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THE GREEN ROAD TO ECONOMIC RECOVERY

HEARING

BEFORE THE

SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING HOUSE OF REPRESENTATIVES

ONE HUNDRED TENTH CONGRESS

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THE GREEN ROAD TO ECONOMIC RECOVERY

THURSDAY, SEPTEMBER 18, 2008

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

The committee met, pursuant to call, at 1:33 p.m., in Room 2175, Rayburn, Hon. Edward J. Markey [chairman of the committee] presiding.

Present: Representatives Markey, Blumenauer, Inslee, Solis, Herseth Sandlin, Cleaver, Hall, McNerney, Sensenbrenner, Walden, and Miller.

The CHAIRMAN. This hearing is called to order.

The United States is in an economic tailspin. Earlier this week, Alan Greenspan characterized the situation as a once-in-a-century crisis and predicted that we are on the verge of recession. The markets are reeling. The Wall Street titans are collapsing, and home values have plummeted. Worst of all for American families, unemployment has soared to its highest level in 5 years with 84,000 jobs lost in August and 605,000 jobs lost since the beginning of this year.

To set the economy right, we will have to take bold action on many fronts. We must restore oversight, transparency and prudence in the financial markets. We must strengthen the dollar and reform our trade policy. And we must forge a new energy strategy, one that will finally release us from big oil's strangle hold and ignite an energy technology revolution and put America back to work. "Change, baby, change" must be our mantra if we are going to successfully work to restore America to strength and prosperity.

Speedy adoption of a green stimulus package is a crucial first step. A recent study from the Center for American Progress and the Political Economy Research Institute shows that by investing $100 billion in greening our buildings, expanding our mass transit, building a smart electrical grid and supporting wind and solar power and advanced biofuels, we can create 2 million new jobs. The green investment package they propose creates more jobs, better paying jobs than they would at the same level of spending on consumer rebates. It creates four times as many jobs as the same level of investment in the oil and gas industry. At the same time, it will save American consumers billions in energy costs and slash global warming pollution.

In States all across the country, from California, from Michigan to Ohio, the clean energy industry is already among the leaders in job creation. In my home State of Massachusetts, cleantech is al-

ready the 10th largest industry, and it is projected to grow to third in the next 10 years.

Energy technology or ET, as Thomas Friedman has called it, is all we need with the right policies to strike the spark. We have begun to make this change a reality by passing the Energy Independence and Security Act last December and the Comprehensive Energy Security and Consumer Protection Act earlier this week. The legislation passed in the House this week establishes a comprehensive energy policy that includes, among other things, tax credits for wind and solar power, a national renewable electricity standard, aggressive building efficiency standards and increased funding for mass transit, green buildings and home energy assistance for low-income households. Extending the renewable energy tax credits alone will save 116,000 American jobs and $19 billion in investment.

We must now take the next step with a targeted set of investments that will put Americans back to work, retrofitting our buildings to save energy, greening the grid, training workers for green jobs and building the fuel-efficient cars of the future right here in America. These measures are a down payment on building America's energy economy, the future first steps toward economic recovery. These are those critical first steps.

The greatest long-term challenges, however, are also going to be dealt with at the same time—America's economy and national security—that is, freeing us from dependence on foreign energy sources and combatting global warming.

We have an excellent panel of witnesses who will be able to discuss all of these issues for us. We look forward to their testimony, and I will turn to recognize the ranking member of the committee, the gentleman from Wisconsin, Mr. Sensenbrenner.

[The prepared statement of Mr. Markey follows:]

"The Green Road to Economic Recovery"
Select Committee on Energy Independence and Global Warming
September 18, 2008

Opening Statement, Congressman Edward J. Markey, Chairman

This hearing is called to order.

The United States is in an economic tailspin. Earlier this week, Alan Greenspan characterized the situation as a "once-in-a-century" crisis – and predicted that we are on the verge of recession. The markets are reeling, Wall Street titans are collapsing, and home values have plummeted. Worst of all for American families, unemployment has soared to its highest level in five years – with 84,000 jobs lost in August and 605,000 lost since the beginning of this year.

To set the economy to rights, we will have to take bold action on many fronts: We must restore oversight, transparency, and prudence to the financial markets. We must strengthen the dollar and reform our trade policy. And we must forge a new energy strategy – one that will finally release us from Big Oil's stranglehold, ignite an energy technology revolution, and put America back to work. "Change, baby, change" must be our mantra as we work to restore America to strength and prosperity.

Speedy adoption of a green stimulus package is a crucial first step. A recent study from the Center for American Progress and the Political Economy Research Institute shows that, by investing $100 billion in greening our buildings, expanding mass transit, building a "smart" electrical grid, and supporting wind and solar power and advanced biofuels, we can create 2 million new jobs. The green investment package they propose creates more jobs and better-paying jobs than would the same level of spending on consumer rebates. It creates four times as many jobs as the same level of investment in the oil and gas industry. At the same time, it will save American consumers billions in energy costs and slashing global warming pollution. In States all across the country – from California to Michigan and Ohio – the clean technology industry is already among the leaders in job creation. In my home State of Massachusetts, clean tech is already the tenth largest industry and is projected to grow to third in the next 10 years. Energy technology – or "ET," as Thomas Friedman has called it – will rival IT as an engine of innovation and economic growth in the coming decades. All we need are the right policies to strike the spark.

We have begun to make this change a reality by passing the Energy Independence and Security Act last December and the Comprehensive Energy Security and Consumer Protection Act earlier this week. The legislation passed in the House this week establishes a comprehensive energy policy that includes, among other things, tax credits for wind and solar power, a national renewable electricity standard, aggressive building efficiency standards, and increased funding for mass transit, green buildings, and home energy assistance for low-income households. Extending the renewable energy tax credits alone will save 116,000 American jobs and $19 billion in investment. We must now take the next step – with a targeted set of investments that will put Americans back to work retrofitting our buildings to save energy, greening the grid, training workers for green jobs, and building the fuel efficient cars of the future right here in America.

These measures are a down payment on building America's future economy – the critical first steps towards economic recovery. Just as important, they will put us on the road towards solving two of the greatest long-term challenges to America's economy and national security – freeing us from dependence on foreign energy sources and combating global warming. We have an excellent panel of witnesses to help us understand the economic crisis in which we find ourselves – and the policies that can solve it. I thank our witnesses for joining us and look forward to your testimony.

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

Not often do I cite the words of Democratic politicians, but much of the testimony submitted for today's hearing reminds me of the words of former President Harry Truman, who once said, quote, "give me a one-handed economist; all my others say, 'on one hand and on the other.'"

There is a lot of speculation on how so-called green jobs will boost the U.S. economy, which, given the recent news is clearly struggling. Any new jobs are good for the economy, green or not. Jobs that can transform our energy economy are especially good jobs.

The question isn't whether green jobs are good or not. The question is whether a program to promote green jobs is the tonic our ailing economy needs. I agree with the testimony of one of our witnesses who says that any government efforts to shore up the economy have to start with stabilizing housing prices and strengthening the financial system.

Margo Thorning, who is the senior vice president and chief economist for the American Council of Capital Formation advises Congress to allow time for recent actions by the Federal Reserve Board and the U.S. Treasury to take effect before putting more taxpayer dollars at risk. I agree, and I am especially concerned about Congress putting more taxpayer dollars on the line. As Ms. Thorning points out, one proposal supported by some here today requires $100 billion from the Federal Government to help create those so-called green jobs. I share her skepticism about this report, particularly since this proposal relies on higher taxes or deficit spending as a means to pay for these government-supported job programs. Taken from either hand, that is a bad idea.

Some of the witnesses today will say this perpetual revenue stream will come from the legislative proposal called "cap and trade." But I call it "cap and tax" because I call them like I see them. Cap and tax failed miserably in the Senate earlier this year, primarily because it was clear that it would raise both energy prices and taxes. Higher taxes won't pull us out of the economic malaise that we are in. In fact, it will stall the economy even more.

A recent report from Ms. Thorning's group, the American Council for Capital Foundation, shows exactly what we can expect from cap and tax: as many as 1.8 million jobs lost by the year 2020; up to $1.46 a gallon rise in gas prices; and potentially more than 100 percent jump in electricity and natural gas prices. All, at the same time, while there are no such price increases in economic competitors like China, India and Brazil.

This does not sound like a formula for economic recovery in America. Unfortunately, the House Democratic leadership missed its chance this week to help lower energy prices, and that would have been a big help to our ailing economy. But instead of opening the vital new energy resources our economy needs, the House leadership passed a sham energy bill that keeps most of our energy resources under lock and key. By keeping the 50-mile ban on offshore drilling, the bill keeps 88 percent of offshore oil and gas reserves off the table forever. By leaving out nuclear and clean coal technology, the bill doesn't advance key low-emission energy tech-

nologies which are vital if we are to confront climate change without damaging the economy.

However, it would be unfair to say this legislation won't help create new jobs. By keeping lawsuit reform out of the bill, there will be plenty of opportunity for the trial lawyers to sue any company that tries to find new domestic energy resources. If that is a green job, I think that this sham of an energy bill will produce plenty of them. But I don't believe it is going to help the economy at all.

As we hear today, economists will have many different ideas of what will and won't improve the economy. As the Irish playwright George Bernard Shaw once said, "if all the economists were laid end to end, they still would not reach a conclusion." That said, it doesn't take an economist for me to conclude that higher taxes and more regulation are not the answer for our ailing economy.

And I thank the chairman and yield back the balance of my time.

The CHAIRMAN. I thank the gentleman. Mr. Sensenbrenner and I are both lawyers if any economists want to retaliate.

Mr. SENSENBRENNER. Will the gentleman yield?

The CHAIRMAN. I will be glad to.

Mr. SENSENBRENNER. Only half the lawyers lose their case.

The CHAIRMAN. We are keeping this in the jocular vein.

The Chair recognizes the gentleman from Washington State, Mr. Inslee.

Mr. INSLEE. Thank you.

I am really looking forward to the panel.

I do want to welcome Bracken Hendricks, who is a friend.

And I just want to comment, just to set the stage for the discussion, Bracken co-authored a book about a year ago, and he talked about three companies that were in just kind of early stages of development. And I want to comment about something that happened in the last couple of months.

One, he wrote about General Motors thinking about building a plug-in hybrid car and thought that this gave America great job-creating potential to create the new nongasoline powered car. Yesterday, General Motors, a day before Bracken shows up, rolled out their version of their plug-in hybrid, the GM Volt. That is a prediction that seems to be coming to pass.

A year ago, in Bracken's book, he wrote about the Ausra company that was developing a solar thermal technology that could use thermal energy to heat a liquid and basically create steam-based electricity. I note that, last month, the Ausra company opened up the first solar thermal manufacturing plant in Nevada, hiring hundreds of workers in Nevada. That prediction is coming to pass.

He wrote about a company called MagnaDrive that was in the early stages of building this transmission system that makes an electrical motor 70 percent more energy efficient. I went and visited their new headquarters in Washington where they are hiring at least dozens of people, and they are shipping their products to China. That prediction is coming to pass.

And I think those who have said for some time that this is a great economic opportunity are now seeing those predictions come to pass, and I look forward to the wisdom from this panel about how we can accelerate that.

Thank you.

The CHAIRMAN. The gentleman's time has expired.

The Chair recognizes the gentleman from Oregon.

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

And coming from a region that is home to extraordinary opportunities for renewable energy, I welcome the panel and look forward to hearing more about not only what can be done to develop green jobs and green energy, but what can be done through the marketplace to do that so we can minimize the taxpayer support to get some of these industries up and running. Because it is no secret that this government is under great strain and stress, as are many of—anybody out there in the capital side trying to find credit right now. And, you know, the window is going to close, and these subsidies can't go on forever.

As much as we want to transition off of the hydrocarbon fuels, we also need to access them in the meantime. So I would like to see us have a little different strategy where we use the revenue generated from the sale of domestic oil and gas, to, A, create jobs and, B, invest in this transition period rather than end up with higher taxes and all of that, because I think consumers are taking it in the wallet now; they can't afford to take it anymore. The government is in debt up to its ears and beyond. And these industries can't be subsidized forever.

So I am willing to do it, to invest in research and get things going, but it can't be permanent.

Mr. Chairman, I will yield back the balance of my time because I know we have other members who want to speak. And I will yield back, Mr. Chairman.

The CHAIRMAN. The gentleman's time has expired.

The Chair recognizes the gentlelady from California.

Ms. SOLIS. Thank you, Chairman Markey.

And I want to thank the witnesses for being here.

I will be very brief. When it comes to green car jobs, I get so excited because I realize how our economic situation over the last few years has suffered so greatly. We lost so many manufacturing jobs to trade deals, to different things that have gone on in the U.S. for the last few years. And I am excited that we know that we can create these jobs, viable jobs that could sustain a family, allow them to have a part of that American dream, but keep those jobs here. I mean, that is something that we are not talking up enough. The reality is most of those manufacturing jobs left Mexico, and they went farther into Indonesia, China and everywhere else and India. Now we have to come back and be a competitive force.

So I just want to say this is an exciting opportunity to start a green revolution that will hopefully bring everybody, stakeholders, all of them to the table. And I am also talking about those people who have traditionally been left out of environmental topics and issues. And those are people of color, hardworking-class folks, blue-collar people who now may have a chance to get retooled, reeducated and hopefully brought into an arena where they can also see a career ladder and hopefully at the end of the day be able to sustain their lifestyles, the American lifestyles that we all want to achieve here for the next few years and decade.

So with that, I yield back the balance of my time.

The CHAIRMAN. The gentlelady's time has expired.

The Chair recognizes the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman.

Dan Quayle is—I like him. It may surprise some, primarily because his grandfather was a renowned Methodist Bishop. There are churches and buildings on college campuses all over Oklahoma and Kansas named Quayle. Quayle United Methodist churches all over. And his grandfather was profound.

Now, the Vice President didn't quite get the profundities that his grandfather had. And so, in a speech, as he was trying to quote the model of the United Negro College Fund, which is "a mind is a terrible thing to waste," the Vice President said, "it is a terrible thing when a man loses his mind." I actually agree with Vice President Quayle.

And I would like to take a twist on that. I would say, a crisis is a terrible thing to waste. We are in the biggest crisis probably in our lifetimes. And it would be tragic indeed if we allowed this crisis to pass without getting something out of it, without coming out on the other side better than we were when we entered.

And that brings us to this whole question of trying to revamp the U.S. economy. The Center for American Progress says that there is a possibility of creating as many as 2 million jobs and within 2 years if the United States would put forth the resources into replacing the conventional fossil fuels, coal and so forth, and with new sources of energy. And it should be, I think, a great opportunity for us to handle a crisis in a manner that we are better than when we entered. I actually had some more Quayle quotes, but we don't have the time for me to use them to dramatize my commitment to this issue.

I yield back.

[The prepared statement of Mr. Cleaver follows:]

U.S. Representative Emanuel Cleaver, II
5th District, Missouri
Statement for the Record
House Select Committee on Energy Independence and Global Warming Hearing
"The Green Road to Economic Recovery"
Thursday, September 18, 2008

Chairman Markey, Ranking Member Sensenbrenner, other Members of the Select Committee, good afternoon. I would like to welcome our distinguished panel of witnesses to the hearing today.

The current financial crisis is of great concern. Just yesterday, the government bailed out the insurer AIG by the means of a two-year, $85 billion loan in exchange for a nearly 80 percent stake in the company. Only two weeks ago, the federal government claimed management of both Fannie Mae and Freddie Mac by placing them into conservatorship. Additionally, just this past Monday – called "Meltdown Monday" by many – Lehman Brothers filed for Chapter 11 bankruptcy protection.

This crisis could have a large and lasting effect on many Americans. Housing prices are expected to continue to decline until the current excess inventory of homes is reduced. Foreclosures continue to occur at high rates, and this is happening in low to middle income neighborhoods. This in turn affects renters, who in some cases have been forced from their homes by foreclosures due to their landlords defaulting on loans. The financial crisis is hurting working families, and we must do all we can to help those Americans who are suffering, especially perhaps those least at fault, but will suffer the greatest.

Increased investment in renewable energy and energy efficiency has the ability to create more jobs and likely help to revitalize our lagging economy. Reliance on new and promising technologies could improve our economy if investment is done wisely and with a mindful eye on the job market. Additionally, greater tax incentives for the use and production of renewables could save energy and money in the long-term. I look forward to hearing from our guests today on these options.

I thank all of our witnesses for their insight and suggestions, and I appreciate them taking the time to visit with our committee today.

Thank you.

The CHAIRMAN. I thank the gentleman.

The gentleman from California, Mr. McNerney.

There are approximately 3 minutes to go on the roll call on the House floor. I am going to leave it to the gentleman to recess this hearing until after the four roll calls on the House floor. We are going to have to go over and make the roll calls and then come back and reconvene the hearing.

I yield to the gentleman.

Mr. MCNERNEY [presiding]. Thank you, Mr. Chairman. I am glad you didn't say 3 seconds.

I don't have much. I am very excited about the opportunity. I spent my career developing wind energy technology. I know it is fun. I know it is exciting. I know it creates jobs. It is clean and good for our economy. And for every dollar we invest in it, we get three to five times as many jobs as we get if we invest in oil or fossil fuels. So this is the way of the future. This is the way we have to go, and I hope that we can make this happen.

With your intellectual capital, with your force of personality, help us make this happen.

And with that, I adjourn this until after the votes—recess. Excuse me, I recess this until after the vote.

[Recess.]

Mr. INSLEE [presiding]. We will gavel our hearing back. Sorry about the delay. We appreciate your patience, and I am looking forward to my colleagues returning in a little bit as they return from the floor.

[The prepared statement of Ms. Blackburn follows:]

"The Green Road to Economic Recovery"
Select Committee on Energy Independence and Global Warming
September 18, 2008
Opening Statement, Congresswoman Blackburn

Mr. Chairman,

I want to thank you for holding this hearing and I want to thank the witnesses for testifying before this committee on green jobs in the American economy.

One fact lost in the debate on this issue is that government does not create wealth.

Government can only take money away from you, spend it, and redistribute it to whoever it feels deserves funding. And if the government does not like the way the money is spent, it forces the company through regulations to steer the money to more **"APPROPRIATE"** areas.

Yet, this is the same mantra being espoused by policymakers about green jobs.

They want to take 100 billion dollars of taxpayer money to redistribute it to create 2 million "green jobs." That is a cost of 50 thousand dollars to create one single job.

Instead of reducing income taxes for individuals and small businesses who could use the money to create wealth and job opportunities; politicians want to **"STRATEGICALLY INVEST"** these billions of dollars in new energy efficiency and production strategies.

They believe they know how best to choose who should receive money for investment. Sounds like a lobbyist paradise to me.

Mr. Chairman,

If "green jobs" are what people want, the market would create them. Entrepreneurs and venture capitalists would be investing billions of dollars into the best ideas, and those that work would prosper.

Instead, the government is picking winners and losers and taking taxpayer dollars to fund industries that would otherwise fail in the marketplace because they do not work.

It is another example of government interfering with the private sector and trying to central plan the market much like Communist China.

I urge my colleagues to not fall for this sham.

I yield the balance of my time.

Mr. INSLEE. We have a great panel today. I would like to introduce them, starting with my friend Bracken Hendricks, who is currently senior fellow at the Center for American Progress. Bracken specializes in energy and climate issues, and he was founding executive director of the Apollo Alliance and co-author of the book, "Apollo's Fire: Igniting America's Clean Energy Economy," which was an incredible feat to co-author considering that he had to drag the other co-author constantly. So that was amazing.

Mr. Hendricks previously served, among other things, as special assistant to the Office of Vice President Al Gore.

And, Bracken, thank you for your leadership for years on these subjects.

Dr. Robert Pollin is our second witness. He is professor of economics and co-director of the Political Economy and Research Institute at the University of Massachusetts in Amherst. Dr. Pollin's research centers on macroeconomics, conditions for low wage workers in the U.S. and globally and analysis of financial markets, certainly timely. He is co-author of the recent report, "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy," which addresses exactly the subject of today's hearing.

We thank you, Dr. Pollin.

We want you to know that not all the members of this panel share disdain for economists. I happen to have a degree in that. So thank you for being here.

Mr. Fred Redmond is the international vice president for human affairs for the United Steelworkers. As a founding member of the Blue Green Alliance and the Green Jobs for American campaign, the steelworkers have taken a true leading role in the labor movement in advocating for environmental protection and green job creation. He was named to the executive council of the AFL–CIO earlier this year.

And please convey our thanks for your president's leadership on this in multiple occasions as well.

Byron Kennard is the executive director of the Center For Small Business and the Environment, which he co-founded in 1998. He is a longtime environmental advocate. He was awarded the leadership medal of the United Nations environmental program for his work in building the environmental movement. He is the author of, "Nothing Can Be Done, Everything is Possible," a book of essays on social change. And he is a guest columnist for GreenBiz.com, FortuneSmallBusiness.com, BusinessWeek.com and other outlets.

And we appreciate you being here. We need a little social change.

Dr. Margo Thorning is executive vice president and chief economist for the American Council for Capital Formation. Dr. Thorning's work focuses on tax, environmental and competitive issues. She is the author of several books on these issues and has testified frequently to quite a number of congressional committees.

Dr. Thorning, thank you for being here today.

With that, we should start with Bracken Hendricks.

STATEMENT OF BRACKEN HENDRICKS

Mr. HENDRICKS. Thank you very much, Congressman Inslee. I understand you are an author as well.

I want to especially thank Chairman Markey and Ranking Member Sensenbrenner and all the members of the committee and the staff, who are an incredibly competent staff, as well.

It is an honor to be here today to talk about a number of issues that are coming together and finding solutions that actually can start to address a number of interrelated issues. August saw the unemployment rate jump to 6.1 percent; 9.4 million people are out of work. Clearly there is a significant financial crisis brewing. Housing values are declining, but there is a whole other sets issues that are also affecting the economy right now: Rising energy prices, coal prices for Appalachian coal have jumped 200 percent in a very short while; $600 billion flows out of the economy for imported oil; and of course, there is a brewing climate crisis which with inaction presents significant costs and significant long-term burdens to the economy.

I am Bracken Hendricks. I am a senior fellow at the Center for American Progress and the Center for American Progress Action Fund. And we were honored to work with the University of Massachusetts Political Economy Research Institute and Dr. Robert Pollin, who is here, in producing a report called, "Green Recovery, a Program to Create Good Jobs and Start Building a Low-Carbon Economy." What we found as we looked at a package of investment in climate solutions, including renewable energy and energy efficiency, was that investing wisely in public infrastructure and in creating these markets, it is possible to build new industry, improve American competitiveness and create good jobs. This is not a substitute for global warming policy, but it is not cap and trade itself.

What we are looking at here is the investment side of the equation. How do we invest in building these markets and creating these new industries? We looked at six strategies, three for energy efficiency, three for renewables, and we found that they create very significant jobs and economic opportunity. They create more jobs and they create more jobs at higher wages when compared either to a traditional program of economic stimulus, and so if we are to consider a package of stimulus, we may want to consider these sorts of investments that produce these other long-term benefits as they jump-start the economy and move us on to a path of recovery.

We also compared those investments to investments in the oil industry and traditional energy sector. And I want to just focus in here with the bulk of my comments on why renewable energy and energy efficiency actually are a very, very strategic point of investment for rebuilding the economy and for creating new opportunities. Investing in energy efficiency and renewable energy should be central to any near-term economic package. They create new investment. This is a situation where public investment, strategically employed, can create, can crowd in, if you will, new private sector investment, helping to create markets, helping to create demand and helping to change the cost structure of businesses to create new opportunities.

It also creates access to credit. If you look at financing mechanisms to invest in building retrofits. We are talking about creating new demand through these public investments for small businesses. And I am very pleased to share the stage today with a rep-

resentative of small business. It is the lighting contractors, the insulators. These are the people who will be employed in a clean-energy economy. They will do the hard work. We call them green jobs, but these are really familiar jobs in professions that we know and that are at the bedrock of the American economy.

And lastly, it is specifically focused on construction and manufacturing. These are very, very significant opportunities. They create good jobs, career ladders, and pathways into middle class professions.

So there is a couple of structural reasons why focusing on energy efficiency and renewable energy makes good economic sense. They are relatively more labor-intensive than either consumption or investment in traditional energy systems. You are taking a dollar that you would otherwise spend on wasted energy and instead you are sinking it—and it would result in pollution—instead you are sinking that into skilled crafts people to retrofit buildings or advanced manufactured goods that operate at a higher level of efficiency. That is a smart investment. It is not just mindless spending. It is strategic spending. So turning this waste into skills is a very significant piece.

Additionally, the domestic content is greater. If we compared the same investment in a consumption-based stimulus, just simply giving reacts to folks and 22 percent of average household expenditures under those circumstances would flow to imported goods. In a domestic green economic package, we are talking about something closer to 9 percent that would flow out of the economy. The bulk of the money stays in local communities. It reduces costs for business, very, very significantly. We have two times the energy intensity of our gross domestic product of the rest of—when compared with other industrial countries. It also creates more jobs overall, and they are very broad-based. So this is an opportunity to create career ladders and pathways into good jobs with appropriate training.

I want to commend Representative Solis on her green jobs package that was in the recent energy bill. Linking this to training and workforce investment is a great opportunity bring people into good jobs.

And lastly, it lowers the cost of action on climate eventually by bringing new products to market. By bringing these new technologies, like renewable energy, up the cost curve so they are in greater mass production it is going to drive down the cost of these new technologies in the long term.

And let us see. I want to just also mention that public infrastructure is fundamentally community-based. These are local investments. They are very difficult to outsource. And so this is money that tends to stay within communities.

The other point that I want to make is that there is a great deal of policy that we can act on very easily. There is a range of policies that are in my written testimony. I would encourage the members and the staff to look at the policies that we cite.

I just want to very quickly touch on the story of the Weatherization Assistance Program as I close my remarks. The Weatherization Assistance Program has a cost-benefit ratio of $2.69 for every dollar invested because it produces savings for ratepayers, savings

for small businesses, and it helps low-income folks. It also creates 52 jobs for every million dollars invested. And but over the life of the program, there have been 5.6 million homes that have been retrofit through this program, but there are 34 million homes that qualify for weatherization assistance. The authorization has been upwards of $700 million, but the appropriation has been about 2 and a quarter million dollars. So we are dramatically under-investing in something that clearly yields a positive cost benefit. It creates more jobs than many other forms of investment, and it saves low-income ratepayers and some businesses money to reinvest in the community. This is a smart, strategic investment for the American economy. It is a good way to be growing our economy at a time of tremendous difficulty in driving new investment into construction and manufacturing jobs.

Thank you very much for the time, and I appreciate your attention.

[The statement of Mr. Hendricks follows:]

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

"The Green Road to Economic Recovery"

Testimony of Bracken Hendricks
Senior Fellow, Center for American Progress Action Fund

September 18, 2008

Chairman Markey, Ranking Member Sensenbrenner, and Members of the Committee: I want to thank you for the opportunity to share my views on a green road to economic recovery, and the role that immediate investment in global warming solutions can play in strengthening the foundation of the U.S. economy during these difficult economic times.

I am Bracken Hendricks, senior fellow at the Center for American Progress Action Fund, a non-partisan multi-issue think tank focused on developing innovative policies that build a more broadly shared prosperity. At CAPAF, we have come to believe, through deep research on the matter, that smart strategic investments in climate solutions can help to rebuild the underpinnings of our economy. Built on the foundation of efficient and low-carbon energy sources, this transition can be a source of increased business opportunity and competitiveness, stronger communities, improved national security, and increased prosperity. We call this approach "the Energy Opportunity," and we believe that it must be at the center of both America's energy policy and our economic policy as we confront the interrelated challenges of a sagging economy, rising energy prices, and a growing climate crisis.

Working in partnership with the University of Massachusetts' Political Economy Research Institute, we released a report this month entitled, "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy." The report outlined a strategy for short-term economic recovery that simultaneously achieves longer-term public purposes by investing not only in a traditional consumption-based stimulus, but by helping to lay the groundwork for the transition to a clean, low-carbon economy.

The recent economic downturn makes the need for a recovery package urgent and incontrovertible. August unemployment was at 6.1 percent, a five-year high, and employers cut nearly 84,000 jobs, primarily in manufacturing and employment services.[1] New housing construction continued to slow in July, with privately owned housing starts at a seasonally adjusted annual rate 11.0 percent below the revised June estimates and 29.6 percent below the July 2007 rate.[2] For the 18th consecutive month home prices

[1] Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," available at http://www.bls.gov/CPS/.
[2] U.S. Census Bureau and U.S. Department of Housing and Urban Development Joint News Release, September 17, 2008, available at http://www.census.gov/const/newresconst.pdf (New construction data available Wednesday, September 17th at 8:30am EST.

continued to drop, with the S&P/Case-Shiller 20-city home price index falling a record 15.9 percent for the year through May.[3] Finally, the recent upheavals in financial markets make the case for some sort of recovery package all the more compelling.

A program of investment in deploying new clean energy technology and improving building efficiency is good short-term economic policy. It would drive immediate spending into some of the hardest hit sectors of the economy in construction and manufacturing, and ensure that an infusion of near-term spending flows directly toward job creation and domestic investment. Specifically, we outline in our report a program of investment that would inject $100 billion into the domestic economy through near-term spending on energy efficiency and renewable energy. We focus on strategies that would ensure the funds are brought to bear rapidly, within an 18- to 24-four month timeframe. We find that a strategy for economic recovery that invests in new energy alternatives and smart public infrastructure provides superior improvements in economic performance and job creation when compared to either rebates or comparable spending on traditional energy sources. Put simply, a green recovery package creates more jobs and more good jobs than any other strategy. It deserves strong consideration at this time.

Drawing on this work, I want to principally address three topics with you today. In this testimony, I discuss:

1. Why public investment in energy efficiency and renewable energy should be central to any near-term economic stimulus package

2. Specific measures that Congress could include in a stimulus package

3. The proper relationship of short- to medium-term measures in the report, and a long-term, comprehensive strategy for investment in clean technology and green jobs

I. Why should public investment in energy efficiency and renewable energy be central to any near-term economic stimulus package?

There are many ways in which government spending can stimulate the economy and create jobs as part of a recovery program. Public spending directed toward a green recovery, however, would result in more jobs than spending in many other areas, including, for example, on rebates for increasing household consumption, which was the primary aim of the April 2008 $168 billion stimulus program. Near-term investments in energy efficiency and renewable energy also have the added benefit of moving the country toward the low-carbon future necessary to increase our international competitiveness and national security, and avoid the devastating social, economic, and environmental effects of global warming over the long term.

[3] Les Christie, "Home prices post record 15% drop," CNNMoney.com, available at http://money.cnn.com/2008/06/24/real_estate/home_prices_CaseShiller_April/index.htm

A green recovery program is more effective as an engine of job creation than spending the same amount of money within the oil industry or on household consumption. Increasing spending by $100 billion on household consumption along the lines of the April 2008 stimulus program would create about 1.7 million total jobs, or about 16 percent fewer jobs than the green recovery program. In addition to creating more jobs, targeting an economic stimulus program at increasing green investments also creates more good jobs at higher wages than either a conventional stimulus or comparable spending in the traditional energy sector. A green recovery strategy also offers longer-term benefits: consumer savings by reducing home energy bills; stabilizing the price of oil, natural gas, and other non-renewable energy sources through reduced demand and increased energy diversity; and, of course, building over time a low-carbon economy.

While it is not proposed as an option for economic stimulus, spending on current fossil fuel-based energy offers a useful comparison to demonstrate the substantially increased economic benefits of spending on renewable energy and efficiency. Spending $100 billion within the domestic oil industry, for example, would create only about 542,000 jobs in the United States. A green infrastructure investment program would create 2 million jobs, or nearly four times more jobs than spending the same amount of money on expanding oil energy resources. And again, spending on oil offers no benefit in transitioning the U.S. economy toward a low-carbon future, and it perpetuates the economic and national security vulnerabilities of continuing to rely on oil for the lifeblood of our economy.

