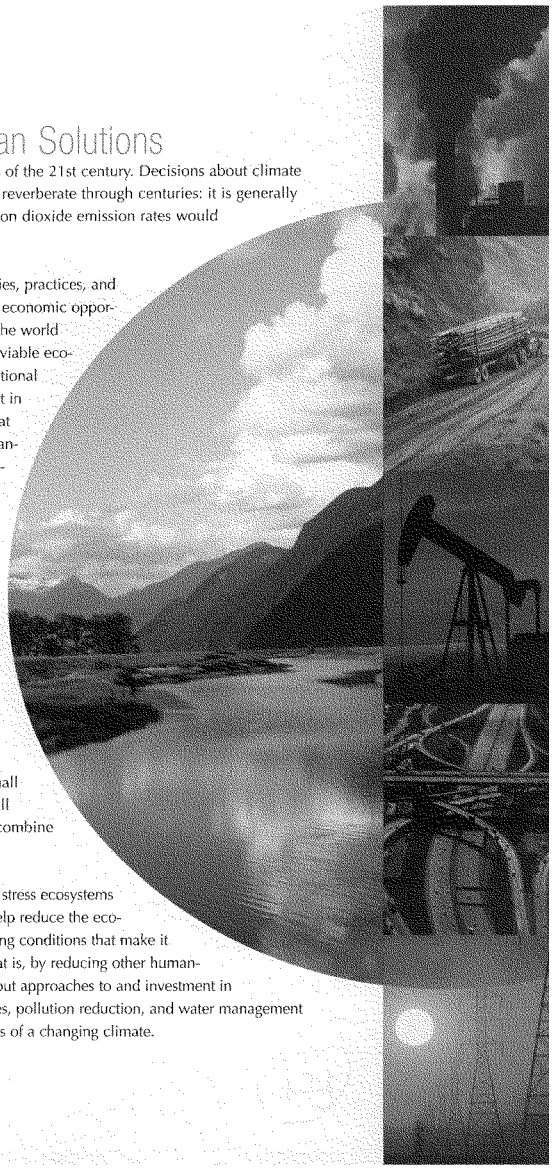
Earth has experienced a series of ice ages over the past million years. Around 21,000 years ago—during the peak of the last ice age—most of Canada and the northern United States was under thousands of feet of ice. Arctic vegetation thrived in Kentucky, and sea levels were about 400 feet lower than today. That ice age ended as subtle changes in the Earth's orbit slowly warmed the globe. This and other periods of cooling and warming caused widespread ecological changes: Some ecosystems shifted to locations with more favorable conditions, others vanished, and new types of ecosystems emerged.

**A scientist in the US Geological Survey National Ice Core Lab. Ice cores, which are samples taken from polar ice caps and mountain glaciers, provide clues about changes in Earth's climate and atmosphere going back thousands of years.**

Climate change in the coming decades could be much more rapid on a sustained, global basis than the transitions into and out of many past ice ages. In past ice ages, ecosystems were pushed off large swaths of Earth's surface as ice-dominated landscapes advanced, but when the change was slow enough—over many thousands of years—similar ecosystems reassembled again as the ice retreated. There have also been abrupt changes in the past, but the rate of change in the current era is expected to be both global and rapid. Ecosystems can be particularly vulnerable when major climate changes happen over a relatively shorter period of time.

One of the major concerns about the future is that climate changes may happen too fast to allow many organisms to respond. Some individuals and species can adapt or move faster or farther than others. For example, a long-lived tree species may take decades to shift to a new range, while an insect species could shift its range much more quickly. Understanding how quickly species and ecosystems can adjust is one of the key challenges in climate change research.





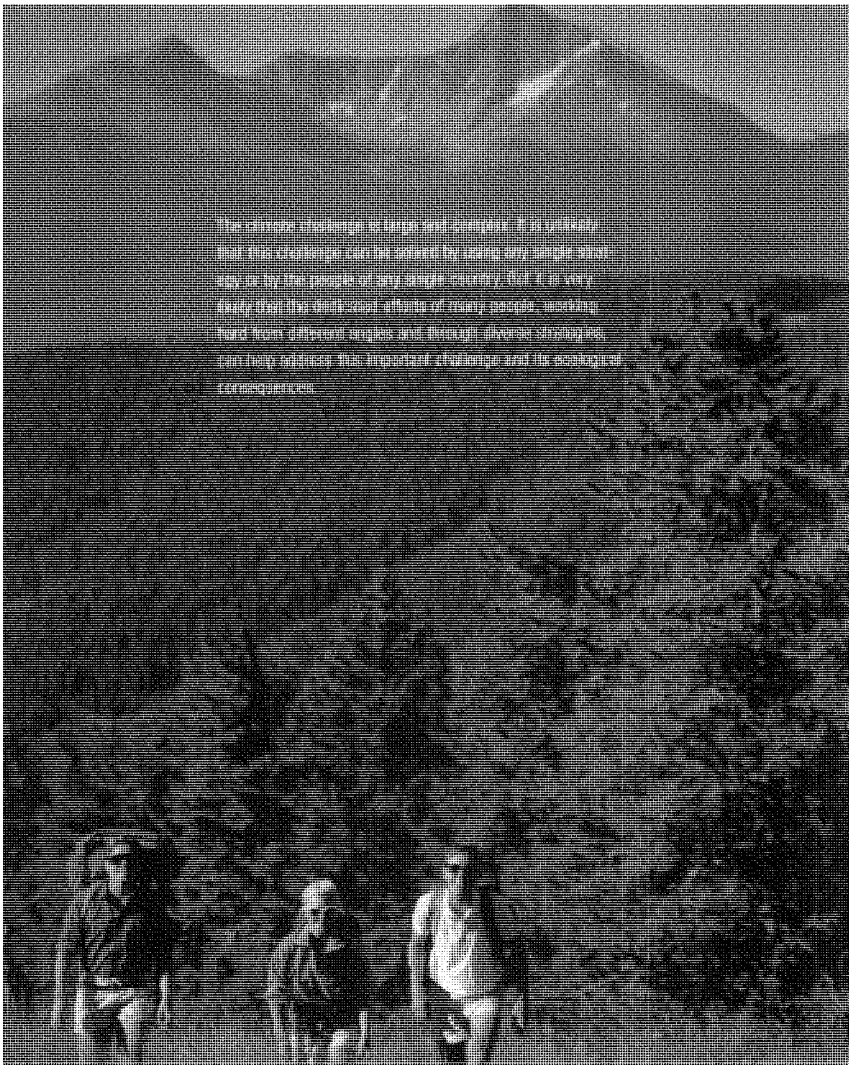
## Human Causes, Human Solutions

Climate change is one of the defining issues of the 21st century. Decisions about climate change over the coming decades will likely reverberate through centuries: it is generally agreed that a change in such factors as carbon dioxide emission rates would change the projected outcomes.

Humans are challenged to find a set of policies, practices, and standards of behavior that provide long-term economic opportunities and improved quality of life around the world while maintaining a sustainable climate and viable ecosystems. Recent analyses by U.S. and international experts conclude that the world should invest in minimizing the amount of climate change that occurs and in adapting to the changes that cannot be avoided. The appropriate level, financing, and structure of these investments are questions to be discussed among all members of society.

Some of the issues are so big that the involvement of governments will be required. These include decisions about the best ways to reduce a country's carbon emissions and where to invest funds in research on alternative energy sources. Other decisions are best addressed at the individual, family, or business level. Each time a car, home appliance, or lightbulb is purchased, a decision is made that has a small influence on climate change. But many small decisions, made by billions of people, can combine to have very large effects.

We know that climate change is not the only stress ecosystems are facing. An important way for society to help reduce the ecological impacts of climate change is by creating conditions that make it easier for species in ecosystems to adapt—that is, by reducing other human-influenced ecosystem stresses. Well-thought-out approaches to and investment in conservation, sustainable agricultural practices, pollution reduction, and water management can all help ecosystems withstand the impacts of a changing climate.


The climate crisiscrisis is here and imminent. It is undeniable
that the challenge can be solved by some big-scale action
only, or by the people and small country. But it is vital
daily that the dark and efforts of many people, working
hard from different angles and through diverse strategies,
can truly address this important challenge and its ecological
consequences.

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Life on Earth is profoundly affected by the planet's climate. Animals, plants, and other living beings around the globe are moving, adapting, and, in some cases, dying as a direct or indirect result of environmental shifts associated with our changing climate—the rising intensity, interactions among Earth's spheres, with profound implications for the natural systems on which humans depend.

Climate change is happening on a global scale, but the ecological impacts are often local. To illustrate how climate change has affected species and ecosystems across the United States, the Leshkin, based on the records kept of its independent, expert committee of the nation's leading scientists, describes some of the ecological impacts of climate change that have already been observed right in our own backyard.

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Senator BOXER. Thank you.

Senators, we need to make a decision. Senator Inhofe and I have conferred, and see if you agree with this. Because we took so long with opening statements, God bless us all, we are running quickly out of time to get to our second panel. We have some very good people we want to hear from.

If it is OK with everyone else, Senator Inhofe and I are recommending that we have just 3 minutes each to ask questions of this panel so that we can at least hear from the next panel. Is that all right with everyone?

[Chorus of ayes.]

Senator BOXER. And I will be strict, so do not be angry. OK. Here we go.

First, let me respond. Senator Bond held up a chart. You can do that with any piece of legislation. He said that the Waxman-Markey Bill was unusually long and the rest. When we back, the Energy Policy Act of 2005 that was brought to us by the Bush administration, the Republican Congress, was 16 titles. The House bill, Waxman-Markey, was 5 titles. So, I think you can just do this with every piece of legislation and I want the record to reflect that.

The next thing, I just really wanted to see if I could get a yes or no. It is going to seem pretty obvious what the answer will be, but I want to make sure I have you on the record and we will go down, just yes or no.

Given the problem of global warming as you see it, and the opportunity for clean energy jobs if we address it correctly, do you agree that this committee should do its job and move forward with a climate change clean jobs bill?

Mr. CHU. Yes.

Ms. JACKSON. Yes.

Mr. VILSACK. Yes.

Mr. SALAZAR. Yes.

Senator BOXER. Thank you. I just wanted that to be clear.

You know, I was very disturbed by Senator Barrasso's comments. He said the following. As we begin debating climate change, I believe we must first look at transparency, transparency on the scientific data on climate change and transparency on economic data. Madam Chairman, you said we would hear fierce words of doubt and fear but that the President says yes, we can and yes, we will. And this is the part that disturbs me. But what I have seen so far, said Senator Barrasso, is an Administration that is saying yes, we can hide the truth, yes, we can ignore the facts and yes, we can intimidate career Government employees.

Now, I think that is a brutal charge to levy and I would like to ask Administrator Jackson a question on this. Would you discuss this charge of Senator Barrasso? I do not believe it, but he is saying that EPA has dismissed or suppressed scientific material relating to the endangerment finding. Could you please address that?

Ms. JACKSON. I am happy to, Madam Chairman. And I will be brief because I do think this committee has more important and substantive issues to deal with this morning with my colleagues and myself.

I will say it again for this committee that transparency and scientific integrity will be the cornerstone principles of my time at

EPA, and they will guide our actions. It occurs to me that that kind of change in openness does not sit easily or well with some interests and some special interests that just refuse to believe that I will ensure that science and the law guide our actions at EPA.

Recently, the Competitive Enterprise Institute issued a press release and accused EPA of preventing an economist in our office, his name is Alan Carlin, from voicing his scientific opinions with respect to the endangerment finding that we issued back in April. But I think it is important to look at the facts because here the facts do not actually justify their release. In fact, they get in the way of the story, and I think it is important to understand them.

First, the economist in question was given permission and encouraged to speak his mind. He participated in conferences and symposiums around the country. He was encouraged to host brown bags for other EPA staff on his views, and he was encouraged to find peer reviewed works that back up his perspective.

His views are reflected in the endangerment finding, in the technical support documents which is a synthesis of the science of global warming and public endangerment. And when I personally learned of his feeling, justified or not, that his memo had not been circulated widely enough, I immediately instructed my staff to inform him that he should feel free to circulate it to whomever he wished. Those are the facts and, as you can tell, they are anything but suppressive.

I honestly do not believe that process debates like this are serving the American people. I believe the way to serve them is to find real solutions that will end our dependence on foreign oil and that will ensure a healthy climate for our children. I am sure that we will continue to have discussions like this, but I hope that we will move on to substantive issues.

Senator BOXER. Thank you for clearing the record.

Senator Inhofe.

Senator INHOFE. Thank you, Madam Chairman.

If we had had time, I had a lot of responses to make also, but there is not time for that. I will only say that the Strassel article that Senator Barrasso referred to, I want to ask that that be made a part of the record, the entire article.

Senator BOXER. Without objection.

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

Senator INHOFE. And the reason is that it lists several countries that have been a part of the Kyoto Treaty who are now having second thoughts. Some of them are going to withdraw because the science is not there. I think that article is an excellent article.

Now, I have a question for each of the members of the panel. I will make this real quick. It is very obvious that China has said that they are not going to be involved in this thing. They are not going to, in fact, they said in Kyoto they would have to have 1 percent of the GDP of the developed nations to actually be plowed into their economy before they would play with us. That amounts to about $140 billion a year.

China, by the way, is the largest emitter now. We also know that closely behind them, India will not do anything. I am going to quote now the Environmental Minister Ramesh. He said "We will not accept any emission reduction targets, period. This is a non-ne-

gotiable stand." Third, if you go back and you look way back during the Clinton administration, when it was Tom Wigley who was given the responsibility of determining how much would it lower the temperature in 50 years if we had, if all developed nations were to sign onto and live by the Kyoto Treaty, the results came out seven-one hundredths of 1 degree Celsius, which is not even measurable.

Now, with that, the question, I would say, if the United States unilaterally adopts a climate bill, will it make any material change in terms of climate, of temperature? Start with Secretary Chu.

Mr. CHU. Yes, it would.

Senator INHOFE. So you disagree with all of the others who are——

Mr. CHU. I would say right now, China and the United States, yes, you are quite right that China has exceeded the United States in its emission of carbon dioxide, but that is two countries that are roughly half of the carbon dioxide emissions of the world.

Senator INHOFE. OK. I want to get on down there. So you say yes, it would. Administrator Jackson?

Ms. JACKSON. I say yes.

Senator INHOFE. Well, I do not have a choice here. We are out of time. And by material, what? Five percent? Or what percentage do you think? Five degrees? Would you like to quantify anything that would happen if we do not have the developing countries participating in this, if it is just the United States unilaterally.

Ms. JACKSON. Well, maybe I can——

Senator INHOFE. OK, OK, OK. Let me just go ahead and say, this is what we determined during the Warner-Lieberman last year, 13 months ago, and that was the EPA that said this is the difference it would make. Let us keep in mind that the IPCC said they wanted to keep it down below 550 parts per million. This shows by the EPA chart that, with or without the developing nations, it makes, it would be virtually no change.

Do you still agree with this chart? I am sure——

Senator BOXER. Could you direct that to Dr. Chu since he is the scientist?

Senator INHOFE. OK, Dr. Chu, the Chairman wants me to address that at you.

Mr. CHU. No, I do not agree with that chart.

Senator INHOFE. Do you, Administrator Jackson?

Ms. JACKSON. I believe that the essential parts of the chart are that the U.S. action alone will not impact world $CO_2$ levels. But, as we have all said, and as many members of this committee said, the race is on for us to enter into a clean energy future. There is technology in this country that can be used to move markets, not only here, but abroad. And that means jobs for Americans that we are apparently losing.

Senator INHOFE. I appreciate your answer very much.

Thank you, Madam Chairman.

Senator BOXER. Thank you so much. Let us see. Senator Merkley is not here nor Senator Klobuchar. Senator Cardin, you are next.

Senator CARDIN. Thank you, Madam Chair.

Let me just, following up the last questions, if the United States were to act alone, and no other country in the world were to take

action, I personally believe it would be good for our economy, it would create more jobs here in America and keep jobs here in America.

But I must tell you, that is not the issue. The issue is what is going to happen in Copenhagen, and I can tell you, in my conversations with my colleagues and fellow parliamentarians around the world, particularly in Europe, they are looking forward to America's leadership. They believe America's leadership will play a critical role in getting other nations to move and to set the bar high enough so we really can make an impact on global environment.

So, I think that is what we are all trying to do. But, looking at the legislation we are considering, we are trying to improve quality of life here in America, trying to make it easier for people to deal with their everyday needs, make it healthier for Americans and keep jobs and create jobs in our own country.

I want to mention one area which seems to me we are out of step with much of the world, the industrialized world, and that is the way that we transport people in public transportation.

I represent Maryland. I know the stress that WMATA is under. It is the second busiest system in the country. I have seen the stations and see the conditions that need to be improved. I know, historically, we have put a lot of Federal funds into our highway system, which I support. I believe we need that. But public transit has not gotten the same attention in America.

I would just like to get, from Dr. Chu or Ms. Jackson, your view as to the advantages of public transportation from the energy and environment point of view. I know from quality of life, getting people out of these traffic jams is going to be adding to the health styles of America. I know that it adds to productivity if people do not have to spend 2 or 3 hours a day in traffic. But if you could just tell us, from the point of view of energy savings and on the environment, an investment in public transportation, what it would mean.

Ms. JACKSON. I will go first. Transportation, from an environmental perspective, is on average across the country about 20 percent of our greenhouse gas emissions. And that comes from people who primarily commute, oftentimes because they have no choice, by single auto, by single passenger in a car.

So, any opportunities to change that or to revise that issue deal with quality of life but also mean fewer cars of the road which means fewer greenhouse gas emissions. And not only greenhouse gases, but other criteria pollutants as well. $NO_x$ is a big byproduct of automobile emissions.

You asked as well about energy. I will let the Secretary of Energy answer that question. But, clearly part of cracking the-of greenhouse gas emissions and the pollution that comes from greenhouse gases is dealing with the transportation sector.

Mr. CHU. Very simply, I would say that increasing public transportation, use of public transportation, especially in suburban and urban areas, would do a lot in decreasing our oil dependency and decreasing our carbon emissions.

I would also add that using trains for long distance freight would also do a lot. Then using the trucks for the more local distribution. There is an ad that has been running for a couple of months. For

every, I think it is metric ton of freight, it is something like 400 or 700 miles per gallon if you use a train. So, trucks cannot get there.

Senator CARDIN. Thank you. Thank you, Madam Chair.

Senator BOXER. Senators, if you could please try to, before you do a 2-minute leading up to your question, but leave a minute. Otherwise, we are not going to get to everybody.

OK. Senator Alexander.

Senator ALEXANDER. Thank you, Madam Chairman.

Ms. Jackson, David Green from the Oakridge National Laboratory testified before our committee that a low carbon fuel standard was a more effective and efficient way to reduce carbon from fuel than a cap-and-trade system. Would you agree with that?

Ms. JACKSON. I would not say, I will not make a judgment as to whether it is more or less. I think it is an important tool that——

Senator ALEXANDER. So you do not agree with it? I have only got 3 minutes.

Ms. JACKSON. I think it is important. I will not say whether it is more or less important——

Senator ALEXANDER. Well, would you please look into it? Because he testified that it is very inefficient and that a low carbon fuel standard would be more efficient.

Ms. JACKSON. I am happy to look into it.

Senator ALEXANDER. Dr. Chu, do you believe that the 100 or so nuclear power plants that we have operating in America today and the, I guess it is classified ,number of nuclear submarines with reactors that we have operating today, are being operated safely?

Mr. CHU. Yes.

Senator ALEXANDER. Do you agree roughly with the figures that carbon is the principle greenhouse gas that is contributing to global warming?

Mr. CHU. Yes, I do.

Senator ALEXANDER. And would you agree that coal plants contribute about 40 percent of that carbon to——

Mr. CHU. I am not sure of the exact number, but something around that, yes.

Senator ALEXANDER. And that nuclear plants, while only producing 20 percent of the electricity, produce about 70 percent of the carbon-free electricity?

Mr. CHU. I agree with that.

Senator ALEXANDER. Then would it not be true, if we are just looking at the next 20 years while we are figuring out how to lower the cost and improve the reliability of renewable energy, that the fastest way to produce clean, large amounts of clean, reliable, low-cost, clean electricity would be nuclear power?

Mr. CHU. I believe that restarting the nuclear power industry is very important in this overall plan of reducing our carbon emissions in the United States.

Senator ALEXANDER. But is it not true solar and wind and other renewables on which the Administration seems to be absolutely fixated, and which I think are fine and useful, only produce 6 percent of our carbon-free electricity? Nuclear produces 70 percent and, as you said, it is being operated safely here. France is 80 percent nu-

clear. Taxpayers are helping India and China build nuclear plants. The President has said Iran may.

Why do we not have the same level of enthusiasm for nuclear power that we do for wind turbines? I noticed that Ms. Jackson said yes, safer nuclear power. But she did not say yes, more reliable wind or yes, more competitively priced solar power. What is the reluctance here?

Mr. CHU. Well, actually, from me, you are not going to get any reluctance. As you may know, I think that nuclear power is going to be a very important factor in getting us to a low-carbon future.

The Department of Energy is doing, with its tools, everything that it can to help restart the American nuclear industry. With the loan guarantees, we are pushing as hard as we can on that. We are going to be investing, in the future, in bettering the technologies and, quite frankly, we want to recapture the lead in industrial nuclear power and utility nuclear power. We have lost that lead as we have lost the lead in many areas of energy technologies, and we should get it back.

Senator ALEXANDER. Thank you, Madam Chairman.

Senator BOXER. Thank you so much, Senator. That was well done.

Senator Lautenberg.

Senator LAUTENBERG. Thanks, Madam Chairman.

I ask Secretary Chu. You are a Nobel Prize winner in physics. We congratulate you for the ability to earn that kind of recognition. Is it possible that global warming could be a conspiracy to mislead, or could it be a hoax in any way? Or is it really related to human activities?

Mr. CHU. I think one has to understand how science works. The entire reason for doing science, and the feedback of this, is that if a scientist can prove what might be generally accepted as wrong and that scientist, that lone voice is right, that person becomes very famous. So, there is in the intimate structure in science this ability to say, give it your best shot. If this is what is a strong consensus, give it your best shot and prove it to me.

So, what has happened over the last several decades, quite frankly, is there were many, many people who still continue to look very, very hard at the facts, at the analysis, and the whole peer review system is a very strong check and balance against a global hoax.

Senator LAUTENBERG. Thank you. Administrator Jackson, are you aware of the fact that America in 2006 had 250 million vehicles on the road? In 1990, 189 million vehicles were on the road. Sixteen years later, there are 62 million more cars on the road. Could that create air quality problems for us?

Ms. JACKSON. Absolutely, Senator.

Senator LAUTENBERG. I was not sure.

[Laughter.]

Senator LAUTENBERG. I want to ask you this, Ms. Jackson. Are you aware that there are now 26 million Americans, including 9 million children, with asthma? These rates are double what they were in 1980. Does that indicate, is there any indication of poor air quality that would be consistent with that kind of growth?

Ms. JACKSON. I am well aware of it, Senator. I am the mother of a child who has asthma, and we know that air pollution and air quality are directly linked to problems with asthma.

Senator LAUTENBERG. Yes, so my grandson is not unique.

Ms. JACKSON. No, not at all.

Senator LAUTENBERG. Thank you very much, Madam Chairman.

Senator BOXER. Thank you very much, Senator.

Senator Barrasso.

Senator BARRASSO. Thank you very much, Madam Chairman.

Administrator Jackson, I had earlier talked about an article in the Wall Street Journal saying the EPA is silencing a climate skeptic. Well, you know, that is not an isolated case.

I sent you a letter on May 13, 2009, to you as well as to the Director of the Office of Management and Budget, regarding the leaking of a Small Business Administration attorney's name who wrote part of an internal OMB memo highlighting the negative economic and the additional consequences of using the Clean Air Act to regulate climate change.

Once this memo was released to the media, the attorney was smeared as a Bush appointee despite her being hired during the Clinton administration. There is really bipartisan concern about the leaking of that person's name. Even in the House, the Small Business Committee Ranking Member, Nydia Velazquez, stated with regard to leaking that attorney's name that that attorney's ability to serve now in three Administrations, Democrat and well as Republican, speaks to her professional and talent. Her abilities and objectivity should not be questioned.

Well, I have not yet gotten a response back to my May 13, 2009, letter from you. I included information on that in my letter to Senator Whitehouse today calling for an investigation. Do you know when I will receive a response to that letter?

Ms. JACKSON. I do not now, but I am happy to check on it for you, Senator.

Senator BARRASSO. Thank you very much. I would appreciate if you would.

There was an article in the Washington Post yesterday, Deconstructing the Climate Bill, Questions and Answers on the Mammoth House Measure. It said the Climate Bill approved by the House last month started out as an idea, fight global warming, and wound up looking like an unabridged dictionary. And Senator Bond, I think, had the big copy of that unabridged dictionary. It runs to more than 1,400 pages swollen with loopholes and giveaways meant to win over un-green industries and wary legislators. And they go through a number of questions.

It said would this bill stop climate change? Would this bill stop climate change? And there answer is no, it would not.

Do you agree with the Washington Post's assessment that this bill will not stop climate change? Or do you disagree with the Washington Post on this?

Ms. JACKSON. I did happen to see that article, Senator, and I agree with their assessment that this bill is the right start and that it sends a strong signal and that you all, in the Senate, have work to do and I respect the fact that you are starting that work.

Senator BARRASSO. So, your impression is that this bill, as we are looking at it right now, will not impact on climate change?

Ms. JACKSON. Well, we already had a discussion earlier about the fact that what the United States does is important in terms of entering the clean energy race in terms of reducing our dependence on oil that comes from outside of our country and in terms of creating millions of jobs. So, this is a jobs bill, it is an energy bill, and it is also a climate change bill and we will need to work internationally to affect changes on global climate change.

Senator BARRASSO. Thank you, Madam Chairman. I would like to add some written questions, if I may, now that I have run out of time.

Senator BOXER. Surely.

Senator Carper is next.

Senator CARPER. Thanks very much.

Dr. Chu, a number of our Republican colleagues on this committee, and a number of our Republican colleagues in the Senate, are very enthusiastic about nuclear energy. They see there is no end to how much we can accomplish with it. I am a strong advocate of expanding nuclear power as well.

One of the things that I would urge you to do, they are looking for somebody in the Administration who is as excited and interested and passionate about it as they are. When I look at the line up of the people who lead in the Administration, I come to you as somebody who knows more about this stuff, who can really be an advocate and can help us figure what, if anything, we can do in climate change legislation to be supportive of nuclear. I would just ask you to put your thinking cap on and help us to do that if you would, please.

[Mr. Chu's response follows:]

During the hearing you asked me to provide my thoughts about how to incentivize an expansion of nuclear power in the context of the pending energy and climate change legislation. I appreciated your work to organize a bipartisan meeting with you and a number of Senators on August 4th to further discuss this issue. At that meeting, we explored a number of issues, including work force development, incentives for component manufacturers and utilities, and several other ideas. I look forward to continuing to work with you and other interested Senators on this vital issue as the legislative process moves forward.

Senator CARPER. Second, Ms. Jackson, thank you so much for joining us here today. Senator Lautenberg already mentioned this. I am going to come back to it again. In 2007, we passed the CAFE legislation, as you will recall. At the time, it was estimated that we effectively took 60 million cars off the road in terms of the emissions and the reduction in gasoline consumption. Sixty million. When the Administration, a month or two ago, moved ahead by 4 years the effective date of CAFE from 2020 to 2016, that is roughly 36 miles per gallon, we basically doubled the effect of what we had done in 2007.

The last time we raised the CAFE standards before 2007 was about 1975. Without oil, we are going to save a lot of energy and reduce a lot of fuel consumption. But you know? We did not. Because we kept driving more cars, we go further, and we continue to drive more. Given what we have done in 2007 and what the Administration has done to CAFE now, we may end up making no progress if we do not figure out how to get us to drive less.

I would like for you to be helping us as we approach the mark up of this bill. How do we think differently, act differently in the transportation sector to make sure that we do not repeat the mistakes that we made between 1975 and 1985 and, frankly, up to this day.

Last, I want to ask of former Governor Vilsack, Thomas Vilsack. Good to see you, pal. My question to you. In the Waxman-Markey Bill, the agricultural offsets are now being controlled, I am told, and verified by the Department of Agriculture. At least they will be. How will your agency, how will the U.S. Department of Agriculture, adapt to the role of regulator? It is a role I do not think USDA has tried to assume over the years. Take that, if you will.

We have got this situation where the EPA has adopted, or is considering adopting, USDA conservation standards as a way for farmers to show they are meeting air quality requirements. I do not know. Is that true or not? Could a similar partnership work between EPA and USDA, maybe for climate?

Mr. VILSACK. Senator, we already work as partners on a number of environmental issues. I see this as a partnership with all of my fellow colleagues at this table. Obviously, USDA has unique assets in terms of its ability to be in virtually every county in the country. It has technical expertise in this area that it needs to lend and add to discussion. But I certainly see this as a partnership. I think EPA has a set of unique tools as well and we need to figure out how best to use our unique characteristics and assets.

Senator CARPER. Good. Thanks.

Senator BOXER. Thank you, Senator.

Senator Crapo.

Senator CRAPO. Thank you, Madam Chairman.

Because of our limited time, Secretary Chu, I am going to focus all of my questions on you. I want to come back to the question of nuclear power. There are so many other issues that we do want to deal with, but the issue of nuclear power is one that I do think we need to pursue more fully.

First of all, I appreciate your stand on nuclear power and your efforts to work to help us make it an integral part of our national energy policy. As I am looking at some of the efforts to develop a renewable energy standard here, both in the Senate and in the House, one of the things that strikes me is that nuclear power is not allowed to be counted as part of renewable energy base, I think in all of the proposals that are surfacing right now.

Can you see any reason why we would not allow nuclear power to be counted in that process?

Mr. CHU. Well, it is being assisted, as already pointed out by the fact that it is a carbon-free source of energy. Strictly speaking, it is not a renewable energy. So, that is the short answer.

Senator CRAPO. Neither are some of the other things that are counted, but go ahead.

Mr. CHU. But it is being assisted in, when you have a carbon cap and you reduce that cap, it greatly favors nuclear power. We have, we are administering $18.5 billion loan guarantees that we hope will bring four nuclear power plants up. We are looking at ways to help the Nuclear Regulatory Agency speed up. Using our expertise

and our modeling analysis capabilities, I think we can help them speed up the approval process.

So, I think that ultimately the rate setting commissions around the country, these are local jurisdictions, should look toward nuclear power as, you know, is it worth it to invest in this clean source of energy?

Senator CRAPO. But is there any reason why we should not count nuclear power in the base for those calculations?

Mr. CHU. In the base of what?

Senator CRAPO. For a renewable energy standard.

Mr. CHU. Well, it certainly is counted in the base of getting off of carbon——

Senator CRAPO. I understand. Well, let me ask this. With regard to the loan guarantees that you mentioned, which I think are one of the key issues that we should focus on in terms of strengthening nuclear power, do you have a time line for advancing the next round of loans?

Mr. CHU. We are working very hard. I hope, by the end of the summer or early fall, to make announcements.

Senator CRAPO. All right. Thank you. I appreciate that. As you know, that is very critical and I would say that it seems to me that the question Senator Carper asked you is one that, if I had more time, I would ask you right now.

I would hope that you would provide some written answers, perhaps, following this hearing on this, and that is, what can this committee do in an energy bill as we are crafting one to do the best job that we can to facilitate our country's reenergizing of the nuclear energy industry? I know you do not have time in 4 seconds to answer that right now, but if you would give that some thought and give us a written reply, I would appreciate that.

Mr. CHU. I certainly will. I have a couple of requests and they are no problem. I will be glad to do that.

Senator CRAPO. Thank you.

Senator BOXER. Thank you. Here is what we are going to do. We have to go fast now because we have a swearing in on the Senate floor and our good panel has been here forever, so we are going to do Sanders, Bond, Udall, Merkley and we have got to end on time.

Go ahead, Senator Sanders.

Senator SANDERS. Thank you very much.

There has been discussion about nuclear and questions to the panel, what is the reluctance? Well, I have a reluctance. You know why? Nuclear waste is highly toxic. We do not know how to get rid of it. The folks in Nevada, Yucca Mountain, have said they do not want it. Maybe the people in Wyoming want it. Maybe the people in Missouri want it, and we will send it there. But right now, to the best of my knowledge, no State in the Union wants this highly toxic waste.

Now, in terms of loan guarantees, Secretary Chu. I am going to ask Ken Salazar a question in a moment. But are you providing loan guarantees to solar thermal plants?

Mr. CHU. Pardon?

Senator SANDERS. Solar thermal plants in the Southwest.

Mr. CHU. We are certainly reviewing the applications at present. We have not provided a loan guarantee yet.

Senator SANDERS. My understanding is there are over a dozen plants on the drawing board ready to go. And if we are talking about putting money into nuclear energy, we do not know how to get rid of that waste, I would hope very much that we are prepared to entertain projects which are based on solar thermal.

Let go right to Secretary Salazar. You mentioned a moment ago, in your testimony, which I strongly agree with, I think you said that we have the potential to produce something like 28 percent of the electricity in this country from solar thermal. Is that what you said?

Mr. SALAZAR. Twenty-nine percent.

Senator SANDERS. Could you elaborate? I think that is an extraordinary statement. I agree with you. How are we proceeding, and when are we going to see the creation of solar thermal plants?

Mr. SALAZAR. The renewable energy revolution, I think, is something that we have begun with some help from this Congress but under President Obama's leadership, opening up this new great opportunity for all of us. Just to give you an example, Senator Sanders, in Nevada, just 10 days or so ago, we announced moving forward with renewable energy applications for solar which we expect we will have some 14 solar power plants that will be under construction by the end of next year, 2010. Those projects alone will create some 50,000 jobs here in the United States of America.

Senator SANDERS. It is extraordinary.

Mr. SALAZAR. And that is just the beginning of this effort——

Senator SANDERS. That is extraordinary. And thank you very much for your leadership on this.

I wanted to ask Secretary Vilsack a question. In Europe right now, there is a huge growth in use of wood pellets. In my State, we have over 35 of our schools heating with wood. Middlebury College switches from oil to wood and saves huge sums of money. What do you see is the potential in terms of biomass as an important part of the energy revolution?

Mr. VILSACK. Senator, it is a very significant part of it and it is recognized by the energy title of the farm bill that was passed in 2008 that created opportunities for the USDA to provide grant money to encourage woody biomass opportunities, as well as the Recovery Reinvestment Act also provided additional resources. Those moneys are being put to use in a number of projects. So there is a significant potential.

The whole point of this is to diversify and to have as many options in terms of energy production that occur in the United States, and certainly woody biomass is a key component.

Senator SANDERS. And the potential there is also to create a whole lot of jobs in the woods as well?

Mr. VILSACK. No doubt about it. And these are jobs that will most likely be in rural communities which helps significantly revitalize the rural economy.

Senator SANDERS. Thank you very much.

Senator BOXER. Thank you.

Senator Bond.

Senator BOND. Thank you very much, Madam Chair.

We are looking forward, Dr. Chu, to having a real effort to reprocess the nuclear waste that we already have as France has so

successfully shown that we can get rid of that waste using what we already have.

I would direct a couple of questions to my former neighbor, Secretary Vilsack, about farmers.

The strong signal that this bill seems to be sending to farmers in my State is that they are going to face higher costs for farm equipment, fuel, fertilizers, drying costs, transporting, inputs in and goods to the market. Do you have any information to show that farmers will not be heavily impacted by this particular, or this Waxman-Markey Bill, or whatever we come up with here?

Mr. VILSACK. Senator, we are in the process of completing a review of the economic analysis. But I would say two things. First, there is no question that innovation is going to make a significant difference in terms of costs. Speaking recently to a seed company executive, he told me that he believed it possible to increase productivity in our part of the world by as much as 100 bushels to the acre and still reduce input costs by one-third. So that has to be factored into it.

Second, there is no question in my mind that if the offset program is administered properly and fairly with credible and verifiable offsets that, at the end of the day, farmers and ranchers will benefit from this.

Senator BOND. How are farmers going to get benefits from the offsets? I mean——

Mr. VILSACK. Well, they will be able, through the use of land, through cover crops, through altering how they use fertilizer, to how they raise livestock, to what they do with their land, there are a series of steps that can be taken and will be taken that will generate opportunities for offsets.

Senator BOND. Well, I look forward to working with you. As we have discussed before, there are tremendous opportunities. We have got new technology that will lower the cost of enzymes with a genetically modified soy bean to move forward cellulosic ethanol from wood. But these do not affect the basic farm costs because you have still got to dry, you have still got to transport, you have still got to buy. If we drive natural gas through the roof, as many of these plans would, we are going to see the end factor going up.

You mentioned, for example, in your testimony, that manure digesters would be a great thing. Now, sure, if we can reuse it. But in California they are costing between $2 million and $3 million. How do you make that pencil out for a farmer?

Mr. VILSACK. Senator, there is tremendous innovation opportunity in terms of livestock feed that actually will, potentially, reduce those gases. That is also an offset opportunity. There is also no question that when you create biorefineries and regional opportunities to use the waste product of agricultural production for fuel, you have created less transportation costs and you have created yet another income source.

I think we are just on the cusp of a revitalized rural America and I am very confident with the Broadband money, with the climate change, with energy policy that you are going to see a significant increase in economic opportunity in rural America.

Senator BOND. Thank you very much, Secretary.

Senator BOXER. New plan in order to make sure that Governor Barbour can do his role. In the next panel we have Rich Wells, Dow, David Hawkins, NRDC, Mayor Fetterman from Braddock, Pennsylvania, and Hon. Haley Barbour. Haley Barbour has a tough schedule. Happily, Jeff Merkley, our hero of the day, is going to come back here at 12:45 with Senator Inhofe, because Senator Inhofe wants to be here for that, and any other members that can be here to just hear from the Governor. Then I will come back at 2 p.m. and hear from the three other panelists. So, with that, we have got to continue to move quickly.

Senator Udall, you are on.

Senator UDALL. Thank you, Madam Chair.

Secretary Salazar, great to have you back. As you know, Western States face immediate impacts from climate change according to the report on climate change impacts. That report found that human induced climate change appears to be well underway in the Southwest. Recent warming is among the most rapid in the Nation. This is driving declines in spring snow pack and Colorado River flow. This report found that the Colorado Compact was based on unrealistic assumptions when it allocated the water in the river among the seven basin States, which include California, Nevada and California.

According to climate scientists, if we fail to reduce global warming, vast areas of the United States will likely face severe water shortages. How would you describe the specific costs and benefits of action and inaction to the average Western farmer and rancher or residence of Western cities like Denver and Albuquerque, particularly as it relates to water resources?

Mr. SALAZAR. Thank you very much, Senator Udall. I think for all of us from the West and dry arid places, we know that water really is the lifeblood of those communities. We see what has happened with drought in New Mexico and now in California and in many other States. That is why most water managers, including farmers and ranchers, are very concerned about what is happening with climate change in terms of the changing precipitation patterns that we see in the Southwest.

What is happening is that the snow packs are melting a lot sooner than they used to, which then impacts the capacity of storage that was built under other assumptions, in some cases over 100 years ago. So it is an area of major concern among water users, farmers, ranchers, municipalities, industrial users of water from California to Arizona to New Mexico and Colorado. So we are going to continue to see more of a concern with respect to those precipitation pattern changes.

Senator UDALL. Thank you. And Secretary Vilsack, you have a few seconds here to also comment, I think, on that with respect to the forests and water supply and watersheds.

Mr. VILSACK. Well, first of all, Senator, the cost of inaction, I think, is unacceptable. I can tell you from my visit recently to Colorado that there are significant economic consequences to the forest problems that are being experienced as a result of invasive species and the beetle.

Second, that is one of the reasons why I think, as you discuss this and why the House discussed this, that they focused on the

fact that forests, private land forests, State forests, and, I also believe the U.S. Forest Service, has an opportunity to participate in a meaningful way in terms of adaptation and also mitigation. And I think that needs to be factored into your deliberations and considerations.

Senator UDALL. Thank you very much. Thanks, Madam Chair.

Senator BOXER. Thank you.

Senator Merkley.

Senator MERKLEY. Thank you very much, Madam Chair.

I want to address this to Secretary Salazar and possibly Secretary Vilsack. Oregon has a tremendous amount, millions of acres, of second growth forest that is overgrown. It is a disaster in terms of carbon dioxide because those forests are prone to burn down. They are bad for disease. They are not growing in a fashion that is most productive for either timber or for good ecosystems. Thinning strategies and healthy forest management strategies can address that. One possibility is that, by changing those practices on those lands, we have a significant impact on carbon dioxide. But since you do not have a private partner, it is not clear how the offsets would work if purchased from the Forest Service, if you will.

The communities greatly need revenues in order to conduct forest thinning programs, and the communities need revenues to offset the lock-up of these lands. This goes back to basically the Secure Rural Schools challenge that we have had.

So there is a real potential win-win, and I just wanted to ask if you have thought about that issue, about how changing practices on public forest land could benefit this issue and how we could direct revenues to assist the health of our forests and our communities?

Mr. SALAZAR. Senator Merkley, the answer is yes, we have thought about it. I think there are two different things that can be done. One is utilizing some of the biomass that is coming off of our forests. Within just the Department of the Interior alone, we oversee about 500 million acres, so that is a huge amount of land that is out there and there is a tremendous fuel there that could be converted over to biomass fuel in a renewable energy world.

Second, as we look at legislation that deals with energy and climate change, one of the things that should be on the table for consideration is the whole sense of offsets that would include private lands for agriculture, as Secretary Vilsack has spoken. We also might want to take a look at that with respect to some of the public lands, including those in Oregon.

Mr. VILSACK. Senator, if I can add, the U.S. Forest Service is in the process of putting together a new strategic vision for the Forest Service which is focused on managing and operating the forests with a climate change and water direction. We think that if we do this, we will manage and maintain the forest more properly. We will provide better maintenance. We will provide greater opportunities, economic opportunities, both in terms of timer and also in terms of recreation. So, you can be assured that we are taking this into very serious consideration in terms of the strategic vision and direction for the Forest Service.

Senator MERKLEY. Thank you both of your comments. I really look forward to working with both of you on this because currently

we have viewed our forests as a source of dimensional lumber. But we can view them, as you have made note, as a source of biomass that can be utilized in biofuels or used cogeneration and produce jobs in energy.

But there is also the chance of changing those practices and viewing our public forests as an opportunity for offsets or sequestration and that also could be a source of revenue. So we might get a triple view of our forests and I think that is very appropriate in the type of review that you are all talking about. It would be tremendous for the health of our forests, certainly for our ecosystems, for the impact on carbon dioxide in the air and the strength of our forest communities. So, thank you very much for your interest and pursuit of these issues.

Senator BOXER. Senator, thank you so much.

I want to say to this panel, thank you so much for working with us on this. This is the challenge of our generation. We are all going to work together.

So, just to reconfirm, Governor Haley Barbour will be a witness at 12:45 p.m. and Jeff Merkley will chair that. And then we will come back at 2 p.m. for the rest of the panel. Thank you again.

We stand adjourned.

[Recess.]

Senator MERKLEY [presiding]. We will open and we will drive right into business.

We are resuming testimony, and we are fortunate to have the Governor of the State of Mississippi with us, Hon. Haley Barbour. We will be taking his testimony, and then I believe that there are a few questions that the Senators may have.

So, welcome. It is good to have you joining us today.

Mr. BARBOUR. Thank you very much, Senator.

[Remarks off microphone.]

Senator MERKLEY. I think that is an excellent idea.

Mr. BARBOUR. This is my bride of 37 years, Marsha, and our younger son, Reeves, who lives up here. So, thank you for that courtesy, Senator Merkley.

## STATEMENT OF HON. HALEY BARBOUR, GOVERNOR, STATE OF MISSISSIPPI

Mr. BARBOUR. Thank you for inviting me to testify before you on the critical issue of the energy policy in America's future. America's future is so tied to our energy policy that this hearing could be held before the Senator Arms Services, Foreign Relations, Finance, Energy or Budget Committees and be equally important and relevant to their work.

Energy policy significantly impacts every aspect of American foreign and domestic policy. Energy is the lifeblood of our economy. Our national security depends on it. So, when we think about energy policy, it must be in the broadest context.

As we all know, our country is in the worst economic crisis in decades. It has been felt at the kitchen table of every family. Unemployment is at its highest rate since 1983, and the average work week has fallen to 33 hours. Our Government is vastly increasing our national debt to get our economy back on track, even though everybody knows that national debt is increasing at an

unsustainable rate. We are taking the risk because robust economic growth is the only way to solve our economic problems.

Yet, as we strive and stretch to get our economy back growing and more Americans back on the job, our Government is considering an energy policy, as set up in the Waxman-Markey Bill and the President's budget, that would make it much harder for the economy to grow. A policy that is, in fact, anti-growth because it will necessarily and purposefully raise the costs of energy for families and businesses, especially manufacturing, but for our economy as a whole.

The cap-and-trade tax, the $81 billion of tax increases on the oil and gas industry contained in the President's budget and the Waxman-Markey renewable energy standard would all drive up costs and drive down economic growth.

Do not take my word for it. President Obama, then a candidate, said to the San Francisco Chronicle in January 2008, Under my cap-and-trade plan, electricity rates would necessarily skyrocket. And before becoming Energy Secretary, Steven Chu told the Wall Street Journal, Somehow we have to figure out how to boost the price of gasoline to levels in Europe.

President Obama's OMB Director, Peter Orszag, in April of last year said under a cap-and-trade program firms would not ultimately bear most of the costs of the allowances, but instead would pass them along to their customers in the form of higher prices. Such price increases would stem from the restriction on emissions and would occur regardless of whether the Government sold emission allowances or gave them away.

Indeed, the price increases would be essential to the success of a cap-and-trade program because they would be the most important mechanism through which businesses and households would be encouraged to make investments and behavioral changes that reduce $CO_2$ emissions.

Just last month in an interview with Forbes Magazine, the CEO of American Electric Power, one of our biggest utilities, Mike Morris, said the cap-and-trade tax would cause AEP's electricity rates to go up 30 to 50 percent.

The gigantic effect of the energy policy on American life means Congress should work particularly hard to ensure that Americans know the facts about the energy policies that you are considering. On the contrary, the House of Representatives added more than 300 pages of its 1,200-page energy bill just a few hours before it was brought to the floor and passed. That is just the opposite of what is needed.

Last month, the Southern Growth Policy Board, a 40-year-old regional economic development group for 13 Southern States, held its annual conference. More than 400 attendees were most concerned about the costs associated with the cap-and-trade tax, the renewable energy mandate, and the $81 billion in tax increases on the oil and gas industry. They were concerned about the costs to families as well as to our economy.

At this conference, there was a great deal of support for conservation and energy efficiency, both of which are indispensable to our energy future. And there was a lot of hope and confidence ex-

pressed about renewables like wind, biofuels, solar and even more exotic sources in the future.

Nevertheless, it was agreed that for a long time there will be a need for traditional fuels like oil, gas and coal, and for nuclear, which generates no greenhouse gas emissions. Clean coal technologies and projects were presented and praised. But the biggest and most discussed issue at this conference was the cost of energy policy proposals like the cap-and-trade tax, the renewable electricity standard and the tax increases proposed for the oil and gas industry.

I should note that there were five Governors who participated in this conference, including three Democrats. There was little dissent about who would bear the cost of this energy policy. The consumer. The one who turns on the light switch, starts the washing machine, fuels up the car with gas, or drives the truck delivering goods across town or across the country. That is who will pay.

Moreover, these increased energy costs hit small businesses hard and will particularly hit energy-intensive industries, like manufacturing or even computer processing. Some manufacturers even predict that these energy policies will cause electricity rate increases that would make their manufacturing facilities uncompetitive to facilities in China and India.

Dan DiMicco, the CEO of Nucor Steel, America's largest steel manufacturer, said the cap-and-trade tax would mean his company would close U.S. plants, shifting production to China. I thought he made a very powerful point when he said making a ton of steel in China results in five times greater emissions of greenhouse gases than to produce that same ton of steel in the United States.

It is hard to believe at a time when growing our economy is our No. 1 goal that Congress is considering a bill that would reduce economic growth. When families are suffering from a serious recession, Congress is considering a bill to drive up the costs of the electricity that cools those families' homes and the gasoline that runs their cars. When U.S. manufacturing faces stiff foreign competition, Congress is considering a bill that will make our manufacturers less competitive.

The concerns I have cited are serious, even if cap-and-trade works as planned. Many Americans worry that it will turn out to be an Enron-style financial scheme where Wall Street manipulators make huge profits while rate payers, motorists and Main Street businesses pay greatly increased costs.

Environmentalists widely worry about the assumed large scale use of international offsets that are not verifiable. Others say that the foreign offsets are planned by CBO to reduce the price of allowances by 70 percent. But that is highly questionable.

To me, a particularly scary feature of the cap-and-trade tax regime is that anyone can purchase emissions permits or credits. There is nothing to stop a large government like China from investing heavily in $CO_2$ emission permits instead of U.S. Treasuries. The effect, of course, would be that U.S.-located industries could not buy those permits or they would have to pay a much higher price for the permits, thereby making our businesses even less competitive with foreign—read: Chinese—manufacturers. Market ma-

nipulation by speculators is bad enough. Driving up demand and prices by foreign companies is anathema.

The right energy policy for our country is more American energy, using all sources of American energy, all of the above. We have abundant, affordable, reliable American energy. Let us use it rather than having a policy that means less affordable American energy.

Senator, I apologize that I ran over, but I do have an accent.

[Laughter.]

[The prepared statement of Mr. Barbour follows:]

Statement of Governor Haley Barbour
State of Mississippi

Before the
Committee on Environment and Public Works
United States Senate

July 7, 2009

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Madam Chairman, Senator Inhofe and committee members: Thank you for inviting me to testify before you on the critical issues of energy policy and America's future.

America's future is so tied to our energy policy that this hearing could be held before the Senate Armed Services, Foreign Relations, Finance, Energy or Budget Committee and be equally important and relevant to their work.

Energy policy significantly impacts every aspect of American foreign and domestic policy. Energy is the lifeblood of our economy; our national security depends on it. When we consider energy policy, it must be in the broadest context.

As we all know, our country is in the worst economic crisis in decades. It is being felt at the kitchen table of every family, as unemployment is at the highest rate since 1983. Our government is vastly increasing our national debt to get our economy "back on track." Even though everyone knows the national debt is increasing at an unsustainable rate, we are taking the risk because robust economic growth is the only way to solve our economic problems.

Yet, as we strive and stretch to get our economy back growing and more Americans back on the job, our government is considering an energy policy, as set up in the Waxman-Markey bill and the President's budget, that would make it much harder for the economy to grow; a policy that is, in fact, anti-growth because it will necessarily and purposefully raise the costs of energy for families and businesses, especially manufacturing . . . for our economy as a whole.

The cap and trade tax, the $81 billion of tax increases on the oil and gas industry contained in the President's budget and the Waxman-Markey renewable energy standard would all drive up costs and drive down economic growth.

Don't take my word for it. President Obama, then a candidate, said to the San Francisco Chronicle in January 2008, "Under my cap and trade plan, electricity rates would necessarily skyrocket."

And before becoming Energy Secretary, Steven Chu told the Wall Street Journal in September 2008, "Somehow we have to figure out how to boost the price of gasoline to the levels in Europe."

President Obama's OMB Director, Peter Orszag, in April 2008 said, "Under a cap-and-trade program, firms would not ultimately bear most of the costs of the allowances but instead would pass them along to their customers in the form of higher prices. Such price increases would stem from the restriction on emissions and would occur regardless of whether the government sold emission allowances or gave them away. Indeed, the price increases would be essential to the success of a cap-and-trade program because they would be the most important mechanism through which businesses and households would be encouraged to make investments and behavioral changes that reduced CO2 emissions."

Just last month in an interview with *Forbes* magazine, the CEO of American Electric Power (AEP), Mike Morris, said the cap and trade tax would cause his electricity rates to go up 30% to 50%.

The gigantic effect of energy policy on American life means Congress should work particularly hard to ensure Americans know the facts about the policies Congress is considering: To the contrary, the House of Representatives added more than 300 pages of its 1200 page energy bill a few hours before it was brought to the floor and passed. That is just the opposite of what is needed.

Last month the Southern Growth Policies Board, a forty-year old regional economic development group for thirteen states, held its annual conference. The more than four hundred attendees were most concerned about the costs associated with the cap and trade tax, the renewable energy mandate and the $81 billion in tax increases on the oil and gas industry. They were concerned about the costs to families as well as the costs to the economy.

At this conference there was a great deal of support for conservation and energy efficiency – both indispensable measures in our energy future – and a lot of hope and confidence was expressed for renewables like wind, biofuels, solar and even some more exotic sources in the future.

Nevertheless, it was agreed that for a long time there will be a need for traditional fuels like oil, gas, coal and nuclear, which generates no greenhouse gas emissions. Clean coal technologies and projects were presented and praised.

But the biggest and most discussed issue at this conference was the cost of energy policy proposals like the cap and trade tax, the renewable electricity standard and the tax increases proposed for the oil and gas industry.

There was no question about who would bear these costs: the consumer. The one who turns on the light switch, starts the washing machine, fuels up the car with gas or drives the truck delivering goods across town or across the country; that is who will pay.

Moreover, these increased energy costs will hit small businesses hard and will particularly hurt energy-intensive industries like manufacturing or computer processing. Some manufacturers even predicted these energy policies would cause electricity rate increases that would make their U. S. manufacturing facilities uncompetitive compared to facilities in China, India, Brazil or Russia.

Dan DiMicco, the CEO of Nucor Steel, America's largest steel manufacturer, said the cap and trade tax would mean his company would close U. S. plants, shifting production to China. Making a ton of steel in China results in five-times greater emissions of greenhouse gases than to produce that same ton of steel in the U.S.

It is hard to believe that at a time when growing our economy is our number one priority, Congress is considering a bill that would reduce economic growth. When families are suffering because of a serious recession, Congress is considering a bill to drive up the cost of the electricity that cools those families' homes and the gasoline that runs their cars. As U. S. manufacturing faces stiff foreign competition, Congress is considering a bill that would make our manufacturers less competitive.

The concerns I've cited are serious, even if the cap and trade tax works as planned. But many Americans worry it will be an Enron-style financial scheme where Wall Street manipulators make giant profits while ratepayers, motorists and Main Street businesses pay greatly increased costs.

Environmentalists rightly worry about the assumed large scale use of international offsets, saying they are not verifiable. Others say the foreign offsets are claimed by CBO to reduce the price of allowances by 70%, but that's highly questionable.

A particularly scary feature of the cap and trade tax regime is that anyone can purchase emissions permits. There is nothing to stop a large government like China from investing heavily in CO2 emission permits instead of U. S. Treasuries. The effect, of course, would be that U. S.-located industries could not buy those permits or that they would have to pay much higher prices for the permits, thereby making our businesses even more uncompetitive with foreign (read: Chinese) manufacturers. Market manipulation by speculators is bad enough; driving up demand and prices by foreign competitors is anathema.

The right energy policy for our country is more American energy, using all sources of American energy . . . all of the above. We have abundant, affordable, reliable American energy. Let's use it rather than having a policy that makes energy more expensive.

I'd be glad to discuss more American energy during questions or to try to answer any other questions.

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

HALEY BARBOUR
GOVERNOR

August 3, 2009

The Honorable Barbara Boxer
United States Senate
Committee on Environment and Public Works, Chairman
410 Dirksen Senate Office Building
Washington, DC 20510

The Honorable James M. Inhofe
United States Senate
Committee on Environment and Public Works, Ranking Member
410 Dirksen Senate Office Building
Washington, DC 20510

Dear Chairman Boxer and Senator Inhofe:

Thank you again for the opportunity to appear before your committee on July 7, to testify on the important topic of energy policy. I am responding to Senator Carper's question attached to your July 27, 2009, letter. He wrote:

*If you don't support a free market approach to addressing climate change – does that mean you support EPA identifying the technology Mississippi companies must use to get the needed greenhouse gas reductions? The reason I ask this question is because if Congress does nothing – we are faced with EPA actions that will be much more stringent, much more costly, and much less flexible.*

I'll start by stating I do believe Congress should do something to address energy policy because our nation has lacked coherent energy policy for much too long. This was evidenced by the priee spikes last summer and is apparent by our excessive, and increasing, dependence on imported oil. But in considering energy policy, as I testified to your committee, it must be in the broadest context and must encourage affordable, reliable, abundant, American energy from all sources and promote continued improvement in energy efficiency and conservation. I strongly believe Congress should avoid taking action that further restricts energy options, purposefully raises the price of energy, and hurts the economy and our competitiveness, as the Waxman-Markey bill does by establishing a cap and trade tax and renewable electricity mandates.

A free market approach to address energy security and climate change is exactly what I support. The methods prescribed in Waxman-Markey are absolutely not a free market. The legislation is designed to give some companies more credits than they need while others will not receive enough, thereby

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forcing those companies to buy allowances and pass the costs to their consumers. Some companies will win and their profits will trickle up to their shareholders; other companies will lose and their costs will trickle down to consumers. The federal government's picking of those winners and losers is not a free market.

On top of the government's choosing who gets free allowances and who has to buy them from companies who don't need them (again, paid for by consumers), Waxman-Markey dictates how electricity generators must supply a portion of their electricity under the Renewable Electricity Standard, or pay a penalty. The legislation explicitly lists what can be considered renewable generation, without regard for whether another form of generation can provide a lower cost and better results with far less life-cycle greenhouse gas emissions. This is contrary to both free market principles and the goal of reducing greenhouse gas emissions because it imposes lawmakers' judgment of what the most effective source of electricity is instead of the market's judgment. For example, one-fourth of the electricity produced in Mississippi comes from nuclear generation, which has no greenhouse gas emissions. If, as in Waxman-Markey, nuclear is not allowed to qualify under a renewable electricity mandate, Mississippi ratepayers will be forced to buy electricity produced in other states by sources the legislation designates, or pay a penalty. Either way, household and business utility bills will increase.

As I testified, since anyone anywhere will be allowed to buy and sell credits, it is disturbing to wonder how Wall Street speculation may drive up energy costs even higher under the Waxman-Markey cap and trade tax regime. Additionally, nothing in the legislation prevents a large government, like China, from investing in $CO_2$ emissions permits instead of U.S. Treasuries. As China amasses credits, U.S. employers would have to pay much higher prices for the permits, thus making our businesses uncompetitive with foreign manufacturers. As U.S. manufacturing and jobs are exported or are lost to overseas competition, global greenhouse gas emissions actually will increase because developing countries like China and India lack the environmental controls of the U.S.

Regarding the concern of EPA promulgating a rule regulating greenhouse gases under the Clean Air Act, Congress is responsible for overseeing federal regulations issued by government agencies under the Congressional Review Act. Congress is responsible for insuring that EPA, or any federal agency, does not disadvantage our country with unreasonable, excessively expensive and ultimately ineffectual regulations. As EPA Administrator Lisa Jackson stated at the July 7 hearing, "U.S. action alone will not impact world $CO_2$ levels." It would be irresponsible for the Congress to allow EPA, by executive fiat, to regulate the energy sector in order to drive up costs of more carbon intensive sources of energy when doing so, by EPA's own admission, would have no effect on global $CO_2$ levels or climate change. Preventing such executive agency action is exactly why the Congressional Review Act exists.

There is a better approach than Waxman-Markey or EPA regulation. It is one that has worked in the past for Americans and one that rewards rather than punishes. We should encourage through positive incentives rather than burdensome, onerous government mandates and regulations. We should support tax incentives to encourage domestic production of energy that emits less carbon; government and private investment in advanced research; streamlining the arcane permitting process that discourages

and punishes those who want a cleaner environment with nuclear generation; and encouraging an enhanced electric grid system that can be constructed more quickly if the government will streamline permitting. This can be achieved while we protect our economy and while preserving our air and water.

Our country is blessed with natural resources, and we must strive to harness them while we also ensure our environment's sustainability. We have an abundance of energy sources that we know are clean – natural gas, wind, hydro, solar, and biomass. We must ensure these resources are developed. We are finding huge deposits of natural gas and oil in Alaska, the Gulf and in the West. Congress should encourage the exploration and production of American reserves, not wall them off. We also have an abundance of coal, and nothing could help us ensure our domestic energy security faster than new breakthroughs in clean coal technologies.

A policy based on more American energy will mean our families and, critically, our economy will benefit from all the available energy sources our tremendously blessed country has to offer, and jobs that come with them: more oil and gas; more nuclear power; cleaner coal-generated electricity; and wind, biomass, hydro and solar to the maximum degree they can contribute. And that will increase over time. Conservation and efficiency also can and must play a larger role in our energy equation. There are much better ways to reduce emissions and transition to clean energy than to burden American families and businesses with enormous costs like Waxman-Markey would.

Sincerely,

Haley Barbour

Senator MERKLEY. Thank you very much, Governor. We appreciated that accent in your thoughtful delivery.

I was wondering if you could take us back to the memo in 2001 which you wrote to Cheney urging the Bush administration to reverse course and reject regulating carbon dioxide as a pollutant. Less than 2 weeks, I believe, after you wrote this memo, news stories reported that under strong pressure from conservative Republican industry groups, President Bush reversed a campaign pledge today and said his Administration will not seek to regulate power plants' emission of carbon dioxide.

Could you bring us up to date a little bit about the role that you played, and who you represented in asking the Bush administration to reverse policy on his campaign promise?

Mr. BARBOUR. Sure. My firm and I represented a number of people in the American business community, utilities, oil and gas companies, manufacturers, various types of industries from Microsoft on the one hand to Southern Company on the other hand. The memo, I think, was more about new source review, if it is the memo that got published in the New York Times, and things like that. I believe that memo was about new source review.

But if it was a separate memo about carbon dioxide, the position that the Bush administration ultimately came out in favor of was that, at the time, there was insufficient evidence that carbon dioxide was a pollutant according to the standards set in the law at the time. That is a position that I agreed with. It would nice as a former lobbyist for me to take credit that the Administration did it because I asked them to, but I think that I was one of many, many, many people in the United States that did not believe it met the standard and that was the purpose of the memo, to say that.

Senator MERKLEY. Governor, this was the memo, not about new sources, but about carbon dioxide, in which you noted that controlling carbon dioxide is eco-extremism. Do you feel any efforts to control carbon dioxide going into the atmosphere, that there is no legitimate partnership between what is good for the environment and what can be good for our economy?

Mr. BARBOUR. The reason I am here, the reason we held the conference on the coast, is on how best to deal with climate change, and whatever role carbon dioxide plays in it. I am not a scientist. But I accept, for our purposes of going forward here, the idea that it would be good for the climate if we reduced emissions.

One of the concerns I have, Senator, is that this legislation would affect $CO_2$ emissions so little, because it has no effect on China, who has passed us as the biggest emitter and is building about five coal-fired power plants a day, I mean a week. As Dan DiMicco, the CEO of Nucor Steel, said, the way the Chinese coal-fired plants work, it emits five times more $CO_2$ to make a ton of steel in China because of the way their coal-fired plants work than it does to generate a ton of steel in the United States.

But the direct answer to your questions is, the reason I am here is that we do need to look at how best, in the best interests of the United States, and most effectively, to deal with the threat that scientists are saying $CO_2$ has for the future of the climate.

Senator MERKLEY. That is why we are here. Well, Governor, I appreciate that and there are several points that you make that I

think I would agree with completely. Certainly, that carbon dioxide is an issue for our atmosphere. I think all of us who look into the next generation need to wrestle with that and exercise the use of our legislative responsibilities to address it. Your note about China, certainly China is a serious source of carbon dioxide, far more per capita than is the United States. But we need to be a part of the international conversation. We need to pull China into that, certainly. That is a point well taken.

I will turn to our minority leader, our Republican leader of the committee, Senator Inhofe.

Senator INHOFE. Thank you, Mr. Chairman. And thank you, Governor, for being here and I am sorry for the all mix up in the scheduling.

Let me just share with you, first of all, on the science. And we are going to go back to talking about that because the last three times we had this bill on the floor, I was the one who led the opposition. One reason was that I was the Chairman of the Environment, the Works Committee, this very committee, when we were a majority.

One of the things that we are seeing is that people realize that the science is mixed. And the louder they say the science is settled, the greater, to me, it seems that they have nothing else to say. Because right now, if you look at the changes that are taking place, Senator Barrasso entered something on the record this morning. It is an article that was reprinted in the Wall Street Journal and it listed five countries where they are changing their position now because they realize that the $CO_2$ is not the villain that they thought it was.

The public perception has totally changed. Right now the polling shows that when you talk about the top 20 concerns, sometimes it makes number 20, sometimes it does not make it at all. And it used to be 2 or 3. So, clearly, it is a wake up call.

I have to share with you my two greatest frustrations. My two greatest frustrations are that when you look, you see people talking about lowering our dependence on foreign countries for our ability to run this machine called America. And yet those same individuals will not let us drill offshore, will not let us get into the tar sands, will not let us get into nuclear, will not let us work on our marginal wells that we have in both of our States, and really do not want to increase the domestic supply.

We are the only country in the world that does export our own domestic supplies. And yet, they still say that they want to reduce our dependence. And we could do it overnight, as I said and documented in my opening statement today, if we were to open things up.

The second thing is, as you alluded to, and I am so happy this morning that the Administrator of the EPA came out and agreed with me when I was making my case, is that if we were to pass this bill, the one that passed the House, unilaterally, that would cause our manufacturing base to leave. We know that, that is a fact. It would go to countries, as you pointed out, China, that have no emission requirements, restrictions. It would have a net increase in $CO_2$.