Why does the green investment program create more jobs than spending within the oil industry or on household consumption? Four factors are at work.

1) Relative labor intensity is higher

Relative to spending within the oil industry, the green investment program utilizes far more of its overall $100 billion in spending on hiring people, and less on purchasing machines and supplies. Renewable energy and energy efficiency create more jobs per dollar invested than traditional fossil fuel-based generating technologies by investing money directly in advanced technology manufacturing, modern infrastructure expansion, and developing the skills of people. This is money that would have been previously spent on wasted energy and imported fuel. These investments substitute dollars spent on pollution and waste and redirect that investment into the skills of workers and the infrastructure of communities.

2) Domestic content is greater, and economic benefits more widely shared

A green investment program relies much more on goods and services made within the U.S. economy and less on imports when compared to spending either within the oil industry or on household consumption. In general, about 22 percent of total household expenditures flow toward imported goods. With the green recovery investment program,

only about 9 percent purchases imports.[4] Another critical benefit of a green economic recovery program is that infrastructure upgrades, building efficiency retrofits, renewable energy installations, and other components of green investment all involve work which cannot easily be outsourced. Moreover, the diffuse nature of these programs ensures that spending on goods and services is spread widely across regions of the country and stays in the local economies where these services are rendered, as compared to large, centralized energy or infrastructure projects. The economic spillover and indirect job creation effects of this phenomenon help explain why green investments create more jobs and more good jobs than the alternatives.

3) Efficiency improves U.S. competitiveness, and new industries can tap a burgeoning export market for clean technology

The United States uses nearly twice as much energy per dollar of GNP as other industrialized countries.[5] Creating a more efficient economy helps us compete with international economic rivals, and improves our balance of trade. Currently, oil imports account for one of the largest single shares of our trade deficit. Moving to energy-efficient technology and clean renewable energy brings dollars back to the domestic economy. Moreover, and largely due to a lack of federal support, the United States is lagging behind countries like Germany and Japan in the production of clean energy technologies, which are now experiencing exploding global demand. Investing public funds and providing tax credits to kick-start domestic demand for these technologies will benefit U.S. manufacturers, who enjoy the competitive advantage of local production. With expanding domestic and global markets, and a subsequent ramp up of the economies of scale in the U.S. clean technology manufacturing sector, U.S. firms will be better equipped to tap burgeoning export markets for these products in coming years. Reducing the energy intensity of the economy is also smart competitive positioning in an era of sustained rising prices for basic energy commodities. From oil to natural gas to coal, exploding global demand is causing prices to outstrip the long-term forecasts of energy analysts with no relief in sight. The cost savings for consumers and businesses from a major push on energy efficiency could be staggering. As an example, if the Bush administration had pursued an aggressive package of energy-efficiency measures across the economy starting in 2001, with implementation beginning in 2002, the cumulative savings to the economy today would be a remarkable $206 billion in avoided energy costs.[6] These sorts of economic benefits are achievable and will help U.S. consumers even as they drive new investment into communities, and open global markets for American business.

4) Pay levels are diverse, representing jobs across the full range of the economy

[4] Robert Pollin, Heidi Garrett-Peltier, James Heintz, and Helen Scharber, "Green Recovery" (Washington: Center for American Progress, 2008), available at http://www.americanprogress.org/issues/2008/09/pdf/green_recovery.pdf

[5] Center for American Progress and the Worldwatch Institute, "American Energy: The Renewable Path to Energy Security" (2006) available at http://www.americanprogress.org/issues/2006/09/american_energy.html/AmericanEnergy.pdf (last accessed October 2007).

[6] American Council for an Energy Efficient Economy, data supplied by Dr. John Laitner, September 2008.

Green investments generate not only more significant numbers of well-paying jobs with benefits than investments in traditional energy supplies like oil, but because they create more jobs overall, they also provide a relatively high proportion of entry-level jobs that offer career ladders, which can move low-paid workers into better employment positions over time. This broad-based nature of the employment effects, across regions, wage and skill levels, and sectors of the economy, is an asset for devising a strategy to invest in economic recovery that is felt broadly on a national basis.

Further, public investment overall represents a sound strategy for economic growth, enabling the market conditions that allow for expanded private sector activity. Infrastructure investments, for example, improve mobility, increase efficiency, and provide public support that adds value and productivity to private investment. Enhancing the electrical grid for reliability and efficiency, or promoting real transportation choices like transit and rail, will not only create substantial employment, but it will create more vibrant and efficient local economies and a better quality of life in communities.

In considering the viability of spending on large-scale public investment projects, one of the major issues that is often raised is whether such expenditures absorb the limited amount of total investment funds in the economy, and thereby "crowd out" private sector investment activities. In fact, the weight of evidence examining the impact of public investment on the U.S. economy does not point to a crowding-out effect. It rather finds that, on balance, higher levels of public investment will promote private sector productivity and higher rates of return for business. As such, the evidence suggests that many kinds of public investments in the United States generally *crowd in* private investment, by establishing the enabling conditions for sustained growth in private sector investment and business formation. As a result, the crowding-in benefits of public investments are also associated with higher rates of private sector employment and job creation.

For our purposes, it is especially important to note that the six categories we outline in the Green Recovery paper are either in an early stage of development and are poised for rapid movement up their growth curve (wind, solar, and "smart grid"), or have suffered from serious underinvestment (building efficiency and mass transit), and are thus primed to productively absorb a significant amount of both public and private capital investment while offering substantial public return on that investment. Moreover, the strategies outlined in the green recovery plan to support a clean energy economy—especially mass transit, freight transport, and smart grid—can also generate the additional benefits of enhancing private sector productivity, competitiveness, and employment.

II. What are specific measures that Congress should include in a stimulus package?

In the "Green Recovery" report, we broadly outline a series of near-term policies that could be enacted quickly to drive new investment in the economy, creating jobs and

promoting increased economic activity. We focus on investments to expand energy efficiency and renewable energy as two central building blocks of the low-carbon economy. These also lend themselves to immediate public investments, and result in expanded opportunities in the construction and manufacturing sectors of the economy. Specifically, we examined three opportunities each in renewables and efficiency for near-term public spending, resulting in six pathways for immediate congressional action.

1. Retrofitting buildings to improve energy efficiency

The building sector alone accounts for approximately 48 percent of all energy consumed in the United States, and 36 percent of the direct energy-related greenhouse gas emissions, the principal cause of global warming.[7] Meanwhile, families of low and moderate means spend a disproportionate amount of their income on home energy bills, and often reside in some of the most inefficient housing stock in the nation. These expenditures will continue to escalate with the rising cost of electricity and natural gas, putting an increasing burden on American families with little or no disposable income. Building efficiency retrofits serve the triple benefit of reducing energy bills, creating good jobs, and reducing global warming emissions associated with home energy consumption.

Moreover, the United States has 300 billion square feet of building stock, of which 5 billion is *already* renovated each year.[8] The energy and money saving potential embedded in the current U.S. building stock is enormous. The Business Roundtable estimates we could save 3.5 quadrillion British Thermal Units of energy (equivalent to 1.65 million barrels of oil/day) by 2025, just by upgrading the efficiency of our existing residential and commercial building stock.[9] Some estimates put the potential annual savings from improved U.S. building efficiency at more than $200 billion.[10] With efficiency savings of 20 to 30 percent readily obtainable through easy interventions (improved insulation, lighting, and HVAC controls), and a payback period of less than 10 years, the opportunity is enormous.

Recommendations:

- Fully fund the Weatherization Assistance Program at $900 million, the amount Congress was authorized in the Energy Independence and Security Act of 2007 to spend on the program in FY 2009

[7] Hal S. Knowles, "Realizing residential building greenhouse gas emissions reductions: The case for a Web-based geospatial building performance and social marketing tool" (2008), available at http://www.epa.gov/ttn/chief/conference/ei17/session5/knowles.pdf.
[8] Architecture 2030, "The Building Sector: A Historica Opportunity," available at http://www.architecture2030.org/current_situation/hist_opportunity.html.
[9] Business Roundtable, "More Diverse, More Domestic, More Efficient" (2007), available at http://www.businessroundtable.org/pdf/Energy/Business_Roundtable_Energy_Report_06062007.pdf.
[10] Joel Rogers, "Seizing the Opportunity (For Climate, Jobs, and Equity) in Building Energy Efficiency" (December 2007), available at http://www.cows.org/pdf/rp-seizing-07.pdf.

WAP has provided weatherization retrofits to 5.6 million low-income families over the past 29 years .Yet there are still 34 million families whose income levels make them eligible, with 15 million of these estimated by the Department of Energy to be good candidates for cost-effective weatherization. By DOE's calculations, WAP produces enormous benefits: an estimated $1.53 in energy-related benefits, plus $1.16 in ancillary benefits (for a total of $2.69), for every $1.00 in federal funds invested. WAP reduces low-income energy bills by an average of 21 percent (or $358 per year, based on 2005 spending levels), and creates 52 direct jobs for every $1 million of WAP funding, as well as additional jobs for subcontractors and material suppliers.[11] However, WAP is consistently underfunded. In fiscal year 2008, WAP was authorized at $700 million, but only funded at $227.2 million.[12] It is a highly effective program that also serves the neediest Americans.

- Fully fund the Low Income Home Energy Assistance Program at its authorized level of $5.1 billion, and expand the energy-efficiency retrofit component

Under LIHEAP, states may allocate up to 15 percent of their basic grant for low-cost residential weatherization or energy-related home repair, and in some cases up to 25 percent, with authorization from Health and Human Services. Fully funding LIHEAP and instructing HHS to allow states to use up to 25 percent of grants for home energy retrofits would leverage money immediately.

- Fully fund the Energy Efficiency and Conservation Block Grant Program, which authorizes $2 billion annually over five years to fund energy audits, strategic planning, and other supports for energy efficiency improvements, and will drive resources directly to states, cities, and counties to do the work of home energy audits and weatherization. This block grant program has been authorized, but is awaiting the allocation of funds. It is poised to be a centerpiece of driving new recovery funds directly into communities where it can do the most good, and should receive the highest level of attention in designing a program of economic recovery

Many other policies would have strong public benefits by moving money into energy-efficiency retrofits that can drive new investment, consumer savings, and growth. Congress should:

- Match state public benefit funds and other locally based programs supporting energy efficiency and green building retrofits to both public and private buildings
- Require the retrofitting of all U.S. government buildings in need
- Extend and increase financial incentives for energy and efficiency improvements in private residences and commercial structures including:
    - Residential Energy Efficiency Tax Credit
    - Residential Solar and Fuel Cell Tax Credit
    - Business Energy Tax Credit

[11] Weather Assistance Program information can be found at http://www.waptac.org/si.asp?id=1029.
[12] U.S. Department of Energy, "Sources of Funding for the Weatherization Assistance Program," available at http://www.eere.energy.gov/weatherization/source_fund.cfm.

- o Energy Efficient Commercial Buildings Tax Deduction
- o Energy-Efficient New Homes Tax Credit for Home Builders
- o Energy Efficient Mortgage federal loan program

2. Expanding mass transit and freight rail

Many critical mass transit programs are currently bottlenecked for lack of federal dollars. A clear example is the Metrorail extension to Dulles International Airport, which has been delayed due to a lack of firm commitment from Federal Transit Administration officials. Mass transit is a critical solution for reducing traffic congestion, urban and rural air pollution, and transportation-related global warming emissions, while weaning the United States off a crippling dependence on oil. Upgrades to our freight rail systems through public investment would also yield immediate job gains and help private industry by increasing the reliability of our national rail distribution system.

Recommendations:

- Fully fund federal transit programs in 2009 at the $10.3 billion level authorized by SAFETEA-LU
- Expand federal support for state and municipal transit operation and maintenance budgets to deal with increased ridership
- Increase federal subsidies for employer-based mass transit incentives
- Expand federal support and underwriting for rail rehabilitation or new construction through the Railroad Rehabilitation & Improvement Financing program of the Federal Railroad Administration

3. Constructing "smart" electrical grid transmission systems

Regional smart grid projects are increasingly being pursued around the country, yet they would benefit enormously from an influx of public investment. A smart grid combines advances in information technology with innovations in power system management to create a significantly more efficient distribution system for electrical energy. Smart grids help defer construction of unnecessary new generation by actively managing electricity loads; reduce costs from outages through active grid management; and increase demand-side efficiencies using advanced controls and diagnostics.

The environmental and energy savings benefits of the smart grid are enormous. A Pacific Northwest National Laboratories study estimates that the value of an energy system transformed with smart grid technology could yield savings in excess of $80 billion over the next 20 years.[13] A study by the independent RAND Corporation identified potential

[13] For more information, see GridWise at Pacific Northwest National Laboratories homepage, available at http://gridwise.pnl.gov/moreinfo/faqs.stm

benefits exceeding $100 billion over the next 20 years in two of the five smart grid deployment scenarios it examined.[14]

Smart grid technology is also an important enabling tool to bring energy online from wind farms, solar panels, and other renewable power sources. By doing so, it would radically accelerate energy efficiency efforts, and ultimately incorporate plug-in electric vehicles.

Recommendations:

- Fully fund and expand the Smart Grid Title (Title XIII) of the Energy Independence and Security Act of 2007
    - Fund the Smart Grid Regional Demonstration Initiative, which provides up to a 50 percent cost share to utilities for qualifying smart grid technology investments included in a demonstration project (up to $100 million per year for the next five years)
- Increase support for the Smart Grid Investment Matching Grant Program, which provides reimbursement of one-fifth (20 percent) of the cost of qualifying smart grid investments
- Establish a "21st Century Electricity System Security and Modernization Fund" to deploy smart grid technologies

4., 5., and 6. Wind power, Solar power, and Next-generation biofuels

Including the 2007 Energy Bill, there have been at least seven attempts to extend and update federal tax credits for renewable energy & energy efficiency. Four of these attempts were blocked because the bill failed a cloture motion to be considered in the Senate. Allowing these tax credits to expire could cost 116,000 U.S. jobs and nearly $19 billion in lost U.S. investment in the wind and solar industries alone. Generous and stable federal tax incentives and credit subsidies are necessary in the near term, to encourage private investment during the nascent stages of these industries, which are sources of manufacturing, installation, and service jobs in all corners of the country.

Meanwhile, next-generation sustainable biofuels have the capacity to deliver a secure, stable, and environmentally-sound supply of fuel to replace our crippling dependence on oil. Moreover, production of biofuels like cellulosic ethanol and biodiesel from non-food crops offers an incredible opportunity for economic development in rural communities throughout America.

Recommendations:

- Renew and expand the Investment Tax Credit and Production Tax Credit for solar and wind energy for a minimum of five years

[14] RAND Corporation, "Estimating the Benefits of the GridWise Initiative" (2004), available at http://www.rand.org/pubs/technical_reports/2005/RAND_TR160.pdf

- For solar, allow the credit to be used to offset the alternative minimum tax, and remove the existing limitation that prevents public utilities from claiming the investment tax credit.
- Fund and expand the following programs established in the 2007 Energy Independence and Security Act to help build advanced biofuels infrastructure:
    - Renewable fuel infrastructure grants for retail and wholesale dealers
    - Pilot grant programs to invest in renewable fuel distribution corridors
- Provide federal loan guarantees for the next generation of advanced biofuels, where new companies face significant financing hurdles to break ground on manufacturing facilities that operate at a commercial scale
- Create a cellulosic biofuels small producer tax credit of $0.30 per gallon for the first 30 million gallons[15]

In addition, the Center for American Progress strongly supports full funding of the Green Jobs Act, authorized in the 2007 EISA at $125 million per year. It would provide job training and workforce investment to build a skilled workforce to undertake energy efficiency upgrades and renewable energy installations. The Green Jobs Act could support smart workforce development that ensures a skilled and ready workforce to provide jobs in the construction of green infrastructure, the installation of energy efficient technologies, and the building of a renewable energy industry. It is smart policy, and would put money directly into the pockets of workers and invest in their skills for participating in the workforce in a rapidly changing and increasingly green economy.

It is also noteworthy that currently in Congress, appropriations for a $25 billion loan program for automobile companies to retool factories and retrain workers are receiving serious consideration. Our paper and its projection of creating 2 million jobs did not look at the benefits of investment in the automotive industry. But it is clear that investing in the rapid conversion of the U.S. auto industry to produce highly fuel-efficient and alternative fuel vehicles could provide a major boost to global competitiveness, near-term stimulative investments, and long-term reductions in CO2 emissions. This strategy should be encouraged. Any loan program that moves forward should have strong guarantees that both the environmental performance goals and domestic retooling and workforce investments are met as a condition of the loans. In addition, the experience of the Chrysler loan guarantee program showed that such emergency relief can also enable the government not only to share the risk, but to benefit from the upside when such loans are successfully repaid. In the Chrysler loan guarantee program, the U.S. Treasury made $311 million dollars when it sold warrants issued as a part of the relief package.

Proportional breakdown in spending

The allocation of total investment funds that we assume in our report is: Forty percent for retrofits; Twenty percent for mass transit/freight rail; and 10 percent each for smart grid, wind power, solar power, and advanced biomass fuels. Adjusting the budgetary allocations would affect the job total estimates, but not to a dramatic extent. The

[15] Jake Caldwell, "Fueling a New Farm Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/01/farm_economy.html

programs presented here are strong candidates for appropriations that would move funds directly into productive purposes that will support economic recovery and invest in a clean energy transition. This is not intended as an exhaustive program, but rather it identifies some high-value targets as such a plan is developed.

As a stimulus and economic recovery package, it is entirely appropriate that these investments should be funded out of near-term general revenue. However, numerous additional revenue sources can be easily identified to provide offsets for some of this spending as well. Immediately, a portion of the investment could be funded by repealing tax loopholes for the oil and gas industry, improving the collection of royalties for drilling on public lands, or by closing offshore tax havens. Over time, revenue from a cap and auction program could more than adequately cover the costs of a green transition. In addition, some investments proposed here, because they have a rapid payback and a positive return on investment, such as energy efficiency, could be designed to provide self-financing mechanisms or to repay the treasury over time.

III. What is the proper relationship between the short- to medium-term measures and a longer-term investment in clean tech and green jobs?

Investing in a green recovery is not a replacement for a more comprehensive climate strategy. Instead, it represents an opportunity to make a significant down payment on the sort of economic activity that will be required to fundamentally transition our economy away from carbon-intensive and imported energy sources, and to begin the process in earnest of moving toward more efficient, domestic, and renewable energy as a solution to global warming.

This green recovery program is entirely consistent with a cap-and-trade program, and these clean energy investments ultimately could be funded through the revenue resulting from a cap and auction mechanism. However, the investments laid out in the CAP report "Green Recovery" are also independent of whatever policy is advanced as a strategy for pricing carbon, and they represent smart economic growth policy in their own right. At a time when the U. S. manufacturing economy has been in dramatic contraction, and the collapse of the housing market is causing severe disruption in financial markets, a program that reinvests in new construction through smart infrastructure and building energy efficiency, while developing new markets for U.S. manufactured products, is a smart way to jump-start the American economy.

In addition to the recent report on Green Recovery, the Center for American Progress has outlined a critical path for the long-term transition to an economy that seriously takes on the challenge of advancing climate solutions. The CAP report, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy[16]" identifies "10 Steps to a Low-Carbon Economy" that will be critical to moving our country toward reliance on low carbon

[16] Report available at: http://www.americanprogress.org/issues/2007/11/energy_chapter.html

energy. This strategy involves a mix of direct investment, smart regulation, and administrative solutions. The near- and medium-term investments outlined in the Green Recovery program are wholly consistent with this longer-term vision for change. A comprehensive program of global warming solutions, however, will include the following:

1. Create an economy-wide, greenhouse-gas-emissions cap-and-trade program: The atmosphere is a limited resource, and it is being used up rapidly. At the center of a broad-based strategy for addressing global warming are policies to cap carbon emissions and put a price on their release. This is a critical policy for fixing broken market signals that encourage pollution. It also can be a significant source of revenue for public investment in climate solutions. The Center for American Progress Action Fund supports a 100 percent auction of CO2 emission credits. Experts place the value of such an auction at $50 to $300 billion each year, when fully implemented. CAPAF estimates conservatively that auction revenues could result in $75 billion per year to the public treasury for advancing public purposes. Ten percent of this auction revenue could be directed to businesses operating in energy-intensive sectors to provide assistance with changing energy prices. The remainder could be divided equally between 1) low- and moderate-income Americans to help offset any equity impacts from potential near-term energy-related price increases during a transition, and 2) funding to spur science and technology innovation to drive our transition to a low-carbon economy by funding RD&D projects, tax incentives, and other initiatives. A green recovery strategy would offer a significant down payment on this effort, and could ultimately be repaid by auction revenue.

2. Eliminate federal tax breaks and subsidies for oil and gas: Providing a level playing field for clean technology will require the elimination of subsidies for mature industries and high carbon sources of energy. To the extent that a green recovery program is funded by closing tax loopholes for oil and gas and shifting subsidies toward investment in low-carbon clean technology, it will help fix longer-term market failures as well as providing needed resources to jump-start critical construction projects and build new market activity in clean energy.

3. Increase vehicle fuel economy: The future of domestic automobile manufacturing lies in developing more fuel-efficient and advanced technology vehicles. Dramatically improving fuel economy across the fleet is also essential for climate protection. In addition to pricing carbon, a host of complementary policies to assist with the challenges faced by particular sectors of the economy will be required. Average fuel economy should be raised to 40 mpg by 2020 and at least 55 mpg by 2030. In addition, a comprehensive policy package should provide incentives to auto manufacturers to retool their assembly lines and retrain workers to produce a new generation of vehicles, while consumer tax credits for the purchase of more fuel-efficient vehicles can also accelerate the turnover of the domestic fleet.

4. Increase production and availability of alternative low-carbon fuels: In addition to increasing the efficiency of the cars we drive, it is also essential to change the fuels

we use to power transportation. The United States should set a target of using low-carbon alternative fuels, including electricity, to supply 25 percent of our nation's transportation fuels by 2025, and a low-carbon fuel standard should reduce lifecycle emissions from transportation fuels by 10 percent by 2020. In addition, a renewable fuels certification program with transparent sustainability labeling will provide certainty to the market for alternative fuels. Turning over our fueling infrastructure can be driven by a pump-or-plug mandate that requires 15 percent of fuel "pumps" (including dedicated electricity charging stations for plug-in hybrid vehicles) to provide low-carbon alternative fuels in any county in the United States where 15 percent of vehicles can run on these alternative fuels.

5. Invest in low-carbon transportation infrastructure: New investment in more diverse and inter-modal transportation networks such as local mass-transit, regional and interstate long-distance high-speed rail systems, and green city programs to encourage the redevelopment of urban areas and reduce long commutes and suburban sprawl, will provide another front for reducing carbon emissions. Such transportation investments will provide consumers with more choices and improve quality of life in our nation's cities and rural areas. In addition, they can be a centerpiece of a green recovery program through investment in smart infrastructure that creates good jobs.

6. Improve efficiency in energy generation, transmission and consumption: In the electricity sector, there has been a tremendous underinvestment in public transmission infrastructure, and regulatory barriers have prevented maximizing the potential for renewables and efficiency to contribute significantly to a clean energy transformation. A national Energy Efficient Resource Standard could require electricity and natural gas distributors to meet a 10 percent energy savings threshold through efficiency upgrades by 2020. At the same time, a major upgrade of the U.S. electricity grid to increase energy and national security, encourage distributed generation, and increase the efficiency of transmission would both create new economic activity in the near term, and improve the efficiency of our energy system. Requiring efficiency upgrades for our appliances and private, commercial, and federal buildings will not only dramatically reduce our national energy consumption, but it will expand the market for new advanced, high-efficiency manufactured products as well.

7. Increase the production of renewable electricity: Both requirements and well structured incentives are required in both the short- and long-term to grow the market for clean domestic renewable energy. A national renewable electricity standard to require 25 percent of energy produced in the United States to come from renewable sources by 2025 will provide certainty to the market. Increasing distributed renewable electricity generation will improve efficiency by generating electricity close to the point of use. It will also increase the resilience of the grid network, and cut costs by shaving peak loads to optimize generation. Investment in renewable energy can be greatly accelerated by improving the structure of investment and production tax credits and low-interest loans to provide long-term predictability to investors.

8. Use carbon capture-and-storage systems to capture and bury the carbon emissions from burning coal: Deployment of new carbon capture-and-storage technologies is essential if future coal generation is to be a positive contributor to our energy security in an economy where carbon emissions are constrained. Market signals from cap and trade are unlikely to be sufficient to spur this new generation. Setting an emission performance standard for all new coal-fired facilities equivalent to the best available capture-and-store technology will be critical in ensuring that new plants are built with the ability to reduce carbon emissions. Federal funds to help offset additional costs of implementing carbon capture-and-storage technology can also help to move energy markets to increase construction of advanced, low-carbon emission coal plants.

9. Create a White House National Energy Council and make the federal government a low-carbon leader: Building the institutional capacity in government to support a rapid shift to a clean energy economy will also be required for a swift and effective transition of our energy system. Creating a White House National Energy Council to lead all other agencies in making energy and global warming top administration priorities will help to make this a true national commitment. The purchasing power of the federal government can also be used effectively to promote low-carbon technologies, while also: implementing new tax policies; creating dedicated federal agency capacity to address global warming; an Energy Innovation Council to spur interagency alternative energy-related research and development; an Energy Technology Corporation to demonstrate the efficacy of these new clean technologies; a Clean Energy Investment Administration to ensure these technologies make it to the marketplace; a Clean Energy Jobs Corps to promote "green-collar" jobs in a new clean energy economy; and more than doubling currently existing federal investment in low-carbon energy RD&D. All of these steps will contribute to making the federal government a driving force in a low carbon economy.

10. Lead efforts to advance international global warming policies: Internationally, the United States can help promote global cooperation by creating an "E-8" of nations comprised of leading developed and developing countries devoted to addressing global ecological and resource issues. It can also take the lead once again in the U.N. Framework Convention on Climate Change, and invest in the energy, environment, and infrastructure sectors in developing nations to alleviate energy poverty with low-carbon energy systems and help these nations adapt to the effects of climate change over the long term.

Such a comprehensive program of domestic and international policy change and investment is beyond the scope of consideration in this near-term investment, stimulus and growth proposal. But given the magnitude of the coming challenges in building a vibrant, competitive, and low-carbon economy, it is essential that Congress, as guardians of public trust resources, seek to make any short-term investments in stimulus with an eye toward coming long-term public challenges. In addition, our research with the

University of Massachusetts shows that as well as providing long-term benefits, a Green Recovery is good economic policy as well, because it provides more jobs and more good jobs for the American people. As such, a green recovery strategy also represents good government by anticipating challenges and investing in healthier communities, a more robust economy, and a safer world.

Thank you for your interest in considering these ideas for a Green Recovery strategy that takes significant strides toward building a low-carbon economy while investing in near-term economic recovery.

Mr. INSLEE. Thank you, Bracken.

Dr. Pollin.

STATEMENT OF ROBERT POLLIN, Ph.D.

Mr. POLLIN. Thank you very much for having me.

Thanks to Mr. Markey for inviting me, and Mr. Sensenbrenner, and the whole committee.

I am Robert Pollin. I am professor of economics and co-director of the Political Economy Research Institute at the University of Massachusetts at Amherst. I am also the co-author of this study that came out last week called "Green Recovery" that was done in conjunction with my friends at the Center for American Progress. And I want to acknowledge the outstanding work done by my friends, especially Bracken and Kit Batten in helping us produce this piece of work.

I am going to actually go down the questions that Chairman Markey posed to me in the written invitation:

Number one, do economic conditions justify such a program? I think we can—don't have to spend too much time on the economic conditions. We all know that unemployment has risen to 6.1 percent. A year ago, it was 4.7 percent. People are also working fewer hours, taking pay cuts. They are discouraged. Those don't get reflected fully in the unemployment statistics.

We know obviously what is going on in financial markets. Though this is not explicitly a financial market program—thank you for acknowledging my work on financial markets—it certainly can be integrated into a solution to conditions in financial markets because, number one, it is establishing a floor for overall demand in the economy, which is one of the main things we need, and number two, it is providing opportunities for a new, productive investment outlets. This is the key.

I mean, the long-term problem with financial markets is excessive attention to speculative profit opportunities and not enough attention to long-term productive investments. So this is integrated into that solution.

Okay. Why a green stimulus program? This is a $100 billion program over 2 years. And according to the modeling that we have done, it would create roughly 2 million jobs. There are six investment initiatives, three in the areas of energy efficiency and three renewables. The energy efficiency are building retrofits, which is in fact the most important single piece in terms of where we think money should be spent now; public transportation and freight rail; and smart grid electrical transmission system. Those are the energy efficiency areas. And the renewables are wind power, solar power, and biofuels.

I want to emphasize that the way we have proposed this, the way we have modelled it, 70 percent of all of the spending is for efficiency. So that is certainly the bulk.

What are the benefits of the program? Well, as Bracken said, the job creation is very widespread. I mean, we have that in the report. We go over in detail the types of jobs. People think that green jobs some how suggests something esoteric. They have never heard of it. Well, these are jobs for roofers, welders, electricians, machinists, accountants, secretaries, and, yes, research scientists. So it is

across the board. It is a jobs program. We don't even have to call it green jobs. We just have to call it jobs. There are good jobs; there is a wide range of jobs.

The 2 million job creation would—in the current job market, as we know, there are 9.4 million people unemployed now. That would drop the unemployment level to 7.4 million. If we consider that in today's economy, that would mean a fall in unemployment from 6.1 to 4.8 percent. And as Bracken said, it is particularly focused on construction and manufacturing. We know how hard construction has been hit. That is the other side of the financial crisis and the housing crisis, is the construction industry is flat. You have over half a million jobs having been lost over 2 years. This program would bring them back.

It is very efficient as a jobs program. As we said, as Bracken said, this combination of investment focused primarily on energy efficiency would create 2 million jobs for the $100 billion in expenditure. That is higher than what we got from the April 2008 stimulus, which would create about 1.7 million jobs. And it is dramatically higher; it is four times higher than what we would get through a similar expenditure in the oil industry.

And as Bracken said, what are the two drivers here? It is not really that difficult to figure out. And you can be a two-handed economist on this. It is domestic content and labor intensity, right? It means more jobs are created within the U.S. economy because they are focused there, and you have a higher proportion of employment relative to expenditures on non-employment, such as on materials, energy, shipping oil from Saudi Arabia to the United States.

For the energy efficiency area, the domestic content is about 95 to 96 percent. That makes sense. When you think about retrofitting this building, it is not going to take a lot of imports to do that.

Now, what about benefits in terms of energy savings, which is what Mr. Markey also asked me about? Very substantial. We think about a building like this, public building retrofits. The U.S. Council on Green Energy Building estimates that we have about 21 billion square feet of public building that could be retrofit on average at a $1.40 per square foot. So that is to retrofit and make energy efficient every single public building in this country would be roughly $30 billion or something less program. It would lower energy costs 20 to 30 percent. If we then think about the same model for households, private individual homes, you can get the same 30 percent return over a matter of 3 years. So energy bills go down while you are creating jobs.

Now, what about the funding in the short term, median term? We outline three different types of investment funds: $50 billion in tax credits for business; $4 billion in loan guarantees, which then, of course, underwrite a much larger number of actual loans themselves; and $46 billion in direct spending. So notice that the majority of spending is going to promote private business.