So, if you are one of those who believe that $CO_2$ is causing all of these problems, you ought to be opposed to this because unilaterally it will not work. As the Administrator said this morning, she said I believe essential parts of the chart, and that is the chart that I use, are that the United States action alone will not impact $CO_2$ levels. And this morning I quoted the top leaders of both India and China saying that under no circumstances were they going to have any reductions.

That is not my question. That is my statement. Do you agree? That is my question.

Mr. BARBOUR. Yes sir, I do. I will say I was surprised to hear the Administrator of EPA say that this morning. That it would not have any effect. But also I was interested in EPA's report on this bill back when it was traveling through the House, made the point that it would not have any effect on importation on foreign oil. Their report says it essentially has no effect on petroleum. And I am like you. We need to wean ourselves off of foreign oil, at least the excessive reliance we have, and this will not do it. According to EPA, this will not do it. But we do have a lot of production capacity that we are not taking advantage of and we ought to be producing.

I was also glad to hear the Secretary of Energy talk about more nuclear. You know, that emits no greenhouse gases. To have more nuclear and get ourselves off foreign oil and gas ought to be a big goal of what we are doing.

But we need to try to do it in a way that does not have huge costs for families, and does not do grave damage to our economy when at the same time we are stretching so hard to do everything we can do to get our economy back strong and people back working.

Senator INHOFE. You have problems in Mississippi, I know, you have a lot of low income people, and they are the ones who are hit the hardest by this. So, you did a great job in trying to preclude something like this from happening.

Senator MERKLEY. Senator Barrasso.

Senator BARRASSO. Thank you, Mr. Chairman.

Governor, it is great to see you. Thank you for being with us today.

Mr. BARBOUR. Thank you, Senator.

Senator BARRASSO. Just following up on what Senator Inhofe said. What could the impacts of this be on the families in Mississippi? I know how detrimental they are going to be to families all across the State of Wyoming.

Mr. BARBOUR. Senator, there have been a number of studies on this, and from the Brookings Institution, whose study says it will cost 600,000 to 700,000 jobs a year, to the National Black Chamber of Commerce study which says it will cost 2.25 million to 3 million jobs per year, every study that has looked at that question says it will cost jobs. That yes, there will be some green jobs created, but they will be more, far more, outnumbered by the lost jobs.

The House bill has got something I did not know Congress did. It has got a huge unemployment section in it for the people who lose their jobs because of this bill. And it is very generous: 3 years of unemployment, and the Government pays 80 percent of your health insurance when this costs you your job. So to talk about this

as a jobs bill and then have huge unemployment and benefits in it is to me a little bit disconcerting.

We do, in our State, we try very hard to do all of the above. We are trying to build a new nuclear power plant. No greenhouse gas emissions. The first commercial scale carbon capture sequestration project in the United States is in Kemper County, Mississippi.

The States have been very supportive of it. It is going to be the first time, and being from and oil and gas State you will understand this, we are going to take lignite, which is indigenous in coal, we are going to gasify it, burn it to make electricity from a gas to make electricity and reduce the emission, but then we are going to capture the emissions and use them for tertiary recovery in our old oil fields.

Today, we have three big tertiary recovery projects going on where they are having buy, to mine, the $CO_2$, and pay for it. This way, they can buy the $CO_2$ as a waste so that the electric utility gets a benefit, and these people get to buy $CO_2$ for a whole lot less and we sequestered an old well.

So, we are trying to do things that are consistent with what Senator Merkley was talking about, and that is, how do we do things in a positive way that reduce $CO_2$ emissions? What we do not want to do, and are worried about, are things that will have terrific harm to families and to our economy.

One of the initial studies of a previous cap-and-trade bill, done by McKenzie, said it would increase the price of electricity per kilowatt hour by 5 to 15 cents a kilowatt hour. If you take the very low end of that, 5 cents per kilowatt hour, in Jackson, Mississippi, that is a 56 percent increase in the electricity rate for a home, from 8.9 cents.

And the penalty for violating the renewable energy standard in the Waxman-Markey bill is 2.5 cents a kilowatt hour. Well, our rate is only 8.9 cents per kilowatt hour. We have got three big utilities, that is for our one in Jackson. That is an enormous increase for our people to have to live with. So those are the kinds of things that we are trying to avoid.

If there one thing that I would just say to the three of you and to Chairman Boxer, it is just the more the public can learn the facts, and not rush through this. This affects every element of our economy and our national security. So let the public know the facts, and then make decisions based on the facts.

Senator BARRASSO. I just have 1 minute left. Governor Barbour, is there anything else that you would like to share with the committee that you did not have the time to do in your prepared statement? Is there anything else you would like to recommend to the Senate? Because you have just seen a bill where they threw in 300 pages at the last minute and that is no way to make legislation, it is no way to come to solutions.

Mr. BARBOUR. Well, it is such a huge issue. I mean, it is an issue that affects every single person in the United States, every job in the United States, for the good or bad. And just that the public needs to know the facts. And the longer the facts are in front of the public, then the better decisions they will call their Senators about on the phone and understand this and understand what is safety.

Senator BARRASSO. Thank you, Governor. Thank you, Mr. Chairman.

Senator MERKLEY. Thank you very much. Any closing comments?

Senator INHOFE. Yes, yes, just one. I know you have a commitment.

You and I are both old enough to remember the BTU tax in 1993. I referenced that this morning. The interesting thing, and let me let you get on your plane and leave, let me share with you, I do not think this bill is going to pass. It will pass out of this committee. I mean, there is nothing that will not pass out of this committee. But on the floor it will not.

In 1993, when they had the BTU tax, it passed the House by the same margin of one. It was 219 votes. That is what this passed. And, of course, it was overwhelmingly defeated when it got to the Senate because people had time to look at it, people had time to know that it was a regressive tax, and, while it was not nearly as a high a tax as this bill would provide, still, the American people did wake up. And I am confident they will do that again.

Mr. BARBOUR. Senator, thank you. I hope that you are right. There are a bunch of things that we could do, and that I would be in favor of doing. I just think the cap-and-trade tax, I know it is not your jurisdiction, but the increase in taxes on the oil and gas industry by $81 billion over 10 years——

Senator INHOFE. That was in the budget. By the way, I might say that some our new Democrats are very supportive of our position on that, such as Senator Begich from Alaska. He is trying to help us right now do that. Eighty-one billion dollars, that would just be the death knoll of some of our oil and gas producers.

Senator MERKLEY. Governor, I am appreciating the exchange, but we are 10 minutes over schedule and I know you also need to, we need to make sure you get off to your plane. I appreciate you adjusting your schedule to meet now and not when the panel is here later.

The committee will recess until 2 p.m. At that time, we will hear from other members of the second panel, Rich Wells, David Hawkins and John Fetterman.

We appreciate your bringing the views from your home State, and I know that, I think for all of us here at the panel, jobs are right at the top of this agenda, and how we restructure our energy economy so that we are not dependent on a few foreign nations, compromising our national security, spending $2 billion a day overseas rather than spending it here creating jobs in the United States of America.

Thank you for your testimony.

The committee will recess.

[Recess.]

Senator BOXER [presiding]. The hearing will come to order.

I want to welcome our panel, and I thank you from the bottom of my heart for coming back. We had a huge turnout here today, this morning. I am sure you may have watched it or were somehow here. It just went on so long that we had to go to Al Franken's swearing in, and then we had other meetings and so on.

I understand that we had Governor Barbour here. Is that correct? And he answered questions and put his statement in the record.

So, why do we not get started? But, before we do, I know that the Mayor has a very nice contingent of people here. So, Mayor, would you introduce them to us please?

Mr. FETTERMAN. Sure. Chairwoman Boxer——

Senator BOXER. Turn on your mic though.

Mr. FETTERMAN. OK. Chairwoman Boxer, please let me introduce the kids of the Braddock Youth Project who are here in our Nation's capital for the first time. Could they stand up?

Senator BOXER. Would you stand up? We will applaud you and we are very happy to see you.

[Applause.]

Senator BOXER. Mr. Mayor, I could use you as I walk around the Halls of Congress.

[Laughter.]

Mr. FETTERMAN. I am sure you can pay me more than I make in my current role, so——

[Laughter.]

Senator BOXER. Very impressive.

Mr. FETTERMAN. Make an offer.

[Laughter.]

Senator BOXER. Oh, that is so great.

Well, we are going to get right to it. We have a very good group, Rich Wells, Vice President, Energy, the Dow Chemical Company, and David Hawkins, Director, Climate Center, NRDC. We are so happy you are here, David. And, of course, last but not least, the Mayor. And, Mayor, you were welcomed this morning by Senator Specter, who I hope will come back, but I know he is busy with markups and hearings and the rest.

So I am very happy to have you here. This will be part of a very important record as we approach the legislation that we will be introducing soon.

Why do we not start with Mr. Wells from the Dow Chemical Company. Welcome.

## STATEMENT OF RICH WELLS, VICE PRESIDENT, ENERGY, THE DOW CHEMICAL COMPANY

Mr. WELLS. Thank you, Chairman Boxer. I appreciate the opportunity to provide our views on future energy and climate change policies in the United States.

I am Vice President of Energy for Dow Chemical, a leading advanced material and specialty chemical producer with over 46,000 employees, half of which are located here in the United States.

As an energy intensive company, we use the energy equivalent of 850,000 barrels of oil every day in our global operations. Therefore, it is imperative that we be good stewards of this precious resource. And we have been. Since 1994, Dow has achieved energy efficiency gains of 38 percent. As a result, we have saved more than 1,600 trillion BTUs of energy. Now, that is a large number. It is equivalent to all of the power used in every home in California for 1 year.

Our track record——

Senator BOXER. Would you repeat that? Because that is amazing.

Mr. WELLS. Certainly.

Senator BOXER. Say it again.

Mr. WELLS. Since 1994, our cumulative energy savings is 1,600 trillion BTUs, a very large number. To put that into terms that people can understand, that is the equivalent of all of the electrical energy used by the homes in the State of California for 1 year.

Senator BOXER. Thank you for that.

Mr. WELLS. Our track record on greenhouse gas emissions reductions is equally impressive. At Dow, we have reduced our greenhouse gas emissions by more than 20 percent since 1990. This has resulted in preventing more than 86 million metric tons of $CO_2$ from entering our atmosphere.

Our company's commitment to reducing its energy and greenhouse gas footprint is consistent with our position on climate change policy. Dow accepts the conclusion of the Intergovernmental Panel on Climate Change that it is very likely that human activities are causing global warming. We believe the cost of inaction will far exceed the cost of comprehensive, far ranging and expeditious action today.

We therefore support the enactment of environmentally effective, economically sustainable and fair climate change legislation to slow, stop and reverse the growth of greenhouse gas emissions.

This is a global problem that requires a global solution. All major emitting countries should commit to reduce greenhouse gas emissions. However, the United States can help secure such a global commitment by first taking action to reduce its own emissions. We believe Congress should enact legislation establishing an economy-wide program, the centerpiece of which should cap-and-trade.

A price signal on greenhouse gas emissions is the most powerful tool to spur innovation and deployment of new low carbon technologies. Such technologies will be needed if we are to grow the economy and achieve the significant reduction in emissions that are required.

We prefer cap-and-trade over a carbon tax as cap-and-trade provides more certainty in achieving emission reductions over a specified period of time. Complementary policies, such as those to advance energy efficiency in buildings and homes, will also be necessary.

We believe the EPA should not regulate greenhouse gas emissions through the existing Clean Air Act because it would not provide the flexibility required by businesses to reduce their emissions in the most cost effective way.

Legislation establishing a cap-and-trade program needs to be designed in a way that maintains the competitiveness of U.S. manufacturers and avoids carbon leakage, which is the shifting of U.S. production and U.S. jobs to countries that lack comparable climate policies. In order to keep carbon leakage from occurring, we believe the climate policy should not penalize fossil energy use as a feedstock. When energy is used as a feedstock, no combustion occurs and there is no emission of $CO_2$.

We also believe that free allowances should be provided to energy intensive and trade exposed manufacturers until such time as there is a globally level playing field. And the climate bill should

minimize fuel switching from coal to natural gas in the power generation sector. Such movement would cause a steep increase in demand for natural gas, harming industrial companies like Dow who depend on natural gas as both a source of energy and as a feedstock.

My written testimony provides more detail on these and other issues related to the design of a cap-and-trade program. Dow commends the U.S. House of Representatives for passage of the American Clean Energy and Security Act, which reflects many of the recommendations of the U.S. Climate Action Partnership, of which Dow is a member.

In our opinion, the bill could be further improved, and we look for the Senate to develop and approve a bill that reflects the recommendations raised in my testimony. We are pleased to see several Senate committees delving into this topic, and we urge a bipartisan approach to ensure Senate passage of a thoughtful and deliberate bill.

I very much appreciate the opportunity today, and I look forward to any questions you might have.

[The prepared statement of Mr. Wells follows:]

# The Dow Chemical Company

STATEMENT FOR THE RECORD

COMMITTEE ON ENVIRONMENT AND PUBLIC WORKS
UNITED STATES SENATE

HEARING ON

Moving America toward a Clean Energy Economy and
Reducing Global Warming Pollution:
Legislative Tools

July 7, 2009

Submitted By:
Rich Wells
Vice President, Energy

The Dow Chemical Company appreciates the opportunity to submit these written comments to the Committee on Environment and Public Works.

Dow was founded in Michigan in 1897 and is one of the world's leading manufacturers of chemicals and plastics. We supply products to customers in 160 countries around the world, connecting chemistry and innovation with the principles of sustainability to help provide everything from fresh water, food, and pharmaceuticals to paints, packaging, and personal care products

Dow is an energy-intensive company. We use energy, primarily natural gas and natural gas liquids, as a feedstock material to make a wide array of products. For its global operations, Dow uses the energy equivalent of 850,000 barrels of oil every day. This amount is comparable to the oil consumption of some countries, such as The Netherlands or Australia.

Dow is committed to sustainability. We have reduced our absolute levels of greenhouse gas (GHG) emissions 22% since 1990, and we are committed to do even better in the future. Our ambitious 2015 sustainability goals underscore this commitment.[1]

Dow operates at the nexus between energy and all the manufacturing that occurs in the world today. Over 90% of the products made have some level of chemistry in them, so no one has more at stake in the solution - or more of an ability to have an impact on - the overlapping issues of energy supply and climate change than we do.

As a world leader in chemistry, Dow is uniquely positioned to continue to provide innovations that lead to energy alternatives, less carbon intensive raw material sources, and other solutions not yet imagined. In fact, our science and technology has been contributing solutions to the global climate change and energy challenges. Our science has led to the development of alternative energy sources such as biofeedstocks, photovoltaics and wind. Many of our products contribute to reduced energy consumption.

This testimony describes the views of The Dow Chemical Company on global climate change and the need for prompt legislative action by the US Congress as a prelude to a global effort by all major-emitting countries. This testimony explains our preference for an economy-wide US program, the centerpiece of which should be cap and trade, and how such a program should be designed to maintain the competitiveness of energy-intensive US manufacturers. We also compare our recommendations with the recently passed legislation in the House of Representatives, the American Clean Energy and Security Act (ACES).

**Dow Perspective on Climate Change**

Dow accepts the Intergovernmental Panel on Climate Change (IPCC) conclusion that it is very likely that human activities are causing global warming. Left unchecked, the

[1] To learn more about Dow's commitment to sustainability, go to our website at www.dow.com.

increase in GHGs poses a significant hazard, and the world's response must be comprehensive, far ranging, and expeditious. We recognize the serious nature of the threat and it warrants bold action with clear, long-term performance objectives.

In the long term, innovation in the technologies of renewable and alternative energy will play a significant role in meeting the world's energy needs and will have a positive impact on climate change. However, those that implement alternative and renewable energy sources must be accountable to demonstrate the economic and ecological sustainability of those solutions across their life cycle.

Traditional fossil fuels (oil, natural gas, and coal) will remain critical to meeting energy and feedstock needs until new technologies can substitute into the existing mix. Efficient use of these limited resources with an emphasis on carbon management must be a strong component of any climate change strategy.

The long-range nature of the climate change issue requires different solutions over successive timeframes. The effect of climate change is global and will require immediate action by all major GHG emitting industry sectors and countries. A global climate change strategy calls for sharp, firm, and direct action now to dramatically slow, stop, and then reverse the growth of greenhouse gas levels in the atmosphere. Delivering the world to future generations in a viable state is a moral responsibility for all of us.

Dow supports the concept of multiple solutions to reduce GHG emissions, as outlined by Princeton Professors Socolow and Pacala in their article, "A Plan to Keep Carbon in Check", which appeared in the September 2006 issue of *Scientific American* . Dow will be implementing its solutions in the context of the wedge stabilization model developed by Professors Socolow and Pacala. We will hold ourselves accountable to apply our innovation and expertise in helping to solve the world's GHG and energy challenges.

**Need for Prompt Action by Congress**

As a member of the U.S. Climate Action Partnership (USCAP), Dow supports prompt enactment of environmentally effective, economically sustainable and fair climate change legislation to reduce U.S. greenhouse gas emissions sharply by mid-century. The centerpiece of legislation should be an economy-wide cap and trade program. This market-based approach is the best way to put a price on carbon and ensure that short- and long-term emissions targets are met. A price on carbon is also the best way to spur the development of new and breakthrough technologies, which are necessary to reduce GHG emissions while growing the economy. It is important to note that the recommendations of USCAP include several complementary policies in addition to cap and trade, such as policies to promote energy efficiency in the building sector. These complementary policies are needed to achieve the economy-wide GHG reduction targets.

USCAP launched its landmark report, titled *A Call for Action*[2], in January 2007, which lays out a legislative framework for climate protection. Most recently, USCAP released

[2] *A Call for Action* and *A Blueprint for Legislative Action* can be found at www.us-cap.org.

*A Blueprint for Legislative Action*, which provides consensus recommendations for climate protection legislation. USCAP includes a total of 30 businesses and environmental organizations.[3] The coalition recognizes that the United States faces an urgent need to reinvigorate our nation's economy, make the country more energy secure, and take meaningful action to slow, stop, and reverse GHG emissions to address climate change. Thoughtful and comprehensive national energy and climate policy will help secure our economic prosperity and provide American businesses and the nation's workforce with the opportunity to innovate and succeed.

A US climate protection program should create a domestic market that will establish a uniform price for GHG emissions for all sectors and should promote the creation of a global market. A USA commitment to reduce emissions will make it clear to other nations that we are committed to a pathway that will slow, stop, and reverse the growth of our GHG emissions.

It is important to note that a price on carbon does not necessarily mean higher energy costs on business and consumers. A price on carbon will elicit changes in behavior and spur the development of new technologies, both of which will reduce total energy costs. For example, since 1995 Dow has saved more than $8 billion due to investments in energy efficiency across our manufacturing sites. This cost savings was spurred largely by rising energy prices in the USA, which caused us to change our behavior. Our energy efficiency and conservation program has now become the way we do business. We caution Congress to be very careful in translating a price on carbon into total costs on US consumers or businesses, as it is very difficult to predict or estimate changes in behavior and changes in technological development.

While Congress takes the necessary first step by creating a US program, the Administration should engage in international negotiations with the aim of establishing emission-reduction commitments by all major-emitting countries. The post-2012 global framework should in addition establish further international GHG markets, assist vulnerable populations in adapting to climate impacts, and boost support for climate-friendly technology in developing countries. Dow recognizes, however, that each country should be allowed to establish its own system, with targets fairly set for each sector. Optimum solutions for the US can differ from what works best in China or India, although competitive distortions must be minimized during the transition while country reduction targets converge.

In December, the global community will meet in Copenhagen under the UN process to negotiate a new international post 2012 framework for reducing GHG emissions. Ideally, legislation to reduce GHG emissions needs to pass through both chambers of Congress

[3] The current members of USCAP are: AES; Alcoa; Alstom; Boston Scientific Corporation; BP America, Inc.; Caterpillar Inc.; Chrysler LLC; ConocoPhillips; Deere & Co.; Dow; Duke Energy; DuPont; Environmental Defense Fund; Exelon Corporation; Ford Motor Company; FPL Group; General Electric; General Motors Corporation; Johnson & Johnson; Natural Resources Defense Council; NRG Energy; PepsiCo North America; Pew Center on Global Climate Change; PG&E Corporation; PNM Resources; Rio Tinto; Shell Oil Company; Siemens Corporation; The Nature Conservancy; and the World Resources Institute.

for the US negotiating team in Copenhagen to have clarity on what they can reasonably commit to. This is why the Senate should take action this Fall: to provide clarity on US climate change leadership to the world as this will be essential to securing a viable international agreement to reduce global GHG emissions.

It is important to note that the EPA is moving to regulate GHG emissions under the authority of the Clean Air Act (CAA). Dow believes that the CAA does not provide the authority to develop a cost-effective program for reducing GHG emissions in the United States. Consequently, we urge the executive branch to work closely with the legislative branch to (1) avoid spending resources developing ill-advised regulatory programs and (2) develop a new, market-driven program to reduce GHG emissions that is both economically sustainable and environmentally effective.

**Maintaining US Competitiveness is Imperative**

Manufacturers and industries that deal with certain commodity products that are both energy-intensive and trade-exposed will be particularly challenged by US climate policy if they face competition from countries that have not committed to an internationally recognized GHG-emission-reduction path. In such cases, there is a risk of "carbon leakage", by which we mean the shifting of GHG emissions (and jobs) from the US to these other countries.

It is imperative that any US program to reduce GHG emissions maintain US competitiveness in the short-term. Over the long-term, technological innovation in the USA spurred by a price on carbon will enhance US competitiveness.

One way (but not necessarily the only way) to maintain competitiveness is to design the US program in accordance with the recommendations in the USCAP *Blueprint for Legislative Action*.

We wish to make three policy recommendations to Congress that are imperative for Dow as an energy-intensive, US chemical manufacturer under any US climate program: (1) do not penalize the use of fossil energy used as a feedstock material, (2) provide free allowances to the most vulnerable US businesses at risk of carbon leakage, and (3) take steps to minimize fuel switching from coal to natural gas in the power sector.

<u>Do Not Penalize Fossil Energy Used as a Feedstock Material</u>

Many cap and trade bills that have been introduced in Congress in recent years impose a point of regulation not just on those who emit GHGs, but also on those who produce fossil energy (i.e., petroleum products). This means that there will be a price signal imposed not just on fossil energy that is combusted (with the release of carbon dioxide, a greenhouse gas), but also on fossil energy that is used as a feedstock material to make carbon-based products that are not designed to be combusted (and do not release carbon dioxide to the atmosphere). The House-passed bill would provide compensatory allowances to those who use fossil energy in non-emissive ways, such as a feedstock

material. We believe the bill that recently passed the House of Representatives meets our criterion: it would not punish companies for using fossil energy in a non-emissive manner.

Provide Free Allowances to Prevent Carbon Leakage

Recent legislative proposals have included provisions to provide rebates to energy-intensive, trade-exposed sectors that are at risk of carbon leakage. Senator Sherrod Brown has long championed this approach, which Dow believes is the best way to address the competitiveness issue prior to an international agreement among major emitting countries or a global sectoral agreement.

The House-passed bill adopts this approach, which proceeds in two steps. In the first step, EPA would identify the most energy-intensive, trade-exposed sectors that are at risk of leakage based on clear and objective criteria. In the second step, EPA would award rebates to eligible facilities to compensate them for some portion of their direct and indirect GHG emissions. This approach, developed by Representatives Jay Inslee and Mike Doyle, is generally consistent with the recommended approach outlined in the USCAP *Blueprint for Legislative Action.*

Dow believes that it is critical that the rebate not be reduced or eliminated until the competitive disadvantage is reduced or eliminated. Targeted assistance to energy-intensive industries should be terminated only when the carbon leakage problem is solved through an international agreement. And, it should be phased down only in proportion to progress made in reducing the cost differentials between trading partners in a fashion that demonstrably reduces the disadvantage to domestic producers.

We note that there are a few challenging implementation issues with this section of the House-passed bill. For example, determining the average GHG intensity by sector is particularly challenging for any sector that doesn't make a homogeneous product using similar production technology. Sectors utilizing combined heat and power seek clarification as to how self-generated electricity and steam will be handled under this provision. Integrated facilities may be disadvantaged versus non-integrated facilities. We plan to work closely to ensure this provision is fair and workable.

The House-passed bill also includes a border adjustment. Dow is concerned about a border adjustment in that it may impede the President's ability to conduct international negotiations and may lead to retaliatory trade measures by our trading partners against US goods. We recommend that any legislation to address competitiveness be consistent with WTO rules.

Take Steps to Minimize Fuel Switching

One of the easiest, and most likely, ways to meet aggressive, short-term emission reduction targets, such as those in the draft bill, is through fuel switching from coal to natural gas in the power sector. Too strong a price signal on carbon would exacerbate

such a movement, which is already underway even in the absence of a US program to reduce GHG emissions. If fuel switching is excessive, demand for US natural gas will rise, and US manufacturers that depend on natural gas will suffer.

The fuel-switching solution could be economically ruinous for those industrial businesses and consumers dependent on affordable natural gas, if natural gas supply does not keep pace with rising demand, or if natural gas supply lags significantly behind demand. Recent US history suggests this is a very plausible scenario.

Congress has been enticed into over-reliance on natural gas before. The Clean Air Act Amendments of 1990 were enacted with the belief that natural gas would be the clean fuel of the future and would be cheap and plentiful. Unfortunately, Congress did not anticipate the run-up in natural gas prices and the resulting demand destruction in the industrial sector.

In designing a cap and trade program, several different elements (targets and timetables, cost containment, the allocation of allowance value, and complementary policies for coal and energy efficiency) will impact the degree of fuel switching, and Congress should keep all of these in mind as it develops a climate policy. For example, fuel switching is exacerbated by more stringent short-term (2020) targets, reduced incentives for CCS, fewer allowances for coal-fired power producers, and fewer offsets. Dow recommends that any US climate policy be designed in ways to minimize fuel switching. We believe the House-passed bill could be improved by favoring short-term targets at the lower end of the USCAP recommended range (i.e., a 14%-20% reduction from 2005 levels by 2020) and by including incentives to spur the growth of nuclear power generation and domestic supplies of natural gas.

**Other Issues**

Other issues are also of concern to Dow, and we wish to raise them to the Committee's attention as it considers legislation to reduce GHG emissions.

Offsets

Dow favors the creation of high-quality offsets for compliance with any US cap and trade program. Offsets—and, in particular, legitimate, high-quality (additional, permanent, verifiable, enforceable) offsets—help to reduce the total cost of cap and trade; indeed, EPA analysis shows that offsets are one of the biggest determinants of the cost of compliance. The more high-quality offsets, the lower the total cost of the program International and domestic offset projects will reduce emissions, while enabling regulated sectors the freedom to select the most economically sustainable option for compliance. This is good for the economy and the environment.

Dow is developing offset projects around the world, but only if such projects have a direct positive impact on the company, either through promotion of a Dow product, advancement of a Dow technology, or in reducing emissions at a Dow facility. For these

reasons, it is puzzling to hear Members of Congress complain that international offset projects send US money abroad and don't benefit the country. Our international offset projects benefit Dow directly, and policies that inhibit the development of high-quality offsets are detrimental, not beneficial, to Dow and to any US company that seeks a range of cost-effective options for compliance under a US cap and trade program.

Dow is concerned that the House-passed bill imposes certain procedural hurdles that will prevent legitimate, high quality, domestic and international offsets from being developed and utilized. These hurdles will delay the implementation of offset projects that would reduce GHG emissions. Specifically, we are concerned about the requirement for EPA to regulate small sources of GHG emissions, which could eliminate a large source of domestic offsets in the early years of the program. We are also concerned that the House-passed bill requires international offsets to only come from developing countries that have a bilateral agreement with the USA and only if such offsets conform to as-yet-unwritten regulations for sectoral offsets. In addition, we are concerned about the requirement for a 1.25:1 ratio of international offsets to allowances. We recommend modification or elimination of such procedural hurdles to better encourage the development of legitimate, high-quality offset projects both domestically and internationally.

HFCs

HFCs are potent greenhouse gases and are also used in specialized applications. For example, HFCs are used to make energy efficient insulation. Dow uses an HFC as a blowing agent to make extruded polystyrene building insulation as well as spray-applied polyurethane foam, both of which improve the energy efficiency of commercial and residential buildings. Indeed, the HFC blowing agent provides the insulation with a very high energy efficiency rating, saving 40 times the GHG emissions during its use than are released to the atmosphere during its manufacturing. Should Congress impose a price on carbon, the price of HFCs will rise, and HFC products will become more expensive to produce. It is likely that many insulation products will become less attractive to consumers, leading to the use of less energy efficient insulation products and potentially eliminating valuable products from the marketplace.

Dow is concerned that the net impact of a carbon price on HFCs will be to increase GHG emissions if consumers choose less energy efficient insulation products. For our building insulation, there are currently no substitutes that allow us to make these same products with the same level of energy efficiency performance, and it will be several years—at best—before substitutes are available.

Ironically, Dow spent the last several years, and tens of millions of dollars, switching our blowing agent from HCFCs to HFCs as a consequence of EPA implementation of the Montreal Protocol to eliminate ozone-depleting substances. This switch reduced GHG emissions as our HCFC had twice the global warming potential as the HFC we currently use. Now, Congress may be forcing us to switch blowing agents again, before adequate substitutes are commercially available.

We recommend that the Senate consider very carefully the impact of any climate legislation on building insulation made from HFCs and design a program such that the most energy efficient insulation products remain available to consumers. Unfortunately, the House-passed bill does not have any special provisions for HFC-containing insulation, and so it is imperative that any Senate bill address this problem.

Combined Heat and Power

CHP is the sequential or simultaneous generation of multiple forms of useful energy in a single integrated system. Most commonly, CHP involves the generation of useful mechanical and thermal energy. Mechanical energy is used for electricity generation and thermal energy is used to produce steam or hot air for drying for use at a host facility. Electricity can be used in part or in whole on-site and any excess exported to the grid for distribution to consumers. CHP increases fuel efficiency, reduces electricity demand and reduces transmission and distribution inefficiencies. CHP efficiencies reach over 80%, while stand-alone power plants average only in the lower 40% range. The vast majority of Dow's US energy requirements are supplied through CHP technology.

Any bill to reduce GHG emissions should not penalize, and preferably should reward, CHP as a source of energy. Existing cap and trade programs have done just that, but in a variety of ways. The House-passed bill does not adequately reward CHP and concerns have been expressed that certain provisions of the bill may actually penalize manufacturers that use CHP over those that do not. We urge the Committee to consider carefully the impact of climate legislation on industrial CHP so as not to penalize, and preferably reward, those who use this most efficient source of energy.

Early Action

Under a cap and trade approach, Congress may choose to provide free allowances based on historical GHG emissions. Such an approach penalizes companies that took early action to reduce GHG emissions and rewards their competitors who did not take such action. For example, Dow's voluntary, company-wide energy efficiency program is a major reason for the company's significant reduction in GHG emissions since 1994. Congress should ensure that such early action is not penalized. The House-passed bill sets aside 1% of allowances for early action, but it is not clear if this amount is adequate, nor is it clear how EPA will determine who receives such early action credits.

**Conclusions**

Dow supports the need for a commitment by all major-emitting countries to reduce GHG emissions. This is a global problem that requires a global solution.

The US can help secure such a global commitment by first taking action to reduce its own GHG emissions.

Congress should enact legislation establishing an economy-wide program to reduce GHG emissions, the centerpiece of which should be cap and trade. Complementary policies will also be important.

The US should not regulate GHG emissions through the existing Clean Air Act because it would not provide flexibility to business to reduce GHG emissions in the most cost-effective way.

Any cap and trade program needs to be designed in the right way to ensure the competitiveness of US manufacturing. This means Congress should not penalize fossil energy used as a feedstock material; should provide free allowances to energy-intensive, trade-exposed manufacturers; and should minimize fuel switching by coal-fired power producers.

Dow commends the House of Representatives for passage of the American Energy and Security Act (ACES), which reflects many of the recommendations of the US Climate Action Partnership (USCAP). In our opinion, the bill could be further improved, and we look to the Senate to develop and approve a cap and trade bill that reflects the recommendations raised in this testimony.

**Appendix—Dow's Progress and Commitment To Reduce Its Climate "Footprint"**

Dow accepts the Intergovernmental Panel on Climate Change (IPCC) conclusion that it is very likely that human activities are causing global warming. We recognize the serious nature of the threat and that it warrants bold action.

We understand that it is not enough to agree with consensus scientific opinion. Our commitment to sustainability requires that we act upon such information responsibly. To that end, Dow has made considerable progress in reducing its climate "footprint":

- From 1994 through 2008, in keeping with its publicly announced sustainability goals, Dow reduced its energy intensity (BTU per pound of product) by 38%, resulting in energy saving of 1,600 trillion BTUs, which is equivalent to all the electrical energy consumed by California residents for one year.
- Since 1990, Dow reduced its absolute greenhouse gas (GHG) emissions since to a level that exceeds Kyoto targets. Overall, emissions of Kyoto GHGs were reduced by more than 20% during this time period.
- GHG emission reductions achieved through the use of Dow products more than offset the GHGs produced during the manufacture of those products.

Although this record is positive, we are committed to continued improvement and reduction of our environmental footprint. In order for Dow to contribute even more to climate change solutions, we have developed a clear vision and key milestones for the years 2015 and 2025. Our vision will guide our decisions today and into the future, and based on this vision, we pledge to reach a number of far-reaching objectives:

- Our vision is to have contributed to the achievement of a world in carbon equilibrium, a target described by Princeton University professors Robert Socolow and Stephen Pacala in the September 2006 edition of *Scientific American*. We will have set the industry benchmark through our own performance. We will apply our innovation and expertise to help solve the world's GHG and energy challenges.

- Our key milestones:

  - By 2015, Dow will reduce its energy intensity by another 25% compared to base year 2005.
  - By 2015, Dow will reduce its GHG emissions intensity (tons of $CO_2$ per pounds of production) 2.5% per year.
  - By 2025, Dow will stop the growth of absolute emissions of GHG within the company. Our absolute emissions will remain below the 1990 baseline, and we will begin on a journey of year-over-year reduction in GHG emissions.
  - By 2025, Dow aims to have non greenhouse gas emissive energy provide at least 400 MW equivalents, or 10% of Dow's global electrical demand.
  - By 2050, at least 50% of the energy consumed by Dow globally will be non-carbon emitting.

July 31, 2009

**The Dow Chemical Company**
Midland, Michigan 48674
USA

The Honorable Barbara Boxer and James Inhofe
Chairman and Ranking Member,
Committee on Environment and Public Works
United States Senate
Washington, DC 20510

Dear Chairman Boxer and Ranking Member Inhofe,

Per your letter of July 27, 2009, here are my answers to your committee's follow up questions regarding my testimony of July 7, 2009.

**From Senator Thomas R. Carper**

1. *Mr. Wells, I understand there are some concerns with the allowance allocations for industrial facilities that perform more than one part of a manufacturing process (such as those facilities that make both the raw material and finished product instead of getting the raw materials overseas). These plants might be only getting allocations for the finished product process and therefore are under-allocated. Do you share those concerns?*

We are concerned that integrated facilities might be disadvantaged versus their non-integrated competitors under the provisions in the House-passed bill providing free allowances for energy-intensive, trade-exposed sectors. We would like to work with the Committee to address this concern.

**From Senator Benjamin L. Cardin**

1. *I understand you recently launched a pilot project in Texas to capture carbon emissions to use in the growth of algae. From this algae, your company intends to make the fuel "algenol". This project will be largest in scale to date covering some 24 acres.*

   - *Can you describe the benefits of the project you recently announced in Texas with Algenol Biofuels to capture CO2 for growing algae to make ethanol?*

Dow did recently announce that we will be working with Algenol Biofuels to build a pilot scale plant in one of Dow's Texas facilities to produce ethanol from CO2 and algae. The advantages of this project over other ethanol production processes include:

Does **not** require food based feedstocks like corn or sugarcane.

Does **not** require harvesting.

Does **not** require fossil fuel based fertilizers.

Does **not** require fresh water.

Does **not** require large amounts of fossil fuel.

Does **not** require arable land.

Does use desert land and marginal land.

Does make fresh water from seawater during the process.

Does have an energy balance over 8:1 (energy output: fossil fuel input).

- *Would this prove that CO2 can be reduced from the atmosphere by recycling it into algae for fuel production to reduce fossil fuel use?*

Yes, projects like this would not only reduce GHG emissions, but also increase domestic sources of energy and therefore enhance our energy security.

**From Senator Mike Crapo**

1. *What can be done to prevent corporations unable or uninterested in meeting these new energy and carbon usage requirements from relocating to nations with less stringent pollution policies?*

The issue of carbon leakage is serious but can be addressed in legislation to reduce GHG emissions. The first critical step is to keep the costs of GHG emission control as low as possible, which can be done by choosing a market-based approach, such as cap and trade. Under cap and trade, free allowances can be provided to those businesses most vulnerable to leakage: those that are relatively energy-intensive and trade-exposed. The House-passed bill includes output-based rebates to such businesses.

2. *How likely is it in your opinion that the rebate approach will be deemed WTO compliant? Could you expound on why border measures would lead to retaliatory trade measures, but rebates would not?*

We believe a rebate approach will be deemed to be WTO compliant as long as US-based companies are treated similarly, with no discriminatory treatment between foreign and domestic investors. A border adjustment, however, is more likely to be perceived as discriminatory and trade distorting (and therefore more likely to be deemed out of compliance with WTO) and spark dispute settlement cases and retaliatory measures against US goods.

I thank you for the opportunity to offer my testimony. Please feel free to contact me if you have any further questions.

Regards,

Rich Wells
Vice President Energy, Climate Change and Alternative Feedstocks
The Dow Chemical Company

Senator BOXER. Thank you.

Mr. Hawkins, welcome again.

**STATEMENT OF DAVID HAWKINS, DIRECTOR OF CLIMATE PROGRAMS, NATURAL RESOURCES DEFENSE COUNCIL**

Mr. HAWKINS. Thank you, Chairman Boxer.

To paraphrase John Gardner, global warming is an opportunity brilliantly disguised as an insoluble problem. What we mean by that is that the things that we need to do to attack global warming pollution are going to help us achieve economic security, energy security and climate security.

Analysis that NRDC and others have done show that climate legislation like the House-passed American Clean Energy and Security Act, which I will call ACES, can actually reduce household energy bills and create more than a million new jobs in the next decade.

As the maps before you show, in 2020, average U.S. household electricity bills can be $6 a month less with the ACES bill than with business as usual. So, if you have that one up? Turning to transportation, transportation household bills could be as much as $14 a month less. Why is this possible? Well, it is possible because of energy efficiency, because of reduced demand for otherwise high-priced fuels that are driven by the climate policies that are in the legislation.

The ACES bill makes a good start on energy efficiency. But the Senate could place even more priority on energy efficiency, and we urge you to do that to provide greater rewards for consumers and the economy.

The third element that I will mention about the benefits of a comprehensive bill is jobs. Again, our calculations, and they are not our calculations they are done by the University of Massachusetts, show 1.7 million new jobs. And these are net jobs. These are net of any losses in jobs in any other sectors, or shifts in jobs, that would be created under this legislation.

So, our view is that we cannot let the opportunity for progress pass us by. It is vital to enact the legislation this year, to help deliver the economic energy and climate security that we all agree we need.

I thought it was interesting this morning that all of the Senators agree on the objectives for the country. What they disagree about are the actions that Congress should take to do it.

The second point I would like to make is that a national cap on emissions can be designed so that it is fair to different regions of the country and different economic sectors. We saw this in the House Energy and Commerce Committee, which, because of its make up, required the committee to craft a bill that was fair to the needs of regions of the country, like the region represented by Mayor Fetterman, that are heavily dependent on coal and trade sensitive industries.

That bill combines many of the recommendations of the U.S. Climate Action Partnership, as well as the Labor Environmental Blue-Green Alliance. That is a very interesting thing, that we have coalitions of businesses and environmental groups, we have coalitions of labor and environmental groups, which is really stronger than

anything I have seen in now almost 40 years of participating in complex environmental legislation.

I will mention a couple of issues that we have with the bill in my remaining time. The testimony I submitted goes on at length about the many strengths.

In terms of improvements, we think that the Senate needs to improve the near-term target, the 2020 target. We think that a 20 percent reduction in emissions is doable and is definitely needed by the science.

Second, as I mentioned, we think that it important to direct more allowance value to energy efficiency. This is definitely a double dividend investment. And it is a jobs creator, too, because a lot of these energy efficiency programs employ lots of people.

The third is that we think it is important to preserve the effective Clean Air Act tools. We think that this new law needs to build on the existing Clean Air Act, not replace it. And we think there is a continuing role for new source performance standards, as well as new source review for very large sources.

A fourth area is the importance of retaining State authority. There are some impacts on State authority in the House bill. We would like to see those dealt with in a somewhat less intrusive way.

The fifth issue has to do with offset integrity. You had some discussion with the Department of Agriculture this morning. We have some serious concerns with the way in which offsets are managed in the House bill.

And finally, we have serious concerns with several provisions relating to biomass, relating to calculations of emissions under the cap, calculations of emissions under the RFS, and finally the safeguards for sourcing of biofuels.

Thank you very much, Madam Chairman.

[The prepared statement of Mr. Hawkins follows:]

**Testimony of David G. Hawkins**
**Director of Climate Programs**
**Natural Resources Defense Council**

**before the**
**Senate Environment and Public Works Committee**

**Hearing on Moving America toward a Clean Energy Economy and Reducing Global Warming Pollution: Legislative Tools**
**July 7, 2009**

Thank you, Chairman Boxer and Senator Inhofe, for the opportunity to testify today on legislation to build a clean energy economy and reduce global warming pollution. My name is David Hawkins. I am Director of Climate Programs at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles and San Francisco, Chicago and Beijing.

NRDC is a member of the U.S. Climate Action Partnership (USCAP), the business-environmental coalition that supports enacting climate legislation this year. The House Energy and Commerce Committee drew heavily on USCAP's recommendations in drafting the American Clean Energy and Security Act (ACES). NRDC is also a member of the labor-environmental Blue-Green Alliance, whose legislative principles are also reflected in the ACES bill.

Helping Congress pass effective climate legislation is NRDC's highest priority. It is vital to enact legislation this year – to help deliver economic, energy, and climate

security. As President Obama has said, the choice is "between a slow decline and renewed prosperity; between the past and the future." Clean, sustainable energy is one of the pillars of growth and prosperity in the 21st Century, and enacting comprehensive energy and climate legislation is the way to put that pillar in place. The time to act is now.

That is why NRDC strongly supports the Committee's intention to move quickly on legislation before the August recess. Working together with other committees, you have the opportunity to put together comprehensive legislation for consideration and adoption by the full Senate early this fall. Today I will focus on the key issues facing this Committee: in particular, why we believe the best policy package is a comprehensive limit on global warming pollution that becomes tighter each year, combined with complementary programs for key sectors, structured like the one in the ACES bill recently passed by the House of Representatives.

It is often the case that bills passed by the House are based on a fundamentally different political logic than that which is needed in the Senate. But that is not true for the ACES bill. Given the make-up of the Energy and Commerce Committee, the House bill was crafted to meet the needs of the regions of our country that rely on coal-based electricity and that are home to energy-intensive and trade-sensitive manufacturing industries. Thus, in the allocation of allowances and many other features, the ACES bill offers concrete solutions to concerns that will be important in the Senate.

This is certainly not to say that the ACES bill is perfect as is. In this testimony, I'll address key strengths and shortcomings of the bill, and make recommendations on improvements this Committee should make.

## I. We Have To Act Now

Action on global warming has been delayed far too long. Every day we learn more about the ways in which global warming is already harming our planet, our health, and the natural systems on which our civilization is built. We must act now to begin making serious emission reductions if we are to avoid truly dangerous levels of global warming pollution. Climate scientists warn us that we face extreme dangers if global average temperatures are allowed to increase by more than 2 degrees Fahrenheit from today's levels (equivalent to 2 degrees Celsius over pre-industrial levels). The Intergovernmental Panel on Climate Change (IPCC) reports that it is still possible to stay below this temperature increase if atmospheric concentrations of $CO_2$ and other global warming gases are held to 450 ppm $CO_2$-equivalent and then rapidly reduced.

Staying under this target is very challenging, even with allowance for some period of "overshoot." It cannot be done without the cooperation of both the industrial North and the emerging South. But it can be done. And for the United States to secure a claim to leadership in the 21st century, we must be instrumental in forging the necessary coalition. Enacting U.S. legislation this year is the single most important step we can take to unlock the global negotiating gridlock of the past decade.

If we delay and emissions keep growing, bad investments and business uncertainty will continue and it will become much harder to avoid the worst impacts of a climate gone haywire. In short, a slow start means a crash finish, with steeper and more disruptive emission cuts required for each year of delay or insufficient action.

The ACES bill appropriately establishes a declining cap on emissions of carbon dioxide and other heat-trapping gases. It sets long-term limits that are consistent with the

science, reaching a 42 percent reduction by 2030 and an 83 percent reduction by 2050, from 2005 levels. In the near-term, however, NRDC believes we can and must aim to achieve at least a 20 percent reduction in 2020 in the emissions of capped sources and in total U.S. emissions. A slow start in the early years condemns us either to even faster reductions later, or to even more severe climate impacts.

According to both the Environmental Protection Agency and the Congressional Budget Office, the actual per household cost of the ACES bill in 2020 will be less than a postage stamp a day. NRDC's research shows that under this bill by 2020 American households will save $6 per month on their electricity bills and $14 per month on the cost of owning and driving their vehicles. Plus, the bill will create a net increase of 1.7 million jobs. These savings and job numbers are detailed on a state-by-state basis in the maps appended to this testimony.

A 20 percent reduction in 2020 is within the range recommended by USCAP. We can achieve that near-term target while continuing to achieve strong economic and job growth for all Americans. According to EPA's most recent analysis, moving from a 17 percent reduction target to 20 percent would increase households' average annual cost by only $27 ($140 versus $113).[1] In the meantime, due to healthy GDP growth, households will have more than $9,000 in additional income to spend ($25 per day). Household costs in 2020 would still be less than a first class postage stamp per day, even with this more effective target.

Some will argue that a 20 percent target for 2020 would place too much pressure on coal-fired electricity or energy-intensive, trade-exposed manufacturing, and on the regions where those industries are most important. The most recent Department of

[1] EPA Analysis of H.R.2454 - Appendix, p. 56

Energy forecast for U.S. emissions in the absence of ACES is for emissions of energy-related carbon dioxide in 2020 to be 1 percent *lower* than 2005 levels, in sharp contrast to the 17 percent increase forecast for 2020 just two years ago.[2] This implies that achieving a 20 percent reduction by 2020 will actually be far easier than the previously anticipated effort required to achieve lesser reductions. Furthermore, the ACES bill's allowance distribution gives the local electricity distribution companies and energy-intensive, trade-exposed manufacturers a large fraction of the allowances they will need for compliance well past 2020. That is true whether the target is a 17 percent or 20 percent reduction. And the bill provides generous incentives for investing in power plants and other industrial facilities equipped with carbon capture and storage. The bill also allows the use of up to two billion tons of offsets per year to further cushion these concerns. A twenty percent reduction by 2020 is both needed and do-able.

## II. ACES Is Built on a Fundamentally Strong "Cap and Trade" Architecture

To meet the climate protection challenge, the ACES bill employs a fundamentally sound architecture. As mentioned, it establishes a declining cap between 2012 and 2050, covering approximately 85 percent of U.S. emissions of carbon dioxide and other heat-trapping gases. The cap directly attacks the pollution that drives global warming by setting a specific limit on the total quantity of dangerous pollution emitted each year, creating certainty that our environmental goals will be achieved.

The ACES bill uses proven methods to achieve this pollution cap at minimum cost. Instead of specifying exactly what every source must do to help meet the cap, it creates a defined number of carbon pollution allowances. Covered sources must

[2] DOE/EIA Annual Energy Outlook 2009 with ARRA (SR/OIAF/2009-03) compared to the Annual Energy Outlook 2007.

surrender an allowance for each ton of carbon emissions at the end of each year. The opportunity to purchase allowances at auction, or to buy and sell them in the marketplace, creates clear economic rewards for investing in energy efficiency and clean energy innovation and allows each covered source to find its lowest cost way to comply – thereby minimizing the cost for the entire economy. Additional cost management flexibility comes from the ability to bank allowances into future years, and to borrow them in limited circumstances.

For further market stability and predictability, ACES creates a strategic reserve of allowances that can be sold into the market should there be a period of unusually high prices. The very existence of this reserve should deter speculative activity in the compliance market. Similarly, to avoid market prices so low that innovation could be stifled, ACES establishes a minimum price for sales of allowances from the regular auction under the bill.

The ACES bill also provides for very large amounts of domestic and international offsets – up to two billion tons per year of reductions achieved outside the capped sectors – to further reduce costs. With a reasonable limit on the total number of offsets, and with strong safeguards to assure that offset credits are earned only for real reductions that would not have happened anyway, offsets can be a valuable component of climate legislation. There are significant problems, however, in the offset provisions added to the ACES bill just before House floor action. I will return to those issues below.

The ACES bill includes important provisions to transparently and effectively regulate the market for trading greenhouse gas allowances, as well as futures and other derivatives. Given recent experience on some other trading markets, the American

people have a right to demand that rules for regulating carbon trading be clear and transparent, and effective in preventing speculative manipulation. The ACES bill gives important new powers to the Commodities Futures Trading Commission, as well as the Federal Energy Regulatory Commission and EPA. Key requirements include limiting any emitting company from purchasing more than 20 percent of the allowances sold in any one auction, fining companies involved in market manipulation up to $25 million, and preventing any single participant from owning more than 10% of any class of derivatives.

NRDC recommends including three additional safeguards in the bill. First, the Senate should consider requiring all trading in allowances and in futures to take place on regulated exchanges to provide the greatest possible transparency to trading activity and prices, and to reduce counter-party risk – the risk that one of the contract participants will fail to perform when the contract is due. At a minimum, the bill should require the reporting to regulators of all non-standardized trades greater than a specified amount – for example, above $10 million. As a further safeguard against manipulation, Congress should set tighter "position limits" on the fraction of allowance futures that any one participant can hold in the carbon market. We recommend that no one be allowed to have more than a five percent (not 10 percent as in ACES) position in the market for the most actively traded futures (for example, the market for contracts to deliver allowances at the end of the next compliance year). This would be more than sufficient for hedging and trading purposes and would deny any single market participant the market power to meaningfully influence prices. Congress should also direct the administration to work

with other nations to provide comparable safeguards as a condition of linkage to the U.S. carbon market.

Is there a viable alternative to this cap and trade architecture? Comprehensive cap bills like ACES have been attacked from two contradictory flanks. First, there are those who mischaracterize ACES as a tax bill, and oppose it for that reason. A cap and trade program is not in any way a tax. It is a firm limit on carbon pollution, directly tied to protecting us from the worst effects of global warming. Fundamentally, this is a smart program to curb extraordinarily dangerous pollution. While it guarantees an overall limit on carbon pollution, it also allows individual sources a great deal of flexibility to find the lowest cost pathway to compliance. But the ACES bill is not a tax any more than any of the nation's other air and water pollution control laws.

At the opposite extreme, there are opponents of caps on pollution like the ACES bill who say it *should be* a tax, and oppose it because it is not. Beyond the obvious political obstacles to this approach, NRDC does not support a carbon tax first and foremost because it would not guarantee achievement of the emissions reductions necessary to limit cumulative emissions over time to a level compatible with a stable climate. A carbon tax would represent, at best, a congressional guess at the imposed cost needed to induce myriad covered sources to limit their emissions enough to meet desired annual emissions targets for the country as a whole. That guess could be wrong on the high or low side – most likely on the low side given the aversion of many political actors to charges of raising taxes. It would require Congress to constantly reconsider the tax rate – or to adopt some form of automatic adjustment. Some carbon tax proponents claim a tax would be a lot simpler than cap and trade. But this is the fallacy of comparing an

idealized concept to a flesh and blood bill. When was the last time Congress wrote a simple tax bill? There would be just as many pressures for exemptions, exceptions, offsets, and other special treatment as we have seen regarding emission cap bills. In short, a carbon tax would be neither environmentally effective, simple, nor politically appealing. The ACES architecture is proven to work and is a far better alternative.

Other opponents of the ACES bill have argued for a "New Manhattan Project" like the substitute offered on the House floor that would have authorized a grab-bag of goals, prizes, and grants for new technologies. While most of the goals are laudable, and while prizes and grants have their place, there are two fatal faults to the call for a grand scale research and development program as an alternative to a comprehensive cap and invest approach. First, the proponents of the Manhattan project have identified no visible means of providing the funding they advocate – without a cap and allowance system, they would have to rely entirely on ever-more-difficult annual appropriations. Second, government-sponsored research and prizes, while useful, cannot remotely hope to create private sector incentives for clean energy innovation on the necessary scale. In marked contrast, the ACES bill does create incentives on this scale by establishing an ever tighter cap on emissions that tells every innovator large and small that there is a predictable, expanding market for low-carbon products and services. The primary barrier to a clean energy economy is not a shortage of American ingenuity or even a shortage of financial resources to apply to the task; it is the lack of a powerful and sustained set of predictable market rewards that are needed to motivate private sector innovators to invest in bringing low-carbon options to market rather than products and services where the carbon footprint is ignored. In addition, the ACES bill uses some allowances strategically to

invest in efficiency and clean energy technology. As I explain below, the ACES bill's allowance allocation can be further improved to more fully seize the cost-saving energy efficiency opportunity and save American households and businesses even more.

Others are touting a collection of worn-out ideas stitched together under the catch-all name "All of the Above." The list includes massive subsidies and free rides for all the old energy technologies, with just enough window-dressing on efficiency and renewables to support a talking point or two. It's little more than political point scoring to call for oil and gas drilling everywhere, even in our most precious natural wonders; to massively subsidize construction of economically-dubious nuclear power plants (while ignoring weapons proliferation risks); or to build more conventional coal plants without regard for carbon emissions. In the simplest terms, this is a recipe for *increasing* our carbon pollution, *increasing* our energy bills, *reducing* our energy security, and doing *nothing* to help re-power the American economy. A program that lacks a cap on carbon pollution, and pursues every energy option regardless of merit, just lets global warming keep getting worse and makes our energy and economic challenges worse.

Effective answers for climate protection, energy security, and economic vitality can be found only by wasting less and investing serious sums in clean energy resources, all within the framework of clear limits on global warming pollution. Of all these approaches, only comprehensive legislation like the ACES bill will create the clarity and drivers for the investments we need to shift to the low-carbon economy.

## III. Complementary Standards to Enhance and Ensure Emission Reductions

A key element of the ACES bill is its provision for complementary energy efficiency, renewable electricity, and carbon pollution control standards. Strong energy efficiency standards for buildings, appliances, vehicles, and other equipment are crucial to meeting our carbon pollution goals effectively and at the lowest cost. In fact, still-untapped energy efficiency opportunities can save thousands of dollars per household. I will not speak at length about the ACES bill's generally strong energy efficiency standards and its combined renewable energy and efficiency standard, because these fall mainly in the jurisdiction of the Energy and Natural Resources Committee. We will work with that committee and on the floor to achieve the maximum gains in these areas.

In areas within this Committee's jurisdiction, the ACES bill contains important carbon pollution performance standards for vehicles and power plants. With regard to light-duty vehicles, it appropriately leaves in place the current requirements of the Clean Air Act under which California and EPA are setting greenhouse gas standards and the Department of Transportation is setting mileage standards. Under the historic agreement announced by President Obama in May, these three regimes will be coordinated and will deliver the benefits of the California program nationwide. The ACES bill includes specific mandates to use existing Clean Air Act authority to set greenhouse gas standards for other classes of vehicles and equipment. Further improvements can be made in these areas to deliver more emission reductions – and fuel savings – from a wide range of mobile sources, including aircraft.

ACES also includes new standards and incentives to deploy carbon capture and disposal technology at scale. Because of the importance of these provisions in shaping

future investments in coal both in the U.S. and globally, I will discuss the ACES coal sections in some detail.

**The role of carbon capture and disposal**

As you know, coal is used to generate about 50% of U.S. electric generation today. U.S. coal plant capacity is aging: about one-third of U.S. coal capacity is over 40 years old today; in 2025, more than half of U.S. coal capacity will be over 50 years old. I have testified previously before this Committee on the toll from coal as it is mined and burned today and on the need to act now to begin reducing $CO_2$ emissions from the U.S. coal and global coal fleets and to prevent new coal plant investments that release their $CO_2$ to the air.

Coal is the most abundant fossil fuel and is distributed broadly across the world. It has fueled the rise of industrial economies in Europe and the U.S. in the past two centuries and is fueling the rise of Asian economies today. Because of its abundance, coal is comparatively cheap and that makes it attractive to use in large quantities if we ignore the harm it causes. However, per unit of energy delivered, coal today is a bigger global warming polluter than any other fuel: double that of natural gas; 50 per cent more than oil; and, of course, enormously more polluting than renewable energy, energy efficiency, and, more controversially, nuclear power.

To reduce the contribution to global warming from coal use, we can pursue efficiency and renewables to limit the total amount of coal we consume but to reduce emissions from the coal we *do* use, we must deploy and improve systems that will keep the carbon in coal out of the atmosphere, specifically systems that capture carbon dioxide ($CO_2$) from coal-fired power plants and other industrial sources for safe and effective

disposal in geologic formations. These systems are referred to as carbon capture and storage (CCS) or carbon capture and disposal (CCD), which is the term I will use.

**The Need for CCD**

Any significant additional use of coal that vents its CO2 to the air is fundamentally in conflict with the need to keep atmospheric concentrations of CO2 from rising to levels that will produce dangerous disruption of the climate system. Given that an immediate world-wide halt to coal use is not plausible, analysts and advocates with a broad range of views on coal's role should be able to agree that, if implemented in a safe and effective manner, CCD should be rapidly deployed to minimize CO2 emissions from the coal that we do use.

Decisions being made today in corporate board rooms, government departments, and congressional hearing rooms are determining how the next coal-fired power plants will be designed and operated. Power plant investments are enormous in scale, more than $1 billion per plant, and plants built today will operate for 60 years or more. The International Energy Agency (IEA) forecasts that more than $5 trillion will be spent globally on new power plants in the next two decades. Under IEA's forecasts, about 1800 gigawatts (GW) of new coal plants will be built between now and 2030—capacity equivalent to 3000 large coal plants, or an average of ten new coal plants every month for the next two decades. This new capacity amounts to 1.5 times the total of all the coal plants operating in the world today.

If we decide to do it, the U.S. and the world could build and operate new coal plants so that their $CO_2$ is returned to the ground rather than polluting the atmosphere.

The ACES bill contains a comprehensive approach to make this happen in the U.S. Modeled closely on the USCAP Blueprint for Legislative Action recommendations, the ACES bill combines a declining cap on greenhouse gas emissions with emission standards that will require new coal plants to capture a substantial amount of their $CO_2$ emissions. In addition, to allow CCD to be deployed without significant impacts on consumers' electricity rates, the ACES bill provides for a program of direct payments for capture and disposal of $CO_2$ from the early generations of new coal plants.

**USCAP Recommendations**

The USCAP Blueprint contains a comprehensive proposal for CCD deployment as part of a broad climate protection law. In addition to an economy-wide cap, the Blueprint recommends Congress adopt the following measures:

- requirements for the government to issue needed regulations for siting $CO_2$ repositories and pipelines;
- government financial support to build 5 GW of CCD-equipped commercial power plants by 2015;
- a transitional program to pay for tons of $CO_2$ emissions captured and disposed through use of CCD;
- mandatory emission standards for new coal plants that are not already permitted as of January 1, 2009.

**ACES CCD Provisions**

Subtitle B of Title I of the ACES bill provides a strong foundation for the deployment of CCD systems that can achieve substantial reductions in emissions from large fossil fuel sources. In NRDC's opinion, proposed sections 111, 112, and 113 of the ACES bill would effectively implement the USCAP recommendation to develop and implement a national strategy to address legal and regulatory barriers to commercial-scale CCD deployment.

USCAP also recommends an early grant program to establish at least 5 gigawatts (GW) of coal fueled facilities equipped with CCD and meeting an emission rate no more that 1100 pounds of $CO_2$ per megawatthour by 2015, including at least one pulverized coal retrofit project. The ACES bill does not contain a provision that specifically requires deployment of this amount of CCD capacity by 2015. The ACES bill does, in proposed section 114, authorize creation of a corporation to provide grants, contracts and financial assistance for commercial-scale demonstrations of carbon capture or storage technology projects. While NRDC believes the section 114 program can be useful in advancing practical knowledge and experience with CCD, we are concerned that as drafted, it does not appear to have a clear enough focus to assure that the USCAP-recommended 5 GW of CCD projects will be established by 2015. If this section is included in a Senate bill, NRDC recommends that it be revised to specifically incorporate an objective to achieve this important early deployment component by 2015.

USCAP also calls for a program of direct payments on a dollar per ton of $CO_2$ avoided basis for the first ten years of operation of CCD systems. Payments would be based on two sliding-scales. Higher payments per ton avoided would be provided for

earlier projects to reflect estimated higher costs and to provide an added incentive for early operation of CCD projects. The payment schedule would be highest for the first 3 GW of projects in the program, with successively smaller payments for later projeets. In addition, a separate sliding scale would provide higher dollar per ton payments for projects with higher capture rates. This would reflect the expected higher costs for high capture rate systems and would provide an incentive to achieve lower emission rates than the minimum mandatory emission standard. For example, for a project in the first 3 GW of the program that achieved a high level of capture (85-90%), the payments for the expected incremental costs are estimated to be on the order of $90 per ton avoided. USCAP recommends that the total size of the financial incentive program should be large enough to support on the order of 72 GW of CCD projects.

Section 115 of the ACES bill includes a direct payment program for captured and stored $CO_2$. This provision includes a requirement for payments to be made based on sliding scales with higher payments provided for early projects and for projects employing higher levels of capture. In NRDC's opinion, this approach is consistent with the USCAP recommendations. As in the USCAP recommendation, ACES specifies payments for the first ten years of CCD system operations and calls for a total program size of 72 GW.

Next, USCAP recommends a mandatory emission standard of 1100 pounds per megawatt hour (lbs/MWh) for coal plants permitted between January 1, 2009 and 2020 and an 800 lbs/MWh mandatory standard for plants permitted after the start of 2020, with authority for EPA to establish tighter standards as justified by technical and economic feasibility considerations. Under the USCAP proposal, compliance with the initial

emission standard would be required upon startup for plants permitted after January 1, 2015. For plants permitted between now and January 1, 2015, compliance would be required within four years after either 2.5 GW of commercial scale CCD power plants are operating in the U.S. or 5 GW of such plants are operating globally. This recommendation guarantees that any proposed coal project not already permitted today must meet an emission standard that requires the operation of CCD, either upon startup or early in its operating life.

The ACES bill modifies both the emission standard compliance dates and the CCD payment provisions in some significant respects, with the two provisions working in tandem to create incentives for more rapid compliance and greater levels of emission reduction from new coal plants. The ACES bill also makes CCD projects that are retrofit to existing coal plants eligible for CCD payments.

Section 116 of the ACES bill, creates a new section 812 to the Clean Air Act, which establishes a minimum stringency emission standard for new coal power plants initially permitted after January 1, 2009. The mandatory emission standard in ACES is expressed as a minimum percentage reduction in annual $CO_2$ emissions produced by the unit: for units permitted after January 1, 2009 and before January 1, 2020, a 50% minimum reduction is required; for units permitted on or after January 1, 2020, the unit must achieve a 65% minimum reduction or meet any more stringent requirement established by EPA. The minimum percentage reduction requirements in ACES are intended to be equivalent to the 1100 and 800 pound emission rate limits recommended by USCAP.

In ACES, the mandatory emission standard compliance dates for units permitted before 2020 are somewhat delayed compared to the USCAP recommendations but as discussed below, the CCD financial incentives program is structured to provide a strong economic incentive for earlier compliance. In general, new units permitted before 2020 must comply within four years after a minimum amount (4 GW) of electric generating capacity equipped with CCD systems is in commercial operation in the U.S. but in no event later than 2025.[3] Units permitted on or after January 1, 2020 must meet the minimum emission standard upon initial operation.

Section 115 of ACES creates a program for direct payments for $CO_2$ captured from power plants and other industrial sources and disposed of in permanent geologic repositories. The CCD program is structured to reward early projects and projects that achieve greater reductions than the minimum emission standards set in new CAA section 812. In contrast to traditional government R&D grant programs, the earliest projects do not apply for grant approval. Rather, they are paid for performance with a statutory schedule of payments in dollars per ton of $CO_2$ avoided[4] through the use of CCD systems. The program is technology neutral, with no capture system favored over another.

To encourage early deployment of CCD, phase I of the payment program establishes a statutorily guaranteed payment amount for the first 6 GW of electric power plant capacity that captures $CO_2$. The bill specifies a payment of $90 per ton of avoided $CO_2$ for phase I units capturing 85% or more of the unit's $CO_2$ and $50 per ton for units capturing 50%, with EPA to set payments on a sliding scale for intermediate capture

[3] There is provision for a case-by-case 18-month extension of the 2025 date upon a showing of technical infeasibility for the unit.
[4] Technically, the provision awards allowances, not dollars. But the number of allowances is prescribed to equal a specified dollar per ton value.

rates. In addition, to reward the very earliest actors, the bill increases the payment amounts by another $10 per ton for units that begin to capture $CO_2$ on or before January 1, 2017.