In the immediate term, we are talking about a fiscal stimulus, a deficit spending. Over the longer term, it would paid through by cap-and-trade revenue. The fiscal deficit is a problem. It is not the overriding problem. The fiscal deficit now as a proportion of GDP

is well within range, certainly, of what we have had historically under these kinds of conditions.

Now, finally, the broader benefits. Reduced demand for oil, it is going to exert downward pressure on oil. It is going to improve the trade balance, which will then improve our current account balance, too. The job creation will generate more tax revenues. It is going to channel funds to productive private investors, and finally, it will fight global warming.

Thank you very much.

[The statement of Dr. Pollin follows:]

Testimony before House Select Committee on Energy Independence and Global Warming

Hearing on "The Green Road to Economic Recovery" September 18, 2008

Testimony of
Dr. Robert Pollin
Professor of Economics and
Co-Director, Political Economy Research Institute (PERI)
University of Massachusetts-Amherst

Dear Chairman Markey, Ranking Member Sensebrenner, and Members of the Committee:

I am pleased to have the opportunity to testify today before the Select Committee on Energy Independence and Global Warming on the issue of "The Green Road to Economic Recovery." My testimony today will highlight some of the main themes of the study "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy," that I authored along with three other colleagues at the Political Economy Research Institute of the University of Massachusetts-Amherst, Professor James Heintz, Heidi Garrett-Peltier, and Helen Scharber. Our study was commissioned by the Center for American Progress. They released the study last Tuesday, September 9.

I am a Professor in the Department of Economics and Co-Director of the Political Economy Research Institute (PERI) at the University of Massachusetts, Amherst. PERI is an independent unit of the University of Massachusetts, Amherst with close ties to the Department of Economics. Our purpose is to promote human and ecological well-being through our original research.

In my testimony, I would like to address six interrelated questions that you have posed to myself and Bracken Hendricks, my colleague at the Center for American Progress:

1. Do current economic conditions justify enactment of an economic stimulus package at this time?

2. How does investment in energy efficiency measures and renewable energy compare with providing direct tax credits to households or other alternative stimulus measures, in terms of domestic job creation, wage levels and related matters?

3. As between tax breaks for oil production and tax breaks for energy efficiency measures and renewable energy production, which is a more productive use of federal dollars from the perspective of economic growth and job creation?

4. What level of benefits are Americans likely to see in terms of energy savings as a result of near-term investments in energy efficiency and renewables?

5. Can investments in energy efficiency and renewables be done quickly enough to help jumpstart the economy?

6. What funding sources are available in the short- to medium term to fund an economic stimulus package?

For purposes of clarity and compression, I think it is useful to combine questions two and three into one question, that considers together the relative benefits of tax benefits for both households and oil production as against investments in energy efficiency and renewable energy.

Question 1. Do economic conditions justify enactment of an economic stimulus package at this time?

The short answer to this question is "yes." For the past year, the U.S. economy has suffered through a serious economic slowdown caused by the collapse of the housing market bubble, the destabilizing effects of the housing implosion on financial markets, and the sharp rise in oil prices.

As of August 2008, there were officially 9.4 people unemployed, producing an unemployment rate of 6.1 percent. This compares with an official unemployment rate of 4.7 one year ago. The situation is worse still when taking into account a labor market where people are working fewer hours than they wish, taking pay cuts, or becoming discouraged from looking for work.

Of course, in addition to these indicators of conditions for working people, we are still deeply enmeshed in a severe financial crisis that shows no signs of abating. As long as the financial crisis proceeds more or less as it has over the previous year, it will act as a drag on U.S. housing construction and the broader investment market. This in turn will serve as a strong headwind against any efforts to expand overall employment.

There will be many factors needed to reverse the financial crisis. One of them is for financial market participants to see fresh new areas for productive investment opportunities. The Green Recovery program that we have outlined relies first on measures to support private investments through tax credits and loan guarantees. These inducements to invest in the green economy will act as a significant counterweight to the severely unsettled investment climate generated by the financial market crisis.

Questions 2/3:

2. How does investment in energy efficiency measures and renewable energy compare with providing direct tax credits to households or other alternative stimulus measures, in terms of domestic job creation, wage levels and related matters?

3. As between tax breaks for oil production and tax breaks for energy efficiency measures and renewable energy production, which is a more productive use of federal dollars from the perspective of economic growth and job creation?

The focus of our study is to estimate the employment effects of a $100 billion government investment program over two years. Overall, we found that a green investment expansion at this level will generate about 2 million net new jobs. We have developed our estimates based on the 2005 input-output tables compiled by the Bureau of Economic Analysis of the U.S. Department of Commerce.[1]

The program focuses on six key investment strategies—retrofitting buildings, expanding mass transit and freight rail, constructing smart energy grids, and expanding production of wind power, solar power, and next generation biomass fuel. In the table below, we list some representative occupations that will be needed to advance investments in each of these areas.

Together, this $100 billion green energy stimulus package would result in:

- **Widespread employment gains**. Investments in these areas will produce employment opportunities across a broad range of familiar occupations—roofers, welders, electricians, truck drivers, accountants, and research scientists. It will also strengthen career ladders by providing pathways for workers to move up from lower paying to higher paying green jobs that can be created on a geographically equitable basis throughout all regions of the country.

- **Lower unemployment**. If this green economic recovery program were fully implemented in early 2009 and unemployment still stood at August 2008 levels, it would reduce the number of unemployed people to 7.4 million, down from 9.4 million, with the unemployment rate falling to 4.8 percent from 6.1 percent.

- **Renewed construction and manufacturing work**. Employment in construction fell to less than 7.2 million in August 2008, down from over 7.7 million in September 2006. Over the next two years, a green economic recovery program

[1] Input-output tables are compiled by the Bureau of Economic Analysis. Every five years the Census Bureau gathers data (in its "Economic Census") and the BEA uses these data along with information from other Census Bureau programs—including annual surveys that cover selected industries, such as manufacturing and services. The I-O tables also incorporate data collected and tabulated by other Federal agencies—including the U.S. Departments of Agriculture, Education, and Energy—and data from a number of private organizations.

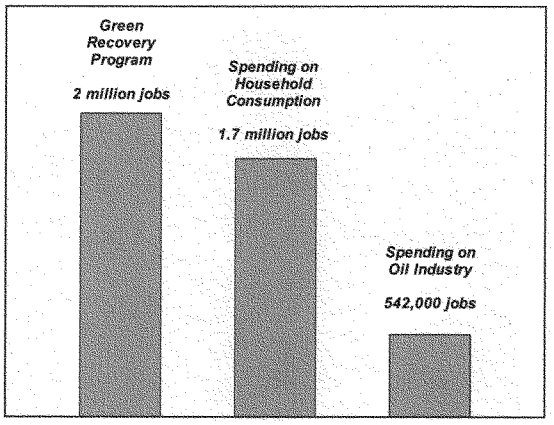
> would replace, at least, those nearly 600,000 lost construction jobs and could result in renewed investment in the housing sector that is at the root of the current economic slump. This green recovery provides a needed transfusion of new credit and investment into the construction industry, which could rapidly provide job opportunities that are badly needed. Our program would have similar, if somewhat smaller, effects in supporting U.S. manufacturing.

We can use this same model to generate figures for the total job creation through alternative areas of spending, such as spending the same $100 billion either within the oil industry or on household consumption. The focus of the April 2008 economic stimulus program, which sent tax rebates back to U.S. taxpayers, averaging around $600 per household, was to generate more jobs by expanding household consumption.

An equivalent proposal to spend $100 billion on new investments within the oil industry does not exist; however, current federal subsidies and incentives offered to the oil industry amount to an average of nearly $9 billion annually (an average of $6.6 billion in domestic incentives and $2.2 billion in international subsidies). Additionally, some of the current legislative proposals in the U.S. Congress argue for increased domestic exploration and drilling as a solution to high gas prices.

As the graph on the next page shows, our green recovery program is an effective engine of job creation compared to spending the same amount of money within the oil industry or on household consumption. Increasing spending by $100 billion on household consumption along the lines of the April 2008 stimulus program would create about 1.7

Figure 1.
Total Job Creation through $100 Billion in Spending



Source: U S Bureau of Economic Analysis (2006) and authors' calculations

million total jobs, or about 16 percent fewer jobs than the green recovery program. In addition to creating more jobs with a green investment program rather than increasing household consumption, targeting an economic stimulus program at increasing green investments also offers longer-term benefits: consumer savings by reducing home energy bills; stabilizing the price of oil, natural gas, and other non-renewable energy sources through reduced demand and increased energy diversity; and, of course, building over time a low-carbon economy.

Spending $100 billion within the domestic oil industry would create only about 542,000 jobs in the United States A green infrastructure investment program would create nearly four times more jobs than spending the same amount of money on oil energy resources. And again, spending on oil offers no benefits in transitioning the U.S. economy toward a low-carbon future, while perpetuating the economic and national security vulnerabilities by continuing to rely on oil for the lifeblood of our economy.

Question 4. What level of benefits are Americans likely to see in terms of energy savings as a result of near-term investments in energy efficiency and renewables?

This green economic recovery program would pay for itself relatively rapidly at the macroeconomic level through returns on energy efficiency in both the public and private sectors. Better insulated schools could spend more over time on teachers, books and other learning materials. Hospitals in time could spend more on direct patient care. And companies could invest more over the long term in new production and services facilities, raising productivity.

Within a short time period, public building retrofits have the most potential for operating at a large scale within a short time period. According to the most recent Commercial Buildings Energy Consumption Survey, there were about 21 billion square feet of building stock in the United States devoted primarily to education, government offices, and hospitals at the end of 2003. Working from these figures, the U.S. Green Building Council estimates that, on average, these buildings could be effectively retrofitted for a bit less than about $1.40 per square foot. Retrofitting all of these buildings would therefore cost about $29 billion.

Moreover, the average payback period for these investments would be about 5 – 6 years. The remaining investments in direct government green infrastructure spending—on mass transit and light rail and smart grid electric transmission systems—would reap similar macroeconomic returns over time as these investments stabilized oil prices through transportation diversification and energy efficiency gains.

Homeowners, too, would benefit over time from investing in green retrofits and other green investments. For the average U.S. homeowner, the Department of Energy has found that a $2,500 investment in home retrofitting can reduce average annual energy consumption by 30 percent. As of 2006, the average household income was around $60,000, and the average household spends about five percent of its income on household energy consumption. The five percent of total income going to energy amounts to $3,000 per year. A saving of 30 percent of that $3,000 total household energy bill would therefore amount to $900 per year. We present these basic figures in Table 1 at the top of the next page.

Table 1
Annual Savings from Investment in Home Retrofit

Example is for Average Household, $2,500 Retrofit

Annual Household Income	$60,000
Annual Household Energy Expenditures (5% of total income)	$3,000
Potential Annual Savings from $2,500 Retrofit (30% of current expenditure level)	$900

Sources: U.S. Household Expenditure Survey; U.S. Energy Information Agency.

Question 5: Can investments in energy efficiency and renewables be done quickly enough to help jumpstart the economy?

The most obvious option for rapid green investment in communities is a large scale building retrofit program, which would rely entirely on known technologies such as high performance windows, efficient heating, ventilation and air conditioning systems, geothermal heating and cooling systems, efficient lighting and day-lighting, building-integrated photovoltaic-powered energy, and the installation of efficient appliances. Retrofitting can begin almost immediately on buildings of all sizes, in all regions of the country, and can provide short-term returns on the money being invested.

To achieve the most rapid and effective short-term economic recovery program through a program of building retrofits, the U.S. government should require the retrofitting of all public buildings, which could commence as soon as Congress appropriated the funds, and should include measures to ensure state and local government participation as well. Indeed, state and local programs to retrofit public buildings are already operating throughout the country, among them Minnesota's Guaranteed Energy Savings Program, Utah's State Building Energy Efficiency Program, California's Green Building Action Plan for State Facilities, and the Energy Efficiency Partnership of Greater Washington.

Public investment in expanding mass transit systems and freight rail networks in the United States could begin immediately in some areas but would take longer in others. In the mass transit arena, investments that could be pursued in very short order include, but are not limited to:

- Expanded bus and subway services

- Lower public transportation fares
- Expanded federal support for state and municipal transit operation and maintenance budgets to deal with increased ridership
- Increased federal subsidies for employer-based mass transit incentives
- Higher funding for critical mass transit programs currently bottlenecked for lack of federal dollars to encourage new ridership and more transportation choices.

Other areas, such as building light-rail or subway systems, will entail long lead times before a large amount of new hiring and spending occurs, but higher funding for existing mass transit and light rail projects would result in job growth in engineering, electrical work, welding, metal fabrication, engine assembly sectors.

Upgrades to our freight rail through public investment would also yield some immediate job gains in similar professions, creating substantial employment through both construction and operations, alongside a down payment on more job creation over two years through improved maintenance and expansion of services. Existing federal programs through which these investments could be made quickly include expanding federal support and underwriting for freight rail infrastructure and rural economic development programs.

Some smart grid investment projects, which entail combining advances in information technology with innovations in power system management to create a significantly more efficient distribution system for electrical energy, are already in planning stages around the country. Though a green economic recovery program the U.S. government could deploy swift federal government support for these pilot projects.

In our three renewable energy areas—wind, solar, and next-generation biofuels — public- and private- sector investment growth is already picking up pace, with renewable energy technology supporting sustained double-digit rates of growth nationwide. Yet an unstable policy environment and the lack of long-term incentives have hurt the investment climate for these technologies, preventing them from realizing even greater growth. With sufficiently generous and stable federal tax incentives and credit subsidies, significant new private-sector investment would flow naturally and quickly into these three renewable energy arenas.

Question 6: What funding sources are available in the short- to medium term to fund an economic stimulus package?

We propose that the green recovery program be initially financed primarily through a $100 billion fiscal expansion, temporarily increasing the level of federal deficit spending targeted specifically to underwrite a green investment program. We propose that the increase in government spending include three sources of new investment funds:

- **$50 billion for tax credits.** This would assist private businesses and homeowners to finance both commercial and residential building retrofits.
- **$46 billion in direct government spending.** This would support public building retrofits, the expansion of mass transit, freight rail and smart electrical grid systems, and new investments in renewable energy
- **$4 billion for federal loan guarantees.** This would underwrite private credit that is extended to finance building retrofits and investments in renewable energy.

The funds for the green recovery program would come directly from the U.S. Treasury, but a high proportion of the $100 billion would be channeled down to state and local governments, which administer many of the programs we described earlier in this study, and to the private sector through tax credits and loan guarantees.

To serve effectively as an economic recovery program, government spending and tax incentives to boost green infrastructure investments would have to be financed primarily by increasing the fiscal deficit. An important additional source of funds would come through eliminating the nearly $9 billion in federal subsidies and incentives now provided annually to the oil industry.

Over time, these expenditures would be covered primarily by the implementation of a carbon cap-and-trade program, which would provide the revenues needed to pay for the U.S. transition to a low-carbon economy. But in the short-term, we have demonstrated that frontloading these green investments makes sound economic and environmental sense.

At the end of fiscal year 2007, on September 30, 2006, the federal government's annual fiscal deficit stood at $162 billion, but with the economy slowing in 2008 this figure inevitably rose sharply, to $389 billion in fiscal 2008, according to the Office of Management and Budget's *Mid-Session Review*. The OMB estimated in July 2008 that the 2009 fiscal deficit would rise further, to $482 billion.

The United States cannot run a reckless fiscal policy no matter how pressing the country's social and environmental needs. But it is important to keep these deficit figures in perspective. The current deficit figure is certainly a matter of concern, but measured as a percentage of GDP the federal deficit today is manageable as part of a responsible long-term plan. And as long as the economy remains in a slump, the primary problem is not the size of the federal deficit but how money is being spent.

Investing funds in a green economic recovery program that is capable in the short run of creating jobs, dampening upward pressure on oil prices, and moving our economy significantly toward a clean-energy economy is a responsible investment of taxpayer money in our present circumstances. Our proposals for financing this short-term green

recovery program through future cap-and-trade revenues are both realistic about current conditions and responsible about facing longer term fiscal challenges.

Conclusion

The full report my colleagues and I have written, *Green Recovery*, outlines a program that could create about two million new jobs within the U.S. economy over two years.

To create two million new jobs within two years, the overall level of fiscal expansion will need to be around $100 billion, or roughly the same as the portion of the April 2008 stimulus program that was targeted on expanding household consumption. This green economic recovery program can create more jobs and better paying jobs than what we can expect through a household consumption-led stimulus. If fully implemented, the green recovery program would push the unemployment rate down to 4.8 percent from 6.1 percent if August 2008 labor market conditions were to persist.

Of course, labor market conditions will change in the coming months, no doubt in some unexpected ways. Nevertheless, whatever else may change about the U.S. economy over the near term, we can be certain that the green economic recovery program will serve as a strong counterforce against pressures that currently are pushing unemployment up as well as more broadly increasing economic disparities. By supporting a whole new terrain for long-term productive investments within the U.S. economy, this program can also buttress other policy initiatives to stabilize our financial markets. Finally, of course, this green investment proposal also makes significant long-term advances toward creating the green, low-carbon economy that we need.

Mr. INSLEE. Thank you, Dr. Pollin.

Mr. Redmond.

STATEMENT OF FRED REDMOND

Mr. REDMOND. Thank you, Congressman.

First of all, Congressman, I want to thank you for being a consistent advocate of working families, not only working families in the great state of Washington but throughout this country. We thank you for your service.

Mr. Chairman, my name is Fred Redmond. I am the International Vice President of Human Affairs for the United Steelworkers.

Steelworkers is the largest industrial union in North America. We have 850,000 active members and 250,000 retirees that we are privileged to represent. We are also the dominant union in every energy-intensive and energy-producing industry throughout this country.

Our union has long held the belief that good jobs and a clean environment go hand in hand. Steelworkers are here today because we endorse the "Green Recovery" report released by the Center for American Progress. And we applaud the Center for highlighting the economic and employment opportunities that can exist when significant investments are made in the green economy.

The report highlights that an investment of $100 billion can mean 2 million jobs in the United States economy over a 2-year period. They estimate that over 900,000 jobs in the construction industry and over 580,000 jobs in the industries that supply goods for wind turbines and building retrofits would be created with this investment. They also estimate that 500,000 jobs would be created in the resell and wholesale industries as a result of increased capital from increased employment.

And during this time, as our Nation continues to experience an economic downturn with falling financial markets and the highest unemployment in 4 years, policies that spur investment in the emerging green economy are more critical than ever. Our union and our members have experienced devastating job losses. Over the last 10 years, over 3.2 million manufacturing jobs have been lost as a result of unfair trade policies, outsourcing, and exporting of jobs instead of products. Many of the jobs have been lost from communities like Cleveland, Ohio; Buffalo, New York; Detroit, Michigan; and Baltimore, Maryland; and have gone to countries, like China and India, that have terrible, environmental and labor standards.

Our union strongly believes that today's environmental challenges are tomorrow's economic opportunities. Evidence of this fact already surrounds us. In Germany, for example, 1.4 million people are already employed in green sectors with about 40,000 people employed solely in the wind energy industry. Increasingly more steel is consumed in Germany by the wind energy industry than any other except automotive.

The green economy offers an opportunity to place the United States on a path toward energy independence. It also offers unique opportunities to revitalize our domestic manufacturing and construction industries. Some of those 2 million jobs in the Center for

American Progress report will be for our Nation's steelworkers machinists, electricians, roofer, drivers and carpenters. And we have already seen this happen in States like Pennsylvania where, in 2004, the State adopted an 18 percent renewable portfolio standard, and as a result, Gamesa, a Spanish-owned wind turbine company, decided to build its first North American plant in Pennsylvania. And because of the demand created by the RPS, today almost 1,000 steelworkers are employed in Gamesa plants outside of Philadelphia, building wind turbines on the site that was abandoned by a U.S. steel mill. State RPS drove Gamesa to invest in Philadelphia and, as a result, has helped to revitalize a community that was devastated by job loss.

The green job change did not just stop at Gamesa. As a result of the demand by the wind industry for steel plate in 2007, Arcelor Mittal Steel recalled 250 steelworkers back to work at its Burns Harbor, Indiana, plate mill to meet the demand. While these jobs are not specifically green jobs in nature, they serve a green purpose because the products that these men and women are making in this steel mill will be used in wind turbines. Likewise, component parts manufacturing, installation of turbines, maintenance and construction of knew transmission lines also serve a green purpose.

This is what we mean when we talk about green jobs and overall greening of the United States economy. It is not just creating new jobs but also spurring growth in existing industries. So Steelworkers is ready to work to reverse the downward trend in manufacturing by creating clean-energy jobs while we fight to save the manufacturing jobs we have left.

We believe that we are at a critical point in achieving these goals, and several opportunities exist right now. There are opportunities for American business to lead the world in clean energy and services. There are opportunities for American workers to thrive in a new generation of well-paid green-collar jobs. There are opportunities for American cities to become cleaner, healthier and more efficient places to live and work. And there are opportunities to stimulate the flow of private and public capital and a clean energy and energy efficiency initiative that create good-paying jobs across a wide spectrum of our economy.

So the Steelworkers Union, we have worked with other labor unions, business, environmental, community groups on both the State and Federal level to develop and support clean energy policies that will encourage job creation with investment and domestic green technologies, energy efficiency, education, training, and we hope to continue to work with Congress on these vital issues through our national economy.

Thank you, Mr. Chairman.

[The statement of Mr. Redmond follows:]

Testimony of
Fred Redmond
International Vice President
United Steelworkers (USW)
Before the
Select Committee on Energy Independence and Global Warming
Hearing on
"The Green Road to Economic Recovery"
September 18, 2008

Mr. Chairman, Members of the Committee, My name is Fred Redmond and I am the International Vice President for Human Affairs for the United Steelworkers Union (USW). The USW is the largest industrial union in North America with 850,000 members and is the dominant union in the steel, paper, forestry, rubber, plastics, aluminum, chemicals, oil, glass, cement and energy industries.

I am especially pleased to be given the opportunity to testify before the House Select Committee on Energy Independence and Global Warming, on "The Green Road to Economic Recovery", as our Union has long held the belief that good jobs and a clean environment go hand-in-hand.

The United Steelworkers endorsed the "Green Recovery" report released by the Center for American Progress, and we applaud the Center for American Progress for highlighting the economic and employment opportunities that can exist when significant investments are made in the "green" economy. Their report highlights specifically what an investment of $100 billion can mean for the U.S. economy over a two year period. They estimate that over 900,000 jobs in the construction industry and over 580,000 jobs in the industries that supply goods for wind turbines and building retrofits would be created. They also estimate almost 500,000 jobs would be created in the retail and wholesale industries as a result of increased capital from increased employment. This leads to a total creation of 2 million jobs from a $100 billion investment.

As our nation continues to experience an economic downturn, with a failing financial market and an unemployment rate of 5.7%, the highest in four years, policies that spur investment in the emerging "green" economy are more critical than ever.

Our Union and our members have experienced devastating job loss first-hand. Over the last ten years over 3.2 million manufacturing jobs have been lost as a result of unfair trade, outsourcing and exporting jobs instead of products. Many of the jobs that have been lost from communities like Cleveland, Ohio, Buffalo, NY, Detroit, MI, and Baltimore, MD have gone to countries like China and India that have abysmal environmental and labor standards.

The USW strongly believes that today's environmental challenges are tomorrow's economic opportunities. Evidence of this fact already surrounds us. In Germany, 1.4 million people are already employed in the "green" sector with about 40,000 people employed in their wind energy industry. Interestingly, more steel is consumed in Germany by the wind energy industry than any other except automotive.

The "green" economy offers an opportunity to not only place the U.S. on a path towards energy independence, but also offers a unique opportunity to revitalize our domestic manufacturing and construction industries. As expressed in the Center for American Progress report, millions of job opportunities exist for our nation's, steelworkers, machinists, electricians, roofers, drivers and carpenters.

The USW is poised and ready to work to reverse the downward trend in manufacturing by creating new "clean energy" jobs while fighting to save the manufacturing jobs we have left. We believe that we are at a critical point in achieving these goals, as several opportunities exist for the U.S. at this time:

1) The opportunity for American businesses to lead the world in clean energy products and services;

2) The opportunity for American workers to thrive in a new generation of well paid, green collar jobs;

3) The opportunity for American cities to become cleaner, healthier, and more efficient places to live and work;

4) The opportunity to stimulate the flow of private and public capital into clean energy and energy efficiency initiatives that create good-paying jobs across a wide spectrum of our economy.

Economic studies that the USW has supported over the past decade have shown repeatedly that well-crafted public policies that move us steadily and predictably toward global warming emissions reductions will have a net positive impact including on manufacturing. A 2002 study produced by the Center for Sustainable Economies and the Economic Policy Institute and released by the United Steelworkers and other unions showed that a menu of renewable energy investments, efficiency measures and carbon reduction mandates in line with the Kyoto targets would have created a net increase of 1.4 million jobs in the economy, including increases in most manufacturing industries.

The USW has worked with a broad coalition of groups including the Sierra Club to support policy initiatives that we believe would encourage these opportunities. One such initiative is working to enact a federal Renewable Portfolio Standard (RPS), which would require large electric utilities to generate a certain percentage of their energy through renewable sources like wind, solar and biomass by a set date. We believe the RPS represents an important economic opportunity on both the state and federal levels to drive demand in the Renewables market.

A study released in 2006 by the Blue Green Alliance, an alliance of the United Steelworkers and the Sierra Club, focusing on the component manufacturing market in the renewable energy industry looked at a 10 year effort to introduce 185,000 megawatts of electricity through renewable sources—the rough equivalent of a 20 percent RPS—found that 850,000 jobs would be created with $160 billion of investments in manufacturing. This

investment would ripple through 43,000 remaining manufacturers in the U.S. and revitalize the 20 states hardest hit by the decline in manufacturing in the last decade.

Economic models for the state of Ohio show that a federal RPS at 20 percent would generate over 51,000 jobs in renewable component manufacturing, while 34,000 jobs would be created in Michigan.

In 2004 Pennsylvania passed its 18 percent RPS at the urging of PA state officials, USW and others. As a result Gamesa, a Spanish-owned wind turbine company, decided to build its first North American plants in Pennsylvania, because of the demand created by the RPS. Today almost 1000 steelworkers are employed in Gamesa plants outside of Philadelphia building wind turbines on the site of an abandoned U.S. Steel mill. The state RPS drove Gamesa to invest in Pennsylvania and as a result has helped to revitalize a community that was devastated by job loss.

The "green" job chain does not stop at Gamesa. As a result of the demand by the wind industry for steel plate, in 2007 Arcelor Mittal Steel, the world's largest steel company and largest in the U.S., recalled 250 steelworkers back to work at its Burns Harbor, IN plate mill to work to meet the demand. While these jobs are not specifically "green" in nature, they serve a "green" purpose because the product these men and women are making will be used in wind turbines. Likewise, component parts manufacturing, installation of turbines, maintenance, and the construction of new transmission lines also serve a "green" purpose. This is what we mean when we talk about "green jobs" and the overall "greening" of the U.S. economy. It's not just creating new jobs, but also spurring growth in existing industries. The Center for American Progress report shows the potential for over 86,000 "green" jobs in Pennsylvania, and over 43,000 "green" jobs in Indiana alone.

In 2006 the USW formed an Alliance with the Sierra Club called the Blue Green Alliance, which was formed around the principles of developing clean energy policy solutions to combat global warming and create jobs, a new vision for trade and advancing green chemistry. We have used this Alliance to take the message of economic opportunity and energy independence to union halls, to the oil refineries where our members work in Houston, to policy debates in dozens of state capitals to planning conferences and International gatherings of NGO's and the United Nations.

Our Union will continue to work with Congress and a broad coalition including other labor unions, business, environmental and community groups on both the state and federal level to develop and support clean energy policies that will encourage job creation through investment in domestic "green" technologies, energy efficiency and education and training.

We will continue to build power in our quest to achieve good jobs and a healthy environment for our members, their families and their communities, so we can ensure the world we leave for our children will be a clean, healthy and economically prosperous one.

Thank you for the opportunity to testify before your Committee.

Mr. INSLEE. Thank you, Mr. Redmond.

And congratulations to those folks getting back to work.

Mr. Kennard.

STATEMENT OF BYRON KENNARD

Mr. KENNARD. Thank you, sir.

Historically, small businesses have created 60 to 80 percent of all net new jobs. This prowess continues even in the current economic downturn. In July of this year, for example, small firms added 50,000 new jobs to the private sector, which offset the 41,000 jobs dropped by larger companies. From this, we argue that if new green jobs are to be created, small business must be called on it create them.

Moreover, two-thirds of all innovations are produced by entrepreneurial small businesses. According to SBA, small firms produce 13 times more patents than large firms. From this, we are argue that if green technology innovations are to be created, then small businesses must create them. In fact, that is the case. Something like 80 percent of all clean-tech companies are small firms.

Small businesses are also the means used to deploy technology, deploy innovations throughout society. For example, thousands of small businesses distribute, sell and install and service air conditioning, heating, insulation, ventilation and lighting systems, now all available in energy-efficient forms. Thus, making America more energy-efficient and self-reliant creates enormous economic opportunity for small business.

This is why the small business provisions in the Energy Independence and Security Act of 2007 were endorsed by the Air Conditioning Contractors of America, the Independent Electrical Contractors, the National Roofing Contractors Association, and the Plumbing-Heating-Cooling Contractors Association. These are not ordinarily people you find lined up at anti-growth rallies.

An added plus is that these jobs can't be outsourced overseas because the work is all local. Thousands of small firms are now becoming more energy-efficient in order to cut costs. This is a big deal. Small business is half of the economy. It consumes half of all energy use for commercial and industrial purposes in this country, much of which is wasted.

According to EPA's ENERGY STAR Small Business Program, small enterprises can save 30 percent on their energy bills through energy-efficiency upgrades. Many good models exist for making this happen; they are up and running successfully. These can and should be widely replicated. I will mention two.

One is the Energy Stewardship Initiative of the National Automobile Dealers Association, NADA. Almost 750 auto dealers are now voluntarily greening their operations as part of this initiative. If all 19,700 members reduced their energy consumption by just 10 percent, that is the association's goal, they would save approximately $193 million in energy costs and eliminate more than 1 million tons of greenhouse gas emissions each year.

Another device is called On-Bill-Financing, which makes small business energy efficiency as easy as falling off a log. Under On-Bill-Financing, an electrical utility offers upgrades to its small business customers and loans to pay for the upgrades. The energy

savings are used to pay back the loan. So the monthly utility bill is no higher than it was before. And when the loan is paid off, the small business owners' utility bill is permanently lower. The big news here is that California's Public Utility Commission, in October of last year, ordered the State's utilities to begin offering On-Bill-Financing to their small business and institutional customers beginning in 2009.

Here is the icing on the cake. The small business half of the economy can be made energy efficient virtually overnight. All the technology needed is now available. Basically, these upgrades involve doing the same thing over and over in millions of workplaces. Examples: Installing improved lighting, better thermostats and occupancy sensors in bathrooms, offices and storerooms. Small stuff, but it adds up. Doing such things will save small business owners money at a time when they are being hit hard by soaring energy costs and struggling to cope. In this setting, the most important thing to do is to get the word out to small business owners that they possess practical, affordable options which can be exercised right now, not years from now.

Here is where the Federal Government can help. In summary, I offer two suggestions. The ENERGY STAR Small Business Program and EPA provides small business owners all the information and technical assistance they need to exercise these options. But it is greatly underfunded. EPA is not very interested in small business on this front. Less than 1 percent of the ENERGY STAR budget is devoted to outreach to small business. It should be given the resources needed to perform the job and to make the small business half of the economy energy-efficient.