For projects that are built after the initial 6 GW are operating, phase II of the ACES program would provide for payments to be made using an annual reverse auction approach: projects proposing the lowest incentive payment per ton of $CO_2$ avoided for a ten-year period would be selected first, with higher bidders selected next until the funds available for that auction are fully committed. The bill authorizes EPA to establish an alternative payment distribution approach for phase II if the Administrator determines that the reverse auction would not provide for efficient and cost-effective CCD deployment.

As I mentioned, compared to the USCAP recommendations, ACES delays the mandatory compliance date for new coal units permitted before 2020. But to create an incentive for earlier compliance, ACES would reduce or eliminate the amount of CCD payments available to units that delay compliance. For new units permitted before 2015, if the unit does not have CCD in operation at the minimum 50% reduction level by the earlier of 2020 or five years from unit startup, it would be subject to a 20% reduction in CCD payment amounts for each year of delayed CCD deployment. Second, new units permitted between 2015 and before 2020 are ineligible for CCD payments if they do not employ CCD at the minimum 50% reduction level when the unit starts operations.

This approach allows compliance date flexibility as a legal matter but attaches a loss of financial benefits to significant delays in CCD deployment at new coal units. As a practical matter, this approach should result in nearly all new coal projects planning to

employ CCD either immediately or within a few years of initial plant operation. For example, a new coal unit receiving a permit in 2010 would most likely start commercial operation in 2014. To be eligible for full CCD payment amounts, the unit would need to be operating a CCD system by 2019. For each year past 2019 the unit delayed CCD operation, it would lose 20% of eligible payments—a delay to 2024 would mean the unit would not receive any CCD payments. Since the new unit has an outer limit compliance date of 2025 in any case, there will be a strong economic incentive to deploy CCD within five years of unit operation in order to secure full payments for 10 years of CCD operations. The more generous payment schedule for the first 6 GW of CCD in operation will add to the incentive for these first units to employ CCD promptly.

In the case of a unit permitted in 2015, it would likely start up in 2019 and would have a mandatory compliance date of no later than 2025 in any case. But if it failed to employ CCD upon startup, it would not be eligible for any CCD payments. Accordingly, there would be a strong economic incentive for immediate compliance for units permitted between 2015 and the end of 2019.

These provisions of the ACES bill will help speed the deployment of CCD here at home and set an example of leadership globally. That leadership will help reconcile coal and climate protection; it will bring us economic rewards in the new business opportunities it creates here and abroad; and it will speed engagement by critical countries like China and India.

The first CCD projects are technically ready for deployment today but the lack of a policy framework means there are regulatory and economic barriers that are difficult to overcome. The ACES bill would correct this problem by directing the adoption of

required siting rules and providing both the financial incentives and clear standards for emission performance that are needed to make CCD a reality in a timely manner.

**Concerns with ACES Clean Air Act and State program provisions**

In constructing a new program to cap and reduce carbon pollution, we should build on, not replace, the existing Clean Air Act. The ACES bill, however, makes a number of unnecessary and, we believe, damaging changes the Clean Air Act.

Several changes do not, in our judgment, raise significant concerns. Sections 831 and 832 of the ACES bill exclude greenhouse gases from coverage under the ambient standards and hazardous air pollutant programs. NRDC believes these changes are sensible as these programs are not well suited to managing emissions of greenhouse gases.

In addition, NRDC believes it is appropriate to specify minimum $CO_2$ emission performance standards for new coal- and petroleum coke-fired sources, as is done in the ACES bill's section 812 standards, rather than relying on EPA rulemaking under the more general authority of the current Act's section 111 New Source Performance Standard provision. NRDC also supports a change to the current law's New Source Review (NSR) provisions to establish an applicability threshold for greenhouse gases of 10,000 tons per year carbon dioxide-equivalent, a move that would remove the much trumpeted possibility of subjecting small sources to NSR.

NRDC disagrees, however, with sections 811 and 833 of the ACES bill as written. Section 811 would entirely repeal current Section 111's New Source Performance Standards for sources covered by the ACES bill's cap. Section 833 would exempt

consideration of greenhouse gases under the current Act's New Source Review (NSR) provisions for all sources, capped or not. NRDC believes these provisions are too sweeping and would inappropriately eliminate the government's ability to establish reasonable and affordable performance requirements that would complement the cap and contribute to achieving the goals of the ACES bill in an efficient and cost-effective manner.

Since the first comprehensive federal clean air law enacted in 1970, Congress has recognized the value of providing complementary approaches to achieving our air quality and emissions objectives, rather than relying exclusively on a single instrument. Thus, Congress coupled an air quality management program focused on ambient air concentrations of pollutants and state implementation plans (sections 108-110) with technology-based programs to continuously reduce emissions from motor vehicles (section 202) and large stationary air pollution sources (section 111). Congress created this dual system because it recognized that without emission reductions from these sources as technology evolves, there would be too much strain placed on the ambient air quality standards. In the 1977 amendments to the Act, Congress established a case-by-case process under the NSR Program in order to assure a more rapid updating of improvements in pollution control technology as new plants were built and old ones modernized.

The argument has been made that with an overall cap or budget on greenhouse gas emissions, we should simply not care about the amount of emissions from individual sources or even entire sectors. But Congress rejected that approach in the 1990 amendments when it enacted a cap on sulfur dioxide emissions from the electric power

sector to combat acid rain. Congress retained the NSPS and NSR programs for the sources covered under the acid rain program, and those programs have continued to function well to minimize emissions from new sources, thereby reducing pressure on the sulfur dioxide cap and demonstrating improved and less expensive means of emission reduction that can be used to reduce emissions from existing sources as well.

Like for acid rain, in this case the cap on total greenhouse gas emissions is a core element of an effective greenhouse gas reduction strategy. It creates a market for the many innovations that will be required to achieve the deep reductions we need to protect the climate. But we should not rely on this alone. The RECLAIM program in Southern California is an example of overreliance on the cap mechanism alone: There exclusive reliance on a cap program led to long delays in reducing emissions from major sources, and to a totally avoidable compliance crisis when the final deadline arrived.

For these reasons, NRDC believes it is important to preserve EPA's authority to set reasonable emission standards under Section 111 even for major industrial sources that are subject to the cap. We also recommend retention of NSR provisions for truly large sources of greenhouse gas emissions. Critics have complained that applying NSR to carbon pollution would result in burdensome coverage of barbecues and donut shops. That concern is easily addressed by raising the NSR threshold to a level that would cover only truly large industrial sources, such as 10,000 tons per year of $CO_2$-equivalent emissions, and we recommend that change be made.

New legislation should also retain important provisions of the current Clean Air Act that protect the rights of states to go beyond federal minimum requirements. During the long period of federal abdication, states pioneered control of greenhouse gas

emissions from vehicles, and they developed effective programs to deploy energy efficiency and renewable energy resources. States, and entities that states regulate (such as local distribution companies) have program delivery capabilities that the federal government cannot match. If the federal program should fall short of what is needed at some point in the future, it is extremely important that states be able to pick up the slack once again.

We are concerned, however, by section 861, which suspends for six years states' authority to implement or enforce their own cap-and-trade programs. Even temporary preemption of this state authority is very troubling. NRDC does not believe a real case has been made why any such suspension is warranted. In its place, recognizing the potential value of integrating state programs into a suitable national program, NRDC recommends a means through which states can voluntarily suspend the adoption or enforcement of state caps so long as the national program provides a strong national cap, retains other state authorities and adequately supports state energy efficiency, renewable energy, and transportation efficiency programs. As this Committee determines the distribution of the valuable emissions allowances, it is essential to provide sufficient resources for these state-run and state-regulated energy efficiency, renewable energy, and transportation efficiency programs.

The bill should also provide a means to assure that the carbon reduction benefits of these state energy efficiency and renewable energy deployment programs will not be lost when we have a national carbon cap. The bill should allow EPA to reduce the national cap by an appropriate amount if states show that their in-state programs have

reduced emissions beyond the national program and in a way that does not raise allowance prices in other states.

## IV. Using Allowance Value for Public Benefit, Not Private Enrichment

The distribution of the carbon allowances is one of the fundamental decisions that Congress must make. This choice is often debated by using the shorthand "auction versus free allowance giveaway." However this shorthand misses the important policy point—more important than whether allowances are sold at auction or distributed for free is the question of what purposes are established for the use of distributed allowance value, whether free or auctioned. A free allowance that the law requires be used to serve a public purpose is just as effective in promoting that purpose as a provision that requires an equivalent amount of auction proceeds to be used for that purpose. While the ACES bill allocates most of the allowances without charge in the early years, most of those free allowances are required to be used for public purposes and an increasing number – eventually effectively all of them – are auctioned over time.

Even though most allowances are allocated without charge at the outset, the vast majority – more than 80 percent over the life of the bill, according to Harvard economist Robert Stavins[5] – are distributed for public purposes, not private windfalls. Nevertheless, significant improvements can be made. Here are the most significant categories:

*Consumer protection for utility customers.* The largest fraction of the initial allowance distribution goes to electric and natural gas local distribution companies (LDC) (30-35 percent and 9 percent, respectively, phasing out by 2030). Amendments

[5] Robert Stavins, *The Wonderful Politics of Cap-and-Trade: A Closer Look at Waxman-Markey* (May 27, 2009), *http://belfercenter.ksg.harvard.edu/analysis/stavins/.*

on the House floor allocated an additional fraction of one percent to small utilities, primarily co-ops, and added protections against allocating any LDC more than it requires for compliance purposes. The LDCs, which are regulated by state public utility commissions, are strictly required to use the value of these allowances for the benefit of their customers. They can do this by investing in cost-saving efficiency or pass the value on to their customers in ways that lower total electric bills.

There is an important difference between the ACES provisions for electricity and gas utilities, however. The bill directs one-third of the emissions allowances given to natural gas LDCs to helping their residential, commercial, and industrial customers make cost-saving energy efficiency investments. Congress should do the same for electricity LDCs. If local electric companies invested a third of their allowances in efficiency, national energy efficiency investments would increase by about $10 billion per year. This would lower consumers' electricity bills and lower carbon allowance prices significantly for all sources.

*Low-Income Consumers.* Fifteen percent of the allowances are devoted every year to protecting low-income consumers, who spend a higher percentage of their income on food, transportation, and other necessities. The Congressional Budget Office concluded that these provisions will be effective in assuring that the ACES bill is progressive, with the lowest income fifth of the population being better off under the bill by about $40 per year.

*Preserving Domestic Competiveness.* The bill provides as much as 15 percent of the allowances to energy-intensive manufacturers of products such as steel, aluminum, cement, and chemicals that are subject to strong international competition. The rebates

are intended to counter pressures to shift production, jobs, and emissions to countries without comparable carbon reduction programs. Rebates are based on an industry average emission rate (e.g., tons of $CO_2$ per ton of cement) and facility-specific output data (e.g., tons of cement produced) and phase out by 2035. The bill also provides for border adjustments after 2020 if rebates do not adequately address competitiveness. Refinements are needed, however, to provide the president with appropriate discretion in applying border adjustments, and to ensure that firms are not overcompensated and that these two measures phase out as other countries step up to the plate.

*Oil Refiners and Merchant Coal Generators.* Oil refiners and merchant coal plants do not qualify for allowances either as LDCs or energy-intensive, trade-exposed manufacturers. Nevertheless, under the ACES bill these sources initially receive about seven percent of the allowances for free. The bill contains an important provision for reducing the merchant coal allocation if EPA finds it will lead to windfall profits. The same provision to avoid windfalls should be attached to any allocation to oil refiners.

*Energy efficiency, renewables, and domestic adaptation.* Other major slices of ACES allowances go to State Energy and Environment Deployment (SEED) funds for energy efficiency and renewable energy programs, and to incentivize new clean energy technologies, including carbon capture and storage, retooling and infrastructure for hybrid- and all-electric vehicles, and efficient building and appliance deployment. Allowances are also dedicated to domestic public health and natural resources adaptation programs.

*Green jobs and worker transition.* The ACES bill creates a program of worker training, education, and transition for clean energy jobs. It also provides transition assistance to qualifying workers who may be displaced by the effects of the legislation.

*International objectives.* A critical portion of the ACES allowances is devoted to international objectives, including reducing deforestation, helping the most vulnerable countries adapt to climate change impacts, and promoting clean technology exports. NRDC urges this Committee not only to include these allocations for international purposes, but to enlarge them. The five percent of allowances dedicated to reducing tropical forest loss is one of the key provisions of the ACES bill, simultaneously tackling the devastating loss of forests and helping to demonstrate that the U.S. is taking action on a scale comparable to other developed countries. NRDC joined in supporting this deforestation allocation with a strong coalition of business, environmental, and conservation groups including American Electric Power, Environmental Defense Fund, Duke Energy, the Sierra Club and others. We urge the Committee to increase the allocations for helping the poorest countries cope with unavoidable climate impacts, and to promote market opportunities for U.S. clean technology. This is in our national interest. Global warming impacts can significantly increase threats to our national security. These allocations are critical to U.S. credibility and engagement with other countries. The clean energy export provision also provides an important tool to help secure a strong commitment from all major emitters as they are made available only to countries that take significant action to reduce their pollution. At the same time, this provision helps create and support the demand for U.S. clean energy technologies.

## V. Market Risks from Subprime Offsets and Biofuels

NRDC's greatest concerns with the ACES bill lie with the agricultural offsets and bioenergy amendments made after mark-up by the Energy and Commerce Committee and before the bill went to the floor. These amendments run the risk of creating a subprime market in both offsets and biofuels. They seriously damage the environmental integrity of the bill, and they will undermine public confidence in the markets for both products.

*Fixing the offset rules*

The ACES bill allows a very large number of offset credits – up to two billion tons per year. Domestic offset credits can be earned by reducing or sequestering emissions from agricultural sources and smaller industrial sources that are not subject to the emissions cap. International offset credits can be earned by reducing rates of deforestation, as well as by measures taken in the electricity and industrial sectors, and agricultural, and reforestation sectors if determined eligible. In order to turn offset use into an engine for making net reductions in carbon pollution, the original Waxman and Markey proposal provided that capped sources acquire 1.25 tons of reductions or sequestrations for each ton of extra emissions they wished to emit. Thus, with every offset transaction, net global emissions were to be reduced by a quarter of a ton of $CO_2$. In this way, using offsets would not merely let us run in place. Rather, the more offsets we used, the faster we would make progress reducing overall emissions. This was a win-win: while offset users benefited from reduced compliance costs, the world benefited from faster emission reductions.

The bill as passed by committee and the full House retained that 25 percent dividend for international offsets after 2017, but allows domestic offsets (and international offsets before 2017) to be used on a one-ton-for-one-ton basis. NRDC believes this Committee should extend the offset dividend to apply to all offsets, as in the original Waxman-Markey proposal.

The Committee also needs to pay close attention to assuring the *quality* of all offsets as this is essential to the integrity of any carbon pollution reduction targets. If an offset credit is not backed by a real reduction, or if that reduction would have happened anyway, then total system emissions actually increase above required levels when that credit is used to enable a capped source to emit an extra ton of carbon.

It is no secret that poor offset quality has been a serious problem in implementation of the Clean Development Mechanism under the Kyoto Protocol. That is why the ACES bill as passed out of the House Energy and Commerce Committee focused much attention on creating a reliable framework for ensuring the reality and additionality of each ton of reductions or sequestrations claimed under an offsets program.

First, the Committee bill established a science-driven process for developing the offset system's rules by creating an Offsets Integrity Advisory Board consisting of experts with the relevant backgrounds and experience, drawn from public, private sector, and university settings. This Board is critical to ensure that regulators are given strong, independent, and scientifically driven guidance on the rules.

Second, the Committee bill placed primary responsibility for ensuring offset quality in EPA, on the sound premise that since offsets are alternate compliance instruments, the agency Congress charges with assuring overall compliance with the cap

should bear primary responsibility for determining the quality of offsets that will accepted for compliance purposes. Third the Committee bill requires that offset credits be based on standardized performance-based methodologies, rather than case-by-case reviews that have proved so problematic under the Clean Development Mechanism. Fourth, the Committee bill required independent third-parties to play an essential role in certifying that offset projects meet the quality standards established by the regulator. Lastly, the Committee bill provided for random audits of projects and mandated a full program review every five years.

Ensuring offset quality through the development and implementation of sound rules should be in the common interest of business, environmentalists, farmers, foresters, ranchers, and the American public. Otherwise, we run the risk of creating a subprime asset. If offsets do not actually reduce emissions as promised, they will quickly lose public trust and support. The loss of public trust will penalize the good actors by reducing confidence in the offset market, while simultaneously damaging our environment. That result isn't in the interest of anyone. As we have seen in the financial markets, loss of confidence in market instruments can have broad and costly ripple effects.

In this regard, we have serious concerns with changes to the offset provisions made after the ACES bill passed out of the Energy and Commerce Committee. In particular, we are concerned by the floor bill's transfer of authority over the development and implementation of the quality safeguards for domestic agricultural and forestry offsets from the EPA to the U.S. Department of Agriculture (USDA). USDA has an important role to play in bringing its scientific expertise to bear, and in serving as an

extension agent to enable thousands of farmers and foresters to take part in the opportunities provided by a well-run offsets market. But for the reasons mentioned above it is not sound policy to divide compliance determination responsibility between two agencies. We are concerned as well with other changes that weakened aspects of the offsets rules, including diminishing the role of the Offsets Integrity Advisory Board regarding agricultural offsets.

One constructive amendment made on the House floor establishes a domestic program administered by USDA to provide incentives, outside the offsets program, for supplemental farm-based emission reductions and carbon sequestration. This program provides an avenue to encourage practices that are beneficial but would have difficulty meeting the strict measurement, verification, and additionality requirements needed for offsets. This concept provides a leading role for USDA in promoting farm-based practices to reduce emissions and store carbon without presenting any risk to compliance with the cap.

It bears noting that the principals in the House negotiations over these issues have explicitly stated that the formulation included for purposes of floor action in the House should not be viewed as the approach that should become law. In a letter to President Obama, Chairmen Waxman and Peterson stated:

> [W]e have not yet agreed upon the appropriate roles of the U.S. Department of Agriculture and U.S. Environmental Protection Agency in developing and implementing the program. For the purposes of House action, we have given responsibility exclusively to USDA, rather than resolve the specific responsibilities of the two agencies.[6]

The letter continues to ask the Obama administration for its advice on appropriate roles for the two agencies.

[6] Letter from Chairmen Henry Waxman and Colin Peterson to President Barack Obama (June 24, 2009).

NRDC believes this issue can be resolved in a manner that ensures each agency plays an appropriate role both in aiding farmers, ranchers, and foresters to participate and in ensuring that resulting offsets meet the high quality standards needed to ensure that we meet our emissions objectives. Well-designed domestic agriculture and forestry projects can play an important role in solving global warming, and so we look forward to working with this Committee, the administration, and other stakeholders to improve these provisions in the Senate bill and in Conference.

*Fixing the treatment of bioenergy*

Sustainably produced biomass feedstocks, processed efficiently and used in efficient vehicles or burned to generate electricity, can reduce our dependence on fossil fuels, cut emissions of heat-trapping carbon dioxide, and contribute significantly to a vibrant rural economy. Based on its potential, bioenergy has benefited from tremendous public investment in the form of production mandates and tax dollars.

Pursued without adequate environmental safeguards, however, bioenergy production can damage in significant ways our lands, forests, water, wildlife, public health and climate. As a result of floor amendments, ACES includes three fundamental flaws in bioenergy policy that if not corrected will significantly undermine the achievement of the carbon pollution reduction targets in this legislation, wreak unintended harm on our natural resources, and undermine the market for bioenergy.

- First, the bill creates a large biomass loophole in carbon accounting that ignores the global warming emissions related to biomass production and combustion when determining if the bill's emissions caps are met. The loophole could dramatically diminish the emission reductions achieved by the bill, bringing actual reductions in

2020 achieved by capped sources to as low as 11 percent, rather than the 17 percent reduction promised by 2020.

- Second, the bill weakens current law by stripping from the renewable fuels standard under the Clean Air Act the requirement for a full lifecycle accounting of the carbon emissions from producing and using biofuels – including market-driven impacts such as international deforestation. This would cause the ACES bill to work at cross-purposes, with one part of the bill using allowance revenue to reduce deforestation while another part drives increases in deforestation.
- Third, the bill eliminates safeguards on the sourcing of biomass that protect federal forests, sensitive ecosystems, and wildlife habitat.

These changes fundamentally threaten the foundation of sound bioenergy policy by pitting environmental objectives and bioenergy production objectives against each other. NRDC and many other environmental organizations have championed bioenergy in the past and NRDC wishes to continue to support this potentially clean and sustainable source of energy. However, if bioenergy is sourced and produced in a manner that conflicts irreconcilably with solving global warming and safeguarding natural resources, it will destroy the support -- by a broad coalition, including NRDC -- that bioenergy has up to now enjoyed. For example, NRDC and a wide range of other organizations have already gone on record that without adequate safeguards, they will have to oppose implementation of the existing biofuels mandate under the RFS.

Fixing the biomass loophole in carbon cap accounting. The ACES bill is supposed to require a 17 percent reduction in carbon emissions by 2020. Because of the biomass loophole in the House-passed bill, the real reduction achieved could be far less –

as little as 11 percent.[7] The loophole is created by not requiring covered sources to account for the life-cycle emissions of biomass and biofuels. In other words, if a coal power plant replaces half of its coal with biomass, it has to hold carbon allowances for only half of its pollution. This makes sense only on the assumption that 100 percent of the carbon dioxide released when the biomass is burned was taken up from the atmosphere during its production. That assumption is true when biomass is grown in a sustainable, low-carbon manner. It is not true if biomass is taken from old growth forests or other practices that result in large releases of sequestered carbon into the atmosphere before the fuel reaches the power plant.

A rational, environmentally-sound market for bioenergy would account for these upstream carbon emissions. The marketplace would then favor sustainable, low-carbon sources of biomass, and shun those that make our climate problem worse. The biomass loophole will encourage ineffective "junk" biomass, disadvantaging and punishing providers of sound biomass. It also punishes providers of other low-carbon energy – wind and solar, for example – and even hurts providers of fossil energy who have to incur the cost of carbon allowances, while no allowances would be required if the source switched to bioenergy.

Fortunately, Chairmen Waxman and Peterson recognized in another letter that this issue requires further work.[8] The common sense solution is to close the loophole by ensuring that covered entities that burn or process biomass report the full net carbon

[7] Drawing on several independent scientific analyses, NRDC estimates that under the ACES bill uncounted bioenergy emissions in 2020 could be 45-354 million metric tons greater than in 2005. Our best estimate is 193 million metric tons, based on results of a preliminary analysis of ACES using a version of the Department of Energy's NEMS model and land-use-related emission factors from EPA's RFS2 proposal. This would erode the effective 2020 emission reductions to only 14 percent using our best estimate, and to as little as 11 percent using the high end of the scientific range.

[8] Letter from Chairmen Waxman and Peterson to Speaker Nancy Pelosi (June 24, 2009).

impacts of that fuel, capturing net emissions reduction benefits from the most sound biomass sources and accounting for emissions increases associated with other types o of biomass.

Preserving full carbon accounting in the RFS. The ACES bill as passed on the floor compounds the above problem by creating a second biomass loophole that strips, for at least five years, a critical safeguard from the renewable fuels standard (RFS) included in the Clean Air Act by the 2007 Energy Independence and Security Act (EISA).

As this Committee is well aware, the expanded RFS mandate established in EISA 2007 included life-cycle greenhouse gas performance requirements for new biofuels. EISA's amendments to the Clean Air Act required EPA to conduct a full life-cycle analysis of emissions associated with producing biofuels – including the emissions from market-driven impacts like deforestation and land conversion in other countries. The amendments specifically defined life-cycle emissions to include "direct and significant indirect emissions such as significant emissions from land-use changes."

The amendments made to the ACES bill before floor action would delay inclusion of so-called "international indirect" emissions from the required life-cycle accounting for at least five years, even though the best available science already establishes that these emissions are real and significant. The loophole could not be closed unless EPA and USDA jointly agree on a new accounting methodology after studies by the National Academy of Sciences.

Emissions from market-driven deforestation and land use change are large. In the California Air Resources Board's adopted rule and in EPA's proposed RFS rule, expert

agencies have found that the emissions from the biomass-generated incentive for clearing land equal between 31 percent and 66 percent of the life-cycle greenhouse gas emissions of gasoline.[9]

As the USDA stated in recent testimony to Congress: "There is little question that increased biofuel production will have effects on land use in the United States and the rest of the world."[10] The USDA testimony also noted: "EPA's proposal reflects considerable input, guidance, and data from USDA. EPA's proposal also utilized many of the same data and assumptions that USDA uses regularly in near-term forecasting agricultural product supply, demand, and pricing."[11]

Ignoring market-driven emissions from land-use change in other countries will allow world-wide emissions to increase as carbon is released from forests and soils, worsening global warming instead of abating it. To be sure, calculation of the emissions associated with market-driven land-use changes is complex. But a sound scientific basis already exists for these calculations. EPA is using the best science and peer-reviewing its proposal.

In fact, EPA is relying on the same peer-reviewed models that the Congress has relied on for years to assess the impacts of the farm bill. These are the same models the corn ethanol industry has pointed to arguing that ethanol subsidies are good because they raise the price of corn and thus lower agricultural subsidies. The main difference in how

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[9] California Air Resources Board (CARB), "Staff Report: Proposed Regulation to Implement the Low Carbon Fuel Standard - Initial Statement of Reasons (ISOR), Volume 1," March 5, 2009. Table IV-5, p. IV-15 AND Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program (Notice of Proposed Rulemaking). Federal Register 74:99 (May 26, 2009) p. 25041.

[10] USDA, *Statement of Joseph Glauber, Chief Economist, U.S. Department of Agriculture Before The House Agriculture Committee, Subcommittee on Conservation, Credit, Energy, and Research*, May 6, 2009, Pg. 15.

[11] *Id.* at 2.

EPA is using these models is that it is including the economic ripple effect those higher corn and crop prices have around the world. If these models are good enough to make the case for ethanol subsidies, they should be good enough to make sure that ethanol actually provides benefits in return for those subsidies.

Addressing this issue, more than 170 scientists wrote to the California Air Resources Board saying:

> As scientists and economists with relevant expertise, we are writing to recommend that you include indirect land use change in the lifecycle analyses of heat-trapping emissions from biofuels and other transportation fuels. This policy will encourage development of sustainable, low-carbon fuels that avoid conflict with food and minimize harmful environmental impacts.[12]

NRDC believes if EISA's requirement for full life-cycle analysis is postponed, then it is necessary to delay further implementation of the Renewable Fuel Standard as well. If a "time-out" is called, it should extend to all the players on the field, including a time out for all increased volume requirements under the RFS. Anything less than keeping the accounting and the volume requirements on the same schedule amounts to cooking the books.

A better approach would be to replace the RFS with a low-carbon fuel performance standard as soon as practically possible. Such a standard should set limits on the average carbon intensity of the entire transportation fuel pool, not simply on the portion added under the RFS. The federal standard, like the California low carbon fuel standard, should be technology-neutral and performance-based, thereby providing the maximum flexibility and incentive to innovate with new fuels and approaches to lower carbon intensity. Any sustainably-produced low-carbon fuel should be allowed to

[12] Matson et al., letter to Mary Nichols, Chair, California Air Resources Board (Apr. 21, 2009).

compete, including biofuels, electricity, natural gas, or even petroleum fuels produced in a lower carbon, more efficient manner.

At the same time, the full carbon emissions of high carbon fossil fuels, such as tar sands, oil shale and liquid coal, and today's conventional oils must also be counted – if these high-carbon fuels are allowed to grow unabated, they could increase transportation fuel carbon intensity by *one-third* by 2030.

This fuels standard would avoid the inefficiencies of the current technology-specific, volume-based mandates and performance thresholds that currently dominate U.S. biofuels policies. It would encourage maximum innovation across all transportation fuel options, which is the key to ensuring compliance at the lowest cost.

Preserving land and wildlife safeguards. The ACES bill's third step backwards for bioenergy policy is to eliminate key sourcing safeguards for biomass feedstocks. In addition to the minimum greenhouse gas standards, EISA 2007 includes a definition of renewable biomass that provides vital protections for wildlife, native grasslands, old-growth, natural forests, and federal forests. While providing this minimum level of protection, EISA makes available a wide range of high-volume biomass materials, assuring diverse opportunities for landowner participation and a wide diversity of feedstocks. These minimum safeguards should be retained for the RFS and extended to all policies that promote bioenergy, including the bill's Renewable Electricity Standard.

Instead, the floor amendments to the ACES bill move completely in the wrong direction. They eliminate all sourcing guidelines on non-federal lands and significantly dilute the level of protection for our federal forests. These new definitions are applied to the RFS, the RES, and to carbon accounting under the cap itself.

EISA's current definition of renewable biomass ensures that the RFS does not encourage biomass harvesting from sensitive wildlife habitat. The ecosystems placed off limits by the RFS are home to our most rare, threatened, and imperiled wildlife. While tree plantations and young forests are increasing in parts of the United States, older forests that provide critical wildlife habitat and store tremendous amounts of carbon are disappearing faster than they are being regrown, both nationally and globally. Loss of native habitat is the greatest threat to biodiversity here and abroad. The RFS safeguards also protect against the use of biomass harvested from native grasslands and old-growth and late successional forest. Loss of forests is one of the greatest threats to biodiversity worldwide and a major contributor to global warming.[13]

The RFS renewable biomass definition in current law allows use of all biomass from existing tree plantations, from new tree plantations established on previously cleared non-forested lands, and from "slash and precommercial thinnings" from natural forests. In concert, these provisions allow woody biomass to contribute to biofuels feedstocks, while protecting against the clearing of forests or the conversion of natural forests to monoculture tree plantations, thus losing their natural ecosystem functions.

The current definition properly discourages the conversion of natural forests to other uses. These forests are under severe threat from unsustainable logging practices, global warming, and real estate development. While outright deforestation is the most dramatic example, equally critical is the conversion of natural forests to single-species tree plantations. Plantations may look like "forests," but they are biological deserts

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[13] Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report Summary for Policymakers*, pg. 5. Available at http://www.ipcc.ch/pdf/assessment report/ar4/syr/ar4_syr_spm.pdf

compared to the natural forests they replace – lacking the diversity of species, structure, carbon content, and ecological functions that make natural forests so important.

The RFS sourcing safeguards also protect our federal forests. Federal lands are held in trust for the American public. Freed from immediate market pressures, their core purpose is a set of values and services largely unavailable from private lands. In the climate context, their highest functions are as carbon sinks, measures of U.S. credibility globally, and ecological refuges. Additionally, these forests represent unique reservoirs of genetic and other biologic diversity, provide many other ecological services like drinking water and flood control, and stand to play a critical role in the face of global warming's growing impacts on biodiversity, ecosystem resilience, and the spread of invasive species.[14]

Old growth forests and native grasslands store vast amounts of carbon. Most private and many state lands are managed with an intensity that greatly reduces carbon sequestration. U.S. national forests and Department of Interior lands are the exception. Their undisturbed areas can be kept intact; those damaged can be guided back to carbon-rich status. No other land use decision within Congress' direct control has so much potential to mitigate global warming.

Some logging enthusiasts optimistically argue that restoration of federal lands is actually enhanced by opening them to biomass sourcing. However, it has proven very difficult to create biomass incentives for these lands that provide reliable greenhouse gas benefits but do not jeopardize their core functions and values. Generally, the more wood removed, the greater the adverse impact on net sequestration and ecologic functioning.

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[14] See, for example, Lovejoy, Thomas, *Climate Change and Biodiversity*, Yale University Press, August 2006.

Thus, while light thinning may in some cases help remedy past abuses, allowing industrial demand to drive restoration decisions is a recipe for disaster.

Conservation of these public lands is also essential to American standing internationally. Climate change cannot be managed without halting native forest loss worldwide. To press that point credibly, we must practice what we preach. Putting our own house in order requires preserving intact federal forests and increasing the carbon storage of others.

These public lands are also vital to climate adaptation. Large undisturbed tracts, like national forest roadless areas, enjoy high ecological health. They are better positioned than altered systems to accommodate warming with their essential processes in place. As America's flora and fauna suffer the stress of climate change, these are the landscapes in which many can best survive. Intact public lands will preserve our natural heritage and biological diversity, and thereby help lessen pressure on private lands.