Secondly, thanks to the House Small Business Committee and the Senate Small Business Committee, very good provisions about small business energy use were included in the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007. Sadly, none of these have been implemented or funded, and we hope the select committee will help their colleagues on Appropriations understand the importance of actually funding these programs. They have laid the basis already for making half of the economy energy-efficient quickly.

Thank you.

[The statement of Mr. Kennard follows:]

THE GREEN ROAD TO ECONOMIC RECOVERY

Hearing of the Select Committee on Energy Independence & Global Warming

Thursday, September 18, 2008
2175 Rayburn House Office Building

Testimony of Byron Kennard, Executive Director
The Center for Small Business and the Environment

Thank you for the opportunity to appear before the Committee on this timely and urgent matter. There is enormous opportunity here, and I applaud the chairman and the Committee for addressing the role of small businesses in reducing greenhouse gas emissions.

The Center for Small Business and the Environment is a small, nonprofit organization located here in Washington, DC. While I am its only employee, we work through a network of small business leaders around the country. Our network is committed to the idea that small scale enterprise holds the key to protection and restoration of the environment.

Permit me to describe why we share that belief.

One-half of the nation's economy is amazingly decentralized, diverse and dynamic. This half consists of small businesses, 27 million of them, located in every nook and cranny of society, and running everything under the sun, from hotdog stands to high-tech start-ups.

These small firms produce 51 percent of the private sector output, make 47 percent of all sales, and employ more than half the country's private work force. In key ways, these firms also constitute the economy's *most productive and creative* half.

Virtually all net new jobs are created by fast-growing small businesses. According to the US Small Business Administration (SBA), since the mid-1990s, small businesses have created 60 to 80 percent of the net new jobs. In the most recent year with data (2005), employer firms with fewer than 500 employees created 979,102 net new jobs, or 78.9 percent.

The job creating prowess of small business continues even in the face of the current economic downturn. According to Fortune Small Business magazine, the economy picked up 9,000 new jobs in July 2008, thanks to small companies that are hiring even as larger businesses shed workers. Firms with fewer than 50 workers added 50,000 new non-farm jobs to the private sector in July, which offset the 41,000 jobs dropped at medium and large companies.

From this we conclude that if new green jobs are to be created, small business must be called upon to create them, an assignment that the small business community welcomes.

Moreover, *two-thirds of all innovations* are produced by entrepreneurial small businesses. According to SBA, small firms produce 13 times more patents than large firms.

From this we conclude that if green innovations are to be created, then small business must be called on to create them. In fact, that's what is happening right now. Something like 80 percent of all clean tech companies are small businesses.

This hearing is entitled "The Green Road to Economic Recovery." If our destination is new employment created through innovation, then I think we should take the road most travelled: small business.

Here is where this road takes us:

Small businesses profiting from retrofitting America

Thousands of small businesses sell, install, and service air conditioning, heating, insulation, ventilation, and lighting systems – now all available in energy efficient forms. They are profiting by helping homeowners, institutions of all kinds, and other businesses to save every cent they can by simply conserving energy.

For example, heating and air conditioning systems should be regularly tuned-up. Some simple steps – identifying duct leaks, checking airflow, cleaning coils and changing filters – will work wonders, reducing energy use up to *40 percent*. That's huge when you consider that nearly $142 billion was spent nationally in 2005 on space heating and cooling for residential and commercial buildings.

Thus, efforts to make American society more energy efficient open up vast opportunities for countless small business owners. This is why the small business provisions in the Energy Independence and Security Act of 2007 were endorsed by the Air Conditioning Contractors of America, the Independent Electrical Contractors, the National Roofing Contractors Association, and the Plumbing-Heating-Cooling Contractors Association.

An added plus is that these jobs here at home for American workers can't be outsourced to China or India because the work is all local.

Small businesses dramatically reducing energy consumption

Thousands of small firms are now becoming more energy efficient in order to cut costs. This is a big deal, potentially. Small businesses consume *half of all energy used for commercial and industrial purposes in the United States*. According to EPA's ENERGY STAR Small Business program, small enterprises can reduce their energy bills by up to 30 percent through energy efficiency upgrades.

Many good models for making this happen are successfully up and running. They ought to be widely replicated. Here are three examples:

- **A model for Trade Associations**

Almost 750 auto dealers are now voluntarily greening their operations as part of the Energy Stewardship Initiative of the National Automobile Dealers Association (NADA). If all 19,700 NADA members reduced their energy consumption by just 10 percent (the Association's goal), they would save approximately $193 million in energy costs and eliminate more than one million tons of greenhouse gas emissions each year.

This model will really kick in if it's adopted by such small business trade associations as the National Restaurant Association (380,000 members), National Grocers Association (50,000 independent stores), and the National Association of Convenience Stores (140,655 stores). Overall, there are 150 trade associations headquartered in Washington, DC, whose memberships are overwhelmingly small business in their composition.

- **A model for Electric Utilities**

On-Bill-Financing (OBF) makes small business energy efficiency as easy as falling off a log. Under OBF, an electric utility offers upgrades to its small business customers and loans to pay for the upgrades. The energy savings are used to pay back the loan, so the monthly utility bill is no higher than it was before. When the loan is paid off, the small business owner's utility bill is permanently lower.

The model here is the Small Business Energy Advantage program offered by United Illuminating Company (UI) an independently owned and operated utility in Connecticut. UI provides electricity and energy services to about 323,000 residential, commercial and industrial customers in Connecticut.

Recently, California took OBF to a new level. In late 2007 the California Public Utilities Commission issued an order instructing the state's utilities to begin offering OBF in 2009, so the program will be available on a larger scale.

If this model were replicated throughout the country, it could reach at least half of the small business owners nationwide. If OBF could facilitate a 30 percent reduction in energy use by half of the small businesses in the country, it would save nearly $9 billion on energy bills and prevent more than 67.5 million tons of global warming emissions (the equivalent to the emissions of about 14.1 million cars).

- **A model for Small Business Development Centers**

There are about 1,000 Small Business Development Centers (SBDC) located around the country, but only a handful offer technical assistance to small business owners on environmental and energy matters. A splendid exception is Pennsylvania Small Business Development Center's Environmental Management Assistance Program. This program

has conducted over 300 on-site energy assessments showing that clients can reduce their costs between 25 and 30 percent. The types of businesses helped range from auto repair shops, restaurants, grocery stores, organic farms, and small office buildings. This model should be expanded through the SBDC system.

The icing on the cake ...

Making small businesses more energy efficient can be achieved quickly. It doesn't require years of expensive R&D. All the technology needed is available now. And a fast turnaround is possible because, basically, energy efficiency upgrades for small businesses involve doing the same thing over and over again in lots and lots of places. Examples: installing improved lighting, better thermostats and occupancy sensors in bathrooms, offices and storerooms.

Small business leading the way in renewable energy

Small business is the fount of innovation. This has been true throughout history. Tinkerers working in garages created the Industrial Age, remember? Their modern day counterparts, working on computers, are now creating the post-Industrial Age, the new green economy. So it's not surprising that something like 80 percent of all clean tech companies are small firms.

These green entrepreneurs are flooding the market with hundreds of new clean and renewable energy technologies, most of them small-scale. These micropower devices make possible the "distributed generation" of energy; that is energy generated from small sources on-site – solar, wind, fuel cells – and used nearby, maybe even in the same building.

Here's a terrific example: Southwest Windpower in Flagstaff, Arizona, is the world's largest producer of small wind generators. (www.windenergy.com)

This small company has produced nearly 110,000 generators used everywhere from homes, farms and ranches to telecom transmitters. Sales are growing at double digit rates, as interest in wind power among businesses and consumers accelerates.

Southwest Windpower has attracted about $20 million in two rounds of venture capital funding. The company estimates that, through its network of dealers, it has created about 500 jobs.

Of course, Southwest Windpower is but one of many examples of new clean tech companies that are taking off. Despite the economic downturn, the boom in clean technology continues unabated. Clean Edge reports a 40% increase in revenue growth for solar photovoltaics, wind, biofuels, and fuel cells in 2007, up from $55 billion in 2006 to $77.3 billion in 2007.

The rapid and extensive deployment of technological innovations devised by green entrepreneurs is a sure path to economic recovery.

Policy Recommendations

Here are measures we think would promote (a) small business energy efficiency; and (b) the process of green entrepreneurship.

(1) Needed Research

Because we know small business constitutes half of the economy, and we know it wastes much of the energy that it buys, we argue that small business probably represents *the largest untapped reservoir of potential for energy efficiency.* But we don't have the numbers to prove it because virtually no research has been done on small business and energy.

Neither DOE nor EPA has researched small business energy use *as such.* So we don't have reliable on numbers of businesses involved, or jobs created by green businesses. Our solution is to rely on case studies to tell the story, like the description of Southwest Windpower provided above.

But if we are to fully deploy the genius to small business to solve environmental and energy problems, then we need targeted research programs to serve up needed information.

Congress should mandate basic research on small business energy use. The only locus in the federal establishment with the knowledge and experience to take this task on is the Energy Star Small Business program. We recommend it be vested with the authority and responsibility for this research.

(2) Implement existing law

Thanks to the House Small Business Committee and the Senate Committee on Small Business and Entrepreneurship, several beneficial provisions were included in both the Energy Policy Act of 2005 (EPACT05) and the Energy Independence and Security Act of 2007 (EISA07).

Among other things, these present laws, if implemented, would:

- Educate consumers and small business owners about the need for proper maintenance of existing equipment small business;

- Require the20US Small Business Administration (SBA) to help small business owners to become energy efficient;

- Expand the capacity of Small Business Development Centers (SBDC) to offer environmental and energy technical assistance;

- Facilitate the spread of On-Bill-Financing; and

- Create a priority status within the Small Business Innovation Research and Small Business Technology Transfer programs for small-business energy research and development projects.

Attached are summaries of these provisions.

Sad to report, none of these provisions have yet been funded or implemented. We hope that the Select Committee will help their colleagues on Appropriations understand the importance of actually funding these programs.

(3) A stronger federal initiative to "green" small businesses

We urge greater support and funding for the invaluable but grievously underfunded ENERGY STAR Small Business program in EPA. We envision a program that has the staff and resources needed to help 27 million small businesses to become good energy stewards.

We urge this because EPA's ENERGY STAR management consistently neglects small business even though it constitutes one-half of the economy. Therefore, it is critical that Congress inserts language in the appropriations bill directing EPA to make outreach/assistance to small businesses a priority. The agency should be directed to report to the Congress each year on its progress/initiatives.

Specifically, we recommend that ENERGY STAR Small Business be funded to expand its cooperative alliances with small business trade associations, such as the Energy Stewardship Initiative of the National Automobile Dealers Association (NADA).

In addition, we recommend that ENERGY STAR Small Business be funded to launch an initiative to promote the strong affinity that exists between micropower devices and small businesses.

Small business owners have no better way to get reliable and affordable energy than from installing their own on-site20generating equipment. But they are largely unaware of this option. This initiative would educate small business owners on micropower generation, net-metering to optimize cost-effectiveness, power reliability, and power quality. It would move small businesses beyond energy efficiency and into energy independence.

(4) Sponsor Research and Development of "Green" Technologies by Small Businesses

As noted, above, a key provision in the *Energy Independence and Security Act of 2007* (*H.R. 6*) "ensures high priority be given to small business concerns participating in energy efficiency or renewable energy system research and development projects." We urge the federal government to increase the 2.5 percent SBIR set aside to 5 percent. Also, the various agencies administering SBIR should be directed to reach out to small businesses regarding the availability of SBIR for green entrepreneurship

(5) Assist Small Business in Deploying New Technologies—Transferable Tax Credit

Policymakers frequently employ tax credits to help businesses commercialize new technologies, but small entrepreneurial firms seldom are profitable in their early stages so tax incentives are of little to no use to them. To circumvent this, we propose the creation of a variation of the current R&D Tax Credit: a Transferable Tax Credit. Under this proposal, an entrepreneur with a new green technology could strike a strategic alliance or investment with a profitable firm that possesses the resources needed to commercialize the technology. The entrepreneur then could assign the tax credit to the firm and/or investor that commercializes the technology.

Thank you for the opportunity to present these views.

FOR MORE INFORMATION, CONTACT:

Byron Kennard
Executive Director
The Center for Small Business and the Environment
P.O. Box 53127
Washington, DC 20009

(Phone) 202.332-6875
(Fax) 202.332-8355
email: csbe2000@aol.com
www.aboutcsbe.org

SUMMARY OF SMALL BUSINESS PROVISIONS IN EPACT 2005 & EISA 2007

EPACT 2005

• Mandated that the U.S. Department of Energy (DOE), in cooperation with the Environmental Protection Agency (EPA), create a consumer education program focused on the energy savings available from properly conducted maintenance of air conditioning, heating, and ventilating (HVAC) systems;

• Required the U.S. Small Business Administration (SBA), in consultation with the DOE and EPA, to implement a government-wide program, built on the ENERGY STAR Small Business program, to help small businesses: (a) become more energy efficient, (b) understand the potential cost savings from improved energy efficiency, and (c) identify financing options for energy-efficiency upgrades;

• Required the DOE to convene an organizational conference for the purpose of establishing an ongoing, self-sustaining national public energy and energy-efficiency education program, examining the interrelationship between energy and its role in the economy and on the environment; and

• Required the DOE to carry out a national public information program on energy efficiency focused on: (a) the need to reduce energy consumption, (b) the benefits of reduced consumption, (c) the benefits of lower energy costs to economic growth and job creation, and (d) ways to reduce consumption through increased efficiency.

EISA 2007

• Required the SBA to implement a government-wide program, built on the ENERGY STAR Small Business program, to help small businesses (a) become more energy efficient, (b) understand the potential cost savings from improved energy efficiency, and (c) identify financing options for energy-efficiency upgrades.

• Required the SBA to establish a Small Business Energy Efficiency Program through select Small Business Development Centers (SBDC)—through this provision, an SBDC would have been eligible, consistent with State public utility regulations, to act as a "facilitator" for on-bill financing agreements between small businesses, electric utilities, lenders, and the Administration;

• Expanded the list of permissible uses for Express Loans to include renewable energy and energy efficiency improvements;

• Rendered plant projects that reduce the borrower's energy consumption by at least 10 percent or that generate renewable energy or renewable fuels, such as ethanol, eligible for 504 loans and increased the maximum debenture to $4 million;

• Established a pilot program for reduced 7(a) fees for the purchase of energy-efficient technologies;

• Created a telecommuting pilot program at the SBA aimed at education and outreach;

• Created a priority status within the Small Business Innovation Research and Small Business Technology Transfer programs for small-business concerns participating in energy efficiency or renewable energy research and development projects;

• Authorized Small Business Investment Companies to issue a new class of debentures, called Energy Saving debentures, for small businesses primarily engaged in the researching, manufacturing, developing, or providing products, goods, or services that reduce the use or consumption of non-renewable energy resources;

Mr. INSLEE. Thank you.

Dr. Thorning.

STATEMENT OF MARGO THORNING, Ph.D.

Ms. THORNING. Thank you very much for the opportunity to appear before this committee.

My name is Margo Thorning. I am chief economist for the American Council for Capital Formation, and I ask that my testimony be submitted for the record.

I commend this committee for its focus on, what do we need to do further to stimulate the U.S. economy? Clearly we face serious challenges, GDP, real GDP has grown really at only 1 percent over the year for the past four quarters, and employment was 6.1 percent last month. And prices have been rising, most recently at a rate of 5.4 percent. Some pundits fear that we are entering a period of stagflation with sluggish growth and rising prices. So I think it is important to focus on what the fundamental problems are with the U.S. economy and try to address those.

Many people think that the housing crisis, the fall of housing prices, is what has caused most of the recent distress, unemployment and sluggish growth. Right now, 10 million people are under water in the sense that they owe more on their house than the house is worth. If housing prices fall another 15 percent, we can expect to see 20 million homeowners under water. So one of the first challenges I think we need to do is keep an eye on the housing market and see whether we are going to need to intervene any more than we already have there. Martin Feldstein of Harvard has put forth a plan for a mortgage replacement proposal, which is detailed in my testimony, which could help put a floor under housing prices and keep them from falling further.

The second thing that we need to do and that we have begun to do is try to stabilize financial markets. I think the actions of the Fed and the Treasury so far have shown resolve and shown that we are not going to let happen to the U.S. economy what happened to the Japanese economy in the 1990s. Japan failed to intervene, failed to act quickly after their real estate and housing bubble and financial markets collapsed. I think our regulators have learned from that.

So I think we have already taken significant steps to try to bring stability to the financial markets, and if we keep an eye on what is going on in the housing situation, I think we have time now to wait. I think it is premature to enact further economic stimulus packages comparable to the one that was passed in February of this year. I think we need to wait and see what happens in terms of stability and see if the housing issue, which is our central problem, begins to resolve itself.

Let me turn to brief comments on the CAP proposal to spend $100 billion over 2 years on various forms of green jobs. First, I think the cap analysis has got serious flaws. They used an input/output model rather than a traditional macroeconomic model or general equilibrium model. The model they used can't take account of changes in prices as they flow through the economy. It is an incomplete snapshot. It is a static analysis rather than a dynamic analysis.

They propose to pay for the increased spending on renewables and other initiatives through a cap-and-trade system which would raise $75 billion to $200 billion a year. The ACCF did an analysis of the Lieberman-Warner bill in conjunction with the National Association of Manufacturers earlier this year. In that study, we found that, by 2014, the cost of the cap and trade bill would be about $78 billion a year, which is close to the number that CAP proposes to spend. And we found that the higher energy prices caused by, on unconventional fuel, caused by the cap and trade, actually reduced job growth compared to the baseline forecast by between 850,000 and almost 2 million jobs. So we lost jobs, even though our study did pick up new green jobs because people were being encouraged to make use of nonconventional fuels. We did pick up green jobs, but on net, we lost jobs because of the higher energy prices that flowed through the economy exerted a drag on productivity and so forth. GDP was less as well.

So I would like to ask that this study be submitted for the record.

[The information follows:]

Analysis of The Lieberman-Warner Climate Security Act (S. 2191) Using The National Energy Modeling System (NEMS/ACCF/NAM)

A Report by the
American Council for Capital Formation
and the
National Association of Manufacturers

Analysis Conducted by
Science Applications International Corporation (SAIC)

ACCF
AMERICAN COUNCIL FOR CAPITAL FORMATION

NAM National Association of Manufacturers

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Analysis of the Lieberman-Warner Climate Security Act (S. 2191) Using the National Energy Modeling System (NEMS/ACCF/NAM)

EXECUTIVE SUMMARY

The American Council for Capital Formation (ACCF) and the National Association of Manufacturers (NAM) believe it important to fully and realistically examine the potential costs that enactment of Lieberman-Warner Climate Security Act (S. 2191) would impose on the U.S. economy. It is becoming increasingly recognized that the cost to U.S. consumers and employers of implementing greenhouse gas (GHG) emission reductions is highly dependent on the market penetration achieved by key technologies and the availability of carbon offsets by 2030. Understanding the potential economic impacts at the national, state and individual household levels can help guide choices on climate change policy to minimize the impacts on economic growth and maximize the benefits to the environment. Greenhouse gas reduction policies need to include consideration of impacts on energy security, economic growth, and U.S. competitiveness. This project is designed to assist in this effort.

This analysis was undertaken using the National Energy Modeling System (NEMS) model, the model used by the U.S. Energy Information Administration (EIA) for its energy forecasting and policy analysis. The ACCF and NAM applied assumptions about the cost and availability of new energy technologies, oil prices, and other key factors. The NEMS/ACCF/NAM[1] study's findings indicate substantial and growing impacts to consumers and the economy of meeting the increasingly stringent emission targets through 2030 established by the Lieberman-Warner Climate Security Act.

Among the NEMS/ACCF/NAM study's findings are:

- The CO_2 emissions allowance price needed to reduce energy use to meet the S.2191 targets is estimated at \$55 to \$64/metric ton CO_2 in 2020, rising to between \$227 to \$271/metric ton CO_2 in 2030.
- The cost of the allowances raises energy prices for residential consumers by:
  - Natural gas: 26% to 36% in 2020, and 108% to 146% in 2030;
  - Electricity: 28% to 33% in 2020, and 101% to 129% in 2030.
- These and other increased energy costs slow the economy by \$151 billion to \$210 billion in 2020 and \$631 billion to \$669 billion in 2030 (in 2007 dollars). This in turn leads to job losses of between 1.2 million to 1.8 million in 2020 and 3 million to 4 million by 2030.
- Manufacturing slows, the value of shipments falls by 3.2 % to 4% in 2020 under the low and high cost cases; by 2030 the value of shipments falls by 8.3 % to 8.5% under the two cases. The higher energy costs, lower economic activity and fewer jobs in turn lowers average household income by \$739 to \$2,927 in 2020 and between \$4,022 and \$6,752 in 2030 (in 2007 dollars).

[1] The term "NEMS/ACCF/NAM" is used in this report to distinguish NEMS runs conducted in this project from those conducted by EIA.

As noted in a November, 2007 Congressional Budget Office study, *Issues in Climate Change:*[2]

> "Obtaining allowances—or taking steps to cut emissions to avoid the need for such allowances—would become a cost of doing business for firms that were subject to the CO_2 cap. However, those firms would not ultimately bear most of the costs of the allowances. Instead, they would pass along most such costs to their customers (and their customers' customers) in the form of higher prices. By attaching a cost to CO2 emissions, a cap-and-trade program would thus lead to price increases for energy and energy-intensive goods and services that contribute the most to those emissions. 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 were encouraged to make investments and behavioral changes that reduced CO_2 emissions. The rise in prices for energy and energy-intensive goods and services would be regressive—that is, they would impose a larger burden, relative to income, on low-income households than on high-income households."

As mentioned above, the ACCF/NAM analysis investigates the sensitivity of assumptions that have proven in the past to significantly impact the cost of limiting CO_2 emissions from energy – particularly the availability of improved technology in the early decades of a long-term effort to reduce greenhouse gas emissions. These assumptions include the availability of nuclear power technology, the availability of carbon capture and storage for more efficient coal and natural gas-based power generation technologies, the availability of wind and biomass technologies, and the availability of low-cost offsets (international and domestic).

[2] Statement of Peter R. Orszag, Director, *Issues in Climate Change,* Presentation for the CBO Director's Conference on Climate Change, November 16, 2007, page 11.

Analysis of the Lieberman-Warner Climate Security Act (S. 2191) Using the National Energy Modeling System (NEMS/ACCF/NAM)

INTRODUCTION

The American Council for Capital Formation and the National Association of Manufacturers (ACCF and NAM)[3] contracted with Science Applications International Corporation (SAIC)[4] to analyze legislation introduced by Senators Joseph Lieberman and John Warner, the Lieberman-Warner Climate Security Act (S. 2191), to substantially reduce U.S. greenhouse gas (GHG) emissions over the 2012-2050 period. This study uses the National Energy Modeling System (NEMS), the model employed by the U.S. Energy Information Administration (EIA) when asked by Congress and other federal agencies to analyze new energy and environmental policy initiatives. This study was performed by SAIC, independent of any EIA analysis and without any input from EIA or its staff.[5]

The ACCF/NAM believes it is important to fully examine the potential costs that enactment of S. 2191 will impose on the U.S. economy. It is becoming increasingly recognized that the cost to U.S. industries and citizens of implementing GHG emission reductions is highly dependent on the market penetration achieved by key technologies and the availability of carbon offsets by 2030. Understanding the potential economic impacts at the national, state and individual household levels can help guide choices on climate change policy to minimize the impacts on economic growth and maximize the benefits to the environment. Greenhouse gas reduction policies should not be undertaken without considering their impacts on energy security, economic growth, and U.S. competitiveness. This project is designed to assist in this effort.

The study offers insights on the results, including economic costs, using input assumptions provided by ACCF and NAM. These input assumptions are likely to differ from those to be used by the EIA in its report on S. 2191 using the NEMS model. This analysis employs two sets of input assumptions for the NEMS model reflecting the variability in the potential availability of emission reduction technologies, new energy sources and market mechanisms (carbon offsets) by 2030. The use of alternative assumptions in this project is intended to assist consideration and preparation for a range of potential results.

In addition to providing economic impacts for the U.S. as a whole, this project also provides the potential economic costs of S. 2191 at the state and household level for citizens and businesses in every state. Two-page reports have been prepared for each state to show the cost impact of S. 2191 under the "High" and "Low" cost scenarios using the input assumptions provided by ACCF and NAM and the NEMS outputs for different census regions in the country.[6] Summaries of the national results and those for every state are included in the reports.

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[3] The American Council for Capital Formation (ACCF) (www.accf.org) is a nonprofit, nonpartisan organization dedicated to the advocacy of tax and environmental policies that encourage saving and investment. The ACCF was founded in 1973 and is supported by the voluntary contributions of corporations, associations, foundations, and individuals. The mission of the ACCF is to promote economic growth through sound tax, environmental, and trade policies.
The National Association of Manufacturers (NAM) is the nation's largest industrial trade association, representing small and large manufacturers in every industrial sector and in all 50 states. Headquartered in Washington, D.C., the NAM has 11 additional offices across the country. Visit the NAM's award-winning web site at www.nam.org for more information about manufacturing and the economy.

[4] SAIC is a leading provider of scientific, engineering, systems integration and technical services and solutions to all branches of the U.S. military, agencies of the Department of Defense, the intelligence community, the Department of Homeland Security, the Department of Energy and other U.S. government civil agencies, as well as customers in selected commercial markets.

[5] SAIC is a policy-neutral, non-advocacy organization. SAIC executed the NEMS model in this project using input assumptions provided by ACCF and NAM. Analysis provided in this report is based on the output from the NEMS model as a result of the ACCF/NAM input assumptions. The input assumptions, opinions and recommendations in this report are those of ACCF and NAM, and do not necessarily represent the views of SAIC. .

[6] Costs are measured as impact on GDP

METHODOLOGY

NEMS Model

NEMS is a publicly available, national, economy-wide, integrated energy model that analyzes energy supply, conversion, and demand. It is used by EIA to provide U.S. energy market forecasts through 2030 in its flagship publication, the *Annual Energy Outlook (AEO)*. NEMS is also the principal energy policy analysis tool used by EIA to report to Congress regarding the projected impact on U.S. energy markets and the economy of GHG policies in proposed legislation. SAIC is a leading consultant to EIA on the design and implementation of NEMS, and has over 100 staff years supporting the model. The diagram below shows the 12 energy industry sectors/sub-modules modeled by NEMS.

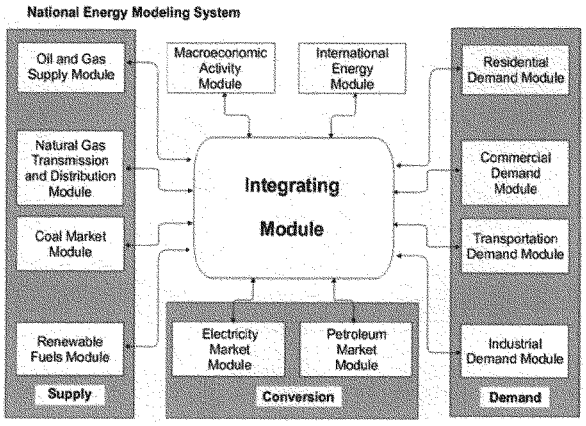

Figure 1: National Energy Modeling System

NEMS provides a common analytical tool for gaining valuable insights into the likely implications of alternative GHG reduction policy options. Using the model relied on by Congress also ensures that the discussion will focus on the merits of assumptions and policy choices rather than methodology. In the end, the use of NEMS in this study supports and supplements congressional consideration of alternatives and enhances opportunities to identify commonalities, strengthen the legislation, and find solution paths.[7]

The Importance of Assumptions Used In the Modeling

NEMS results are dependent on model input assumptions related to technology, cost, performance, and other factors. EIA generally performs NEMS runs using its own assumptions, and those consistent with current government laws and regulations as specified in the *AEO*, as well as assumptions included in congressional or federal agencies' requests. As with any forecast, the assumptions are the best judgment of the requestor or EIA staff, but may not necessarily be the same assumptions that would be used by others.

In its report on S. 280[8], EIA emphasized the importance of assumptions, in particular the "sensitivities" and "uncertainties" with respect to the market penetration achieved by key technologies and market mechanisms

[7] Two additional key information items on the operation of the NEMS model are included at Appendix 1 regarding: (1) How the model accounts for supply-side energy conversion efficiency; and, (2) Sensitivity of the model to supply-side technology capital costs for power generation.

[8] Energy Information Administration, "Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007", EIA Report #: SR-OIAF/2007-04, July 2007

(carbon offsets) by 2030. Specifically, EIA stated that "Sensitivity analyses suggest that the economic impacts can change significantly under alternative assumptions regarding costs and availability of new technologies. In addition, the cost and availability of offsets outside of the energy sector, both domestically and internationally, is a significant area of uncertainty."[9]

We too want to emphasize the importance of the input assumptions relative to the results provided by the NEMS model. Providing NEMS results using alternative sets of assumptions is the centerpiece - - indeed the purpose - - of this study. Applying alternative input assumptions - - different from those EIA will likely use in its analysis of S.2191 - - in the model used by EIA and relied on by Congress provides insights on implications of a range of possible outcomes that may occur as the economy adjusts to mandatory carbon constraints under provisions of S.2191. The desire is to enhance understanding and analysis.

Analysis Using Alternative Assumptions

The ACCF/NAM believe there is legitimate uncertainty regarding whether the emissions reduction technologies, new energy sources and market mechanisms (carbon offsets) anticipated for achieving GHG emission reductions will be fully available by the period analyzed (2012 – 2030). While they will likely make some level of contribution to meeting GHG limits, the ACCF/NAM believe that, for a variety of reasons including limitations in technology advancements as well as societal concerns and regulatory requirements, it is unlikely that they will make the full level of contribution required to achieve emissions reduction targets in S. 2191 by 2030.

It is important to note that, while the NEMS model is the most robust model of the U.S. economy for energy forecasting, it forecasts only economic decisions and does not predict, or include in its calculations, technical, societal and political decisions. These considerations must be externally imposed on the NEMS model.

Accordingly, for executing NEMS model runs in this project (referenced as "NEMS/ACCF/NAM"[10]), the ACCF/NAM provided alternative assumptions regarding the regarding the likely availability of emissions reduction technologies, new energy sources and market mechanisms by 2030. Analyses were performed under two scenarios on the variability and uncertainty in the availability of these items by 2030. These analyses allow examination of the impacts at different levels of limited availability.

The model runs used input assumptions under two scenarios provided by ACCF/NAM - - High Cost, and Low Cost scenarios.[11] The scenarios used in the model runs include variable input assumptions on the following items: Caps on available nuclear capacity; Caps on sequestered coal-fired (IGCC) generation; Caps on sequestered natural gas-fired (NGCC) generation; Caps on biomass and wind powered generation; and, Availability of Offsets. These caps reflect the considered opinion of ACCF/NAM and others of the likely availability of these technologies given engineering, technical and socio-political constraints. In addition, construction costs (capital requirement build estimates) were updated from those in the *AEO* to reflect current costs for power generation facilities for nuclear, IGCC, NGCC, supercritical PC, IGCC and NGCC with sequestration, wind (on-shore and off-shore) and biomass. Further, the oil price profile was modified in the High Cost case. Cellulosic ethanol and natural gas prices, were not constrained, nor were allowance prices constrained. Banking of CO_2 allowances was not implemented for the NEMS/ACCF/NAM modeling. (see Figure 2). The NEMS/ACCF/NAM modeling included modifications to the *AEO* as a result of the new "Energy Bill", H.R. 6[12].

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[9] EIA Report #: SR-OIAF/2007-04, page 60.

[10] The term "NEMS/ACCF/NAM" is used in this report to distinguish NEMS runs conducted by SAIC in this project from those conducted by EIA.

[11] Costs scenarios reflect the impact on GDP.

[12] When the NEMS/ACCF/NAM model runs were performed, *AEO2008* was available only in preliminary form, and was still undergoing modification by EIA relative to H.R. 6. The NEMS/ACCF/NAM model runs used *AEO2007*, plus the economic growth rate in *AEO2008*, together with the key elements of H.R. 6 that could be modeled.

ACCF/NAM CASE SPECIFICATIONS
(Alternative Assumptions under Two Scenarios)

	CASE #1 High Cost Scenario	CASE #2 Low Cost Scenario
TECHNOLOGY BUILD CONSTRAINTS (2030 Build Limits)		
NUCLEAR	10 GW	25 GW
IGCC w sequestration	25 GW	50 GW
BIOMASS	Max 3 GW/year	Max 5 GW/year
WIND	Max 3 GW/year	Max 5 GW/year
NGCC w sequestration	25 GW	50 GW
TECHNOLOGY TOTAL CAPITAL REQUIREMENT (2008 $/kW)		
NUCLEAR	3,410	3,410
IGCC	2,640	2,640
NGCC	1,100	1,100
SUPERCRITICAL PC	2,200	2,200
IGCC w SEQ	3,696	3,696
NGCC w SEQ	2,090	2,090
WIND - ONSHORE	2,000	2,000
WIND OFFSHORE	3,800	3,800
BIOMASS	3,968	3,968
OTHER SPECIFICATIONS		
OFFSETS	15% - 20%	Greater than 20%
OIL PRICE PROFILE	AEO2007 High Profile Side Case	AEO2008 Ref Price Profile
NATURAL GAS PRICES	Not Constrained	Not Constrained
CELLULOSIC ETHANOL	With HR6 – Not Constrained	With HR6 – Not Constrained
BANKING	No Banking	No Banking
HR6 (Key items that could be modeled)	YES	YES
ALLOWANCE PRICES (Annual Growth)	Not Constrained	Not Constrained

Figure 2: ACCF/NAM Case Specifications

Provisions of S. 2191

Key provisions of the Lieberman-Warner Climate Security Act (S. 2191) include:

1. Establishes an emission cap of 5775 million metric tons (MMT) CO_2 for covered sectors/gases by 2012, declining to 1732 $MMTCO_2$ by 2050
2. Coverage includes:
   - Facilities that use more than 5,000 tons coal/year
   - Natural gas upstream cap; covers all natural gas users
   - Petroleum and coal-based production and processing facilities and import facilities
   - Chemical facilities that produce or import fuels that emit more than 10,000 CO_2e/year
3. Allows use of offsets beginning in 2012, with covered entities allowed to satisfy up to 15% of total allowance requirements by submitting offset allowances from domestic sources. Entities can submit an additional 15% in offset allowances obtained in foreign markets with provisions similar to those in the U.S.
4. Provides a low carbon fuel standard on transportation fuels with carbon intensity to decline by 5% by 2015, and by 10% by 2020. (Not modeled)
5. Allowance trading, borrowing and banking are permitted
6. Creates a Carbon Market Efficiency Board to monitor emissions trading.(not modeled)

CO_2 Emissions by Energy Consuming Sector: Comparison of Business as Usual with the S.2191 Cap Overlaid

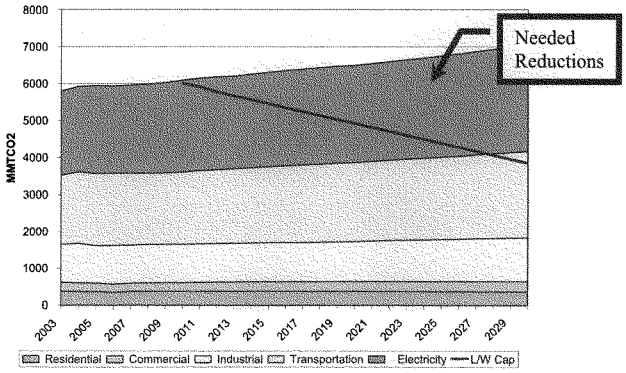

Figure 3: Comparison of Business as Usual with the S.2191 Caps

Overall CO_2 emissions from energy production and consumption grow to almost 7,000 $MMTCO_2$ by 2030. Targets proposed under S. 2191 would constrain emissions to a path shown as the descending red line in Figure 3. Based on analysis of S. 2191, emissions would need to be cut to 5,775 $MMTCO_2$ by 2012, another 4,922 $MMTCO_2$ by 2020, and another 3,856 $MMTCO_2$ by 2030.

Regulated entities will have a number of options for achieving CO_2 emissions reductions, including zero CO_2 emitting technologies such as nuclear or wind generation, new technologies such as CCS, carbon offset projects that reduce CO_2 emissions by an amount equivalent to that emitted, or purchasing CO_2 emissions permits on a tradable market. S. 2191 allows companies to invest in carbon offset projects or to purchase CO_2 emissions up to 30 percent of the targeted emissions (15 percent from domestic sources; another 15 percent from foreign sources with provisions similar to those in the U.S.). Consequently, it would be possible for the economy to generate 30 percent more emissions than targeted by S. 2191 as long as such emissions are offset by carbon sinks.

RESULTS OF THE ANALYSIS

Using the input assumptions and two scenarios provided by ACCF/NAM the model runs generated results to showing the economic effects of S. 2191 provisions at the national level and for every state. The study assumes federal preemption. The absence of federal preemption would risk higher costs.

NEMS/ACCF/NAM Results at the National Level

National results for key variables are presented in Table 1 below for the years 2014, 2020 and 2030 and for the baseline forecast.. The baseline incorporates key provisions of HR6, but does not incorporate provisions of S. 2191. All impacts of S. 2191 are measured against the baseline.

	Baseline			Low Cost Case			High Cost Case		
	2014	2020	2030	2014	2020	2030	2014	2020	2030
GDP (Billion 2007$)	$ 16,419	$ 19,448	$ 24,674	$ 16,284	$ 19,297	$ 24,043	$ 16,151	$ 19,238	$ 24,005
Loss in GDP (Billion 2007$)				$ 135	$ 151	$ 631	$ 269	$ 210	$ 669
% Loss				0.8%	0.8%	2.6%	1.6%	1.1%	2.7%
Employment (Millions)	151.52	156.74	166.95	150.68	155.53	163.91	149.66	154.94	162.90
Job Loss (Millions)				0.85	1.22	3.04	1.86	1.80	4.05
% Loss				0.6%	0.8%	1.8%	1.2%	1.2%	2.4%
Industrial Output (Billion 2007$)	$ 7,865	$ 8,044	$ 8,230	$ 7,695	$ 7,844	$ 8,002	$ 7,575	$ 7,726	$ 7,904
Loss in Industrial Output (Billion 2007$)				$ 170	$ 200.0	$ 228.21	$ 288.93	$ 317.67	$ 326.09
% Loss				2.2%	2.5%	2.8%	3.7%	3.9%	4.0%
Coal Mining Output (Billion 2007$)	$ 27.64	$ 27.64	$ 32.05	$ 21.48	$ 18.28	$ 8.57	$ 22.27	$ 18.36	$ 8.56
Loss in Coal Mining Output (Billion 2007$)				$ 6.17	$ 9.36	$ 23.47	$ 5.38	$ 9.28	$ 23.49
Primary Metals (Billion 2007$)	$ 188.02	$ 196.22	$ 195.52	$ 170.15	$ 167.16	$ 117.22	$ 162.52	$ 159.59	$ 103.35
Loss in Primary Metals Output (Billion 2007$)				$ 17.87	$ 29.06	$ 78.30	$ 25.50	$ 35.63	$ 92.16
Carbon Allowance Price (2007$ / Ton CO2)	$ -	$ -	$ -	$ 36.69	$ 54.59	$ 227.52	$ 38.36	$ 64.28	$ 271.27
Average Household Income (2007$)	$ 98,606	$ 112,504	$ 137,390	$ 97,597	$ 111,765	$ 133,368	$ 95,827	$ 109,578	$ 130,637
Loss (2007$)				$ 1,010	$ 739	$ 4,022	$ 2,779	$ 2,927	$ 6,752
				1.0%	0.7%	2.9%	2.8%	2.6%	4.9%
Energy Expenditures (Billion 2007$)	$ 1,058	$ 1,114	$ 1,319	$ 1,222	$ 1,372	$ 2,358	$ 1,412	$ 1,637	$ 2,829
				$ 164	$ 258	$ 1,038	$ 354	$ 522	$ 1,510
				15.5%	23.2%	78.7%	33.5%	46.9%	114.5%
Retail gasoline prices (2007 $/gallon)	$ 2.14	$ 2.13	$ 2.32	$ 2.42	$ 2.56	$ 4.10	$ 3.22	$ 3.59	$ 5.87
				13%	20%	77%	50%	69%	145%
Residential Electricity Price (2007$ Cents/Kwh)	9.3	9.5	10.2	10.6	12.2	20.5	10.7	12.7	23.3
% diff				13%	28%	101%	14%	33%	129%
Industrial Electricity Prices (2007 Cents/Kwh	5.8	5.9	6.6	7.0	8.4	16.0	7.1	8.9	18.8
%diff				21.8%	41.3%	141.5%	22.6%	49.3%	184.5%
Residential Natural Gas Prices (2007$/Mcf)	$ 10.92	$ 11.29	$ 12.67	$ 12.87	$ 14.25	$ 26.33	$ 13.18	$ 15.40	$ 31.13
% diff				18%	26%	108%	21%	36%	146%
Industrial Natural Gas Prices (2007 $/Mcf)	$ 5.96	$ 6.30	$ 7.44	$ 8.10	$ 9.38	$ 20.87	$ 8.34	$ 10.48	$ 25.61
				$ 2.13	$ 3.09	$ 13.43	$ 2.38	$ 4.18	$ 18.17
% diff				36%	49%	180%	40%	66%	244%
Electric Utility Coal Prices (2007 $/Ton)	$ 33.82	$ 32.30	$ 33.77	$ 100.43	$ 136.38	$ 480.28	$ 105.91	$ 157.80	$ 585.84
				$ 66.61	$ 104.08	$ 446.51	$ 72.09	$ 125.50	$ 552.08
% diff				197%	322%	1322%	213%	389%	1635%

Table 1: Summary of Results for the United States

The results at the national level are further provided in a two-page summary included at Appendix 2.

CO2 Allowance Prices

Key Finding: *Given two alternative sets of assumptions used for this study and unlimited allowance price potential, the model derives allowance cost profiles that would be required to meet the emissions goals established by S. 2191. While the two cases differ, with the Low Cost case being price-displaced by 1 to 3 years further into the future, both ultimately call for very high price levels to satisfy the emissions cap profile. The 2020 levels range from $55/ton (Low Cost case) to $64/ton (High Cost case). Due, in part, to offset availability limits, the 2030 levels would be significantly higher -- ranging from $227/ton (Low Cost case) to $271/ton (High Cost case).*

Based on the particular set of technology input assumptions used by the model (e.g., capital costs, operating costs, etc.), the technology market penetration constraints that the ACCF/NAM cases impose, and the cost and availability of offsets, the NEMS/ACCF/NAM model derives the CO_2 allowance cost profile required to achieve the S. 2191 emissions goals to 2030. This cost profile is calculated so as to adjust fossil fuel prices to the extent needed by the model to add and dispatch an annual inventory of technologies required to meet the emissions goal profile.

In constant 2007 dollars, the price of CO_2 allowances (what companies must pay to emit CO_2) could reach between $55 and $64 per metric ton of CO_2 (MT) by 2020 and could increase to between $227/MT and $271/MT by 2030 (see Figure 4). In both cases, the purchase of relatively inexpensive offsets significantly constrains allowance prices until the early 2020s (more offsets being made available in the low-cost case), followed by a rapid increase in prices as offset availability levels off and the CO_2 emissions goal continues to become more restrictive. The steepest parts the price curves reflect significant retirement of conventional coal-fired power generation with replacement by more expensive advanced coal and natural gas generation technologies that capture and sequester CO_2, other gas-fired technology, nuclear power, and renewable generation technologies.

The revenues obtained from the sale of CO_2 allowances in the two cases are not lost to the economy, but flow into the coffers of the selling entities (e.g., U.S. treasury or state treasuries) and can be redistributed based on specific policies. The modeling performed for this study only assumed that the revenues would ultimately flow to the U.S. government and displace other forms of taxation, and did not make policy-oriented redistribution judgments. The incremental costs associated with modifying the energy infrastructure via selection and dispatch of more costly technologies (than selected in the reference case) represents the real cost of implementing S2191.

Some may question the "acceptability" of levels to which these cases assess the CO_2 allowance prices. If an upper limit is imposed an on allowance prices (e.g., $100/ton) as a "relief value," then after the upper limit is reached (between 2023 to 2026), the model will be constrained to using only the $100/ton value to increase fossil fuel prices. For the cases reported here, such a price level would not be high enough to appropriately influence the technology addition and dispatch solution set required to meet the S.2191 emissions goals; in other words, after the allowance price limit would be met, CO_2 emissions would no longer decline and would start increasing for the remainder of the projection period. Since the model calculates allowance prices and emissions for all years in the projection, we know that the $100/ton level (constant $2007) will be met sometime in year 2023 for the "high-cost case" and year 2026 for the "Low-Cost case." This "relief value" actually provides another approach to explain the impact of different constraint scenarios – identification of the year after which the goal can't be met or the number of years difference between the cases when the model begins to diverge from the goal.

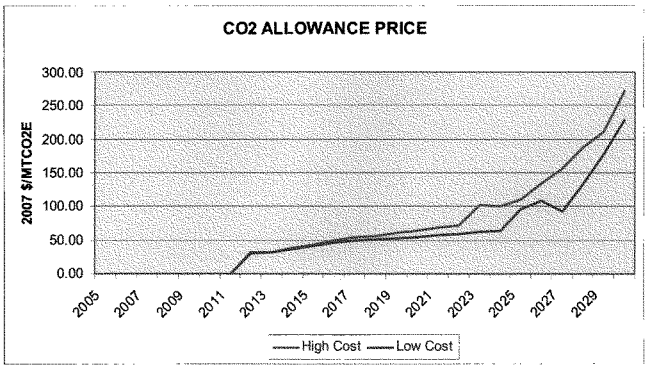

Figure 4: CO_2 Allowance Price

Impact on Jobs

Key Finding: *Based on the allowance price profiles derived for the two ACCF/NAM cases, S. 2191 is projected to yield significant employment loss due to the loss of revenues resulting from higher fuel and electricity costs. In 2020, job loss is projected to range from 1.2 million (Low Cost case) to 1.8 million (High Cost case) jobs/year, and from 3 million jobs (Low Cost case) to 4 million jobs in 2030.*

Under S. 2191 the U.S. economy would begin to shed approximately 850,000 jobs a year by 2014 under the low cost scenario (see Figure 5). This is primarily a result of higher carbon prices resulting in higher fuel costs for industry and higher cost to industry to comply with emissions limits. As the cap becomes more restrictive and the economy has less freedom to deal with reducing emissions, carbon prices and fuel prices increase rapidly, leading to greater job losses of between 1.2 and 1.8 million jobs in 2020 and between 3 and 4 fewer million jobs in 2030 (see Figure 5). These job losses are net of the new jobs which may be generated by increased spending on renewable energy, energy efficiency, and carbon capture and storage.

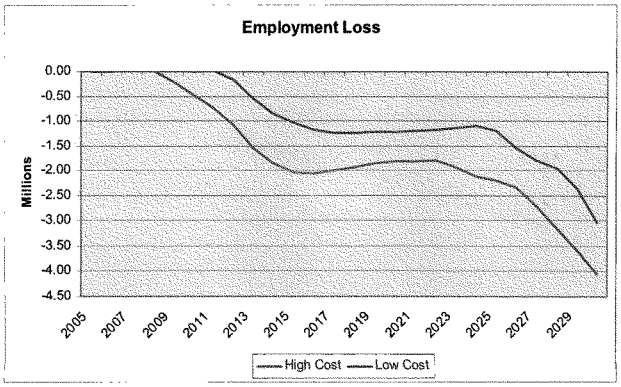

Figure 5: Employment Loss

Impact on Household Income

Key Finding: *S. 2191 is projected to yield significant household income loss resulting from higher payments for fuels and electricity. Higher energy prices would have ripple impacts on prices throughout the economy and would impose a financial cost of $739 to $2,927 per year by 2020 on national households, rising to $4,022 to $6,752 per household by 2030.*

Figure 6 compares household income loss for the two ACCF/NAM cases. Both income loss profiles are similar in shape as impacted by the projected allowance price profiles. For the Low Cost case, an initial decline of $1,172 is followed by an extended period of level valuation from 2015 to 2025, which is then followed by a steep decline to $4,022. For the High Cost case, an initial decline of $3,049 is followed by an extended period of level valuation from 2015 to 2023, which is then followed by a steep decline to $6,752 in 2030.

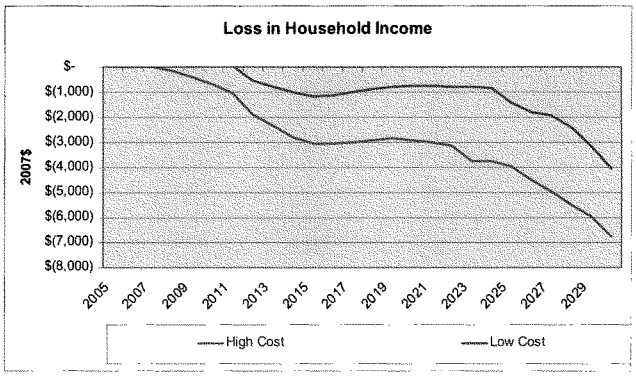

Figure 6: Household Income Loss

Impact on Energy Prices

Key Finding: *S. 2191 is projected to yield significant energy price increases by 2030 based primarily on the inclusion of the cost of carbon (as quantified by CO_2 allowance price profiles) as a price component for fossil fuels, as well as the construction and operation of a more costly suite of energy conversion technologies that help satisfy emission limits. A revamped power generation sector is projected to increase the cost of electricity to the residential sector between 101 (Low Cost case) and 129 percent (High Cost case) by 2030, while the natural gas price increase is projected to range between 108 (Low Cost case) to 146 percent (High Cost case).*

In order to influence technology selection and utilization to control CO_2 emissions, the model translates a CO_2 tax into an incremental adjustment of fossil fuel prices. The tax is based on the fuel price levels required by the model to annually add and dispatch energy conversion supply technologies so as to meet annual emissions goals for covered sectors. Adjustments are made on the basis of the contribution of carbon to the total energy content of a fuel; therefore, the impact on coal is much greater than natural gas. The allowance price profiles discussed previously were calculated in this manner with the resultant impacts on fuel prices shown in Figures 7 through 10.

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

would increase between 13 and 50 percent in 2014 and by 20 to 69 percent by 2020. For example, motorists would pay an additional $0.28 to $1.07 dollars per gallon in 2014 and an additional $0.43 to $1.46 per gallon by 2020 (see figure 7). Heating oil prices in the Northeast would increase by 19 to 60 percent by 2014, by 28 to 81 percent by 2020, and by 104 to 178 percent by 2030 (see Figure 8). In addition, US residential consumers would see electricity prices rise between 101 and 129 percent by 2030 (see Figure 9), while the residential natural gas price increase is projected to range between 108 to 146 percent (see Figure 10).

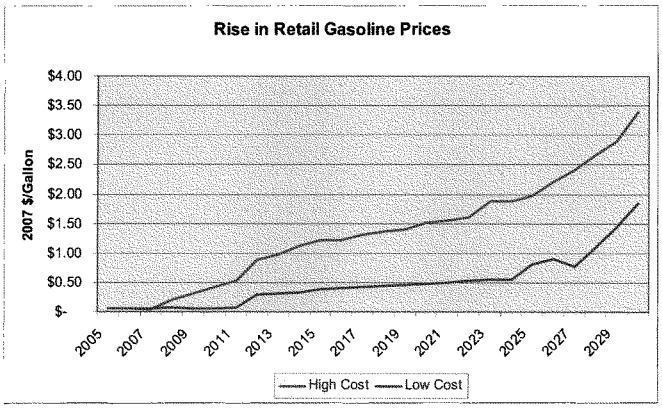

Figure 7: Retail Gasoline Price Increase

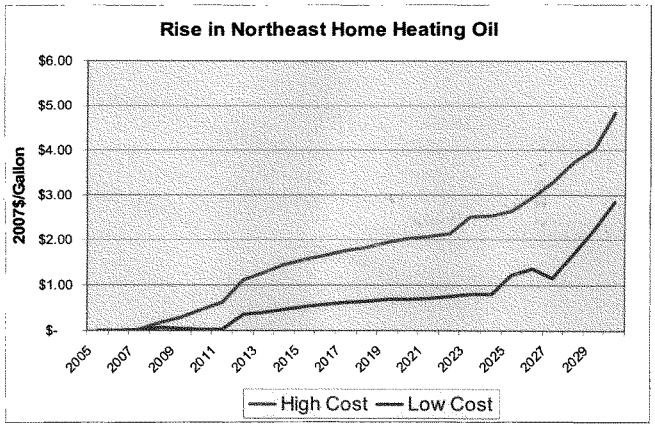

Figure 8: Northeast Heating Oil Price Increase

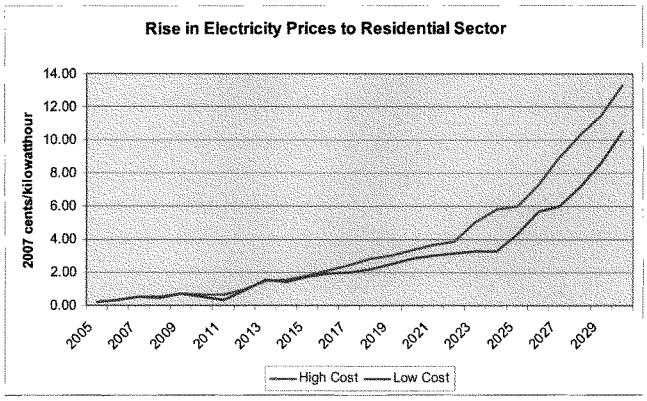

Figure 9: Residential Electricity Price Increase

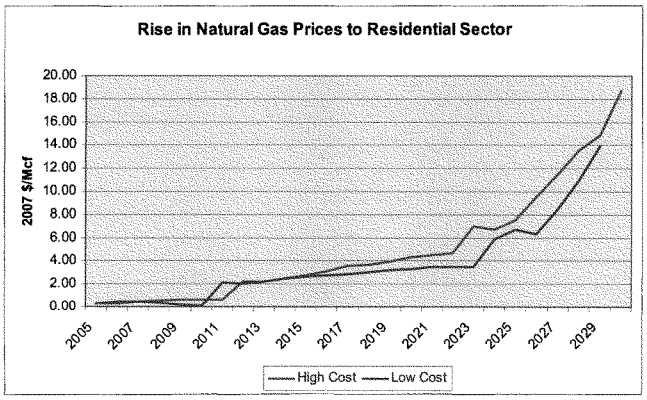

Figure 10: Residential Natural Gas Price Increase

Factors Contributing to Higher Electricity Prices

S. 2191 would reduce GHG emissions from all sectors of the economy (transportation, residential, commercial, and industry); however, as the largest emitter of GHGs, the primary impact would fall on the electricity production sector. S. 2191 would result in the electric industry shutting down (or retrofitting) a significant portion of existing, conventional coal-based generation and/or using expensive, as yet unproven technology, to capture and store CO_2 in geologic repositories. To meet the stringent goals of S. 2191, the electric industry would also have to substitute high cost technologies, such as wind, for conventional generation. This is true in both the Low and High Cost cases.

Impact on Total Energy Expenditures

Key Finding: *By 2030, gross US energy expenditures are projected to increase 79% in the Low Cost case and 115% in the High Cost case over the ACCF/NAM baseline case. These significant increases reflect the impacts of increased fuel costs (primarily resulting from CO_2 allowance prices) and changes to energy conversion technology infrastructure costs. However, these results do not reflect any direct redistribution of allowance revenues back to these sectors.*

Figure 11 presents the ACCF/NAM model results for the total non-renewable US energy expenditures for the residential, commercial, and industrial sectors, plus the renewable and non-renewable expenditures for the transportation sector. The High and Low Cost cases are compared with the baseline; inherent in these results is the inclusion of the CO_2 allowance price impacts on fuel costs. Starting in 2012, increases are projected to range from 13 percent for the Low Cost case to 26 percent for the High Cost case. By 2020, this range becomes 23 percent to 47 percent, and the projected results for 2030 range from 79 percent to 115 percent.

Please note that the curves in Figure 11 do not account for the revenues generated from the sale of CO_2 allowances by the different entities established in S. 2191 and their potential redistribution back into the different energy sectors. Therefore, the results presented here are gross expenditures.

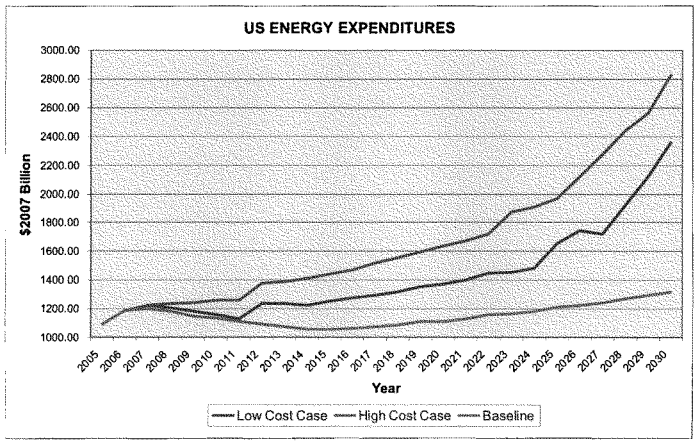

Figure 11: Increase in U.S. Energy Expenditures

Utility Electricity Generation by Fuel Type

Key Finding: *Constraints on nuclear, fossil with sequestration, and renewables generation capacity growth (see Figure 2: ACCF/NAM Case Specifications) results in a significant redistribution of generating capacity from coal to natural gas, nuclear and renewables generation sources. This redistribution is accompanied by a marked reduction in net utility generating capacity over the projection period relative to the Baseline projection; this results from significant demand-side energy efficiency improvements and reduced growth of electricity demand.*

Figures 12 through 14 show the breakdown of net electric utility power generation by fuel type for the Baseline, Low Cost, and High Cost cases, respectively. In the Low and High Cost cases, the rate of decline in coal retirements varies in its rapidity through around 2022, but then converges post 2022 (slowest decline in the low cost case and highest decline in the high cost case prior to 2022). Total generation supplied to the grid declines between the reference case and the two cases, due to a combination of less-expensive demand-side energy efficiency improvements and increased on-site power generation. Such declines represent real revenue loss for the utilities. In 2030, total electricity generation from utility sources is projected to markedly decline from 4,565 billion kW-hrs in the baseline case to 3,765 billion kW-hrs in the Low Cost case (17.5% decline) and to 3,643 billion kW-hrs in the High Cost case (20 percent decline).

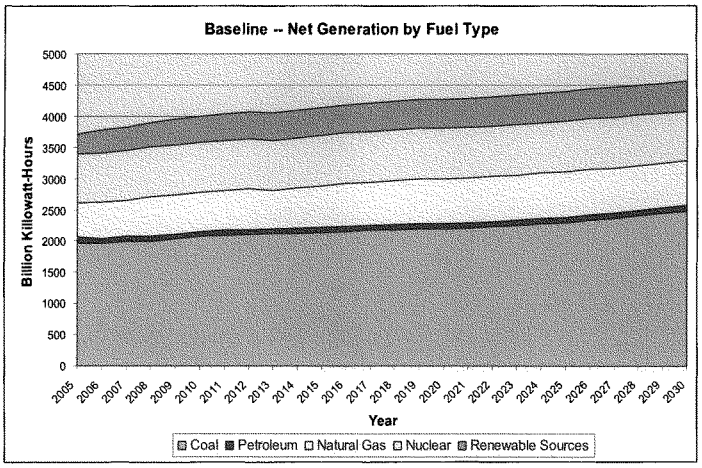

Figure 12: Baseline - - Electricity Generation by Fuel Type

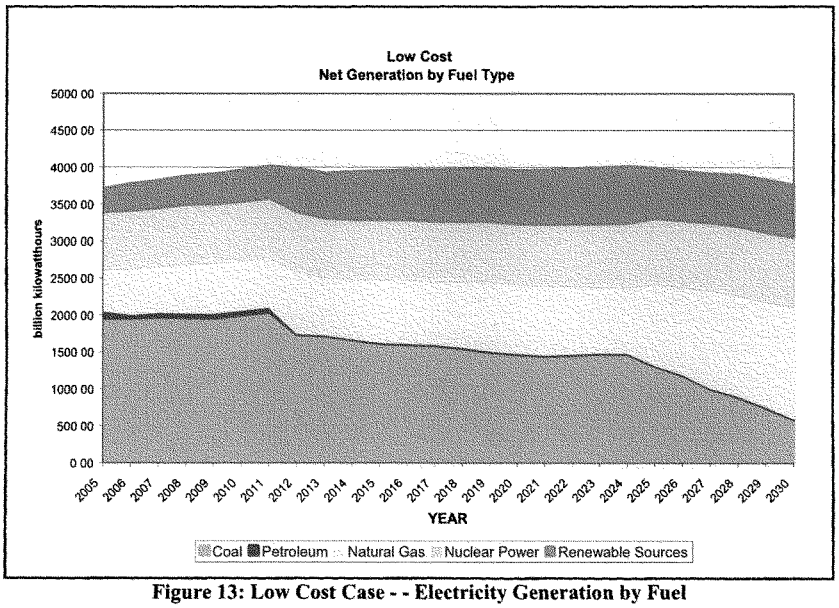

Figure 13: Low Cost Case - - Electricity Generation by Fuel

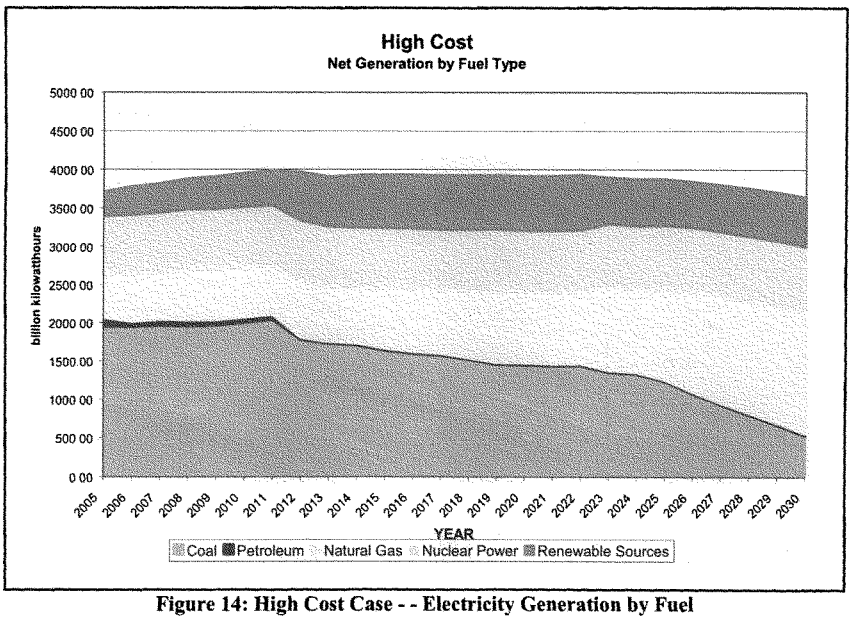

Figure 14: High Cost Case - - Electricity Generation by Fuel

Low Cost Scenario –

- Coal generation gradually declines from 2012 (1,735 BkWh) until 2020 (1,465 BkWh) and remains roughly level until 2024. Coal continues to play a dominant role in electric generation until about 2024 when it begins to drop significantly to help meet emissions goals, ultimately dropping to 591 BkWh by 2030.
- Natural gas generation grows very gradually from 2012 (823 BkWh) until 2024 (871 BkWh). After 2024, natural gas generation rapidly increases and becomes the predominant fuel for generation, ultimately reaching 1,491 BkWh by 2030.
- Renewable generation shows strong growth over the forecast, but is limited by the 5 GW per year additional capacity growth limits on wind and biomass as established by the scenario assumptions. Renewable generation grows from 596 BkWh in 2012 to a peak of 774 BkWh in 2024, tapering off to 717 BkWh in 2030.
- Nuclear generation is limited to moderate growth due to assumptions regarding the market penetration that can be achieved by new capacity (25 GW maximum); the model only added 19 GW of new generation capacity by 2030. Nuclear generation grows from 804 BkWh in 2012 to 938 BkWh in 2030.