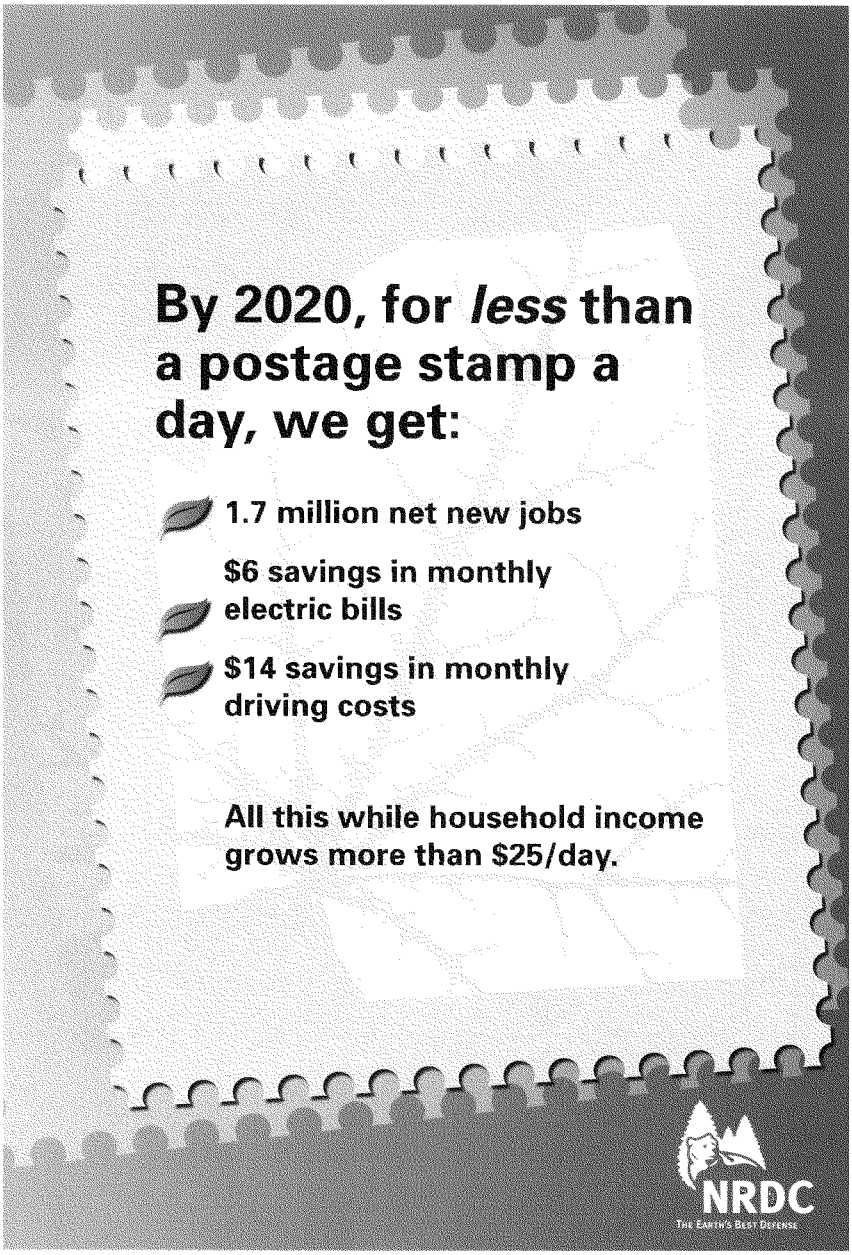
In sum, these floor amendments to ACES should be rejected to ensure that American agriculture reaps the benefits of bioenergy without damaging our natural resources and worsening climate change.

## VI. Conclusion

Chairwoman Boxer and members of the Committee, the time for action to address the triple threat of overdependence on insecure energy resources, a weakened economy, and an imperiled climate is long overdue. The ACES bill passed by the other body has the right broad architecture: a comprehensive limit on greenhouse gases that gets tighter over time, a set of complementary policies to spur rapid improvements in emission

performance in key sectors of the economy, a balanced approach to allowance value distribution that addresses the different transition challenges for different regions and economic sectors and provides needed resources for clean energy deployment, well-designed provisions to manage program costs without weakening the program's environmental performance, and modest but important support for forest protection in other countries. The bill has its defects, some of them substantial as discussed above, and these should be corrected in the Senate. But ACES is a very good starting point that should allow the Senate to move promptly to pass a companion measure so that a bill can be presented to the President for his signature later this year.

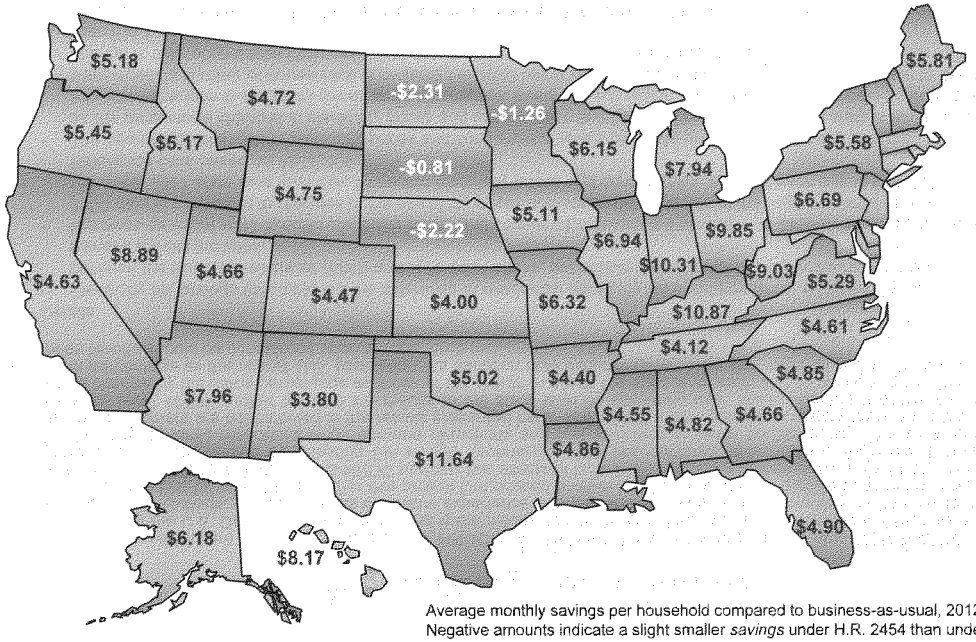
There is a story about the advice a Chinese gardener gave to his employer. When the landowner asked, "what is the best time to plant an oak tree," the gardener replied, "100 years ago but the second best time is today." For climate protection perhaps the best time to enact a comprehensive program to fight global warming was thirty years ago but the second best time is this year.


By 2020, for *less* than a postage stamp a day, we get:
1.7 million net new jobs
$6 savings in monthly electric bills
$14 savings in monthly driving costs
All this while household income grows more than $25/day.
NRDC
The Earth's Best Defense

# Climate Bill Cuts Electricity Bills

## *H.R. 2454 saves Americans an average of $6 per month*

Americans in nearly every state will save on their monthly electricity bill under the American Clean Energy and Security Act. With its energy-efficiency and consumer protection provisions, H.R. 2454 creates modest savings for most consumers. Even in the few states where savings compared to business-as-usual are not projected, bills still will be lower under H.R. 2454 than they were in 2007.




**US Average Savings: $5.99/month**

| | |
|---|---|
| CT | $8.11 |
| DC | $4.06 |
| DE | $9.01 |
| MA | $5.53 |
| MD | $8.07 |
| NH | $5.82 |
| NJ | $6.28 |
| RI | $4.45 |
| VT | $5.27 |

Average monthly savings per household compared to business-as-usual, 2012-2020. Negative amounts indicate a slight smaller *savings* under H.R. 2454 than under business-as-usual. Methodology and sources on back.

NRDC

# Methodology and Sources

The data presented are based on analysis that NRDC commissioned from OnLocation Inc., using NEMS-NRDC. NEMS was developed by the U.S. Department of Energy, and is the model that the Energy Information Administration (EIA) uses to develop its Annual Energy Outlook. OnLocation has extensive experience with the NEMS model, and has provided NEMS model development and support to EIA for over 20 years. For this project OnLocation analyzed H.R. 2454 using a modified version of the model, which is referred to as NEMS-NRDC. NEMS-NRDC portrays the effects of H.R. 2454, including carbon price projections, energy efficiency improvements (represented by adopting EIA's High Technology case assumptions), allocations to local distribution companies (LDCs), and dynamic responses (e.g., demand reductions and fuel switching to lower carbon fuels). The bill's refunds to low-income consumers are not included in the results presented here. The NEMS model generates results resolved to the regional, not the state level. NRDC further focused the results to the state level by assuming each state's electricity prices and consumption would change by the same percentage as those of the region in which the state is located, and its population would change by the same percentage as the overall U.S. population. As variation may occur between state and regional and state and national trends, these results should be considered approximate.

Details:

- Electricity bill savings (or costs) are the difference in residential electricity expenditures (price multiplied by consumption) between the Business-as-usual (BAU) and H.R. 2454 cases, per household. Changes in expenditures on energy-using devices are not included.
- Business-as-usual state-specific electricity prices and consumption levels are projected to 2020 by scaling state-specific 2007 data in proportion to changes in the electricity prices and consumption levels of the region in which the state is located. [Sources: 2007 state data from EIA. Projected electricity prices and consumption levels of each region from NRDC-NEMS Reference case based on AEO2009.]
- The percentage changes in electricity prices and consumption levels per state under H.R. 2454 are assumed to be the same as the percentage changes in electricity prices and consumption levels of the region in which the state is located. [Sources: Projected changes in electricity prices and consumption levels of each region from NEMS-NRDC modeling of H.R. 2454.]
- State-specific number of households is projected to 2020 using 2000 state-specific data scaled in proportion to the projected change in the national total [Sources: 2000 data from U.S. Census. Projected growth in number of households in total U.S. from EIA.]
- Regions are based on the NERC regions and sub-regions that EIA uses in AEO 2009. If a state falls into more than one region then its projections are calculated through taking a population-based weighted average of the two or more regions into which it falls.
- Four states experience modest bill increases relative to the business-as-usual case despite electricity prices that are projected to be below 2007 levels under H.R.2454. In the region that all four states are in, electricity prices are projected to drop by 14.6% between 2007 and 2020 under BAU and by 2.6% under H.R. 2454.

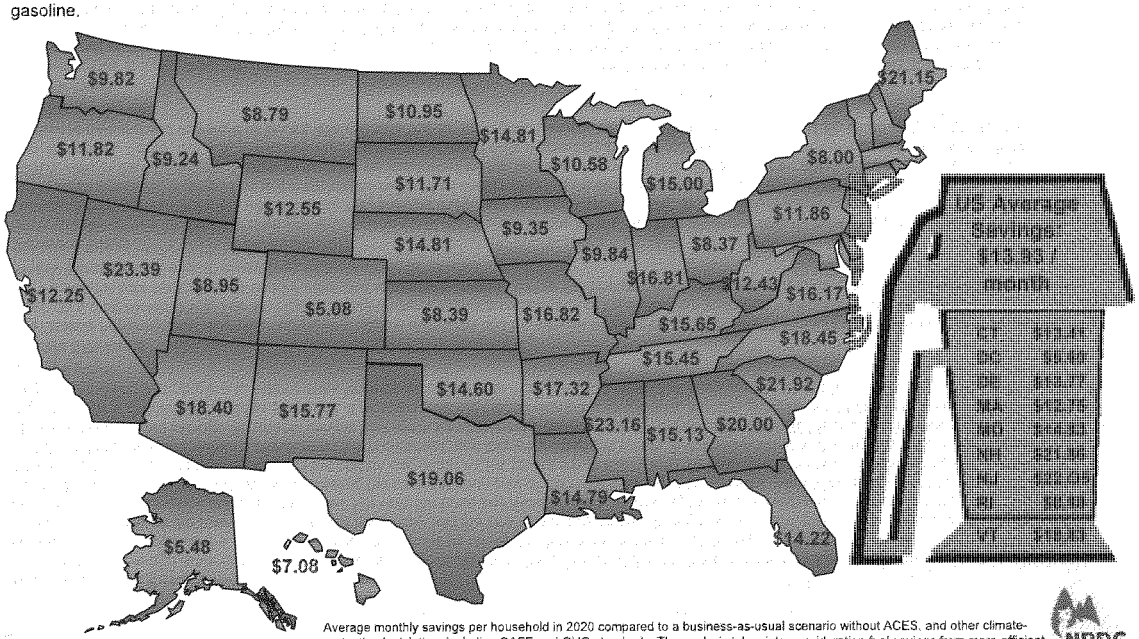
Sources used are: NEMS-NRDC modeling of H.R. 2454 (built upon AEO 2009). Department of Energy's Energy Information Administration. U.S. Census Bureau.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

# Climate-Protection Policies Cut Fuel Bills

## *ACES Bolsters Other Fuel Policies to Save Americans $17 Billion/yr by 2020*

The American Clean Energy and Security (ACES) Act allocates funding to produce the next generation of clean, fuel-efficient vehicles in the United States, and when combined with clean vehicle performance standards adopted by the Obama administration, the American on-road fleet will become about 25% more fuel efficient over the next decade. As a result, by 2020, Americans will drive more efficient vehicles and have lower household transportation costs. Even in the face of rising gasoline prices, cleaner vehicles will save money by sipping instead of guzzling gasoline.




Average monthly savings per household in 2020 compared to a business-as-usual scenario without ACES, and other climate-protection legislation, including CAFE and GHG standards. The analysis takes into consideration fuel savings from more efficient vehicles, allowance costs, and the incremental purchase cost of more efficient vehicles. Methodology and sources on back.

NRDC

# Methodology and Sources

***Methodology and Assumptions***

The bulk of the average American household's transportation costs come from owning and operating personal vehicles, such as cars, minivans, SUVs, and pickup trucks. We calculate the savings to households in 2020 by taking the difference in the cost of driving a fleet made up primarily of vehicles that get the same fuel economy as the average new vehicles sold today and the cost of purchasing and driving more efficient vehicles. The cost of driving is simply the product of fuel consumption and gasoline prices. For both the base and more efficient vehicle cases, we start with gasoline prices as projected by DOE's Energy Information Administration (EIA). When calculating the transportation cost of the more efficient fleet, however, we adjust the cost to include two counteracting effects: (1) fuel prices increase because of the carbon cap under ACES (about 5% in 2020), and (2) state gasoline expenditures decrease because a reduction in U.S. oil demand puts downward pressure on world oil prices, and therefore state gas prices. It should be noted that, even without the cost-reduction effect in (2), all states have net savings. A national vehicle fleet stock turnover model developed by Therese Langer at ACEEE projects on-road vehicle efficiency. When that efficiency is divided into mileage estimates, it provides national fuel consumption projections. For this analysis, the 2020 national consumption is then allocated to states in proportion to historic state-level consumption data from EIA. State-level fuel costs are calculated by multiplying a state's consumption by its gasoline prices.

***Vehicle Efficiency***

The Obama Administration recently enacted new vehicle standards of 27.3 mpg for model year (MY) 2011 and announced an extension of those standards to reach 35.5 mpg for MY 2016. The savings in our calculations reflect a comparison of these new standards with a fleet that remains at 2008 levels for cars and 2011 levels for light trucks (based on EPA data and regulations enacted before the Energy Independence and Security Act). The improved fleet increases linearly between 2011 and 2016 and then remains at the 2016 level.

***Gasoline Prices***

State gasoline prices for the base case are assumed to equal the regional prices for the region in which the state is located, as reported by EIA's Annual Energy Outlook 2009 (Updated Release, which reflects the American Recovery and Reinvestment Act). In the ACES+vehicle standards case, those base case gasoline prices were increased in proportion to the carbon content of fuel consumption using allowance prices (in $/MTCO2e) from the Congressional Budget Office (CBO). Also in the ACES+vehicle standards case, we accounted for the fact that changes in U.S. oil demand can affect world oil prices and therefore U.S. gasoline prices. Today, the U.S. consumes nearly a quarter of world daily production and a reduction in demand from driving more efficient vehicles will lower worldwide demand and therefore oil prices. We estimate that for each gallon saved, total state costs decrease by $0.27, which is the estimate from NHTSA's MY2011 CAFE rule.

***Vehicle Costs***

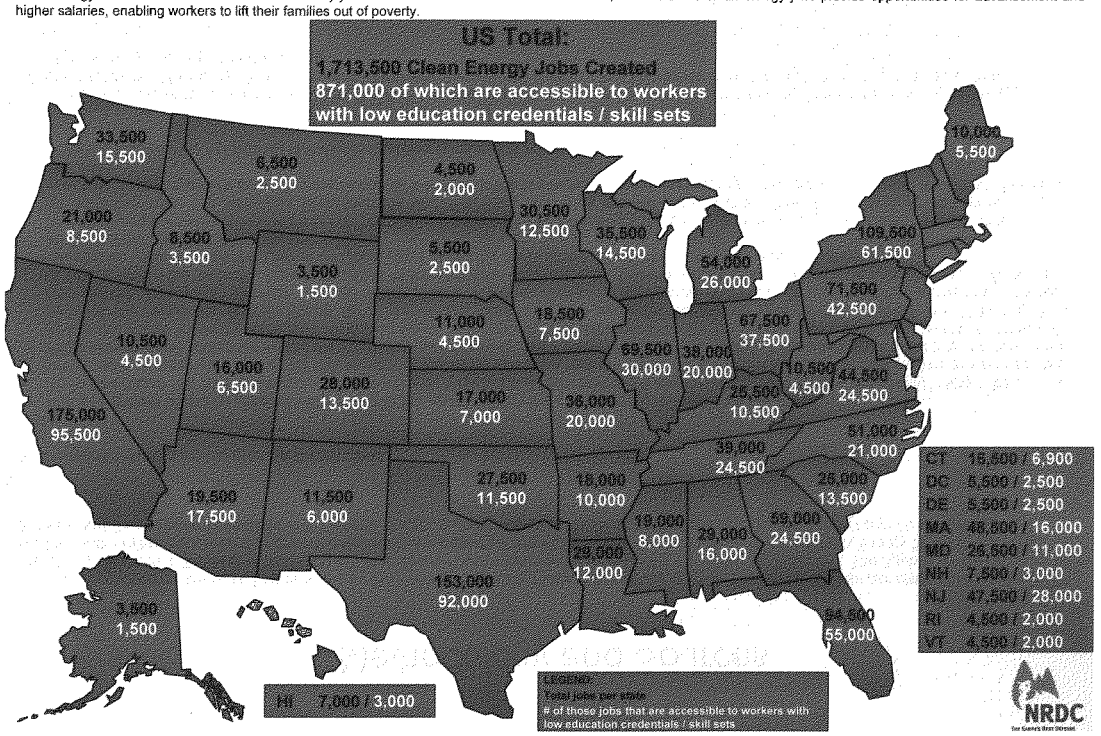
The technology to make more efficient vehicles increases the price of the vehicles. The Obama Administration estimates that MY2016 vehicles that average 35.5 mpg will cost approximately $1300 more than today's vehicles. NHTSA estimates that achieving the shorter run MY2011 standard will cost less, at $91 per vehicle. To get costs for MY2012-2016, we interpolate linearly between MY2011 and MY2016 costs. We also assume that the incremental cost is not paid for entirely upfront but is included in a 5-year loan with an 8 percent interest rate. We allocate the more efficient vehicle incremental costs to individual states according to an estimate of new vehicles sales in each state. We use the EIA AEO 2009 projection of national sales and assign each state a share of the sales according to a recent breakdown of vehicles per state provided by Ward's Automotive Group for 2006.

It is also worth noting that though a main driver of savings is the switch to more efficient vehicles, and low income households tend to drive older and less-efficient vehicles, there are provisions in the bill to ensure that low-income households are not negatively impacted. More specifically, ACES provides 15% of allowance value to low-income households in the form of a rebate to fully cover their increased costs (not only for transportation, but for home energy and all other direct and indirect costs). In fact, a recent CBO analysis shows that low-income households will actually benefit slightly under ACES.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

# Clean Energy Investments Create More Jobs

The American Clean Energy and Security Act will help spur $150 billion in clean energy investments, which will create 1.7 million good-paying jobs throughout the United States. Clean energy jobs are labor intensive, and clean energy investments create more jobs across all skill and education levels than comparable investments in fossil-fuel energy sources. Clean energy investments create 3.2 times as many jobs as fossil-fuel investments overall. Among workers with few educational credentials and little work experience, clean energy investments create 5.5 times as many jobs as fossil-fuel investments. Furthermore, 75% of those clean energy jobs provide opportunities for advancement and higher salaries, enabling workers to lift their families out of poverty.



# Methodology and Sources

The figures presented are based on analysis by the Political Economy Research Institute (PERI). Overall job figures per state are from the PERI report "The Economic Benefits of Investing in Clean Energy" commissioned by the Center for American Progress. The figures on jobs accessible to workers with limited educational and work credentials are based on the PERI report "Green Prosperity: How Clean Energy Policies Can Fight Poverty and Raise Living Standards in the United States, commissioned by the Natural Resources Defense Council and Green for All.

Both reports fully explain the methodologies used.

Notes:

- The jobs shown would be created roughly within the year in which the clean energy investments are made.
- PERI calculated the jobs accessible to workers with limited education and work credentials in the "Green Prosperity" report for 21 states. NRDC derived estimated figures for the remaining states by allocating the remainder of the national figure for low-credential jobs reported by PERI among those states for which the figure was not originally calculated. This was accomplished by taking the percentage of low-credential jobs in the states for which such jobs were calculated, and applying that percentage to the total number of jobs (i.e. all levels of credentials) in each of the remaining states. States for which NRDC calculated low-credential accessible jobs by this method are Alabama, Alaska, Connecticut, Delaware, Georgia, Hawaii, Idaho, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Hampshire, North Carolina, North Dakota, Oklahoma, Oregon, Rhode Island, Utah, Vermont, West Virginia, Wisconsin, Wyoming and the District Of Columbia. Figures for these states should be considered approximations.
- All figures are rounded to the nearest 500.
- The job figures presented indicate the net jobs that will be created by investing $150 billion in clean energy, an amount PERI calculates based on spending from the American Reinvestment and Recovery Act, plus the American Clean Energy and Security Act, plus the private investments that both will spur. The imposition of a carbon price in the ACES act is particularly important to leveraging the private investments assumed.
- State job figures may not add up to national total due to rounding errors.

Sources:

"The Economic Benefits of Investing in Clean Energy" downloadable from http://www.americanprogress.org/issues/2009/06/clean_energy.html.

"Green Prosperity: How Clean Energy Policies Can Fight Poverty and Raise Living Standards in the United States" downloadable from http://www.nrdc.org/energy/greenjobs/.

For more information, please contact Antonia Herzog at aherzog@nrdc.org

**Congress of the United States**
**Washington, DC 20515**

June 24, 2009

The President
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear Mr. President:

The American Clean Energy and Security Act (H.R. 2454) includes specific provisions for agricultural offset credits, which can be used to comply with the pollution reduction requirements in the bill. We have agreed upon the terms of a program to issue such credits, but we have not yet agreed upon the appropriate roles of the U.S. Department of Agriculture and the U.S. Environmental Protection Agency in developing and implementing the program. For purposes of House action, we have given responsibility exclusively to USDA, rather than resolve the specific responsibilities of the two agencies.

To assist us in resolving this issue as this bill moves through the legislative process, we respectfully request that you provide us with recommendations for the appropriate roles for the two agencies.

Thank you for your consideration of our request.

Sincerely,

Henry A. Waxman
Chairman
Committee on Energy and Commerce

Collin C. Peterson
Chairman
Committee on Agriculture

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**Congress of the United States**
**Washington, DC 20515**

June 24, 2009

The Honorable Nancy Pelosi
Speaker of the House of Representatives
Washington DC, 20515

Dear Madam Speaker:

The American Clean Energy and Security Act (H.R. 2454) includes several provisions related to the use of biomass and biomass-based fuels. We have agreed on the definition of renewable fuels to be used in this bill for the renewable electricity standard, the renewable fuel standard, and the global warming pollution program. As a result of changing the definition of renewable biomass from what was in the Energy and Commerce reported bill, we also agree on the need to account for the carbon footprint of biofuels and biomass used for electricity and power generation through the carbon accounting system in the global warming pollution program or an equally effective mechanism.

Implementing this change in the bill raises a number of details that will need to be worked through between us and with stakeholders. We do not have time to resolve these details before House passage, so we are not including biomass and biofuels under the cap for purposes of House action. But we want you to know that we are both committed to developing appropriate provisions so that we can have a complete resolution of this important matter.

We also agree to look at additional options for promoting energy independence and protecting the environment, such as a national low-carbon fuel standard.

Sincerely,

Henry A. Waxman
Chairman
Committee on Energy and Commerce

Collin C. Peterson
Chairman
Committee on Agriculture

PRINTED ON RECYCLED PAPER

**STATEMENT OF JOSEPH GLAUBER,
CHIEF ECONOMIST, U.S. DEPARTMENT OF AGRICULTURE
BEFORE THE HOUSE AGRICULTURE COMMITTEE,
SUBCOMMITTEE ON CONSERVATION, CREDIT, ENERGY, AND RESEARCH**

**May 6, 2009**

Mr. Chairman, members of the Subcommittee, thank you for the opportunity to discuss the indirect land use provisions that are part of the Energy Security and Independence Act of 2007 (EISA). Renewable fuels produced from renewable biomass feedstocks are defined in terms of their impact on lifecycle greenhouse gas (GHG) emissions. EISA further defined lifecycle GHG emissions to mean "the aggregate quantity of GHG emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes), as determined by the Administrator of the EPA, related to the full fuel lifecycle, including all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential."

The feedstock limitations associated with the exclusion of some sources of renewable biomass as defined in EISA-particularly with respect to cellulosic materials from both private and public forest lands-may serve to limit the opportunity to replace fossil fuels. In the future, ethanol produced from cellulosic sources, including wood biomass, has the potential to cut life cycle GHG emissions by up to 86 percent relative to gasoline (Wang et al. 2007).

Yesterday, the Administrator of the Environmental Protection Agency (EPA) signed a notice of proposed rulemaking for the Renewable Fuel Standard (RFS) included in the EISA. EPA's proposal reflects considerable input, guidance, and data from USDA. EPA's proposal also utilized many of the same data and assumptions that USDA uses regularly in near-term forecasting agricultural product supply, demand, and pricing. They further acknowledge the uncertainty associated with the various models and input assumptions involved in their lifecycle modeling, present a number of different sensitivity analyses, and seek comment on what, if any changes should be made for the final rule.

While the effects of biofuel production on GHG emissions are expected to increase land under cultivation, existing estimates of the magnitude due to land use conversion vary. Work such as that published in *Science* by Searchinger et al. (2008) concluded that if GHG emissions from indirect land use changes were taken into account, GHG emissions from biofuel production were potentially far larger than previously estimated. On April 23, 2009, the California Air Resources Board adopted a regulation that would implement a Low Carbon Fuel Standard (LCFS) for the reduction of GHG emissions from California's transportation fuels by 10 percent by 2020. The LCFS would take into account the GHG emissions of indirect land use from biofuel production, potentially resulting in the exclusion of corn-based ethanol produced in the Midwest from California fuel markets.

Today, I would like to discuss how biofuel production affects land use in the United States and the rest of the world, and will discuss what is meant by emissions

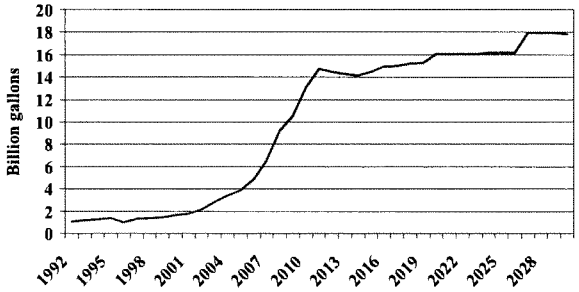
associated with land use change. I will defer to EPA to describe the results of their most recent research , but will present some various other research on GHG emissions from renewable fuels and discuss some of the key uncertainties noted in these research efforts in estimating the effects of land use change on GHG emissions.

**Historic Trends in US Agricultural Land Use and Biofuel Production**

Before getting into each of these issues, I would like to present some context for this discussion by presenting a brief overview of the historic trends in U.S. biofuel production and agricultural land use in the United States and the rest of the world. Figure 1 shows the growth in corn and other starch based ethanol in the United States since 1992 as well as the forecasted growth in corn and other starch based ethanol to 2030 based on the latest long-term forecast from the Energy Information Administration (EIA). The chart shows that EIA forecasts much of the growth in corn and other starch based ethanol will occur in the next couple of years and then stabilize at about 15 billion gallons per year into the future. The EIA projection of a plateau of 15 billion gallons of corn and other starch based ethanol reflects the limits placed on the volume of non-advanced ethanol that may qualify for credits under the RFS in the EISA, mandated minimum levels of cellulosic-based ethanol under RFS, and projected improvements in the profitability of cellulosic-based ethanol.

In 2008/09, corn use for ethanol production is projected to be 3.7 billion bushels and account for about 31 percent of total corn use in the United States (figure 2). By 2015/16, assuming current baseline assumptions remain constant, corn use for ethanol is expected to exceed 4.8 billion bushels, about 34 percent of total corn use in the United

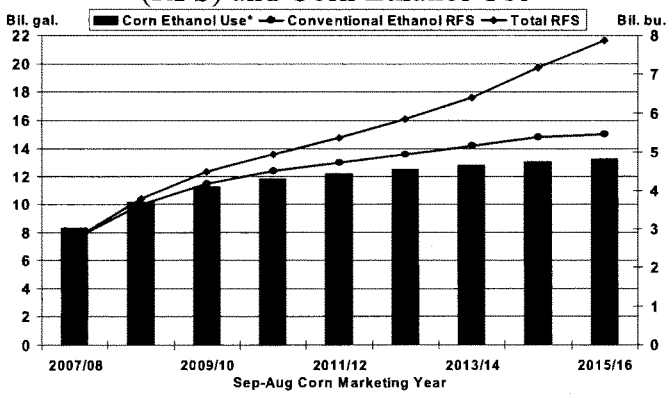
Figure 1--Corn-Starch Based Ethanol Production in the United States




*Source: EIA*

*Primarily corn-starch based ethanol but also including minor amounts of ethanol from other crops.*

Figure 2—The Renewable Fuel Standard (RFS) and Corn Ethanol Use




* 2008/09 is projected based on the *World Agricultural Supply and Demand Estimates*, April 9, 2009. 2009/10 is projected based on USDA's *Grains & Oilseeds Outlook*, Agricultural Outlook Forum, Washington, D.C., February 27, 2009. Projections for 2010/11-2015/16 are from USDA *Agricultural Projections to 2018*, February 2009.

States. Corn production in the United States is expected to increase from 12.1 billion bushels in 2008 to 14.0 billion bushels in 2015, an increase of 15.7 percent. Corn plantings are expected to increase from 86 million acres to 90 million acres, up 4.7 percent, while yields are anticipated to increase by almost 10 percent, from 154 bushels per acre in 2008 to 169 bushels per acre in 2015.

What is the potential for expansion of cropland in the United States? Cropland use in the United States has varied considerably over the past 30 years. Figure 3 shows planted acreage to the eight row crops (wheat, corn, barley, grain sorghum, oats, soybeans, rice and cotton) since 1975. Over 297 million acres were planted to these crops in 1981. Plantings fell off to less than 245 million acres in the late 1980s and generally remained between 245 to 255 million acres during the early 1990s as land was idled. The annual Acreage Reduction Programs authorized by the 1981, 1985 and 1990 farm bills, and Conservation Reserve Program (CRP) starting under the 1985 farm bill contributed significantly to this acreage reduction. Planted acres to the eight principal crops rose to almost 261 million acres in 1996, however, as grain prices spiked.

From 1996 to 2006, plantings to the eight row crops generally trended downward due to lower commodity prices, increased planting flexibility offered by the 1996 and subsequent farm bills which allowed producers to fallow land that had formerly been maintained in more permanent cultivation, and expansion of minor crops such as canola. With the return of higher prices in 2007, however, plantings to the eight row crops rose again, reaching 253 million acres last year. Based on producer planting intentions, NASS estimates that 246 million acres will be planted to the eight row crops in 2009.

Figure 3--Area planted to 8 principal row crops

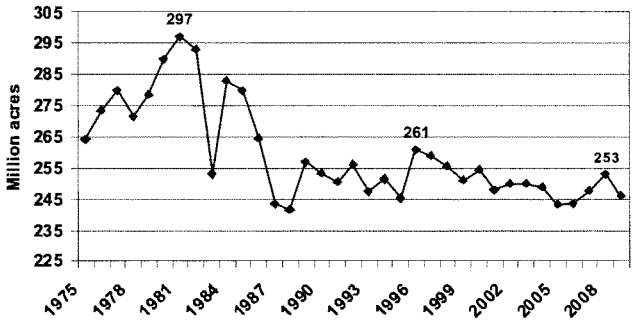



**Table 1—US Planted Acreage in 1996 and 2008**
**(million acres)**

| Crop | 1996 | 2008 | Change from 1996 to 2008 |
|---|---|---|---|
| Wheat | 75.1 | 63.1 | -12.0 |
| Corn | 79.2 | 86.0 | 6.8 |
| Other feed grains | 24.8 | 15.7 | -9.1 |
| Soybeans | 64.2 | 75.7 | 11.5 |
| Rice and cotton | 17.5 | 12.5 | -5.0 |
| 8 row crops | 260.8 | 253.0 | -7.8 |
| Hay 1/ | 61.2 | 60.1 | -1.1 |
| Other crops | 11.7 | 10.9 | -0.8 |
| Principal crops | 333.7 | 324.0 | -9.7 |
| CRP | 34.5 | 34.5 | 0.0 |
| Principal crops plus CRP | 368.2 | 358.5 | -9.7 |

1/ Harvested acreage

Table 1 compares plantings in 1996 to plantings in 2008. Even though acreage enrolled in the CRP was unchanged between 1996 and 2008, total acreage planted to the eight row crops in 2008 was down nearly 8 million acres (about 3 percent) and acreage planted to principal crops was down almost 10 million acres from 1996 levels. Corn and soybean acreage were up by over 18 million acres in 2008 compared with 1996; however, this was more than offset by declines in wheat, small feed grains and cotton acreage. Thus, while it is clear that producers planted substantially more acreage as recently as 1996, most of the implied capacity is likely in areas more suitable for wheat and small grain production.