High Cost Scenario –

- Coal generation gradually declines from 2012 (1,782 BkWh) until 2020 (1,452 BkWh) and remains roughly level until 2022. Coal continues to play a dominant role in electric generation until about 2022 when it begins to drop markedly to meet emissions goals, ultimately dropping to 536 BkWh by 2030.
- Natural gas generation steadily climbs from 2012 (722 BkWh) and begins to ratchet up significantly after 2020 (915 BkWh), and very significantly after 2022 as coal generation falls. After 2025, natural gas becomes the predominant fuel for generation ultimately reaching 1,564 BkWh by 2030.
- Renewable generation shows strong growth over the forecast, but is limited by the 3 GW per year additional capacity growth limits on wind and biomass as established by the scenario assumptions. Renewable generation grows from 631 BkWh in 2012 to a peak of 714 BkWh in 2022, tapering off to 649 BkWh in 2030.

Impact on Gross Domestic Product

Key Finding: *Due to the higher projected energy expenditures in different sectors of the economy, the ACCF/NAM model projects a loss of household income, lower commercial and industrial output, and lower employment over the projection period that results in reduced gross domestic product (GDP). The Low Cost case results project a loss of 0.8 percent in 2020 and 2.5% in 2030. The High Cost case results project a loss of 1.1 percent in 2020 and 2.6% in 2030. Overall impacts are moderated by CO_2 allowance revenues assumed to flow to the U.S. treasury to increase the tax base.*

As presented previously, both the High and Low Cost cases result in projections of very high CO_2 allowance price levels that commensurately raise fuel prices. These higher fuel prices "force" the economy to undergo a significant shift in fuel conversion technology selection/utilization and fossil fuel consumption to satisfy the S.2191 emissions cap goals through 2030. Due to the higher energy expenditures in different sectors of the economy, the ACCF/NAM model projects a loss of household income, lower commercial and industrial output, and lower employment over the projection period that results in reduced gross domestic product (GDP). GDP is projected to drop between $151 billion (Low Cost case) and $210 billion (High Cost case) per year by 2020 and $631 billion and $669 billion by 2030.

Since the model assumes that a portion of the revenues collected from the sales of CO_2 allowances flow back to the U.S. treasury as collected taxes, the overall impact to the economy as a whole is somewhat moderated. Note that this modeling effort has not made any attempt at directing the use of the collected revenues to further stimulate economic activity.

To put these numbers in perspective, the U.S. spent $581 billions on social security payments and $371 billions on Medicare for retirees in 2007. Slower growth in the productivity of the labor force and lower levels of investment overall are responsible for lower levels of GDP. Labor productivity as measured by dollar of output per person falls between 0.8% and 1.5%.

Table 2 shows the impact on manufacturing, a key component of GDP. By 2030, some of the largest hit sectors are transportation ($212 to $292 billion), chemical manufacturing ($88 to $107 billion), petroleum and coal products ($34 to $69 billion), and metals ($78 to $92 billion).

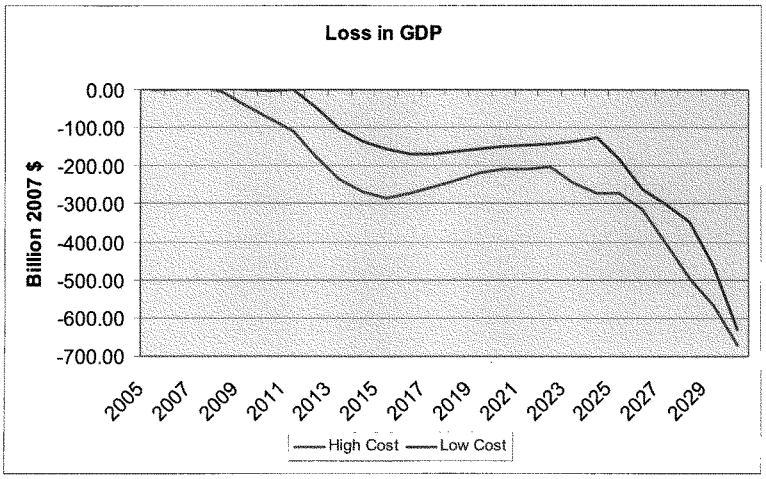

Figure 15: Loss in U.S. Gross Domestic Product

Manufacturing Sector	Baseline 2020	Baseline 2030	Low Case 2020	Low Case 2030	High Case 2020	High Case 2030
Food Products	$ 692.06	$ 809.27	-$10.44	-$45.15	-$16.57	-$59.12
Beverages and Tobacco Products	$ 125.12	$ 125.16	-$4.39	-$9.05	-$6.69	-$13.08
Textile Mills and Products	$ 65.60	$ 53.41	-$2.88	-$7.04	-$3.57	-$8.97
Apparel	$ 26.17	$ 16.40	$0.10	-$0.25	-$0.24	-$0.40
Wood Products	$ 116.43	$ 116.20	-$5.31	-$25.07	-$6.45	-$29.08
Furniture and Related Products	$ 112.59	$ 134.16	-$1.69	-$4.46	$3.07	$0.09
Paper Products	$ 213.37	$ 229.16	-$10.48	-$23.92	-$14.94	-$30.32
Printing	$ 97.20	$ 100.74	-$0.40	-$0.80	-$0.79	-$1.15
Chemical Manufacturing	$ 738.58	$ 853.56	-$38.48	-$88.22	-$42.68	-$107.24
Petroleum and Coal Products	$ 335.14	$ 353.50	-$11.87	-$33.94	-$30.77	-$69.38
Plastics and Rubber Products	$ 264.90	$ 300.57	-$15.51	-$51.25	-$17.34	-$59.56
Leather and Leather Products	$ 4.12	$ 3.02	$0.00	$0.00	$0.00	$0.00
Stone, Clay, and Glass Products	$ 137.37	$ 145.22	-$13.97	-$37.97	-$16.34	-$45.60
Primary Metals Industry	$ 196.22	$ 195.52	-$29.06	-$78.30	-$36.63	-$92.16
Fabricated Metal Products	$ 372.59	$ 414.27	-$10.51	-$30.47	-$8.97	-$29.91
Machinery	$ 458.12	$ 526.84	-$20.62	-$44.69	-$24.42	-$52.22
Computers and Electronics	$ 1,208.90	$ 1,706.10	-$22.81	-$91.50	-$18.94	-$80.10
Transportation Equipment	$ 1,091.84	$ 1,263.98	-$65.90	-$211.56	-$150.25	-$292.64
Electrical Equipment	$ 175.41	$ 205.46	-$3.63	-$7.06	-$4.71	-$7.38
Miscellaneous Manufacturing	$ 274.27	$ 372.48	$1.22	-$3.53	-$3.28	-$20.32
Total Industrial Value of Shipments	$ 8,775.76	$ 10,146.56	-$277.84	-$838.22	-$352.64	-$865.94

Table 2: Impact on the Value of US Manufacturing (Billion 2007 $)

NEMS/ACCF/NAM Results at the State Level

For each state, a two-page report was prepared to show the impact of S. 2191 on the state under the "High" and "Low" cost scenarios using the assumptions provided by ACCF/NAM. The two-page reports describe the potential higher energy costs and resultant impacts in each state on jobs, household income, economic growth, industrial production, low income and elderly citizens, and state budgets. (A sample two-page report is included at Appendix 3). To prepare the state-specific analyses, the regional NEMS/ACCF/NAM results were post-processed based on historical trends/relationships and population projections from the Census Bureau to get population and gross state product weighted results for economic growth, household income, jobs, industrial production, emissions, and prices at the state[13].

Tables summarizing the impacts for each of the 50 states are provided below.

[13] NEMS reports all of these results by census regions.

Table 3: Loss in Employment (Thousands of Jobs)

State	LOW CASE PROJECTION		HIGH CASE PROJECTION	
	2020	2030	2020	2030
Alabama	-17	-45	-26	-60
Alaska	-2	-6	-4	-9
Arizona	-23	-64	-35	-85
Arkansas	-11	-30	-17	-40
California	-130	-338	-196	-450
Colorado	-21	-57	-31	-76
Connecticut	-14	-33	-21	-44
Delaware	-4	-11	-6	-15
DC	-3	-8	-4	-10
Florida	-78	-221	-118	-294
Georgia	-41	-117	-62	-155
Hawaii	-5	-12	-7	-16
Idaho	-6	-16	-9	-22
Illinois	-48	-118	-72	-157
Indiana	-24	-59	-36	-79
Iowa	-13	-31	-19	-42
Kansas	-11	-28	-17	-37
Kentucky	-16	-41	-24	-55
Louisiana	-17	-46	-25	-61
Maine	-5	-13	-8	-17
Maryland	-27	-76	-40	-101
Massachusetts	-25	-62	-38	-83
Michigan	-37	-91	-56	-122
Minnesota	-22	-56	-34	-75
Mississippi	-10	-27	-16	-36
Missouri	-23	-57	-34	-76
Montana	-4	-11	-6	-15
Nebraska	-8	-19	-11	-25
Nevada	-10	-27	-15	-36
New Hampshire	-5	-13	-8	-18
New Jersey	-31	-74	-47	-99
New Mexico	-7	-20	-11	-27
New York	-66	-156	-99	-208
North Carolina	-39	-110	-59	-147
North Dakota	-3	-7	-4	-9
Ohio	-44	-107	-66	-143
Oklahoma	-14	-39	-22	-52
Oregon	-14	-35	-21	-47
Pennsylvania	-44	-104	-66	-139
Rhode Island	-4	-10	-6	-14
South Carolina	-18	-52	-28	-69
South Dakota	-3	-8	-5	-11
Tennessee	-23	-60	-35	-80
Texas	-93	-251	-140	-335
Utah	-10	-28	-15	-37
Vermont	-3	-7	-4	-9
Virginia	-36	-101	-54	-135
Washington	-24	-62	-36	-82
West Virginia	-7	-20	-11	-27
Wisconsin	-23	-56	-34	-74
Wyoming	-2	-6	-3	-8

Table 4: Household Income Impact (2007$)

State	LOW CASE PROJECTION		HIGH CASE PROJECTION	
	2020	2030	2020	2030
Alabama	-$805	-$3,431	-$2,611	-$6,257
Alaska	-$1,095	-$4,548	-$3,552	-$8,294
Arizona	-$822	-$3,382	-$2,665	-$6,167
Arkansas	-$733	-$3,088	-$2,378	-$5,631
California	-$1,244	-$5,163	-$4,032	-$9,414
Colorado	-$977	-$4,019	-$3,167	-$7,328
Connecticut	-$1,472	-$6,417	-$4,774	-$11,701
Delaware	-$1,003	-$4,226	-$3,250	-$7,705
DC	-$1,267	-$5,342	-$4,109	-$9,740
Florida	-$918	-$3,868	-$2,976	-$7,053
Georgia	-$941	-$3,966	-$3,051	-$7,231
Hawaii	-$1,090	-$4,524	-$3,532	-$8,249
Idaho	-$789	-$3,247	-$2,558	-$5,920
Illinois	-$1,116	-$4,625	-$3,617	-$8,434
Indiana	-$899	-$3,728	-$2,916	-$6,798
Iowa	-$916	-$3,866	-$2,970	-$7,050
Kansas	-$947	-$3,994	-$3,069	-$7,283
Kentucky	-$794	-$3,383	-$2,575	-$6,169
Louisiana	-$794	-$3,343	-$2,574	-$6,095
Maine	-$807	-$3,517	-$2,617	-$6,414
Maryland	-$1,191	-$5,022	-$3,863	-$9,157
Massachusetts	-$1,341	-$5,842	-$4,346	-$10,653
Michigan	-$933	-$3,867	-$3,024	-$7,051
Minnesota	-$1,066	-$4,497	-$3,455	-$8,201
Mississippi	-$770	-$3,280	-$2,496	-$5,980
Missouri	-$891	-$3,758	-$2,887	-$6,852
Montana	-$709	-$2,918	-$2,299	-$5,321
Nebraska	-$961	-$4,056	-$3,116	-$7,396
Nevada	-$1,013	-$4,167	-$3,283	-$7,598
New Hampshire	-$1,157	-$5,040	-$3,749	-$9,190
New Jersey	-$1,381	-$5,854	-$4,478	-$10,675
New Mexico	-$727	-$2,990	-$2,356	-$5,452
New York	-$1,211	-$5,134	-$3,927	-$9,362
North Carolina	-$836	-$3,525	-$2,712	-$6,428
North Dakota	-$840	-$3,542	-$2,722	-$6,459
Ohio	-$902	-$3,739	-$2,924	-$6,819
Oklahoma	-$810	-$3,409	-$2,625	-$6,216
Oregon	-$913	-$3,789	-$2,959	-$6,909
Pennsylvania	-$1,018	-$4,314	-$3,299	-$7,866
Rhode Island	-$1,124	-$4,900	-$3,645	-$8,934
South Carolina	-$778	-$3,279	-$2,522	-$5,978
South Dakota	-$921	-$3,887	-$2,986	-$7,087
Tennessee	-$906	-$3,859	-$2,937	-$7,037
Texas	-$1,044	-$4,395	-$3,384	-$8,015
Utah	-$919	-$3,780	-$2,979	-$6,893
Vermont	-$901	-$3,925	-$2,920	-$7,157
Virginia	-$1,073	-$4,522	-$3,479	-$8,246
Washington	-$1,083	-$4,497	-$3,512	-$8,200
West Virginia	-$677	-$2,855	-$2,196	-$5,206
Wisconsin	-$913	-$3,786	-$2,961	-$6,904
Wyoming	-$894	-$3,678	-$2,898	-$6,707

Table 5: Loss in Gross State Product (Million 2007$)

State	LOW CASE PROJECTION		HIGH CASE PROJECTION	
	2020	2030	2020	2030
Alabama	-$1,857	-$6,848	-$2,573	-$8,085
Alaska	-$461	-$1,700	-$639	-$2,007
Arizona	-$2,605	-$9,608	-$3,610	-$11,344
Arkansas	-$1,072	-$3,953	-$1,485	-$4,667
California	-$19,957	-$73,603	-$27,657	-$86,903
Colorado	-$2,657	-$9,800	-$3,683	-$11,571
Connecticut	-$2,407	-$8,878	-$3,336	-$10,482
Delaware	-$691	-$2,549	-$958	-$3,010
DC	-$1,017	-$3,750	-$1,409	-$4,427
Florida	-$8,053	-$29,699	-$11,159	-$35,066
Georgia	-$4,461	-$16,452	-$6,182	-$19,425
Hawaii	-$666	-$2,456	-$923	-$2,900
Idaho	-$560	-$2,064	-$776	-$2,437
Illinois	-$7,024	-$25,905	-$9,734	-$30,586
Indiana	-$2,979	-$10,987	-$4,128	-$12,972
Iowa	-$1,450	-$5,349	-$2,010	-$6,316
Kansas	-$1,310	-$4,831	-$1,815	-$5,703
Kentucky	-$1,737	-$6,406	-$2,407	-$7,564
Louisiana	-$2,144	-$7,907	-$2,971	-$9,336
Maine	-$561	-$2,069	-$777	-$2,443
Maryland	-$3,014	-$11,117	-$4,177	-$13,126
Massachusetts	-$4,055	-$14,954	-$5,619	-$17,656
Michigan	-$4,789	-$17,664	-$6,637	-$20,856
Minnesota	-$2,900	-$10,696	-$4,019	-$12,629
Mississippi	-$1,000	-$3,686	-$1,385	-$4,353
Missouri	-$2,701	-$9,963	-$3,744	-$11,763
Montana	-$365	-$1,346	-$506	-$1,589
Nebraska	-$893	-$3,295	-$1,238	-$3,890
Nevada	-$1,304	-$4,809	-$1,807	-$5,678
New Hampshire	-$673	-$2,482	-$932	-$2,930
New Jersey	-$5,384	-$19,855	-$7,461	-$23,443
New Mexico	-$838	-$3,091	-$1,162	-$3,650
New York	-$11,974	-$44,160	-$16,593	-$52,140
North Carolina	-$4,335	-$15,989	-$6,008	-$18,878
North Dakota	-$303	-$1,119	-$420	-$1,321
Ohio	-$5,563	-$20,518	-$7,710	-$24,225
Oklahoma	-$1,491	-$5,499	-$2,066	-$6,492
Oregon	-$1,750	-$6,454	-$2,425	-$7,620
Pennsylvania	-$6,100	-$22,496	-$8,453	-$26,561
Rhode Island	-$545	-$2,010	-$755	-$2,374
South Carolina	-$1,761	-$6,494	-$2,440	-$7,668
South Dakota	-$384	-$1,415	-$532	-$1,671
Tennessee	-$2,805	-$10,347	-$3,888	-$12,216
Texas	-$11,996	-$44,242	-$16,624	-$52,236
Utah	-$1,090	-$4,018	-$1,510	-$4,745
Vermont	-$287	-$1,059	-$398	-$1,250
Virginia	-$4,287	-$15,809	-$5,940	-$18,666
Washington	-$3,384	-$12,479	-$4,689	-$14,734
West Virginia	-$656	-$2,421	-$910	-$2,858
Wisconsin	-$2,721	-$10,035	-$3,771	-$11,848
Wyoming	-$320	-$1,180	-$444	-$1,394

Table 6: Change in Retail Gasoline Prices (2007$)

State	LOW CASE PROJECTION		HIGH CASE PROJECTION	
	2020	2030	2020	2030
Alabama	$0.27	$2.19	$2.29	$5.22
Alaska	$0.28	$2.17	$2.44	$5.58
Arizona	$0.28	$2.27	$2.35	$5.20
Arkansas	$0.27	$2.24	$2.32	$5.32
California	$0.27	$2.10	$2.35	$5.39
Colorado	$0.29	$2.28	$2.36	$5.23
Connecticut	$0.27	$2.31	$2.34	$5.44
Delaware	$0.28	$2.29	$2.37	$5.42
DC	$0.31	$2.56	$2.65	$6.08
Florida	$0.25	$2.08	$2.16	$4.94
Georgia	$0.24	$1.96	$2.03	$4.64
Hawaii	$0.30	$2.39	$2.68	$6.14
Idaho	$0.29	$2.28	$2.36	$5.23
Illinois	$0.28	$2.28	$2.36	$5.41
Indiana	$0.26	$2.13	$2.20	$5.05
Iowa	$0.27	$2.17	$2.23	$5.10
Kansas	$0.27	$2.22	$2.28	$5.22
Kentucky	$0.28	$2.31	$2.41	$5.50
Louisiana	$0.27	$2.24	$2.32	$5.32
Maine	$0.27	$2.25	$2.28	$5.31
Maryland	$0.29	$2.38	$2.46	$5.64
Massachusetts	$0.27	$2.25	$2.28	$5.31
Michigan	$0.27	$2.17	$2.25	$5.15
Minnesota	$0.29	$2.31	$2.37	$5.43
Mississippi	$0.27	$2.18	$2.27	$5.19
Missouri	$0.27	$2.15	$2.21	$5.05
Montana	$0.29	$2.34	$2.42	$5.37
Nebraska	$0.27	$2.21	$2.26	$5.19
Nevada	$0.30	$2.37	$2.45	$5.44
New Hampshire	$0.26	$2.21	$2.23	$5.20
New Jersey	$0.26	$2.20	$2.22	$5.18
New Mexico	$0.27	$2.19	$2.26	$5.02
New York	$0.27	$2.31	$2.33	$5.44
North Carolina	$0.26	$2.15	$2.23	$5.10
North Dakota	$0.28	$2.25	$2.30	$5.28
Ohio	$0.27	$2.23	$2.31	$5.30
Oklahoma	$0.27	$2.17	$2.25	$5.16
Oregon	$0.27	$2.13	$2.39	$5.47
Pennsylvania	$0.27	$2.27	$2.29	$5.35
Rhode Island	$0.27	$2.31	$2.33	$5.43
South Carolina	$0.25	$2.08	$2.15	$4.94
South Dakota	$0.28	$2.24	$2.29	$5.25
Tennessee	$0.27	$2.21	$2.30	$5.26
Texas	$0.27	$2.23	$2.31	$5.30
Utah	$0.28	$2.27	$2.35	$5.21
Vermont	$0.26	$2.23	$2.26	$5.25
Virginia	$0.27	$2.21	$2.29	$5.25
Washington	$0.26	$2.07	$2.32	$5.31
West Virginia	$0.28	$2.30	$2.39	$5.47
Wisconsin	$0.28	$2.31	$2.39	$5.48
Wyoming	$0.27	$2.15	$2.23	$4.94

Table 7: Change in Residential Electricity Prices (2007 Cents per KWh)

	LOW CASE PROJECTION		HIGH CASE PROJECTION	
State	**2020**	**2030**	**2020**	**2030**
Alabama	1.46	9.16	3.59	15.10
Alaska	0.83	3.72	1.69	5.64
Arizona	0.84	9.56	2.98	14.90
Arkansas	0.75	8.08	3.14	14.38
California	0.84	3.79	1.72	5.75
Colorado	0.78	8.85	2.76	13.79
Connecticut	0.87	6.43	2.50	10.04
Delaware	1.28	9.13	4.03	15.03
District Of Columbia	1.17	8.37	3.70	13.78
Florida	1.24	8.88	3.93	14.63
Georgia	1.14	8.13	3.60	13.39
Hawaii	1.15	5.15	2.34	7.81
Idaho	0.61	6.93	2.16	10.81
Illinois	1.47	9.79	3.56	17.48
Indiana	1.21	8.04	2.92	14.35
Iowa	1.67	10.20	3.77	14.95
Kansas	1.50	9.19	3.39	13.47
Kentucky	1.16	7.24	2.84	11.93
Louisiana	0.78	8.42	3.27	14.99
Maine	0.98	7.26	2.82	11.34
Maryland	1.15	8.21	3.63	13.52
Massachusetts	0.89	6.61	2.57	10.33
Michigan	1.44	9.58	3.48	17.09
Minnesota	1.49	9.13	3.37	13.38
Mississippi	1.51	9.46	3.70	15.59
Missouri	1.37	8.38	3.09	12.28
Montana 2	0.72	8.23	2.57	12.83
Nebraska	1.31	8.03	2.96	11.77
Nevada	0.89	10.17	3.17	15.85
New Hampshire	0.97	7.16	2.78	11.18
New Jersey	0.69	7.61	2.93	13.53
New Mexico	0.86	9.82	3.06	15.31
New York	0.92	10.16	3.91	18.05
North Carolina	1.21	8.67	3.83	14.27
North Dakota	1.27	7.79	2.88	11.42
Ohio	1.45	9.62	3.50	17.17
Oklahoma	0.73	7.90	3.07	14.07
Oregon	0.46	2.08	0.94	3.15
Pennsylvania	0.63	6.94	2.67	12.34
Rhode Island	0.90	6.63	2.58	10.35
South Carolina	1.15	8.26	3.65	13.61
South Dakota	1.46	8.94	3.30	13.09
Tennessee	1.31	8.22	3.22	13.55
Texas	0.89	9.55	3.71	17.00
Utah	0.68	7.75	2.42	12.08
Vermont	0.99	7.33	2.85	11.45
Virginia	1.15	8.21	3.63	13.51
Washington	0.41	1.85	0.84	2.80
West Virginia	0.92	6.60	2.92	10.86
Wisconsin	1.43	9.49	3.45	16.93
Wyoming	0.69	7.89	2.46	12.29

Table 8: Change in Residential Natural Gas Prices (2007$/MMBtu)

	LOW CASE PROJECTION		HIGH CASE PROJECTION	
State	**2020**	**2030**	**2020**	**2030**
Alabama	$0.95	$11.97	$4.68	$21.20
Alaska	$0.26	$4.29	$1.57	$7.22
Arizona	$0.92	$14.81	$5.30	$24.58
Arkansas	$0.84	$10.73	$4.17	$19.00
California	$0.53	$8.59	$3.15	$14.46
Colorado	$0.59	$9.49	$3.39	$15.76
Connecticut	$0.69	$11.32	$4.21	$19.72
Delaware	$0.69	$9.09	$3.57	$16.12
District Of Columbia	$0.86	$11.34	$4.45	$20.12
Florida	$1.03	$13.65	$5.36	$24.21
Georgia	$0.75	$9.88	$3.88	$17.53
Hawaii	$1.37	$22.33	$8.19	$37.60
Idaho	$0.65	$10.46	$3.74	$17.37
Illinois	$0.82	$10.34	$4.00	$18.05
Indiana	$0.86	$10.91	$4.22	$19.05
Iowa	$0.83	$10.82	$4.16	$18.76
Kansas	$0.84	$10.86	$4.18	$18.83
Kentucky	$0.75	$9.38	$3.67	$16.62
Louisiana	$0.83	$10.59	$4.12	$18.75
Maine	$0.58	$9.57	$3.56	$16.67
Maryland	$0.75	$9.90	$3.88	$17.56
Massachusetts	$0.65	$10.66	$3.96	$18.57
Michigan	$0.66	$8.41	$3.26	$14.69
Minnesota	$0.78	$10.14	$3.90	$17.58
Mississippi	$0.77	$9.67	$3.78	$17.12
Missouri	$0.90	$11.70	$4.50	$20.28
Montana 2	$0.58	$9.33	$3.34	$15.49
Nebraska	$0.74	$9.62	$3.70	$16.68
Nevada	$0.73	$11.68	$4.18	$19.40
New Hampshire	$0.65	$10.58	$3.93	$18.43
New Jersey	$0.59	$8.66	$3.35	$15.26
New Mexico	$0.63	$10.16	$3.63	$16.87
New York	$0.79	$11.60	$4.48	$20.44
North Carolina	$0.76	$10.00	$3.92	$17.73
North Dakota	$0.69	$8.94	$3.44	$15.50
Ohio	$0.88	$11.07	$4.29	$19.34
Oklahoma	$0.77	$9.79	$3.80	$17.32
Oregon	$0.56	$9.14	$3.35	$15.38
Pennsylvania	$0.73	$10.68	$4.13	$18.83
Rhode Island	$0.65	$10.60	$3.94	$18.47
South Carolina	$0.76	$10.05	$3.94	$17.82
South Dakota	$0.79	$10.19	$3.92	$17.67
Tennessee	$0.76	$9.60	$3.75	$17.00
Texas	$0.74	$9.36	$3.64	$16.57
Utah	$0.57	$9.15	$3.27	$15.18
Vermont	$0.56	$9.21	$3.42	$16.04
Virginia	$0.78	$10.26	$4.03	$18.20
Washington	$0.52	$8.37	$3.07	$14.10
West Virginia	$0.59	$7.73	$3.03	$13.71
Wisconsin	$0.87	$10.97	$4.25	$19.15
Wyoming	$0.58	$9.34	$3.34	$15.50

APPENDIX 1: ADDITIONAL INFORMATION ON THE OPERATION OF THE NEMS MODEL

1) How is supply-side energy conversion efficiency accounted for in NEMS?

Each supply-side technology used by NEMS (e.g., nuclear, natural gas combined cycle) incorporates a design specification that accounts for temporal changes in technology efficiency based on commercial implementation experience and technology improvement expectation. Efficiency values are specified for the year that a technology is assumed to become commercially available for deployment and for some year in the future (different for each technology) that accounts for improvements associated with experiential learning and continued technology R&D. The model interpolates to establish annual efficiency improvements for each supply-side technology.

2) What is the sensitivity of the model to supply-side technology capital costs for power generation?

For capacity expansion decision-making in any given year of the projection, NEMS calculates an associated present-value cost of each competing technology based on **capital cost, fixed & variable operating and maintenance costs** (O&M), and projected **fuel consumption costs**. In concert with specified operating and environmental constraints, the model chooses the least-cost mix of technologies to meet projected energy demand for the projection period. Therefore, relative differences in technology capital costs directly impact the cost-competitiveness of each technology and the extent to which annual capacity is added for each. Commercialization-year capital costs are user-specified for each technology type and the model projects learning-based cost reductions based on the total capacity added for each technology over the projection period. Therefore, the relative technology capital costs often change over the projection period depending on the relative levels of technology deployment.
With regard to operating dispatch decisions, NEMS only chooses the mix of plants that minimizes fuel, variable O&M, and environmental costs, subject to meeting electricity demand and environmental constraints.

APPENDIX 2: SUMMARY OF THE NEMS/ACCF/NAM ANALYSIS OF S. 2191 AT THE NATIONAL LEVEL

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National Association of Manufacturers

ACCF

United States
Economic Impact from the Lieberman-Warner Proposed Legislation to Reduce Greenhouse Gas Emissions

Understanding the economic impacts of the Lieberman-Warner Climate Security Act[1] (L/W bill) can help guide choices on climate change policy.[2] In this study, the L/W bill was analyzed under low and high cost cases with respect to a baseline that projects the future in the absence of the bill. The L/W bill would enforce a nationwide cap and trade program for the emissions of greenhouse gases (GHGs) and would reduce GHG emissions covered by the bill to 4,992 Million Metric Tons of CO_2 ($MMTCO_2$) by 2020 and 3,856 $MMTCO_2$ by 2030 (Figure 1). L/W sets targets that would reduce GHG emissions to 15% below 2005 levels by 2020; 30% below 2005 levels by 2030; and 70% below 2005 levels by 2050. Covered emissions are assumed to include everything from combustion of fossil fuels in the United States, plus non-CO_2 GHG emissions included in the L/W cap. The price of carbon permits (what companies must pay to emit CO_2) could reach between $55 and $64 per metric ton of CO_2 (MT) by 2020 and could increase to between $227/MT and $271/MT by 2030.[3]

Impact on Jobs

Under L/W, the United States would lose between 1.2 and 1.8 million jobs in 2020 and between 3 and 4 million jobs in 2030. The primary cause of job losses would be lower industrial output due to higher energy prices, the high cost of complying with required emissions cuts, and greater competition from overseas manufacturers with lower energy costs.

Impact on Disposable Household Income

Higher energy prices would have ripple impacts on prices throughout the economy and would impose a financial cost of $739 to $2,927 per year by 2020 on national households, rising to $4,022 to $6,752 by 2030 (Figure 3).

L/W's Impact on Energy Prices

Most energy prices would rise under L/W, particularly, coal, oil, and natural gas. The price of gasoline would increase between 60% and 144% by 2030, while electricity prices would increase by 77% to 129%. Table 1 shows the increase in gasoline and electricity prices faced by US households. US consumers would pay between 84% and 146% more for their natural gas by 2030.

Figure 1. US CO_2 Emissions and S. 2191 Targets

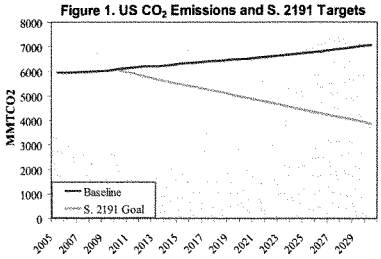


Figure 2: Loss in Employment Relative to Baseline (Millions of Jobs)

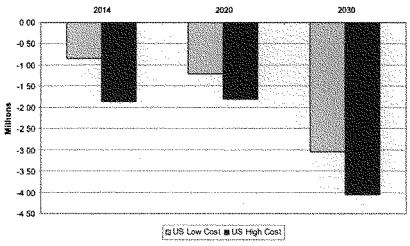
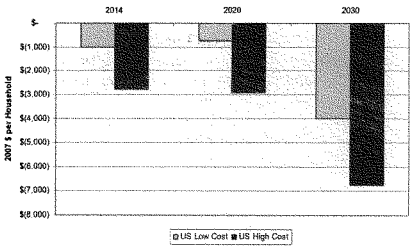


Figure 3: Household Impact Relative to Baseline (Annual Dollars Lost per Household)



[1] S. 2191

[2] The study used the National Energy Modeling System (NEMS) and assumptions provided by AACF and NAM for this analysis. NEMS is used by the US Energy Information Administration for energy forecasting and policy analysis. "Low" refers to the Low Cost Case, which assumes higher nuclear capacity, less constraint on new generating technologies, etc. Both cases use higher capital costs than the baseline. "High" refers to the High Cost Case, which assumes low nuclear additions, constrained new generation technologies, high oil prices etc. (See the full report for all assumptions)

3. All dollar figures in this summary are reported in constant 2007 dollars.

Factors Contributing to Higher Electricity Prices
L/W would reduce GHG emissions from all sectors of the economy (transportation, residential, commercial, and industry); however, as the largest emitter of GHGs, the primary impact would fall on the electric sector. L/W would result in the electric industry shutting down most carbon-based generation and/or using expensive, as yet unproven technology, to capture and store CO_2. To meet the stringent goals of L/W, the electric industry would also have to substitute high cost technologies, such as biomass and wind, for conventional generation.

Impact on Economic Growth
High energy prices, fewer jobs, and loss of industrial output are estimated to reduce gross domestic product (GDP) by between $151 billion and $210 billion per year by 2020 and $631 billion and $669 billion by 2030 (Figure 4).

Impact on Industry
Some major economic sectors will be adversely hit by emission caps (Figure 5). By 2020, primary metals output would be reduced by between 15% and 19%; stone, glass, and clay products would be reduced by between 10% and 12%; motor vehicle manufacturing would be reduced by between 6% and 14%; and paper products would be reduced by between 5% and 7%. In addition the general shift away from coal would result in a 35% reduction in coal production and electricity production would fall around 12%. These losses would be significantly higher by 2030 and would have a lasting impact on the economic base of the US.

Impact on Low Income Families
The impacts of L/W will be felt especially by the poor, who spend more of their income on energy and other goods than other income brackets. By 2020, higher energy prices mean that low income families (with average incomes less than $18,500) will spend between 19% and 22% of their income on energy under L/W compared to a projected 17% without L/W. Others on fixed incomes, such as the elderly will also suffer disproportionately.

Table 1: Percentage Energy Price Increase Relative to Baseline

		US	
Sector	Year	Low	High
Electricity (Residential)	2014	13%	14%
	2020	28%	33%
	2030	101%	129%
Gasoline	2014	13%	50%
	2020	20%	69%
	2030	77%	145%
Natural Gas (Residential)	2014	18%	21%
	2020	26%	36%
	2030	108%	146%

Figure 4: Annual Impact of GDP Relative to Baseline (Billion 2007$)

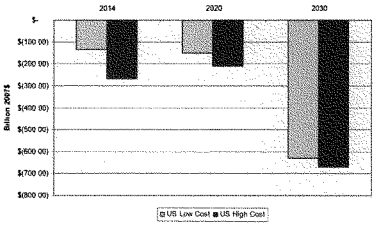


Figure 5: Impact on Industrial Value of Shipments Percentage Change from Baseline in 2020

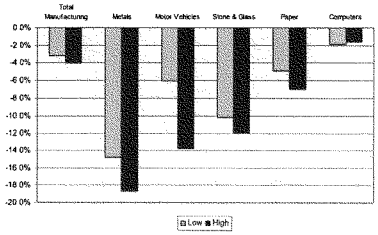
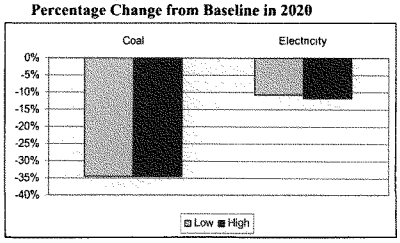


Figure 6: Impact on Production Percentage Change from Baseline in 2020



APPENDIX 3: SUMMARY OF THE NEMS/ACCF/NAM ANALYSIS OF S. 2191 AT THE STATE LEVEL

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NAM National Association of Manufacturers

ACCF AMERICAN COUNCIL FOR CAPITAL FORMATION

Alabama
Economic Impact on the State from the Lieberman-Warner Proposed Legislation to Reduce Greenhouse Gas Emissions

Understanding the economic impacts of the Lieberman-Warner Climate Security Act[1] (L/W bill) can help guide choices on climate change policy.[2] In this study, the L/W bill was analyzed under low and high cost cases with respect to a baseline that projects the future in the absence of the bill. The L/W bill would enforce a nationwide cap and trade program for the emissions of greenhouse gases (GHGs) and would reduce GHG emissions covered by the bill to 4,992 million metric tons of CO_2 ($MMTCO_2$) by 2020 and 1,732 $MMTCO_2$ by 2050 (Figure 1). By 2020 L/W would result in approximately a 15% reduction in GHG emissions from 2005 levels for those sectors of the economy covered by the bill. By 2050, the emissions reduction would be 33% compared to 2030. Covered emissions are assumed to include everything from combustion of fossil fuels in the United States, plus non-CO_2 GHG emissions included in the L/W cap. The price of carbon permits (what companies must pay to emit CO_2) could reach between $55 and $64 per metric ton of CO_2 (MT) by 2020 and could increase to between $227/MT and $271/MT by 2030.[3]

Impact on Jobs

Under L/W, Alabama would lose 17,200 to 25,874 jobs in 2020 and 44,721 to 59,530 jobs in 2030 (Figure 2). The primary cause of job losses would be lower industrial output due to higher energy prices, the high cost of complying with required emissions cuts, and greater competition from overseas manufacturers with lower energy costs.

Decrease in Disposable Household Income

Higher energy prices would have ripple impacts on prices throughout the economy and would impose a financial cost on households. Alabama would see disposable household income reduced by $805 to $2,611 per year by 2020 and $3,431 to $6,257 by 2030 (Figure 3).

L/W's Impact on Energy Prices

Most energy prices would rise under L/W, particularly coal, oil, and natural gas. The price of gasoline in Alabama would increase between 74% and 144% by 2030, while electricity prices would increase by 122% to 159%. Table 1 shows the increase in electricity, gasoline, and natural gas prices faced by a typical Alabama household compared to national household increases. Alabama residents would pay between 99% and 142% more for their natural gas by 2030.

Figure 1. US CO_2 Emissions and S. 2191 Targets

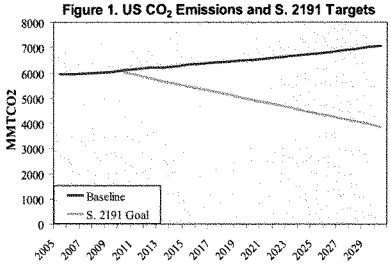


Figure 2. Loss in Employment

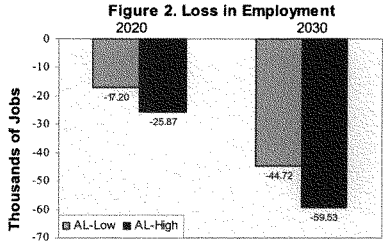
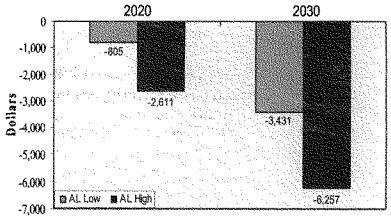


Figure 3. Loss of Disposable Income per Household



[1] S. 2191

[2] The study used the National Energy Modeling System (NEMS) and assumptions provided by AACF and NAM for this analysis. NEMS is used by the US Energy Information Administration for energy forecasting and policy analysis. "Low" refers to the Low Cost Case, which assumes higher nuclear capacity, less constraints on new generating technologies, etc. Both cases use higher capital costs than the baseline. "High" refers to the High Cost Case, which assumes low nuclear additions, constrained new generation technologies, high oil prices, etc. (See the full report for all assumptions).

[3] All dollar figures in this report are presented in constant 2007 dollars.

Factors Contributing to Higher Electricity Prices
L/W would reduce GHG emissions from all sectors of the economy (transportation, residential, commercial, and industry); however, as the largest emitter of GHGs, the primary impact would fall on the electric sector. L/W would result in the electric industry shutting down most carbon-based generation and/or using expensive, as yet unproven technology, to capture and store CO_2. To meet the stringent goals of L/W, the electric industry would also have to substitute high cost technologies, such as biomass and wind, for conventional generation.

Impact on Economic Growth
High energy prices, fewer jobs, and loss of industrial output are estimated to reduce Alabama's gross state product (GSP) by between $1.9 and $2.6 billion per year by 2020 and $6.8 and $8.1 billion by 2030 (Figure 4).

Impact on Industry
Alabama's major economic sectors will be affected by emission caps (Figure 5).[4] The current two largest sectors, transportation manufacturing and paper manufacturing, show decreases in output of 5.9% to 13.2% and 4.8% to 6.5%, respectively in 2020. All manufacturing sectors will suffer output losses of between 3.5% and 5.9% by 2020, while output from energy intensive sectors fall between 7.5% and 9.5%. Alabama's coal production would fall between 18.5% and 22.1%, although due to its low cost of generation, electricity supply could rise slightly over the baseline forecast (Figure 6). These continued losses will have a lasting effect on the economic base of Alabama.

Impact on Low Income Families[5]
The impacts of L/W will be felt especially by the poor, who spend more of their income on energy and other goods than other income brackets. By 2020, higher energy prices mean that low income families in Alabama (with average incomes of $12,945) will spend between 22% and 25% of their income on energy under L/W compared to a projected 19% without L/W. Others on fixed incomes, such as the elderly will also suffer disproportionately.

Impact on State Budgets[6]
The increases in Alabama's energy costs under L/W will impact expenditures throughout the state. Specifically, Alabama's 2,069 schools and universities and 134 hospitals will likely experience a 62% to 71% percent increase in energy costs by 2020 and a 215% to 267% increase by 2030. For government entities, costs for services, including public transportation and vehicle fleets, such as school buses, will also rise under L/W.

Table 1: Change in Energy Prices at Household (% change from baseline)

Sector	Year	AL Low	AL High
Electricity (Residential)	2020	32%	40%
	2030	122%	159%
Gasoline (Retail)	2020	21%	70%
	2030	74%	144%
Natural Gas (Residential)	2020	25%	35%
	2030	99%	142%

Figure 4. Loss in Gross State Product

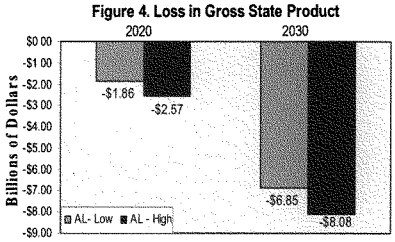


Figure 5: Impact on Industrial Value of Shipments Percentage Change from Baseline in 2020

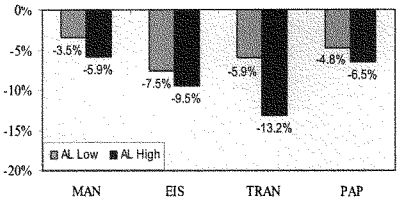
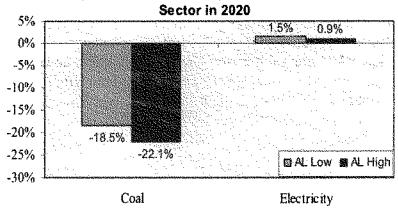


Figure 6. Percent Change in Production by Sector in 2020



[4] MAN = Manufacturing, EIS = Energy Intensive Sectors; TRAN = Transportation equipment manufacturing; PAP = Paper products manufacturing.
[5] These projections assume that the energy expenditures by income quintile in the state are the same as the average for the census division, since there is insufficient data to accurately calculate this quantity on the state level.
[6] These projections assume that the expenditures on schools and hospitals are the same as the average for the census region, since there is insufficient data to accurately calculate these quantities on the state level.

Ms. THORNING. Renewables already get the lion's share of Federal subsidies. That is detailed in Figure 2 and Table 2 of my testimony. I think it is probably not a good use of taxpayer money to accelerate the spending that we are already doing on renewables. Renewable energy is more expensive than conventional fuels. I have a table in my testimony that shows that solar, for example, solar electricity was, according to testimony by a GE representative, about 36 cents a kilowatt hour compared to about 7 cents for gas and 4 and a half cents for coal.

Furthermore, if you take a look at states that make great use of renewables and have high renewable portfolios, like California and Texas, they have the highest electricity costs in the U.S. So I think more focus on pushing renewables right now is not appropriate because high energy costs are already exerting a significant drag on the U.S. economy.

I do think there are ways we can encourage energy efficiency more than we do in a cost-effective way. One is to increase cost-recovery allowances so that we can depreciate more quickly energy-efficient investments. And we have a study on our Web site detailing how disadvantaged U.S. firms are in terms of cost recovery.

When we need to accelerate research on carbon capture and storage, so that we can use the 400 years supply of coal we have here and hopefully reduce greenhouse gas emissions and develop plug-in vehicles that we will be able to plug in to coal-fired plants, thereby decreasing our dependence on foreign oil.

We need to promote domestic energy sources by increasing access to onshore and offshore areas.

And finally, to conclude, I think the U.S. economy does not need the one-two punch of high-cost renewables and a cap-and-trade system.

Thank you.

[The statement of Ms. Thorning follows:]

Strategies to Promote U.S. Economic Recovery and Long-Run Growth: What Role for Energy and Climate Change Policy?

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

Before the
Select Committee on Energy Independence
and Global Warming
U.S. House of Representatives
September 18, 2008

Executive Summary

Is Further Intervention Needed to Restore Strong U.S. Growth?

The outlook for the U.S. economy is uncertain, credit markets are in turmoil with takeover of Fannie Mae and Freddie Mac, the failure of Lehman Brothers, and the possibility that other large companies may fail. In addition, there is no sign that housing prices have stabilized. Housing prices today are down 16.0% from a year ago and there is a 10-month inventory compared to a normal 6 months' supply. A question facing policymakers is whether the U.S. needs an additional fiscal stimulus package in order to "prime the economic pump." One possible course of action is to try to address the fundamental economic problems bedeviling the U.S.: falling housing prices and turmoil in the financial markets which has lead to tight credit for households and businesses.

Renewable Energy: How Would Additional Spending Impact U.S. Economic Growth?

Rising energy costs have played a role in the current U.S. economic slowdown and security of supply remains an important concern for households, business, and government. Some suggest that enlarging the current U.S. effort to replace conventional fossil fuels (coal, oil, and natural gas) with renewables could provide new jobs and help restore strong economic growth. For example, a recent report, "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy" by The Center for American Progress (CAP) calls for $100 billion over 2 years in new expenditures on a variety of programs, including expanding production of wind power, solar power and the next generation of biofuels to help jump start a U.S. economic recovery. The CAP study estimates that $100 billion in federal spending on green infrastructure would create approximately 2 million jobs within 2 years. CAP proposes to raise the $100 billion by either an increase in the federal deficit or by imposing a cap and trade system on greenhouse gas emissions that could raise between $75 and $200 billion per year.

Concerns about the CAP Report

The analysis uses an inappropriate economic model and omits key factors that could negate its principal conclusions pertaining to job creation. More specifically, the study does not consider the negative economic consequences that would occur from replacing lower cost energy with higher cost energy – a key factor in any analysis of this kind. Furthermore, the report employs questionable use of data and methods in its analysis that further undermines the validity of its results and conclusions.

The CAP report proposes to fund the $100 billion outlay on green projects by either a cap and trade system which auctions the right to emit carbon or by having the U.S. government run a larger deficit. Imposing a cap and trade system to reduce GHGs would raise energy costs and slow U.S. economic growth.

Strategies for Promoting Economic Growth, Energy Security and Global GHG Reductions

Getting the U.S. economy back on track for strong growth in jobs and household income may require policy changes which restore stability to the housing and credit markets and avoid further disruptions to energy markets. However, at this time it would be prudent to wait to see how the economy reacts to the recent actions of the Federal Reserve Board and the U.S. Treasury to shore up U.S. financial markets before putting any more taxpayer dollars at risk in an attempt to stimulate economic recovery.

Strategies to Promote U.S. Economic Recovery and Long-Run Growth: What Role for Energy and Climate Change Policy?

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Before the
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Introduction

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

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

Chairman Markey, Ranking Member Sensenbrenner, and the members of the Select Committee on Energy Independence and Global Warming are to be commended for their focus on improving the current sluggish U.S. economy as well as enhancing energy security and reducing the growth of greenhouse gas emissions so as to mitigate the threat of human-induced climate change. The questions we need to ask are first, what policy options will do the most to restore strong U.S. economic growth and second, how do energy and climate change policy fit into the picture? My testimony will address these key issues.

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

Is Further Intervention Needed to Restore Strong U.S. Growth?

The outlook for the U.S. economy is uncertain, credit markets are in turmoil with takeover of Fannie Mae and Freddie Mac, the failure of Lehman Brothers, and the possibility that other large companies may fail. In addition, there is no sign that housing prices have stabilized. Housing prices today are down 16.0% from a year ago and there is a 10-month inventory compared to a normal 6 months' supply. Consumer demand, the major driver of U.S. economic growth, is rising at less than half its normal rate of 3-3.5 % per year. Unemployment rose to 6.1% last month compared to 4.7% last year. The Consumer Price Index rose at an annual rate of 5.4% in August and Gross Domestic Product (GDP) has grown by less than 1% over the last four quarters. Some analysts suggest that the U.S. economy may be entering a period of stagflation (rising prices and little or no economic growth). Another challenge is the rising Federal deficit, which is projected to be nearly 3% of GDP this year. Finally, many of our trading partners such as Germany, the UK, and Japan are close to recession and growth even in boom countries like China, India, and Hong Kong is slowing down. A slowdown in global economic growth makes a U.S. economic rebound more difficult.

A question facing policymakers is whether the U.S. needs an additional fiscal stimulus package in order to "prime the economic pump." One possible course of action is to try to address the fundamental economic problems bedeviling the U.S.: falling housing prices and turmoil in the financial markets which has lead to tight credit for households and businesses.

- **Housing Market Stabilization**

Preventing further sharp drops in U.S. housing prices is key to restoring consumer confidence and economic growth, according to many experts. A new analysis Dr. Jan Hatzius of Goldman, Sachs and Co.(www.brookings.edu/economic/bpea/bpea.aspx) points out that the U.S. housing downturn impacts the economy in four ways: (1) residential construction has declined sharply; (2) declining income in the housing sector impacts other sectors (for example laid-off construction workers and real estate agents cut back on consumer spending, homebuilders and their subcontractors invest less, and so on as the effects ripple through the economy); (3) declining house prices weigh on personal consumption through a negative wealth and/or mortgage liquidity effect; and (4) mortgage credit losses deplete the equity capital of leveraged financial institutions and persuade them to reduce their financial leverage, resulting in reductions in credit to households and nonfinancial businesses.

Breaking this spiral of declining housing prices should be given the highest priority by policymakers, according to experts like Martin Feldstein, George F. Baker Professor of Economics at Harvard and President Emeritus of the National Bureau of Economic Research. In a recent article, Dr. Feldstein notes that 10 million homeowners have mortgages that exceed the value of their homes. For half of this negative equity group, their debt exceeds the value of their house by more than 20 percent. If house prices fall

another 15%, the number of homeowners with negative equity will rise to 20 million. To help stabilize housing prices, Dr. Feldstein proposes a plan of "mortgage replacement loans," which he suggests would stop the downward spiral of house prices (http://www.ft.com/cms/s/0/29e69ebc-736f-11dd-8a66-0000779fd18c.html).

The basic idea is to provide an incentive to stop defaults among those homeowners who have positive equity but are vulnerable to further price declines. Under the Feldstein plan, the federal government would offer every homeowner with a mortgage the opportunity to replace 20% of that mortgage with a low-interest government loan – up to a loan limit of $80,000 – that reflects the government's lower borrowing rate. Creditors would be required to accept this partial mortgage pay-down and to reduce the monthly interest and principal by the same 20%. That mortgage replacement loan would not be collateralized by the house but would be a loan that the government could enforce by lodging a claim on an individual who does not pay. With the mortgage replacement loan, people who now have a mortgage equal to 90% of their house value would see that mortgage fall to just 72% of the house value, implying that it would take a very unlikely price fall of more than 28% to push those individuals into negative equity. By stopping the downward overshooting of house prices, Dr. Feldstein concludes that the mortgage replacement program would help all homeowners, including those who now have negative equity. Limiting the destruction of homeowners' wealth would help to maintain consumer spending, boosting production and employment.

- **Strengthening the U.S. Financial System**

Strengthening the U.S. financial markets and restoring investor confidence should also be a key goal for policymakers. Without access to credit by homeowners and business, strong U.S. economic growth will not resume. The recent actions taken by the Board of Governors of the Federal Reserve, including putting Fannie Mae and Freddie Mac into conservatorship and broadening the types of assets against which financial firms can borrow through its Primary Dealer Credit Facility, should help restore confidence both in the U.S. and abroad.

Longer term reforms such as those outlined in the U.S. Treasury's *Blueprint for a Modernized Financial Regulatory Structure* in March 2008 should also be given serious consideration. Briefly, the short-term recommendations include improvements to regulatory coordination and oversight that regulators can make quickly. The *Blueprint* recommends creating a new federal commission for mortgage origination to protect consumers better. The report also recommends modernizing the President's Working Group on Financial Markets and clarifying the Federal Reserve's liquidity provisioning. The intermediate-term recommendations focus on eliminating some of the duplication in our existing regulatory system, but more importantly they offer ways to modernize the regulatory structure for certain financial services sectors within the current framework. Recommendations include eliminating the thrift charter, creating an optional federal charter for insurance and unifying oversight for futures and securities. The long-term recommendation is to create an entirely new regulatory structure using an objectives-based approach for optimal regulation. The structure will consist of a market stability

regulator, a prudential regulator, and a business conduct regulator with a focus on consumer protection.

What Role Should Energy Policy Play in Stimulating U.S. Economic Recovery?

- **Renewable Energy: How Would Additional Spending Impact U.S. Economic Growth?**

Rising energy costs have played a role in the current U.S. economic slowdown and security of supply remains an important concern for households, business, and government. Some suggest that enlarging the current U.S. effort to replace conventional fossil fuels (coal, oil, and natural gas) with renewables could provide new jobs and help restore strong economic growth. For example, a recent report, "Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy" by The Center for American Progress (CAP) (http://www.americanprogress.org/issues/2008/09/pdf/green_recovery.pdf), states that more expenditures on a variety of programs, including expanding production of wind power, solar power and the next generation of biofuels, would help jump start a U.S. economic recovery. The CAP study estimates that $100 billion in federal spending on green infrastructure would create approximately 2 million jobs within 2 years. CAP proposes to raise the $100 billion by either an increase in the federal deficit or by imposing a cap and trade system on greenhouse gas emissions that could raise between $75 and $200 billion per year.

- **Concerns about the CAP Report**

The analysis omits key factors that could negate its principal conclusions pertaining to job creation. More specifically, the study does not consider the negative economic consequences that would occur from replacing lower cost energy with higher cost energy – a key factor in any analysis of this kind. Furthermore, the report employs questionable use of data and methods in its analysis that further undermines the validity of its results and conclusions.

- **Inappropriate Choice of Economic Model**

The CAP analysis did not employ a macroeconomic model which has the capability to measure the impact of a shock to the economic system of shifting from lower cost fossil fuels for electricity generation to higher cost renewables **(see Figure 1).** A macroeconomic model can measure the impact of an energy price rise as it flows through the whole economy while an input-output model such as that used in by the CAP report is not able to capture the dynamic impact on the economy of increases in factors like interest rates or energy prices. Instead, the CAP analysis uses the U.S. National Input-Output Accounts that are not capable of measuring the dynamic impact of energy price changes.

The CAP report proposes to fund the 100 billion outlay on green projects by either a cap and trade system which auctions the right to emit carbon or by having the U.S. government run a larger deficit. Imposing a cap and trade system to reduce GHGs would raise energy costs and slow U.S. economic growth.

- **Impact of a Cap and Trade Program to Reduce GHGs**

A macroeconomic analysis of the impact of the Lieberman/Warner Climate Security Act (S.2191), which requires a 40% reduction in covered GHG emissions by 2030, released earlier this year by the American Council for Capital Formation and the National Association of Manufacturers showed that by 2014, the total cost of the emission allowances that industry would need to purchase that year amounts to between $73 and $78 billion dollars **(see Table 1)**. The drag of higher energy prices caused by the cap and trade system in S.2191 reduces total U.S. employment (net of new jobs created in green industries) by 850,000 to 1,860,000 jobs in 2014, depending on whether the low cost or high cost scenario prevails (see study at http://www.accf.org/pdf/NAM/fullstudy031208.pdf). Thus, if the CAP "green recovery " plan was paid for by imposing a cap and trade system to raise $50 billion (or more) per year, economic recovery would be slowed, not enhanced. Similarly, increasing the federal deficit by $50 billion per year is likely to raise interest rates which will also slow overall economic and job growth.

In addition, the U.S. government is already spending billions of dollars annually to develop renewable energy. In fact, in FY 2007 renewable energy received the largest amount of federal subsides of all U.S. energy sources **(see Figure 2)**. While we need all types of energy, renewables are not expected to increase their share of U.S. energy production to much more than the current level of 7 percent by 2030, according to the U.S. Department of Energy. Furthermore, the U.S. does not have the trained engineers and manpower to spend additional billions of dollars on renewables productively over a two-year period. Much of the money called for in the CAP's two-year project would simply be wasted. If it is true that the most significant problem facing U.S. homeowners is declining housing prices, it seems unlikely that CAP's proposal to spend large additional amounts of taxpayer dollars on renewable energy projects will address this fundamental issue.

Other Concerns with the CAP Report

- The analysis makes use of questionable data. The study cites that on average, subsidies and incentives to the oil industry add up to $9.0 billion annually. However, the Department of Energy's Energy Information Agency (EIA) reported that during FY 2007 federal subsidies and support to natural gas and petroleum liquids totaled $2.1 billion **(see Figure 2).**
- In terms of electricity production, EIA reported that natural gas and petroleum liquids subsidies were $0.25 per megawatt hour, significantly lower than solar ($24.34 per megawatt hour) and wind ($23.37 per megawatt hour **(see Table 2).**

- For non-electric energy subsidies it is a similar story. The EIA reports that natural gas and petroleum liquid subsidies in FY2007 were equivalent to $0.04 per million Btu. *This is significantly lower than either ethanol/biofuels* ($5.72 per million Btu) or solar ($2.82 per million Btu).

In sum, the results of the CAP study are suspect due to the deficiencies in the analysis as explained above. There is no doubt that increased use of commercially viable renewable energy and conservation should be objectives of U.S. energy policy going forward. However, these objectives are advanced with analysis that does not stand up to close scrutiny.

Accelerating U.S. Energy Efficiency and GHG Reductions

U.S. economic growth and energy use go hand in hand; each 1% increase in U.S. GDP has historically been accompanied by a 0.3% increase in energy use. The U.S. Department of Energy projects that the U.S. will need approximately 19% more energy by 2030 to accommodate our growing population, higher levels of employment, and economic activity.

The development of various high technology programs and new energy efficient investments can be accelerated through government programs as well as by reforms to the federal tax sytem. For example, some policies may be of particular help to taxable entities while others would be of more benefit to cooperatives (which pay little or no federal income tax).

Companies Subject to the Federal Income Tax

The efforts of U.S. industries to increase energy security and efficiency and to reduce growth in GHG emissions are hindered by the slow rate of capital cost recovery allowed under the U.S. federal tax code and by the high U.S. corporate tax rate. As a recent Ernst & Young international comparison shows, the U.S. ranks last or nearly last among our trading partners in terms of how quickly a dollar of investment is recovered for many key energy investments. For example, a U.S. company gets only 29.5.cents back after 5 years through depreciation allowances for each dollar invested in "smart meters," which can substantially reduce electricity use. In contrast, in India an investor gets $1.00 back in 5 years and in Germany the figure is 63.1 cents. (See full report at: http://www.accf.org/pdf/Energy-Depreciation-Comparison.pdf.)

In addition to slow capital cost recovery allowances, U.S. industry faces the highest corporate income tax rates among our primary trading partners. Of the 12 countries in the E&Y survey, only Japan had a higher corporate tax rate than the U.S. Reforms to the U.S. tax code to speed up capital cost recovery allowances and reduce the corporate tax rate would reduce the cost of capital and could have a positive impact on energy sector investment, and help "pull through" more energy efficient, cleaner, less-emitting technologies.

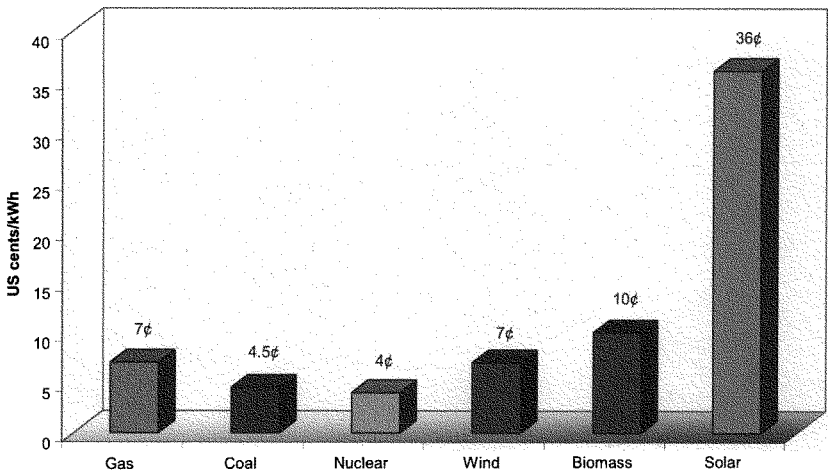
Strategies for Promoting Economic Growth, Energy Security and Global GHG Reductions

Getting the U.S. economy back on track for strong growth in jobs and household income may require policy changes which restore stability to the housing and credit markets and avoid further disruptions to energy markets. However, at this time it would be prudent to wait to see how the economy reacts to the recent actions of the Federal Reserve Board and the U.S. Treasury to shore up U.S. financial markets before putting any more taxpayer dollars at risk in an attempt to stimulate economic recovery. In addition, looking to the next administration, which will take over in January 2009, policymakers need to promote U.S. energy supplies of all types and avoid unrealistic climate change policies. Allowing increased access to both off-shore and on-shore areas for drilling and exploration would also have a positive impact on U.S. energy supplies.

U.S. economic growth and energy use go hand in hand; each 1% increase in GDP is accompanied by a 0.3% increase in energy use. Climate change is a global problem and meaningful reductions in greenhouse gas emissions will require the participation of developing and industrializing countries such as India, China, Brazil, Indonesia, and others whose emissions are growing rapidly. While reducing U.S. GHG growth is a worthwhile goal, it is important to realize that without international participation, U.S. sacrifices in terms of higher energy prices and reduction in energy use will slow our own economy with no meaningful reduction in global GHG emissions.