**Estimated Land Use Effects of Biofuel Production**

The literature on biofuel production and international land use has developed largely over the past 5 years. Most of the focus has been on the effects of biofuel production on U.S. agriculture (see, for example, USDA, ERS/Office of the Chief Economist 2007; FAPRI 2008; Biomass Research and Development Board 2008; de Gorter and Just 2009). However, several more recent studies attempt to also model the ripple effects that would occur in agricultural markets around the world due to increased biofuel use within the U.S., and the implications this might have on GHG emissions. Table 2 presents the results from several recent modeling efforts that estimate the effects of ethanol production on global land use. These studies attempt to quantify the market response in the United States and in other countries to increases in commodity prices due to increases in biofuel production. These studies also quantify the GHG emissions from these market responses and attribute these emissions to biofuel production. The table is

not meant to be comprehensive, but shows a selected range of central estimates. Other models, such as MIT's Emissions Prediction and Policy Analysis model, have also been used to examine indirect land use change impacts (Gurgel et al. 2007; Melillo et al. 2009). Key uncertainties are discussed below.

One of the first studies of the effects of biofuels on GHG emissions was published by Searchinger et al., in the February 2008 issue of *Science*. That study used a worldwide agricultural model to estimate emissions from land-use change, and reached the conclusion that corn-based ethanol nearly doubles greenhouse emissions over 30 years, and increases greenhouse gases for 167 years. In contrast, when emissions from land use change were not included in their model, corn-starch based ethanol reduced GHG emissions by 20 percent compared to gasoline. Using the multi-market, multi-commodity international FAPRI (Food and Agricultural Policy Research Institute) model, Searchinger et al. assessed the land use change and GHG implications of increasing corn ethanol production in the United States by 14.8 billion gallons and found that an additional 26.7 million acres of land would be brought into crop production world-wide (1.8 million acres per billion gallons of ethanol). In terms of GHG emissions per unit of energy produced, Searchinger et al. estimated that the emissions from land use change alone (104 grams of CO2 equivalent per MJ of energy in fuel) outweighed the emissions from gasoline (92 g CO2-eq/MJ).

Using the 2007 FAPRI baseline, Fabiosa et al. (2009) estimated that a 1-percent increase in U.S. ethanol use would result in a 0.009 percent increase in world crop area. Most of the increase in world crop area is through an increase in world corn area. Brazil

and South Africa respond the most, with multipliers of 0.031 and 0.042, respectively. Fabiosa et al. did not estimate the GHG implications of the lower land requirement.

Based on the 10-year averages of U.S. ethanol use and world crop area taken from the 2007 FAPRI international baseline, and using the world area impact multiplier from Fabiosa et al. (0.009), the results suggest an impact multiplier of 1.64 million acres per 1 billion gallons of additional ethanol use, which is lower than the acreage effect estimated in the Searchinger study.

The California Air Resources Board (CARB), as part of their recent proposed low carbon fuel standard, also estimated the GHG emissions associated with renewable fuels. CARB employed the Global Trade and Analysis Project (GTAP) model and also found significantly less land is required to produce ethanol than Searchinger et al. In the CARB study, each additional billion gallons of corn-starch based ethanol requires only 726,000 acres; about 60 percent less compared to Searchinger et al. Primarily as a result of this reduced acreage, CARB estimated the GHG emissions associated with land use change were 70 percent less than those estimated by Searchinger et al. The GHG emissions due to land use change were reduced from 104 grams of CO2 equivalent per MJ of ethanol to 30 grams of CO2 equivalent per MJ of ethanol.

A more recent article by Tyner et al. (2009), which like the CARB study, employed the GTAP modeling framework, differentiated between various levels of ethanol production. Their results show smaller GHG emissions impacts from corn-starch based ethanol than the CARB study and one-forth of those estimated by Searchinger et al. Tyner et al. note their results are significantly less than Searchinger et al. due to three factors: 1) the significantly smaller change in total land use, 2) differences in which part

of the world the change in land use occurs, and 3) differing assumptions regarding the percent of carbon stored in forest vegetation that is emitted when forest is converted into cropland (Searchinger et al. assumes 100 percent of carbon stored in forest vegetation is emitted while Tyner et al. assumes 75 percent of the carbon stored in forest vegetation is emitted with the remaining 25 percent stored in long-term wood products).

**Table 2—Land Use Change and CO2 Emissions from Ethanol**

| Study | Modeling framework | Increase in ethanol production | Change in Global Land Use | Change in Global Land Use | CO2 equivalent emissions |
|---|---|---|---|---|---|
| | | Billion gallons | Million acres | Million acres per bil. gal | Grams CO2-Eq. per MJ of Ethanol |
| Searchinger et al. 2008 1/ | FAPRI/ CARD | 14.8 | 26.73 | 1.81 | 104 |
| | | | | | |
| Fabiosa et al. 2009 2/ | FAPRI/ CARD | 1.174 | 1.923 | 1.638 | na |
| | | | | | |
| California (CARB) 2009 | GTAP | 13.25 | 9.62 | 0.726 | 30 |
| | | | | | |
| Tyner et al. 2009 3/ | GTAP | | | | |
| 2001 to 2006 | | 3.085 | 1.8 | 0.576 | 20.8 |
| 2006 to 7 BG | | 2.145 | 1.3 | 0.625 | 22.7 |
| 7 to 9 BG | | 2 | 1.3 | 0.658 | 23.8 |
| 9 to 11 BG | | 2 | 1.4 | 0.689 | 24.9 |
| 11 to 13 BG | | 2 | 1.4 | 0.722 | 26.1 |
| 13 to 15 BG | | 2 | 1.5 | 0.759 | 27.4 |
| 2001 to 15 BG | | 13.23 | 8.77 | 0.663 | 24.0 |

1/ Searchinger et al. reported their results in terms of a 55.92 billion liter increase in ethanol production which resulted in a 10.8 million hectare change in global land use.
2/ Based on a 10 percent increase in U.S. ethanol use using 10 year averages of US ethanol use and world crop area taken from the 2007 FAPRI baseline. Impact multiplier of 0.009 taken from Fabiosa et al., table 2.
3/ Based on data from Table 7 and Table 8 and converted to MJ of ethanol by assuming each gallon of ethanol contains 76,330 Btu's of energy and each Btu is equal to 0.00105 megajoules (MJ).

**Sources of Uncertainty**

Modeling the change in land use resulting from the expansion in the production of corn-starch based ethanol, requires making projections about future values of parameters that cannot be known with certainty. Therefore, judgments and assumptions must be made as to the likely values these uncertain data will take. Each assumption, whether made explicitly or implicitly in the structure and data of the model, will influence the outcome. Here is a partial list of some of the major assumptions that influence the estimate of GHG emissions from corn-starch based ethanol and other biofuels.

***Yields on converted lands***. Estimating the yields on converted land is one of the most important aspects associated with the GHG emissions and land use change. In the CARB analysis, a small change in the expected yields on converted land had a large impact on the amount of land necessary to meet the added demand for renewable energy and, therefore, on GHG emissions. When yields on converted land were expected to be more similar to yields on existing land, only 500,000 acres of additional cropland were required to produce each billion gallons of ethanol and the emissions associated with land use change fell to 18.3 grams of CO2 equivalent per MJ of ethanol; a reduction of almost 40 percent. Alternatively, when yields on converted land were expected to be lower than yields on existing land, 850,000 acres of additional cropland were required to produce each billion gallons of ethanol and the emissions associated with land use change increased to 35.3 grams of CO2 equivalent per MJ of ethanol; an increase of about 18 percent. Unfortunately, as discussed in the CARB analysis, there is little empirical evidence to guide modelers in selecting the appropriate value for estimating the

productivity of converted land. There is even experience to suggest that yields on converted land may be higher than yields on existing land. For example, when Brazil began expanding soybean production from the temperate South into the tropical Center-West, research led to the development of a soybean variety that flourished in the tropics. As a result, soybean yields in the tropical Center-West were double that of the national average. On the other hand, in many other regions, existing crops are already on the most productive agriculture land, so yields on newly converted lands would be lower than on existing cropland. On net, we would not expect to see significantly higher yields on converted land, but there is little information on how yields may change when land is converted.

***Shifts between different land uses.*** Converting land from one land use to another can have dramatic impacts on the emissions associated with land use change. However, it is difficult to model the specific contribution of the many factors that determine land use, especially when changing between broad land use categories. It is one thing to try to estimate the movement of land allocation among different crops, such as switching between corn and soybeans. However, land conversion between land uses, such as from forest to pastureland or cropland can be very costly and therefore driven by longer-term economic factors. For example, Midwest farmers can readily move cropland between corn and soybeans when the relative profitability of those crops change. In contrast, expansion of agricultural land into other areas will depend on the cost of conversion of that land and land supply availability. For land that is currently in active use there are decisions to be made on long term profitability, for example for land to be converted from forest to cropland, long term decisions must be made regarding the relative

profitability between agricultural and forestry commodities for many years into the future. Conversion of land that does not have a current market use (grassland or unmanaged forest) would be based on costs of conversion, land availability, and in addition, there are several non-economic factors that may significantly affect land conversion decisions in a particular area or country, such as national conservation and preservation policies and programs.

Some studies have suggested that conversion of land into cropland would be associated with grassland conversion because it costs less to clear and prepare grassland than clearing and preparing forestland. In the Tyner et al. study, for example, 23 percent of the increase in cropland comes from conversion of managed forest. The remaining 77 percent of the increase in cropland is a result of the conversion of grassland to cropland. While a majority of the land conversion is from grassland to cropland, a majority of the emissions due to land use change result from the conversion of forests to cropland, due to the relatively larger GHG pulse associated with forest conversion. If we assume there is no forest conversion and only grassland conversion, the emissions associated land use change estimated by Tyner et al. would fall by 50 percent. In many studies, estimates of forest conversion surfaces as a key factor driving the lifecycle GHG results. In addition, the GTAP modeling framework used by CARB and Tyner et al. includes only managed lands. This could also influencing the type of land conversion predicted by the model.

***Yield growth over time.*** Another important factor driving the amount of land required to produce biofuels is the growth in yields that are expected to occur over time. At USDA, we estimate that corn yields in the United States will grow at 2 bushels per acre. If we assume that global corn yield growth increases at the same rate as in the

United States, by the 2015, the average corn yield in the rest of the world would be about 10 percent higher than used in the CARB study. The increase in land productivity in the rest of the world would reduce the estimated amount of land converted into cropland in the CARB study from 726,000 acres to 663,000 acres for each additional billion gallons of corn-starch based ethanol, and the average GHG emissions due to land use change would fall from 30 grams of CO2 equivalent per MJ of ethanol to 27 grams of CO2 equivalent per MJ of ethanol.

In addition, higher commodity prices due to greater demand for renewable fuels would likely result in some increase in crop yields. In the CARB analysis, each 1 percent increase in the price of corn relative to the input costs associated with growing corn was assumed to increase corn yields by 0.4 percent. Varying that assumption from a 0.1 to a 0.6 percent increase in yields for each 1 percent in the price of corn relative to inputs costs altered the estimate of GHG emissions due to land use change by 49 percent.

***Substitutability of Distillers Dried Grains (DDGs).*** DDGs are a co-product of corn-starch based ethanol production, and can substitute for corn as feed, thereby reducing the amount of corn which goes directly into livestock feed. Thus, the more DDGs that are assumed to be used in livestock feed, the fewer total cropland acres will be needed and therefore less GHG emissions. For example, each bushel of corn generates about 2.8 gallons of ethanol and almost 18 pounds of DDGS. In the CARB study, each pound of DDGs is assumed to displace one pound of corn. However, DDGs have attributes that may allow a greater than a one-for-one displacement of corn in animal feed. DDGs have higher protein and fat content compared to corn. Tyner et al. assume each pound of DDGs replaces 1.16 pounds of corn as animal feed. Arora et al. recently

found that 1 pound of DDGs displaces 1.271 pounds of conventional feed ingredients. However, DDGs cannot completely replace traditional feed.

***Other Sources of Uncertainty***. In addition to the uncertainties discussed above, many other modeling assumptions will influence the predicted impact of added renewable fuel production on GHG emissions, (e.g., the level of disaggregation in the underlying crop data, assumptions about international trade in agricultural commodities, assumptions about changes in fertilizer use, etc.). There are also simplifying assumptions that relate to accounting for future GHG emissions. Generally, when comparing the GHG emissions of renewable fuels to nonrenewable alternatives, studies assume that increases in GHG emissions from land use conversion occur in the year of conversion, while reductions in GHG emissions due to the production and use of renewable fuels occur over several years into the future. For example, the results from the studies referenced in this testimony assume the reduction in GHG emissions from expanded ethanol production occur over a period of 30 years. Increasing the expected time frame for renewable fuel production on converted land reduces their net GHG emissions, because the total emissions reductions associated with producing and using renewable fuels will be greater.

**Conclusions**

There is little question that increased biofuel production will have effects on land use in the United States and the rest of the world. The more interesting question concerns magnitude. To the degree to which the supply response to increased biofuel production is met through increased yields, cropland expansion will be less. Land use change is more likely to occur where producers are more responsive to price changes. How much pasture and forest is converted to cropland will ultimately depend on the region, national

and local land use policies and the degree to which competing uses (grazing, forest products) impose constraints for expansion.

While economic modelers have a long history of policy analysis in agriculture, most of the analyses have focused on impact of various domestic or international trade policies (e.g., farm bills, trade agreements) on cropland. By contrast, the empirical literature on land use and GHG emissions is relatively young, with most studies appearing in the last two or three years. Sensitivity analysis suggests wide variation in results. In particular, much is to be learned about land conversion from forest to pasture and from pasture to cropland.

We have had a very constructive and cooperative relationship with EPA as they have developed their RFS2 proposal. Their proposal raises challenging issues for public comment and will do much to advance the scientific understanding of the lifecycle GHG emission impacts of biofuels, and in particular the land-use change impacts. USDA looks forward to continuing our relationship with EPA as they complete the work necessary to finalize the RFS2 rule.

Mr. Chairman, that concludes my statement.

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April 21, 2009

Mary D. Nichols, Chairman
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Dear Chairman Nichols,

As scientists and economists with relevant expertise, we are writing to recommend that you include indirect land use change in the lifecycle analyses of heat-trapping emissions from biofuels and other transportation fuels. This policy will encourage development of sustainable, low-carbon fuels that avoid conflict with food and minimize harmful environmental impacts.

Our comments are relevant to the development of California's Low Carbon Fuel Standard (LCFS), which the Air Resources Board (ARB) will consider for adoption in its April hearing, as well as other policies that evaluate lifecycle heat-trapping emissions from biofuels. For policies like the LCFS to successfully reduce GHG emissions, it is critical to include all major sources of emissions, including indirect land use emissions from biofuels.

We encourage you to investigate and include significant direct and indirect emissions from all fuels, including conventional petroleum, heavy oils, natural gas for transportation, oil sand-based fuels, and the range of fuels used to power electrified transportation, consistent with the best available science. However, you should not delay inclusion of known sources of emissions, including indirect emissions from biofuels, pending discovery of potential effects from other fuels.

Recent peer-reviewed research indicates that conventional biofuels can directly or indirectly result in substantial heat-trapping emissions through the conversion of forests and grasslands to croplands to accommodate biofuel production. Increased demand for crops to make fuel results in higher global commodity prices that can induce farmers in other countries to plow up sensitive, high-carbon ecosystems—including rain forests in South America and Southeast Asia. Previous lifecycle analyses did not adequately account for these emissions, giving biofuels credit for greater carbon savings than actually achieved.

There are uncertainties inherent in estimating the magnitude of indirect land use emissions from biofuels, but assigning a value of zero is clearly not supported by the science. The data on land use change indicate that the emissions related to biofuels are significant and can be quite large. Grappling with the technical uncertainty and developing a regulation based on the best available science is preferable to ignoring a major source of emissions. Over time, greater accuracy and detail in a more refined analysis can be reflected in future LCFS rulemakings.

The need to address uncertainties applies to other areas the analysis as well, and we urge you to evaluate the increasing use of nitrogen fertilizers and herbicides associated with greater biofuel production. In particular, nitrogen fertilizers enhance the emission of nitrous oxide—a powerful greenhouse gas in Earth's atmosphere.

To spur innovation in low carbon fuels, the LCFS must send an accurate signal to the growing clean energy market. Strategic investment decisions should be based upon the best available data of the carbon footprint of alternative fuels. Failure to include a major source of pollution, like indirect land use emissions, will distort the carbon market, suppress investment in truly low carbon fuels, and ultimately result in higher emissions.

The work you are doing in California sets an important precedent for transportation fuel policy nationally and internationally, as well as for action to confront climate change more broadly. We urge you to ensure that your policies are based on the best science, including consideration of emissions from indirect changes in land use.

Sincerely,

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Senator BOXER. Thanks for that. I am going to ask you a little more specifically later, David, on a couple of these.

Mayor, we welcome you again.

**STATEMENT OF THE HON. JOHN FETTERMAN, MAYOR, BRADDOCK, PENNSYLVANIA**

Mr. FETTERMAN. Thank you. Chairwoman Boxer, thank you for inviting me here today.

I am John Fetterman. I am the Mayor of Braddock, Pennsylvania, Allegheny County's poorest community, which is the region that encompasses the city of Pittsburgh and the most populous area in Western Pennsylvania.

My testimony this afternoon will be short and straight to the point. I do not pretend to be an expert in economics or energy policy. But I do know what I have seen with my own eyes: the path we are on has failed.

In my part of Pennsylvania, we have lost over 250,000 jobs in the steel industry in the last several decades. Braddock, my town, once was a thriving steel community of over 20,000. It is not a shattered town of under 3,000 residents today. Ninety percent of our community is gone. Communities and families face desperate times. We need change and we need it now.

For decades, we have watched jobs leave America. For decades, we have heard about the dangers of America's oil addiction. For decades, we have seen real change blocked by those who profit from the status quo. And if there is a silver lining in the current economic crisis, it is that America may now finally be ready to find a new path and to face tough questions that we have ignored for so long.

I believe that new path starts today with a cap on carbon pollution. By driving massive private investment dollars into the clean energy industry, a cap offers us a chance to create jobs, and not just high tech positions making solar cells or exotic technology, but the kind of blue collar jobs that can provide towns like Braddock, or Akron, or Detroit, with jobs making the 250 tons of steel, or the 8,000 parts it takes to build every wind turbine. Jobs making windows, like they do in an old factory in Vandergrift, Pennsylvania, a factory that was shut down until it was revived to make these windows. Or LED lights like they make in North Carolina and export to China. Or one of the thousands of other products that it will take to build this new energy economy.

The Government investment in the Clean Energy Recovery Act was a good start. But we will not truly transform the economy until we spur the private sector to action. This Nation is full of entrepreneurs, investors, inventors and steelworkers prepared to jump start a true energy revolution. And that will only happen once you pass a cap on carbon pollution.

To win the most jobs, the most economic opportunity, we must be a market leader in these new products and technologies. A cap on carbon in the U.S. will spur our companies to be the early movers in these markets, supplying solutions at home and subsequently selling them across the globe.

Two weeks ago, the House of Representatives passed the American Clean Energy and Security Act. This legislation was sup-

ported, among others, by the United Steelworkers, the United Autoworkers, the AFL–CIO and the AFL–CIO Building and Construction Trades Department, which includes the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers; the International Brotherhood of Electrical Workers; the International Brotherhood of Teamsters; and the Sheet Metal Workers International Association. These workers of America recognize that a cap on greenhouse gas pollution is the surest way to create jobs for the clean economy.

So, I respectfully ask the Senate to be as bold as the House has been, to overhaul the economy and free us from our addiction on imported oil. I ask that you ignore the scare tactics of these well funded interests, and answer the call of Braddock to build a new energy future and a new American century with the ready hands of America's workers.

Thank you.

[The prepared statement of Mr. Fetterman follows:]

**Testimony of John Fetterman**
**Mayor of Braddock, Pennsylvania**
Environment and Public Works Committee
U.S. Senate
*July 7, 2009*

Chairman Boxer, Mr. Inhofe, members of the Committee, thank you for inviting me here today. I am John Fetterman, and I'm the mayor of Braddock, Pennsylvania-Allegheny County's poorest community.

My testimony this afternoon will be short and straight to the point. I don't pretend to be an expert in economics or energy policy – but I do know what I've seen with my own eyes: The path we are on has failed. In my part of Pennsylvania, we've lost a quarter of a million jobs in the steel industry in the last several decades. Braddock, a once thriving steel town of over 20,000, is now a shattered community of under 3,000 residents today. Ninety percent of our community is gone. Communities and families face desperate times. We need change – and we need it now.

For decades we've watched jobs leave America. For decades we've heard about the danger of America's oil addiction. For decades we've see real change blocked by those who profit from the status quo. If there is a silver lining in the current economic crisis – and from where I sit it is awfully hard to find one – it is that America may now finally be ready to find a new path...and to face the tough questions we've ignored for so long.

I believe that new path starts with cap on carbon pollution. By driving massive new private investment into clean energy industries, a cap offers us the chance to create jobs. And not just high tech positions making solar cells and exotic technology, but the kind of blue collar jobs that could revive towns like Braddock – or Akron or Detroit. Jobs making the 250 tons of steel or 8,000 parts it takes to build a wind turbine. Jobs making new windows, like they do in the old factory in Vandergrift, Pennsylvania – a factory that shut down until it was revived to make energy efficient windows. Or LED lights, like they make in North Carolina and export to China. Or one of the thousands of other products it will take to build this new energy economy.

The government investment in clean energy in the Recovery Act was a good start, but we will not truly transform this economy until we spur the private sector to action. This nation is full of entrepreneurs, investors, inventors – and Steelworkers – prepared to jump start a true energy revolution. And that will only happen once you pass a cap on carbon pollution. To win the most jobs, and the most economic opportunity, we must be a market leader in these new products and technologies - and a cap on carbon in the US will spur our companies to be early mover in these new markets, supplying solutions at home and then selling these solutions across the globe.

Two weeks ago, the House of Representatives passed the American Clean Energy and Security Act of 2009 (ACES). This legislation was supported by the United Steelworkers, the UAW, the AFL-CIO, and the AFL-CIO Building and Construction Trades Department, which includes the International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers; the International Brotherhood of Electrical Workers; the International Brotherhood of Teamsters; and the Sheet Metal Workers' International Association. These workers of America recognize that a cap on greenhouse gas pollution is the surest way to create the jobs of the clean economy.

So I respectfully ask the Senate to be as bold as the House has been. To overhaul our economy and free us from our addition to imported oil. I ask you to ignore the scare tactics of the well funded interests – and answer the call of Braddock to build a new energy future, and a New American Century, with the ready hands of America's workers.

Thank you.

Senator BOXER. Thank you, Mayor.

I wanted to note that Senator Specter's staff is here, Paul Robos, we are very happy that he is, and I hope that you will let Senator Specter know the passion that the Mayor has displayed.

I would just like to ask you, Mayor, how did you get interested in this? Did you work through the Conference of Mayors or is this something that you have been working on for a while?

Mr. FETTERMAN. Well, one of the keys for helping revise Braddock is green initiatives.

Senator BOXER. Tell us where Braddock is.

Mr. FETTERMAN. Braddock is about 10 miles from downtown Pittsburgh. It is part of the region known as the Monongahela Valley which, at one point in the last century, made a significant portion of the steel in the world. And, as a result of the export of the steel jobs, our region as a whole has suffered greatly. As I mentioned in my testimony, our community went from 20,000 from mid-last century to under 3,000 today.

We got involved with a lot of green technologies. These young people, among others that are working in our community, will be designing and working on the first green roof in the Mon Valley this summer as part of their training. So, it is something that really kind of naturally evolved. And when I was asked to partner with the Environmental Defense Fund, I took the option.

Senator BOXER. Well, I am very glad that you are here, and you make a lot of sense because, right now, the information that I have been given, we are not making all of the solar panels in this country that we should. We are not making all of the parts of the wind turbines. We are losing out, and we have this tremendous opportunity, as was said, coming at us in the form of a big problem. But we have this amazing opportunity.

David Hawkins, I wanted to ask you, what parts of the Clean Air Act would you restore, and why? Taking it from the Markey-Waxman bill.

Mr. HAWKINS. Yes. Well, the ACES bill repeals several provisions with respect to carbon dioxide pollution. Some of them make sense, frankly——

Senator BOXER. Well, tell us what makes sense and what does not make sense.

Mr. HAWKINS. Yes. The ambient air quality standard system does not make sense for $CO_2$, and there is no reason to leave that in the act as technically applying even though it could not be implemented. Similarly, the toxic air pollutant sections do not really have a sensible application to carbon dioxide.

However, the technology-based standards, the performance provisions, the new source performance standard and the new source review, we think are important to retain. This has been, actually, a battle since the Lyndon Johnson administration. There was a debate in the Lyndon Johnson administration about having emission standards or only an ambient management program.

And, interestingly enough, when President Nixon sent up what became the 1970 Clean Air Act, he included both. So, this hybrid program of an ambient overall management program together with performance standards for key sectors is something that can be traced all the way back to the Nixon administration. It has been

in the bill. It was in the law in the acid rain bill. We kept new source performance standards for sulfur dioxide even though we had a cap-and-trade system for sulfur dioxide. It has worked perfectly well. It can work just as well for carbon dioxide, in addition.

Senator BOXER. Right. David, would you do me a favor and put that in a letter form? We have your testimony, which we will get transcribed, but if you would not mind just directly saying, in response to your question as to what parts of the Clean Air Act should be restored, if you could just do it that way, that would be very, very helpful.

In terms of allowance value for energy efficiency, do you know if that is a big score-able item by CBO?

Mr. HAWKINS. The CBO has taken the position that it is something that is score-able because it affects the tax status of the recipient, or the tax benefits of the recipient. Frankly, we think that the CBO position is really difficult to defend as a matter of sound public policy because essentially they are saying that Congress will have a more difficult time passing a better piece of policy than passing a worse piece of policy because of the scoring aspect.

Everyone agrees that the more money we can put into energy efficiency, the better off we will be. We will reduce the demand for allowances in the electric sector, and we can reduce the demand for natural gas, which will benefit companies like Dow Chemical. You know, we are completely aligned on the importance of energy efficiency.

But CBO is saying that if you put in a criterion that says that some of this money has to be spent on energy efficiency, they are going to score the bill differently. Frankly, we think that this is something that should be taken up at the member level with the head of CBO. We have been batting our heads against a variety of walls at the staff level and have not gotten anywhere.

Senator BOXER. Right. Well, I will talk to CBO about this. We will have a meeting with them. And again, you know, frankly, in that same letter, if you would not mind saying that we think that CBO is off base for the following reasons in terms of their scoring provisions regarding allowance values for energy efficiency. That would be very, very helpful.

Let us see. Again, the State preemption, obviously, you do not want to have a series of cap-and-trade systems all over the country. So, if you could again, in that same letter, well, maybe I can just ask you this. What areas do you think we should preempt and what areas do you think we should not preempt?

Mr. HAWKINS. We do not think there should be preemption. We think that the record of the Clean Air Act, going on 40 years now, has been quite good. Preemption is the exception rather than the rule in the Clean Air Act.

Senator BOXER. So, you think it is OK to have four different cap-and-trade systems?

Mr. HAWKINS. As a practical matter, we do not think that is what will happen.

Senator BOXER. OK. But you know what? Do not be so sure about that, because I think there are a lot of people that want to benefit from that. So, I am just saying, what troubles you more than that about, I agree that we do not want to shut down our

States. They are the laboratory here. So, is there a way that we can reward the States rather than say we are not going to preempt? In other words, if States do better, maybe there is an award system. Is that some approach that you would think would be good?

Mr. HAWKINS. Yes. We think that provisions which say that some allowance allocations are directed preferentially to States that forgo the use of their authority——

Senator BOXER. Yes.

Mr. HAWKINS. Or, comply with certain harmonizing requirements so that there is one set of harmonized requirements rather than multiple sets. We think those are the innovative ways to essentially make it worth the States' while to be part of a single harmonized system. And you do not have to breach what is a very important precedent about having Federal authority not preempt the States.

Why we care about this is that in the first few years of a Federal program, and maybe it is the first 5 or 10 years of a Federal program, the Federal program may be strong enough to do everything it needs to do and there may not be a role for any State activity. But what we have seen, historically, is that the States usually are a step ahead in recognizing the need for a change in the law.

Senator BOXER. Well, Lieberman-Warner-Boxer did have that approach and——

Mr. HAWKINS. Yes, it did.

Senator BOXER. So we are going to definitely look at that. One more question for you, David. I hope I am not working you too hard here——

Mr. HAWKINS. I am enjoying it.

Senator BOXER. OK, good.

[Laughter.]

Senator BOXER. It just shows you how exciting our lives are. Right?

[Laughter.]

Senator BOXER. Are there alternatives, like performance standards, based on the age of plants or birthday provisions that you would support? And how does that compare to restoration of Clean Air Act provisions?

Mr. HAWKINS. NRDC would support provisions that would guarantee that the emissions from the fleet of the existing power plants should decline over time. We think that is a sensible approach. The power plants in the U.S., especially the coal-fired power plants, are aging, and sometime in the next 5 or 10 years they are going to face an investment decision. Do they continue to patch up that power plant and try to run it for another 15 or 20 years? Or do they replace it with advanced technology?

Having a well crafted performance standard that kicked in for aging capacity could tip the decision in favor of replacing it with new, advanced technology rather than patching it up and having it limp along until it is finally shut down.

Senator BOXER. Now, how does that compare to restoration of the Clean Air Act provisions? This idea of performance standards.

Mr. HAWKINS. Well, this would be a concept that is not currently implemented in the law. There are arguments about whether EPA

might have the authority to do it, but it certainly is not implemented in the law. And I think it is fair to say that it might be possible to craft some compromise language where some of the current provisions for new source review might arguably be replaced by a system that was along the lines that we have been discussing.

Senator BOXER. Thank you. You know, any work that you do with your colleagues on this particular issue would be extremely helpful because we all want the same thing at the end of the day. We want to get the carbon out of the air. I am not ideological on how to do that and I do not think you are, either. You have shown a lot of flexibility. So, as we get this bill going, I just need to know what you think is the most effective way to get where we want to get.

[The referenced letter follows:]

NATURAL RESOURCES DEFENSE COUNCIL

July 10, 2009

Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
U.S. Senate
Washington, D.C.

Dear Chairman Boxer,

During the July 7, 2009 Committee hearing on global warming legislation you asked me to provide additional responses to two questions: what provisions of the current Clean Air Act authority to regulate greenhouse gas emissions are important to retain and why. Second, you asked for NRDC's views and recommendations on the Congressional Budget Office's approach to estimating the budget impact of allowance allocation provisions.

I. Current Clean Air Act

In constructing a new program to cap and reduce carbon pollution, we should build on, not replace, the existing Clean Air Act. The House bill, however, makes a number of unnecessary and, we believe, damaging changes to the Clean Air Act.

The House bill would add a new section 811 to the Clean Air Act that would entirely repeal current Section 111's New Source Performance Standards for greenhouse gas emissions from sources covered by the House bill's cap. Section 833 of the House bill would exempt consideration of greenhouse gases under the current Act's New Source Review (NSR) provisions for all sources, capped or not. NRDC believes these provisions are too sweeping and would inappropriately eliminate the government's ability to establish reasonable and affordable performance requirements that would complement the cap and contribute to achieving the goals of the law in an efficient and cost-effective manner.

Since the first comprehensive federal clean air law signed into law by President Nixon in 1970, Congress has recognized the value of providing complementary approaches to achieving our air quality and emissions objectives, rather than relying exclusively on a single instrument. Thus, in the 1970 Act Congress enacted both a broad *air quality management program* aimed at limiting ambient air concentrations of

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pollutants (sections 108-110) and *emission standard* programs to continuously reduce emissions from motor vehicles (section 202) and large stationary air pollution sources (section 111).

Congress created this dual system because if we did not take advantage of technology improvements to achieve emission reductions from the largest pollution source categories in the economy, there would be too much strain placed on the ambient air quality standards. In the 1977 amendments to the Act, Congress established a case-by-case process under the NSR Program in order to assure a more rapid updating of improvements in pollution control technology as new plants were built and old ones modernized.

The argument has been made that with an overall cap or budget on greenhouse gas emissions, we should simply not care about the amount of emissions from individual sources or even entire sectors. But Congress rejected that approach in the 1990 amendments when it enacted a cap on sulfur dioxide emissions from the electric power sector to combat acid rain. Congress retained the NSPS and NSR programs for the sources covered under the acid rain program, and those programs have continued to function well to minimize emissions from new sources, thereby reducing pressure on the sulfur dioxide cap and demonstrating improved and less expensive means of emission reduction that can be used to reduce emissions from existing sources as well.

There are even stronger reasons to retain minimum levels of emission reductions for key sectors in the global warming legislation Congress is considering. First, we know that the near-term cap targets in the legislation are substantially weaker than what the science requires. They are compromises, apparently reflecting the best that a majority in the current Congress is prepared to support. The goal of reducing emissions by 80% from 1990 levels by 2050 is like a marathon: we cannot hope to complete the race if we do not set and maintain a pace of technology improvement for key sectors from the start of the race. This is especially true for long-lived, high capital investment projects like coal-fired power plants. If we do not craft a program that will reduce emissions from the existing fleet of coal-fired power plants at a reasonable but steady pace we run the risk of facing claims of threatened power shortages or destructively large electric rate increases as an aging fleet reaches the point where major retrofits or retirements are required for a huge fraction of the fleet in a very short period of time. A cap with no other complementary measures would encourage delay in reducing emissions from the existing coal fleet.

In addition, the very large volume of offsets in the House bill will encourage reliance on offsets to comply rather than on investments to reduce emissions from existing coal generating units. Even if the offsets are of the highest quality and represent emission reductions fully equivalent to emissions from covered sources, overreliance on such offsets by key sectors like the power sector will leave the sector poorly positioned to achieve the deep reductions that are required to meet the longer-term cap objectives of the legislation. And if, as is likely, some fraction of offsets do not achieve fully

equivalent reductions, then system-wide emissions will be higher than required to meet the legislation's objectives.

The amendments made by the House bill would exacerbate the threat of continued high emissions from the existing coal fleet. While the bill includes statutory emission standards for new coal units, all existing units are grandfathered from these standards. In addition, the new source standards in the House bill do not apply even if an existing unit makes a major overhaul that increases its emissions substantially and extends its operating life by decades. Under the current Clean Air Act such old plant overhauls would be covered under NSPS as a modification and required to meet modern emission standards. But the House bill repeals this NSPS modification provision, creating a loophole that could frustrate the intent to require new investments in coal generating units to meet the emission standards established by new section 812. With the new modification loophole there will be an incentive for existing coal plant owners that need additional capacity to produce that additional capacity by refurbishing and expanding one or more existing units rather than building a new unit that would have to meet the section 812 emission standards. For example, if a power company needs an additional 300 MW of generating capacity to meet forecasted demand it could build a new 300 MW unit and meet the section 812 standards but due to the modification loophole, it could evade these standards by refurbishing and expanding an existing unit that has only operated a fraction of the year. Instead of building a new 300 MW unit the company could refurbish and expand 500 MW of existing capacity that has operated, say, only 35% of the year so that the expanded modified capacity is available 85% of the year, providing generating capability as great as or greater than building a new unit. This loophole must be closed and can be done by including a simple provision that requires existing units that expand operations and/or increase nameplate generating capacity to meet the section 812 standards. Since the House bill provides for substantial subsidies for carbon capture and disposal for existing as well as new units, meeting these requirements at refurbished coal plants need not result in disruptive fuel shifts or substantial electric rate increases.

While closing the modification loophole is critical, if only that change were made EPA would still be left without adequate authority to assure reasonable progress in reducing emissions from the existing coal fleet. Under current law section 111(d) provides EPA and the states with a mechanism to achieve reasonable reductions from existing units but that provision is repealed in the House bill. Rather than creating a gap in authority to implement such reasonable reductions, we urge your Committee to consider a couple of alternatives that would be effective in assuring that today's existing coal fleet does get cleaned up over time. One approach would be to require aging coal units to either meet the section 812 emission standards or to be replaced with modern capacity. Such a "birthday provision" would apply only to older units that have been fully amortized, for example units that have reached 50 or 60 years of age. Another approach would be to establish a low-carbon generation obligation that would require an increasing fraction of generation from the existing coal fleet to meet the section 812 standards over time. A version of this concept was included in S. 309 in the previous Congress, sponsored by you, Senator Sanders and then Senator Obama, among others.

II. CBO Budget Impact Estimate Methodology

The Congressional Budget Office described their approach to estimating the budget impacts of allowance allocations in a May 15th letter to Chairman Waxman.[1] In this letter CBO indicates that allowances allocated to electric local distribution companies (LDCs) would be scored as not having a net budget impact if the LDCs are allowed to use the allowances to reduce customer bills directly through rate reductions or rebates, but that if LDCs are directed to use allowance value for energy efficiency investments such allocations would be subject to a 25% revenue offset. NRDC believes that this analysis is substantively incorrect and leads to a perverse policy outcome by discouraging a requirement for LDCs to invest in cost-effective energy efficiency measures which would result in greater consumer benefits than direct rate reductions.

CBO's analysis is premised on the idea that direct rebates to electricity consumers counteract the price impact that would otherwise occur so there is no budgetary impact, whereas increased spending on energy efficiency is assumed to displace other spending in the economy (based on CBO's fixed nominal GDP assumption) and therefore does not generate an "offsetting offset" to the 25% revenue offset CBO normally assumes for government measures that raise revenues or equivalently increase consumer costs. CBO's analysis is incomplete, however, because it does not consider the consumer benefits that result from cost-effective energy efficiency investments.

Consider the following examples:

Case 1: An LDC sells $100 worth of allowances and uses the proceeds to "counteract the price increase that consumers would otherwise face" by reducing the distribution charges on customer's bills. Overall taxable income would be unaffected by the policy, according to CBO's May 15 letter.

Case 2: An LDC sells $100 worth of allowances and uses the proceeds to buy energy efficient light bulbs for their customers. This efficiency improvement counteracts the price increase that consumers would otherwise face by lowering their electricity consumption. The LDC has no net change in its income because its rates are subject to a decoupling provision (which automatically adjusts their per kilowatt-hour rates to compensate for reduced sales from the efficiency measures), and consumers would face the same total cost of electricity as before the proposal was enacted. Electricity generators would have less taxable income due to lower demand, but this is compensated by increased spending elsewhere in the economy according to CBO's fixed nominal GDP assumption. Accordingly, taxable income in the economy as a whole is unchanged as are government revenues.

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[1] http://www.cbo.gov/ftpdocs/102xx/doc10232/5-15-WaxmanLetter.pdf

Both of these cases result in the same outcome for consumers—their electric bills remain unchanged as a result of the policy—yet CBO's current approach suggests that Case 2 results in a $25 loss of government revenue whereas Case 1 does not.

As I stated in response to your question at the July 7th hearing, I urge you to ask the Director of CBO to reconsider their approach and ensure that CBO is appropriately accounting for the consumer benefits of energy efficiency investments.

Please let me know if I can provide any additional information.

Sincerely,

David G. Hawkins
Director
Climate Programs

Senator BOXER. I understand that Senator Whitehouse is on his way. So I will just ask a couple of questions because this is such a great chance for me.

Mr. Wells, I thought that your point about energy efficiency should not be lost on anybody. You have done that because it is in the best interest of your company. Is that right?

Mr. WELLS. That is correct. The one number that I did not give you was the dollar savings. Since——

Senator BOXER. Tell me.

Mr. WELLS. Since 1994, we have accumulated savings of over $8 billion.

Senator BOXER. How much?

Mr. WELLS. Eight billion dollars.

Senator BOXER. With a b.

Mr. WELLS. With a b.

Senator BOXER. Over how many years?

Mr. WELLS. Since 1994. And that never stops, right, because once you implement something with energy efficiency it just keeps on giving. So it is $8 billion and climbing. Every day it climbs. It was said earlier today that energy efficiency is our cleanest, cheapest, easiest fuel. And at Dow, we have demonstrated that in spades.

Senator BOXER. It is phenomenal. I just wanted, before I call on Senator Whitehouse, which I am going to right now, Mr. Wells, if you would reiterate two numbers, the first one that you talked about, the savings in BTUs and relating it to California, and the second, again, this one you just gave me now.

Mr. WELLS. Sure. It all evolves around Dow's energy efficiency program and Dow's energy efficiency results. We have always been very in tune to energy efficiency. We have to be. We are a company full of engineers. But back in the mid-1990s, we made a concerted effort. And since 1994, as a company we have cut our energy intensity by 38 percent. That has allowed us to save over 1,600 trillion BTUs of energy since that time, a very large number that equates to, that is the energy equivalent of all of the electricity used in all of the homes in California for 1 year.

For a bottom line perspective, we have saved over $8 billion since that time. Those are dollars straight off the bottom line of the company.

Senator BOXER. So, the Senator heard that.

I wanted to say, Mr. Mayor, I do not know if you have undertaken or had the capital to undertake any energy efficiency in this City Hall or in the building that you operate. Have you done anything like that?

Mr. FETTERMAN. In fact, next month we are having some people provide a presentation about upgrading all of our street lights and city lights to LED. It is something we are looking at and they would be paid for by the guaranteed energy savings that would accrue with their installation.

As I said earlier, green technologies, green initiatives, really have driven our summer youth employment in our community, too, which has led to not only a healthier community, but one where young people are learning quantifiable skills, job skills.

Senator BOXER. Excellent.

Senator Whitehouse, would you be willing to take the gavel over because this is it, and you can ask as many questions as you want. Is that all right? Can I give you the gavel?

Senator WHITEHOUSE. You certainly can.

Senator BOXER. All right. Here is the gavel. You have it.

[Laugher.]

Senator WHITEHOUSE. I am gaveled.

Senator BOXER. I want to thank our wonderful panel. And just for David, we appreciate your direct answers and we look forward to working with you as we put the finishing touches on our bill. Thank you.

Senator WHITEHOUSE {presiding]. Thank you, Chairman.

My first question is for Mayor Fetterman. I am delighted that you are here. I am also interested that you are here and I wonder if you could tell me a little bit more about Braddock and your community and how——

Mr. FETTERMAN. Well, aside from the fact that there are a dozen of young people here that would like to say hello, it is their first trip to Washington, Braddock is a real historic community in what is known as the Monongahela Valley which is just outside of Pittsburgh. It was actually where Andrew Carnegie built the first Bessemer mill, and it was the place where he started off his empire.

Braddock, at its height, was about 20,000 residents and now it is significantly under 3,000. So, we have lost 90 percent of our population, and that corresponds to our housing stock, building stock, businesses, what have you. So we are a community that has really suffered the most in the region when the steel industry basically moved offshore.

Senator WHITEHOUSE. And you see the climate change legislation not as a threat and an economic burden to your population, but as an opportunity?

Mr. FETTERMAN. We see it absolutely as an opportunity. For example, right next to our town border is what is known as the Kerry Furnace site, which is an abandoned steel mill. It is 150 acres that we re-purposing for, essentially, a green enterprise zone and encouraging manufacturers to effectively set up shop and bring jobs into the Mon Valley.

And, tangentially speaking, Braddock has the highest youth asthma rate of any community, I believe, in Western Pennsylvania. So, air quality is something that we take very seriously, and the impacts are measurable in our children's quality of life.

So, we do not see it as a threat. We see it as an opportunity. And to our critics or detractors, I would say, well, if not this, then what? Come take a walk with us down Braddock Avenue, and if this is not what you would select, help us out, what would you suggest?

We are a community that did not get any bail out dollars, did not get any help when the region lost 250,000 jobs. We are not just looking for a handout. We are looking for a hand up. I believe that this legislation not only is good for our air quality but for jobs and business in general.

When I participated with the Environmental Defense Fund, all the steelworkers that were involved were the ones that have lost their jobs. All of them were unemployed or laid off. They never counted themselves as environmentalists or, you know, they kind

of rolled their eyes at tree huggers and thought that they all had to wear Patagonia and drive Subarus. But this all made sense to them. It is like, hey, there are 250 tons of steel in a windmill. If we are selling millions less, millions of fewer cars, where is our steel production going to come from?

With each new round, with each new quarter, there is additional lay offs. So, we see this as a positive force in the Valley.

Senator WHITEHOUSE. What is your primary source of electricity there?

Mr. FETTERMAN. Coal-fired. In fact, we have, I guess you would call it a middle man, who ships by barge down the Monongahela. In fact, that is where Senator Specter was just at in our community a few weeks ago, the Braddock Locks and Dams, that sends it to the Conemaugh Power Station. So, this is something that are very steeped in, this is part of our day in and day out. And everyone that I have spoken to gets the concept of why this, I think, would be a good thing.

Senator WHITEHOUSE. I appreciate that.

Mr. FETTERMAN. Thank you.

Senator WHITEHOUSE. Mr. Hawkins, on the subject of asthma, that is a subject near and dear to Rhode Island. I think we have, like many other States, a dramatic increase in asthma. One of the reasons, we believe, is that we are downwind of Midwestern coal plants that pump enormous amounts of pollutants up into the sky, and the prevailing winds bring them our way, to the point where, back when I was Attorney General, even if we had shut down every engine in Rhode Island, we still would not meet the top air quality standards because of what was being blown in from out of State from people who have stayed on coal.

Mr. HAWKINS. Right.

Senator WHITEHOUSE. We have absorbed considerable expense in my home State going off of coal. The Brayton Point Power Station used to be fueled by coal and now it is fueled by natural gas. The power station right in downtown Providence is now fueled by natural gas.

My concern is that we need to think of a way to be fair to communities like Rhode Island which took the hard step of getting off coal early on, whose economic situation is as bad as any State in the country right now, with over 12.5 percent unemployment. We continue to face the costs of coal pollution, but it is beyond our control. It is coming from the Midwest and falling in on us. We find it in our healthcare system in particular.

What we see is a bill that does a lot of good for the people who kept polluting and not much by way of a credit for the people who acted early. There is sort of a laggard's benefit. As a matter of public policy, and as a matter of simple justice, and as a matter of constituent service, I am interested in what thoughts you may have on what ways the bill could provide some value to folks who were early adopters of getting off of coal so that the benefit is not so lopsided in favor of those who continued to pollute and continued to export healthcare costs to other States through this period when it was widely know what was going on.

I mean there has been litigation about this. As Attorney General, I sued over these things. I think your organization was actually in

that litigation with us. At various times the EPA was with us or again us, depending on which way the winds were blowing. What is your thought on that subject now?

Mr. HAWKINS. Well, it is a challenging issue. Of course, as you noted, NRDC has been involved in this transported air pollution problem for a long time, and we have really appreciated the willingness of the States at the end of the tailpipe to step up and protect their citizens.

The climate legislation is addressing some of the transitional costs of controlling carbon dioxide. But we must not forget the existing Clean Air Act where there is a lot of work to be done on the conventional pollutants. Unfortunately, in the last Administration, the industry manipulated the process with, in my view, the willing complicity of the Administration officials, to essentially stretch out through two terms of the presidency a do nothing approach on conventional pollutants.

That clean up of the conventional pollutants from existing coal-fired power plants is long overdue. There would be value in including in the legislation, and I know that Senator Carper and others would be interested in this, some spur to accelerated, accelerated is the wrong word to use, it would have been the right word 20 years ago, but now accelerated clean up of some of that existing capacity.

I was just answering a question a moment ago from Chairman Boxer about what to do about these old coal-fired power plants, and the issue is completely entangled by the conventional pollutants, too. If an old power plant faces a list of additional clean up obligations, then the decision might be a sensible one to just shut it down and replace it with something that is highly efficient.

And that does not necessarily mean that it will not be a coal plant. We have the technology today to build a new coal plant that has minimal emissions of all of the conventional pollutants, as well as with carbon capture and storage, minimal emissions of carbon dioxide.

So, we have actually progressed to a point where we do not have to choose whether we are going to use coal or not. I know this is a controversial position in the environmental community. But we have the technology that allows us to enable coal to play a role as a resource in the economy.

In addition to the air pollution that we are discussing, we have to deal with atrocious practices like mountaintop removal. If we do not, then coal is never going to be accepted by the environmental community as a responsible fuel.

But these are all fixable problems. We do not have to throw up our hands and say, gee, we have to choose between having a quality of life that protects our kids, that protects our forests, or giving up coal. That is a phony choice. We have the technology to have that resource available in appropriate amounts and used, but used without all the damage that is associated with it today.

Senator WHITEHOUSE. Fundamentally, what we are about here is to make sure that people cannot externalize internal costs of pollution and harm to others so that the full cost of a particular product is actually born by the manufacturer, the way it should be. In the same way that we allow them bear the full profit of it, they should

bear the full costs so that they are making economically sensible decisions.

Mr. HAWKINS. Exactly right. To show you how far we had to come, one of the first cases that I was involved in at NRDC involved the construction of tall stacks in the Southeast and the Ohio River Valley, which were literally intended to move the pollution from the local area as far away as possible by building a very tall stack.

Senator WHITEHOUSE. States like Rhode Island, for instance.

Mr. HAWKINS. Yes, it worked. It worked if that was your objective. It did not work to solve the problem. We ultimately won that case, but it took about a dozen years.

Senator WHITEHOUSE. Well, I appreciate the effort that NRDC has put into this for many years.

I want to thank the panel for their efforts and for their testimony today. We have a long battle ahead of us, as those of you who have seen the discussion back and forth here today can appreciate. There are a wide range of views and even the fundamental science of what we are doing to our climate is challenged, again, I think only in this room and the board room of ExxonMobil, but in this building. We do have to face those challenges, and our colleagues bring those points of view and they have to be addressed, they have a vote just the way anybody else does. So, I do not think it is going to be an easy situation.

I hope that Dow, in particular, and other members of the manufacturing community will ramp up your level of advocacy, particularly in the business community, to help us get through this. I think that there is a very strong and responsible business voice that has emerged and that is growing, and I hope that it can carry the day against the voices of the past and the voices of self-interest and the voices of those who seek to continue to pollute for free. But you have a bit of a job ahead of you.

Mr. WELLS. We recognize that, but we are also proud of what we have accomplished so far, and we look forward to working with you and the rest of the committee in moving this forward.

Senator WHITEHOUSE. I guess, let me ask one last question, which is, the allowances seem, shall we say, overabundant? I would be interested in either of your assessment on what the hard base is of how much allowance revenue the various industries really require and how much compared to what was given away on the other side. I think we are at kind of a danger point in that if anybody adds anything over here, the whole enterprise begins to lose credibility.

If I am not mistaken, we have given away 107 percent of the allowances in the first year. We have not only given all of them away, but even more than there are. We have borrowed from the future in order to be able to give them away. That is not really a promising start for a market and for a price signal, and I also think it leaves the bill open to criticism that we are already seeing.

In fact, some criticism that we are seeing from the Republican side is that this is irresponsible and too much of a pay off to industry. And it strikes me that we need to scroll it back.

I would love to have Mr. Wells, Mr. Hawkins, and Mayor Fetterman, any of your thoughts on how far you think we have

room to maneuver back before you start to hit a really hard base for people who have a legitimate claim on the allowances as opposed to just trying to get all they can through the legislative process.

Mr. WELLS. Let me give an answer for that. I will speak for the trade exposed energy intensive industries, which Dow is one of. In that case, if I am not mistaken, the House bill allocates 15 percent free allowances to that industry. In our analysis, that is a good number.

The issue with the trade exposed energy intensives, as we have seen, as energy prices have done what they have done in this country since the turn of the century, where, in our case, we are a huge natural gas user and natural gas prices through the last summer increased over 400 percent. And we saw industries start to move to places where natural gas is cheaper. That same thing will happen with respect to allowance if we have to pay the full allowance value.

And then you have the unintended consequences. The industries moving, the jobs move with it, they move to geographies that probably are more carbon intensive than we are here, and so the environment actually suffers and the U.S. suffers. It is truly a lose-lose.

Whereas, if we get the free allowances, the industries can stay here, we have some certainty as to our investment, and those investments, particularly in the basic industries like chemistry, can then be used to help develop the solutions, the breakthrough technologies, whether they be wind or solar, or whether they be something that we have not yet imagined. That is what it is going to take to get us out of that. So, we think in that case, that is very important.

If you look at the other allocations, there is also an issue of transition here. We have to have a transition. I talked about that in my testimony, slow, stop and reverse. If we go straight to reverse, the economic consequences are going to be pretty bad. So, I have not examined for other industries, but I will leave it that we have to make sure that we have the transition to allow us to move through slow, stop and then head to reverse so that this can be effective the first time through.

Senator WHITEHOUSE. Mr. Hawkins.

Mr. HAWKINS. I would say that an area to focus on, in addition to the amount of allowances that go to a sector, perhaps even more importantly is what are the conditions for use of those allowances? The allowances can go to a sector, but if they are directed in the statute to be used for a public purpose, for example, investment in energy efficiency, then at least from our standpoint there is nothing wrong with that. That creates a benefit because, by investing in energy efficiency, you are reducing the allowance price for everybody in the system, including the payers in Rhode Island, because you reduced demand for allowances.

So, one opportunity in particular for the allocations to the local distribution companies, gas and electricity, is to put a greater emphasis on requiring a certain fraction of those allowances to be used for cost effective energy efficiency investment programs. And if they are cost effective, then by definition they pay and they should be pursued. But having that directive in the statute would

help overcome traditional biases or blind spots against exploring those areas.

Senator WHITEHOUSE. Good. Well, I look forward to working with you on that. I have been talking to my friends in the electric utility industry. They got used to TransCos and DisCos and GenCos, now they need ConsCos, and I think that provides a good vehicle for that conservation side to take place. I look forward to working with you on it.

I thank you all for your courtesy. I know that we have gone over this afternoon as a result of the lengthy time this morning and that may have been an inconvenience to you, and I hope it was not too serious an inconvenience. We much appreciate your testimony.

The hearing will remain open for a week if anybody seeks to add to its record.

Otherwise, it is adjourned.

[Whereupon, at 2:58 p.m., the committee was adjourned.]

[An additional statement submitted for the record follows:]

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

Madam Chairman, I appreciate you convening today's hearing. I am hopeful that it will serve as the beginning of a very serious commitment on the part of this committee to recommend an intelligent and informed course of action on the issue of addressing climate change to the full Senate.

It is my understanding that additional hearings have been scheduled for next week. I hope that these hearings continue to inform us about the policies that may be implemented to address global climate change. One question I believe many members here share is whether we will use legislation that was recently passed out of the House Energy and Commerce Committee as a basis for our hearings and a mark-up or whether we will consider a separate bill. Your personal commitment to me to hold additional hearings on the legislation was appreciated. But the most important thing is that we have actual legislative language to work with and have the time necessary to have our concerns addressed in the committee.

Another area where I have concern is with the impacts the legislation would have on the economy. In this regard, I continue to have concerns with EPA's evaluation of legislation that was recently passed out of the House Energy and Commerce Committee. To help us fully understand how this bill will impact emissions and our Nation's energy infrastructure and economy, I joined Senator Inhofe and my other colleagues in asking that EPA address a number of flaws in its analysis. Those flaws centered around assumptions the agency made regarding the availability of new nuclear power, carbon capture and sequestration technology and the availability of international offsets.

EPA's response to these particular issues was insufficient, at best. Other aspects of our request were not addressed at all: particularly with regard to economic impacts of a cap and trade system combined with a national renewable energy requirement. The Senate is now set to consider legislation that mirrors that bill. We therefore requested an analysis that provides a comprehensive picture of the economic impacts of implementing these two policies simultaneously. As it stands now, EPA's analysis is of limited value in determining how families and workers could be impacted if things don't work out exactly as the Administration hopes.

Indeed, the Administration continues to use this analysis to paint a rosy picture of the costs of the proposed legislation, which stands in stark contrast to analyses of previous less-stringent bills, showing the potential for significant economic burden. Statements suggesting that the bill would cost but a "postage stamp a day" don't stand up to scrutiny. EPA's modeling is only as good as the assumptions that are built into it. And here, optimistic assumptions about technology and offset availability and the lack of a comprehensive analysis of the entire legislative proposal greatly limit our understanding of the potential costs of the program.

These oversights may point to very serious problems in the design of the proposal. The time to take a detailed look at these issues is now. These are not issues that can be simply fixed on the Senate floor. Indeed, the very reason we employ a committee process in the drafting of legislation is so major problems can be resolved prior to moving to the floor.

In closing, I would ask for your commitment to release the language of the bill you intend to mark up and hold hearings on that language before proceeding to a committee vote. I would also ask that you join me in calling on EPA and the Energy Information Agency to refine their economic impact analyses so that a more accurate picture may be drawn as to the bill's potential impacts.

I want to make clear that my request for this information is not to slow the bill's movement through the committee, but to see if we can work on a bipartisan basis to address some of the major problems many of us have with Chairman Waxman's bill—or in the alternative—problems we may have with legislation you introduce.

Madam Chairman, only through a deliberate and inclusive process can we ensure the best outcome for our country. We must refrain from taking the politically expedient path and do the hard work the American people deserve.

[Additional material submitted for the record follows:]

111TH CONGRESS
1ST SESSION

# H. R. 2454

## AN ACT

To create clean energy jobs, achieve energy independence, reduce global warming pollution and transition to a clean energy economy.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

1 section 426 shall not exceed the amount deposited in that
2 fiscal year into the Climate Change Worker Assistance
3 Fund established under section 782(j) of the Clean Air
4 Act. The annual spending limit for any succeeding year
5 shall be increased by the difference, if any, between the
6 amount of the prior year's disbursements and the spend-
7 ing limitation for that year. The Secretary shall promul-
8 gate rules to ensure that this spending limit is not exceed-
9 ed. Such rules shall provide that workers who receive any
10 of the benefits described in section 426 receive full bene-
11 fits, and shall include the establishment of a waiting list
12 for workers in the event that the requests for assistance
13 exceed the spending limit.

## 14 Subtitle C—Consumer Assistance

15 **SEC. 431. ENERGY REFUND PROGRAM.**

16 The Social Security Act (42 U.S.C. 201 et seq.) is
17 amended by adding at the end the following:

## 18 "TITLE XXII—ENERGY REFUND
## 19 PROGRAM

20 **"SEC. 2201. ENERGY REFUND PROGRAM.**

21 "(a) IN GENERAL.—The Secretary shall formulate
22 and administer the program provided for in this section,
23 which shall be known as the 'Energy Refund Program',
24 and under which eligible low-income households are pro-
25 vided cash payments to reimburse the households for the

1 estimated loss in their purchasing power resulting from
2 the American Clean Energy and Security Act of 2009.
3 "(b) ENTITLEMENT OF ELIGIBLE HOUSEHOLDS TO
4 CASH PAYMENTS.—At the request of the State agency of
5 a State, each eligible low-income household in the State
6 shall be entitled to receive monthly cash payments under
7 this section in an amount equal to the monthly energy re-
8 fund amount determined under subsection (d).
9 "(c) ELIGIBILITY.—
10 "(1) ELIGIBLE HOUSEHOLDS.—A household
11 shall be considered to be an eligible low-income
12 household for purposes of this section if—
13 "(A) the gross income of the household
14 does not exceed the greater of—
15 "(i) 150 percent of the poverty line;
16 or
17 "(ii) the greatest amount of household
18 gross income in respect of which a benefit
19 could be payable under subsection
20 (d)(2)(B);
21 "(B) the State agency of the State in
22 which the household is located determines that
23 the household is participating in—
24 "(i) the Supplemental Nutrition As-
25 sistance Program authorized by the Food

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# THE AMERICAN CLEAN ENERGY AND SECURITY ACT (H.R. 2454)

**Committee on Energy and Commerce**

On June 26, 2009, the U.S. House of Representatives approved H.R. 2454, the American Clean Energy and Security Act, by a vote of 219 to 212. The legislation will create millions of new clean energy jobs, enhance America's energy independence, and protect the environment. The following is a brief summary of H.R. 2454.

Key provisions in the bill:

- Require electric utilities to meet 20% of their electricity demand through renewable energy sources and energy efficiency by 2020.
- Invest in new clean energy technologies and energy efficiency, including energy efficiency and renewable energy ($90 billion in new investments by 2025), carbon capture and sequestration ($60 billion), electric and other advanced technology vehicles ($20 billion), and basic scientific research and development ($20 billion).
- Establish new energy-saving standards for new buildings and appliances,.
- Reduce carbon emissions from major U.S. sources by 17% by 2020 and over 80% by 2050 compared to 2005 levels. Complementary measures in the legislation, such as investments in preventing tropical deforestation, will achieve significant additional reductions in carbon emissions.
- Protect consumers from energy price increases. According to estimates from the Environmental Protection Agency, the reductions in carbon pollution required by the legislation will cost American families less than a postage stamp per day. The Congressional Budget Office (CBO) calculates that the legislation will cost the average household less than 50 cents per day.

Because of its balanced approach, the American Clean Energy and Security Act has received broad support from industry and environmentalists. Passage of the bill in the House was supported by electric utilities, oil companies, car companies, chemical companies, major manufacturers, environmental organizations, efficiency advocates, agricultural interests, labor organizations, and representatives of the faith community, among many others. According to CBO, the legislation meets PAYGO requirements.

## Clean Energy Provisions

**Renewable Electricity Standard.** The American Clean Energy and Security Act (ACES) requires retail electric suppliers to meet a growing percentage of their load with electricity generated from renewable resources and electricity savings. The combined renewable electricity and electricity savings requirement begins at 6% in 2012 and gradually rises to 20% in 2020. At least three quarters (75%) of the requirement must be met by renewable energy, except that upon receiving a petition from the governor, the Federal Energy Regulatory Commission can reduce the renewable requirement to three fifths (60%). In 2020,

**Protection of Consumers.** ACES establishes five programs to protect consumers from energy price increases: one for electricity price increases; one for natural gas price increases; one for heating oil price increases; one to protect low- and moderate-income families; and one to provide tax dividends to consumers. In combination, these programs substantially reduce the impact of ACES on American consumers. EPA has estimated that ACES would cost the average household $80 to $111 per year, less than a postage stamp per day. According to EPA, families would actually spend less on utility bills in 2020 than they would in the absence of legislation because of the energy efficiency provisions in ACES.

CBO has reached a similar estimate, calculating that that the global warming provisions in legislation will cost the average household just $175 in 2020. The EPA and CBO estimates do not take into account any of the benefits of preventing global warming, and the CBO estimate does not take into account the considerable savings to households from the bill's energy efficiency provisions.

*Protection from Electricity Price Increases.* Electricity price increases will be regional in nature, with the greatest increases occurring in the coal-dependent regions of the country. To mitigate these price increases, the regulated utilities that distribute electricity to consumers will receive 32% of allowances through 2025 under a formula that distributes half of the allowances based on emissions and half based on electricity generation. These utilities are directed to use these allowances exclusively to keep rates low and, to the extent they use rebates, to do so to the maximum extent practicable by reducing the fixed-rate portion of consumer electricity bills. ACES contains a ratepayer fairness provision that ensures against windfalls by providing that no local distribution company should receive more allowances than necessary to cover its direct and indirect costs.

*Protection from Natural Gas Price Increases.* To mitigate increases in natural gas prices, the regulated utilities that distribute natural gas to consumers will receive 9% of allowances from 2016 through 2025. One-third of these allowances must be used for energy efficiency programs. The remainder must be passed through to consumers through lower prices under provisions similar to those that apply to the regulated electric utilities.

*Protection from Heating Oil Price Increases.* To mitigate increases in home heating oil prices, states will receive 1.6% of allowances through 2025 under a formula based on home heating oil use. These allowances must be used for rebates to consumers and investments in energy efficiency.

*Protection of Low- and Moderate Income Families.* The electricity, natural gas, and heating oil provisions mitigate the costs of ACES on all consumers. In addition, ACES directs that 15% of the allowances be auctioned and the proceeds distributed back to consumers through a combination of refundable tax credits and electronic benefit payments. The Center for Budget and Policy Priorities estimates that these provisions will fully protect the bottom quintile of families and part of the next quintile from any direct or indirect energy price increases.

*Consumer Climate Dividend.* Under ACES, many of the allowance provisions phase out starting in 2026. As these allowance allocations are phased out, ACES directs that the remaining allowances be auctioned and the proceeds distributed to consumers through tax credits.

**Protection of Trade-Vulnerable and Other Industries.** Pursuant to the Inslee-Doyle program, energy-intensive, trade-exposed industries that make products like iron, steel, cement, and paper will receive allowances to cover their increased costs. The number of allowances set aside for this program will equal 15% of the allowances in 2014 and then decrease based on the percent reductions in the carbon emissions cap. These allowances will phase out after 2025 unless the President decides the program is still needed.



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