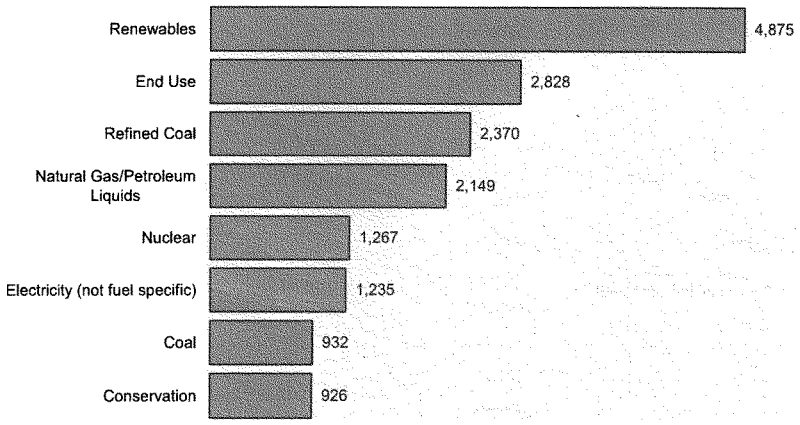
The questions being raised by this committee – specifically linkages between economic recovery, long-run growth combined with the role of energy and climate change policy – are important questions. Finding constructive policies that will create productive jobs for our growing population – while addressing the concern over greenhouse gases at the same time – is a very important policy challenge for this country and it is good those questions are being addressed by this committee.

Figure 1. Cost of Electricity
(20 Year Levelized Costs)



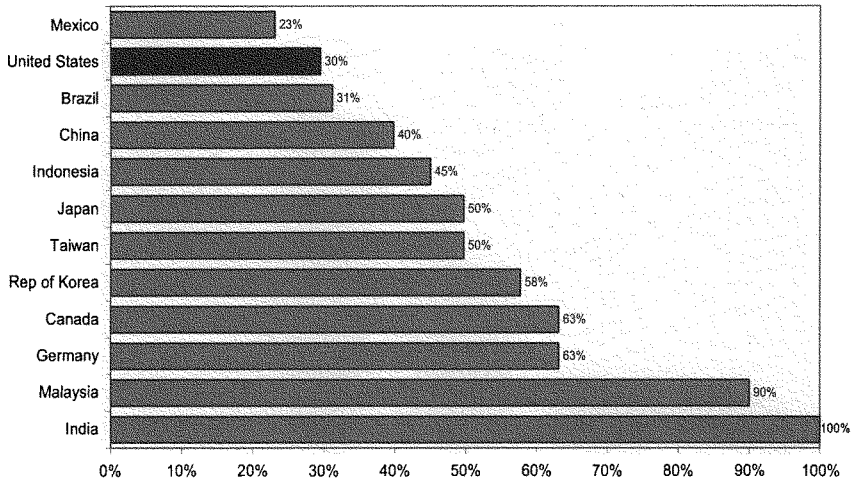
Source: "Hearing on "Unlocking America's Energy Resources: Next Generation," Written Testimony of Victor Abate, Vice President, Renewable Energy, GE Energy, May 18, 2008 (pg 7).

Figure 2: Renewable Energy Received the Greatest Share of Energy Subsidies in FY 2007.
Federal Energy-Specific Subsidies and Support FY 2007



Source: Energy Information Administration, Federal Financial Interventions and Subsidies in Energy Markets 2007 (April 2008)

Figure 3. U.S. Capital Cost Recovery for Smart Meters Compares Poorly with Our Trading Partners
(Percent of Nominal Cost Recovered After 5 Years)



Source: "International Comparison of Depreciation Rules and Tax Rates for Selected Energy Investments," prepared for the American Council for Capital Formation by Ernst & Young LLP, May 2007.

Table 1. Impact of Climate Security Act (S.2191) on U.S. Economic Growth (Compared to Baseline Forecast)

	Low Cost Case			High Cost Case		
	2014	2020	2030	2014	2020	2030
GDP (Billion 2007$)	$ 16,284	$ 19,297	$ 24,043	$ 16,151	$ 19,238	$ 24,005
Loss in GDP (Billion 2007$)	$ 135	$ 151	$ 631	$ 269	$ 210	$ 669
% Loss	0.8%	0.8%	2.6%	1.6%	1.1%	2.7%
Employment (Millions)	150.66	155.53	163.91	149.66	154.94	162.90
Job Loss (Millions)	0.85	1.22	3.04	1.86	1.80	4.05
% Loss	0.6%	0.8%	1.8%	1.2%	1.2%	2.4%
Industrial Output (Billion 2007$)	$ 7,695	$ 7,844	$ 8,002	$ 7,575	$ 7,726	$ 7,904
Loss in Industrial Output (Billion 2007$)	$ 170	$ 200.0	$ 228.21	$ 289.93	$ 317.67	$ 326.09
% Loss	2.2%	2.5%	2.8%	3.7%	3.9%	4.0%
Carbon Allowance Price (2007$ / Ton CO2)	$ 36.69	$ 54.59	$ 227.52	$ 38.36	$ 64.28	$ 271.27
Cost of Purchasing Carbon Permits (Billion 2007$)	$ 77.54	$ 100.37	$ 207.58	$ 77.98	$ 116.02	$ 279.34
Average Household Income (2007$)	$ 97,597	$111,765	$133,368	$ 95,827	$109,578	$ 130,637
Loss (2007$)	$ 1,010	$ 739	$ 4,022	$ 2,779	$ 2,927	$ 6,752
% Loss	1.0%	0.7%	2.9%	2.8%	2.6%	4.9%
Energy Expenditures (Billion 2007$)	$ 1,222	$ 1,372	$ 2,358	$ 1,412	$ 1,637	$ 2,829
Loss (2007$)	$ 164	$ 258	$ 1,038	$ 354	$ 522	$ 1,510
% Loss	15.5%	23.2%	78.7%	33.5%	46.9%	114.5%
Residential Electricity Price (2007$ Cents/Kwh)	10.6	12.2	20.5	10.7	12.7	23.3
% diff	13%	28%	101%	14%	33%	129%
Industrial Electricity Prices (2007 Cents/Kwh)	7.0	8.4	16.0	7.1	8.9	18.8
%diff	21.8%	41.3%	141.5%	22.6%	49.3%	184.5%

Source: "Analysis of the Lieberman-Warner Climate Security Act (S.2191) Using the National Energy Modeling System (NEMS/ACCF/NAM)" (http://www.accf.org/nam.html)

Table 2. Rankings of subsidies and support based on absolute amount and amounts per megawatthour of generation differ widely, reflecting substantial differences in the amount of generation across fuels.

Subsidies and Support to Electric Production by Selected Primary Energy Sources

Primary Energy Source	FY 2007 Net Generation (billion kilowatthours)	Subsidies and Support Allocated to Electric Generation (million FY 2007 dollars)	Subsidies and Support per Unit of Production (dollars/megawatthour)
Natural Gas and Petroleum Liquids	919	227	0.25
Coal	1,946	854	0.44
Hydroelectric	258	174	0.67
Biomass	40	36	0.89
Geothermal	15	14	0.92
Nuclear	794	1,267	1.59
Wind	31	724	23.37
Solar	1	174	24.34
Refined Coal	72	2,156	29.81

Source: Energy Information Administration, Federal Financial Interventions and Subsidies in Energy Markets 2007,
SR/CNEAF/2008-1 (Washington, DC, 2008).

Mr. INSLEE. Thank you all.

I will start, if I can. Maybe I can start with Dr. Pollin, and then anyone else who wants to join in.

I wanted to ask, you, Dr. Pollin, how do you decide how to allocate the strategy between tax credits, loan guarantees, grant programs in the proposal?

Maybe Bracken can address this, too. But what is the rationale for that particular allocation?

Mr. POLLIN. Well, the first rationale is I think there is actually universal agreement that we would like this over time to be primarily focused around the private sector. So the fact that we have the program—the main funding allocation is for tax credit. So that does lower the cost of capital for private business, small business included.

Similarly, the loan guarantee program, the loan guarantee program offers a lot of opportunity for probably relatively low burden on the public fisc because of course the public fisc only pays when loans go into default.

So, then, why do we even have any? We have $46 billion allocated to the public spending. Well, first and foremost, that is the fastest way to generate this recovery program.

Right now, if a measure were to pass, we could get public building retrofits going right now. Number two. And as I said, if we take those estimates of the American Council on Green Buildings, to do all the public buildings in the country would be in the range of $26 billion to $29 billion. We could start that right now in a big way.

Secondly, the public transportation. It is often said, well, if Americans love their cars so much they will never take public transportation. Well, actually, public transportation use has gone up by 5 percent over the past year, obviously correlated with the rise in oil prices. So another measure that we propose is public spending to increase availability of public transportation, lower fares and increase maintenance. So that is the basic mix.

Mr. INSLEE [presiding.] Bracken, did you want to add something to that or not?

Mr. HENDRICKS. I wanted to actually, if I may, just speak briefly to the question of renewable energy and the subsidy that it has received.

There are a number of subsidies that the fossil fuel industry has received consistently over time that are actually not contained in the analysis that Dr. Thorning was referring to. The exclusion of public power, inappropriate treatment of highway funding, exclusion of liability caps, the value of underwriting the risk associated with nuclear power, a range of costs associated to the investments in the Strategic Petroleum Reserve and dealing with fuel cycle costs to nuclear power.

In a whole host of ways there are a number of very substantial investments that have been made in the traditional fossil fuel and existing mature energy industries over time, and these costs I think need to be given full consideration.

I also would like to just point to the fact that renewable energy, when it is brought on line, it provides much greater predictability and stability in energy prices; and that essentially what we are doing is enabling a situation where capital investments can be

made now in new technology that will lock in energy costs and prevent some of the spikes that have been going on. We are at a moment where we have just seen 200 percent increases in Appalachian coal when we are sending over half a trillion dollars in oil imports.

We had an opportunity to invest in the creation of new industries, drive these technologies down the cost curve. It is creating new manufacturing opportunities, new small business opportunities. And these are investments that stay within the domestic economy; and this a fundamental difference with the dollars that are spent on clean, renewable energy than those that are spent on energy imports.

I also would just like to take a very brief moment to comment on the role of energy efficiency. Energy efficiency, which is the bulk of this package, this is 70 percent focused on energy efficiency which drives down the cost for businesses for consumers.

There is an analysis by the American Council for an Energy Efficient Economy, which looked at just a basic suite of energy efficiency programs. And if, in 2001 when the Bush administration came in, they had implemented a full and consistent commitment to achieving energy efficiency across the American economy, today we would have realized $206 billion of energy cost savings as a result of moving these existing technologies into the market. Those are very real cost savings.

So if we are looking at the impacts of costs on the economy, I would put to you that the combination of saved energy costs through energy efficiency and improved stability and reduced volatility of energy prices from renewables are a significant contribution to the American economy. And I just wanted to underscore those points.

Thank you for your attention.

Mr. INSLEE. Thank you. If I can, while I still have the chair, at least in part, I want to ask Mr. Redmond, how does your membership look at these public investments? If I was going to ask them what is a more valuable public investment, $85 billion, loaning it to AIG or putting it into the steel going into everything we want to build.

How would your members look at that issue?

Mr. REDMOND. Well, our members, one of the things that we—or task that we took on as a union was to really educate our members, the workers throughout the AFL–CIO, on the future of the manufacturing sector and how the opportunity to revive the manufacturing economy in this country has come through the establishment of creating a green economy.

I think that workers throughout this country, not just in my union, but workers generally in manufacturing, understand that the need to—that the possibility not only to do a fundamental, humane—we have a fundamental, humane responsibility to leave a clean planet for our children.

Also, with these new technologies, it is going to revitalize the manufacturing base in this country. If you were to pose the question of investing in AIG in terms of investing toward a green economy, then I think the majority of workers in this country would choose investment, particularly in manufacturing, toward a green

economy, because these are jobs that can't be outsourced, these are the type of jobs that can't be lost to insufficient trade agreements and these are jobs that provide a very, very critical responsibility that we have to our children and to our planet. And I think that more and more American workers are becoming aware of that fact.

And it is not just directly related, as the example that I gave you with steel companies, it is not directly related toward a green economy. But it is the aspects that go into the green economy and the amount of products that are going to be needed in order to make that become a reality.

Mr. INSLEE. I thank you.

And of course the good news is, a couple days ago we passed a bill that will move many of the things forward that this report talks about, and we have got some more work to come.

Thank you very much.

The CHAIRMAN [presiding]. The Chair recognizes the gentleman from Missouri, Mr. Cleaver.

Mr. CLEAVER. Thank you, Mr. Chairman.

Dr. Pollin, I was very interested in your comments and in your submitted report with regard to the economy and the subject matter today. I was not—I was ambivalent on the stimulus package that we approved for a variety of reasons. In my real life, I am a United Methodist pastor, and I knew what was going to happen when people received those checks. They were not going to go buy new big screen televisions or refrigerators, all the things I heard here in Washington. I knew what they were going to do. They were going to put the extra money on their MasterCard payment, make a house payment, and that money was not going to turn over in the economy.

Because I deal with real people, I asked Mr. Bernanke—I am on the Financial Services Committee. I asked Mr. Bernanke whether we needed another stimulus package when he appeared before our committee about 6 weeks ago; and he said that it remains a question that there may be a need for what I had said to him, "stimulus 2."

Do you believe that if we had a stimulus package—I mean, you were saying you didn't think we needed one. But let us assume that all the smart people conclude that we do need a stimulus package—you know, the people who tell us what we ought to do because they are smarter, who appear before the Financial Services Committee—and we decide to do it. Would it be a good idea if we used that money to get a jump start, as a launching pad for creating the 2 million green jobs that I think we all—at least the panel and the two members of this committee remaining—believe that we will be able to create?

I mean, let us take, for example, natural gas. If we created central fueling places in cities where natural gas could be used or—there are cities who are in need of infrastructure projects. If we can create green source systems, as we think we are going to do in my community in Missouri, in Kansas City, Missouri, and really begin to do this now instead of its being some futuristic goal; that if we have a stimulus package, could we not do two things at once—stimulate the economy and give a jump start to the creation of a green economy?

Ms. THORNING. A very thoughtful question. And of course I have the highest respect for Ben Bernanke's analysis. And in fact I would tend to agree that we might need a stimulus package, but I think it is premature. And I think if we do need one there would be better ways to deploy $100 billion than trying to force it into alternative energies like solar, wind, photovoltaic, that are very expensive, that we have been funding.

I was at the Department of Energy almost 30 years ago. I know I look too young for that.

Mr. CLEAVER. You do, you actually do.

Ms. THORNING. But I was there 30 years ago, almost 30 years ago, and we were funding these projects very heavily back 30 years ago. So these types of energy we hope some day may be commercially viable, but I think they are not there yet.

Solar, for example, we can't store it; it is only practical in certain situations. Wind has to be backed up by conventional fossil fuel, so the cost of wind is really double the cost in my testimony.

So if I had limited taxpayer money, I would try to focus it on the most—where you get the most bang for the buck. And I think—as I say in my testimony, I think it is premature to decide whether we need to spend even more taxpayer money to stimulate the economy.

I think we ought to wait and see what may happen to financial markets, and then if the housing market doesn't begin to rebound, if I were going to spend some money, I would spend it on a plan like Martin Feldstein has put forth to try to keep people in their homes. People who are fighting to stay in their homes aren't going to be interested in insulating their house and that sort of thing, they are going to be trying hard to make the payments they need to stay there.

So I would keep an eye on the economy—and your committee, I know you are doing that—and I would wait to see if by the next 2 or 3 months things aren't improving. But then I would take a look at how to help housing, because that is our central problem and that is the reason we have had so much turmoil in U.S. financial markets, which unfortunately now has spread to many of our trading partners.

Mr. CLEAVER. But—it is not a but; I agree, and I guess most of the experts agree that to solve the housing problem is to at least begin the healing of the economy.

And I agree, we had 300—I think 300,000 first steps toward additional foreclosures last month. I can't remember the exact figures, 320,000, which means that this crisis is far from over. And there is no reason to believe that we are—that, as many are saying, let's keep the free market, it will correct itself, leave everything alone, anybody who invested in products that were not sound will pay for it and they won't do it again and everything is glorious, and we all sing Kumbaya.

The truth of the matter is, I don't know if we can get a hand around the housing market. We have reinvigorated FHA. We beefed them up. FHA only had about 3 percent of the market, and now it is going to become a viable option for people buying homes.

We increased—we are now allowing jumbo loans, some $600,000. I think we are doing things that we think are going to help. We

thought Fannie Mae—in fact, we thought that was going to be a help as well, Fannie Mae and Freddie Mac.

But maybe if we are talking about homes in the poor sections of towns, of cities, people might be better able to keep their homes if their homes were better insulated. I mean, if you look in the colder regions of the country, people are heating up their front yards and back yards and little areas over the roof because of how energy inefficient homes are.

I am not Pollyanna, but I really wonder about losing this opportunity where perhaps there is a convergence of two things, the need to get the economy rolling again and the need to do, I think, a first step toward a green economy.

Ms. THORNING. Well, if I could just say one more thing, of course we all want to see more energy efficiency as new houses are built. It is a question in my mind of what is the most best way to use taxpayer money, because this is our taxpayer money we are talking about. And if you try to accelerate what is already going on, which is considerable work on renewables and new initiatives in that direction, the Federal Government spending lots of money, as are States; and of course the renewable portfolio standards also accelerate that kind of transition.

But one of the earlier witnesses mentioned the German economy with 1.4 million workers employed in green energy and 44,000 in the wind energy business. I think we ought to take a look at how the German economy has performed. In recent years, since 2003, the German economy has grown on average at 1.2 percent a year, and their unemployment rate has averaged 9.6 percent a year.

I think one reason the German economy is struggling and so sluggish is that they have very stringent environmental requirements, including trying to meet the Kyoto Protocol targets to reduce their greenhouse gas emissions; and they have directed a lot of their taxpayer money into very costly renewable energy. So it may be that the 44,000 German workers who are making windmills are doing fine, but 9.6 percent of their population is out of work and their economy is really in the doldrums.

So I think, as an economist, I want the most bang for the buck. I want to achieve the best we can for all of our people. And if 10 million people are under water on their mortgages right now and if 20 million more home owners—if 20 million would go under water if housing prices fall another 15 percent, that is the most serious challenge we will face since the Great Depression. People who are owing more on their house than it is worth simply have very little incentive to stay in it.

We will never break this downward spiral if we don't focus on stabilizing housing prices. So I believe while many of the goals are quite worthy in the CAP report, I think their analysis is fundamentally flawed because they used an inappropriate model. And I don't think we would see a net gain of 2 million jobs; I think we would see loss of jobs in other sectors as prices rose.

And, of course—so, on balance, I think we need to hold back and wait and see how the economy is going to do; and then, if it isn't improving, put the resources into our fundamental problem, which is falling housing prices.

Mr. CLEAVER. Thank you.

The CHAIRMAN. The gentleman's time has expired.

Let us just have a brief discussion if we could about efficiency. Let us leave aside renewables for a second. Let us just focus on efficiency.

Is it worth it to invest in efficiency? Do we get a big payback from moving that way? Is the short-term investment almost inevitably rewarded by a longer-term benefit to the individual, to the company, to the country?

Dr. Pollin, could you deal with that question?

Mr. POLLIN. Well, the short answer is "yes." The efficiency gains, as I documented and discussed, are very straightforward. We are using known technologies. We aren't thinking about futuristic technologies.

We know that we can deploy workers because a lot of it is construction jobs. We know that 600,000 or so construction jobs have been lost over the last year. We know we can start these things immediately. We don't have to engage in land purchases, designing projects for infrastructure and so forth.

So the answer is a very straightforward "yes."

The CHAIRMAN. Okay.

Dr. Thorning, what do you have to say to Mr. Pollin?

Ms. THORNING. I think energy efficiencies ultimately are very desirable. The question is how fast do we get it and who pays for it.

The U.S. economy, if you look at the DOE data, is getting more energy efficient by about 1.7 percent every year. Each dollar of GDP is generated with less energy every year. So we are making good strides in that direction.

The question is, what is the best way to accelerate it. And as I mentioned, if we could take a look at the U.S. Federal Tax Code—and, for example, smart meters, which communicate between the electricity company and the customer, are depreciated real slowly here in the U.S.

The CHAIRMAN. Good. That is what I am saying. Let's agree on that. Let's agree that we are going to work on it.

We will put together a package that you, Dr. Thorning—it is called the Pollin-Thorning plan to invest in energy efficiency all across the country. And we could do that, don't you think?

Ms. THORNING. But the question is, how much taxpayer money goes into this?

The CHAIRMAN. How much does the taxpayer save as a consumer? If you think of the taxpayer as a consumer then, you know, I see Mr. Hendricks; he looks at this $9 billion tax break that the oil and gas industry gets each year. Well, obviously, the same consumer is actually subsidizing the oil and gas industry as they are getting tipped upside down at the pumps.

So they are one and the same, right, the consumer and the taxpayer, when it comes to this whole energy sector?

So could you deal with that, Mr. Hendricks, in terms of the relationship that exists between the incentives that are given for one, as opposed to the other, that is efficiency?

Mr. HENDRICKS. Well, that is an excellent point. It is something that we document in the report.

I mentioned earlier the difference in household expenditures. When a traditional stimulus is spent just to encourage consump-

tion, 23 percent of that money flows out of the economy. If you invest in energy cost savings in an infrastructure, only 9 percent flows out of the economy. So that basically is money that stays within local communities.

In addition to the sort of investments that we are talking about on improved transit spending. Dr. Thorning mentioned the smart grid. The economic benefits of improving our grid infrastructure are very, very substantial, and they cascade throughout the economy because they make the economy, as a whole, function more efficiently.

I believe the Pacific Northwest Laboratories estimated the benefit at about $80 billion over 20 years of moving to a smart grid that has these kind of real-time pricing and abilities to manage and optimize proficiency. RAND Corporation estimates that at about $100 billion. That is very, very substantial new investment.

If you look at how transit spending cascades throughout a community, you are making job access easier for working families, you are saving money that consumers would otherwise be spending on oil imports, and you are improving quality of life overall. So you are creating opportunities for new economic development that are very substantial.

And the efficiency of our economy, we use about twice as much energy for every unit of GDP as our closest direct economic competitor. That, in itself, is a competitive disadvantage that we need to address. This is a chance to do it in a way that is also going to create benefits and growth.

The CHAIRMAN. I agree with you 100 percent, Mr. Hendricks. That is the model that we have to go to.

Mr. Redmond, let me go over to renewables here for a second. Somebody told me that it takes 26 tons of steel to build one wind turbine, 26 tons of steel.

Now, that seems like a lot of jobs here in the United States, that seems like a lot of new opportunities for our country. And Dr. Thorning doesn't think that wind is yet efficient enough as a competing source of electricity, but the cost is certainly plummeting almost the same way that the cost of what we did when we got the policy—we had the policy wrong on cell phones. Going into 1993 we had analog, and we only had two companies doing it; and it was 50 cents a minute, and very few people had cell phones.

But then, in 1994, the committee that Mr. Inslee and I served on, the Energy and Commerce Committee—I was the chairman of Telecommunications—we moved over 200 megahertz of spectrum and didn't let the first two companies bid on it. The third, fourth and fifth company that bid in each market then went digital and they lowered the price down to under 10 cents a minute, and now there are more cell phones than there are Americans, because you just changed the model.

So if you predict the future by looking at today, you are going to have a very real problem. You have to have some confidence that this technology is going to come down and there will be a transition period.

Talk to us a little bit about that and how it impacts the steelworkers and other blue collar workers across the country.

Mr. REDMOND. You are right, the number that we got is more like 20, 28 million pounds of steel.

The CHAIRMAN. Twenty-eight tons of steel?

Mr. REDMOND. Twenty-eight tons of steel could go into the building of—construction of one windmill. And the two largest domestic steel companies in the United States, which are U.S. Steel and Mittal Steel, have been actively pursuing that market. But the markets do not exist here in the United States.

We have had relationships with—I spoke in my report about Gamesa, which is a Spanish company, which this week is over in Canada because the Canadian Government is very, very interested in this sort of technology.

But the two largest steel producers here in the United States are tuned up. They are ready to go. The building trades throughout the United States are investing within their training centers in order to teach workers, and they have been doing educational courses to train dislocated workers in this sort of technology. So the infrastructure is there with the steel companies in the American workforce to capitalize and take advantage of this.

The CHAIRMAN. So if we had a national renewable electricity standard, if we mandated that 15 percent of all electricity by 2020 had to come from renewables, what would that mean for the steelworkers? What would that mean for other workers across the country?

Mr. REDMOND. Well, it would be huge, not just for steelworkers. But with that sort of renewable standard, I mean, it would also have a boom in the construction industry. It would employ and generate the need and the capacity to train and employ thousands of electricians and people within the building trades.

And the capability is there. The irony of this is that competing markets are coming to realize the necessity for us to go in this direction. And the disappointment to working families and to the American labor movement is that the U.S. Government and the corporations of the United States and—the investment is not just there. We haven't totally grasped upon this model where, if we don't feel we are going to grasp behind it soon, we are going to be left behind in this sort of technology.

The CHAIRMAN. Thank you, Mr. Redmond.

Dr. Pollin, Dr. Thorning points to the Lieberman-Warner climate change bill as a good example of why legislation in this area of controlling global warming is way too costly and will kill the economy.

How do you respond to that?

Mr. POLLIN. Thanks very much. And thanks for the opportunity to address this point, because Dr. Thorning has made a couple references to the inappropriateness of the model we used to estimate the employment.

Our model is a very simple model; I acknowledge that, and in fact I endorse it, obviously. Whatever we do within any modeling, you have to assume things, you have to build in assumptions; and my model has an absolute minimum number of assumptions. And the basic findings that fall out of it are that you are going to get a lot of jobs because of the increased labor intensity and the domestic content. That won't go away no matter how much we complicate the model.

Now, by contrast, the model that Dr. Thorning has referred to is full of hidden assumptions that she makes no reference to. And in fact I have the full paper here. It is very unclear what the references are, and I won't go through all of them; but I want to get to the punch line, the conclusion of their model where Dr. Thorning says that this is going to have serious negative consequences with Lieberman-Warner, and they know that because of the general equilibrium model that they have built.

Well, if you turn to page 12 of her testimony that shows the model and the results—and I am only going to refer to the high-cost case. So we see the GDP estimate of 2,014 is 16,100—I mean, 16.1 trillion and so forth.

I want to break that down just so we understand what is really in this model. It is very important to understand this.

They begin with the 2005 level of national income, which is 12.4 trillion; and then they have a baseline case without Lieberman-Warner. Without Lieberman-Warner, you come out with 16.4 trillion. With Lieberman-Warner, high cost case, you come out with 16.1 trillion. It is the difference between a growth of 32 percent versus 30 percent, almost indiscernible. And I want to break this down further so it is clear, put it in terms that are real for people.

Per capita income in 2005 is $41,300. And if we move their model—I am not even going to get into my criticism of the hidden assumptions; I am saying let's go with their conclusion. This is their conclusion that she was just referring to.

Under the baseline situation—so we start at 2005 at $41,300. Their baseline estimate for 2014, without Lieberman-Warner, is $50,930; with Lieberman-Warner, it is $49,900. Again, almost indiscernible from their own model, from her testimony, okay? And that takes no account of these factors that I was referring to, the increase in labor intensity, the increase in domestic content, the reduction in fossil fuel expenditure and a solution to global warming.

The CHAIRMAN. Dr. Pollin, thank you for that answer. And I might note how proud we are in Massachusetts. You are University of Massachusetts. Thank you so much for being here.

Mr. POLLIN. I love UMass. Thank you.

The CHAIRMAN. And I love UMass, and I love the fact that you are from UMass. And by the way, I also love the Boston Celtics; I love them with every bone in my body.

But I would like to note that we are honored to have your mother and father in the audience, the owners of the Washington Wizards, Abe and Irene Pollin, sitting right over here in the front row. And we are very proud to have them here with us today as well.

And I can understand your split allegiance on that.

Mr. POLLIN. No, not split.

The CHAIRMAN. No, I mean, you like UMass, but not the Celtics. I know there is no love for the Celtics in your entire being. That I know.

And let me go to you, Mr. Kennard, in terms of the small business aspect of this and the benefits that flow from the construction and efficiency industry investments. Could you deal with that question for a second?

Mr. KENNARD. On energy efficiency, I would like to point out that there are 27 million small businesses; they are half of the economy,

and getting them made energy efficient doesn't require anything in the way of taxpayer support.

If these businesses become energy efficient, they save money, they cut their energy bills. The hang-up is getting the information to them about the availability of practical, affordable operations for new lighting or whatever. And the difficulty has been getting their attention, because small business owners have many responsibilities and haven't focused much on energy costs. They have assumed they can't do anything about it. That is changing now because soaring energy prices are compelling small business owners to pay attention.

There have been recent polls. Energy costs have displaced health care costs as a priority concern for small business owners. So they are really now taking it seriously. So the point is to get them the information and say, hey, you can do this now; you don't have to wait on government or the utilities or anybody else, you have got options now that will save you money.

The CHAIRMAN. Thank you, Mr. Kennard. My time is expired.

The Chair recognizes the gentleman from Washington State, Mr. Inslee.

Mr. INSLEE. Thank you. I think I have one question.

Dr. Thorning, in your assessment did you factor in the damage to the economy that would be occasioned by global warming if it is not restrained?

Ms. THORNING. That is an excellent question.

Our study did not try to measure the harm that might ensue if global emissions don't fall. None of the other studies by EPA or EIA do that either. However, EPA released a study right after our study was released, looking at Lieberman-Warner, and they also analyzed the impact that would occur if the U.S. met the Lieberman-Warner targets to reduce emissions by 40 percent by 2030 and by 60 percent or so by 2050.

EPA's analysis showed that unless China and India and other developing countries also got on a sharp path to reduce emissions that, by 2050—by 2100, global concentrations of CO_2 would be only 2 to 3 percent less. They would drop from about 730 parts per million to 727 parts per million.

So EPA concluded that Lieberman-Warner would have no beneficial impact on the global greenhouse gas situation unless other countries participate. So that is something that needs to be kept in mind as we try to see how to cost effectively reduce greenhouse gas emissions.

I would also like to address the points that Dr. Pollin made when he stated that the ACCF/NAM study was full of obscure assumptions. I would like to direct your attention to page 6 of the study where all the assumptions are laid out. And our study was one of the first to really spell out what assumptions were used when SAIC ran the NAM's model, the Department of Energy's own model.

So we didn't hide a thing. And when you use realistic assumptions about how quickly nuclear power generation can come on line and how quickly carbon capture and storage can occur and what the construction costs for new generation are, you get results simi-

lar to us. EPA's scenario number 7 came up with the same results as ours did. They constrain nuclear constrained carbon capture.

So I think it is inescapable that near-term targets and timetables to reduce carbon emissions, to switch away from fossil fuel to other types of energy would have a drag on the economy. And with respect to the question about the economic consequences of a bill like Lieberman-Warner, I do direct you to page 12 of the testimony where we show the absolute change compared to the baseline in household income, which is very substantial over the three time periods we looked at, as well as the employment impact. And that impact happens because energy prices have to rise sharply to meet these targets.

Mr. INSLEE. Dr. Thorning, excuse me, you have answered six questions so far I haven't asked. We do have some time constraints.

I just have to say that it is always interesting to me when those who want to prevent America from solving global warming come to talk to us, they always ignore the fact that we will have economic costs associated with inaction. And they come and they urge us to do nothing and forget the fact that doing nothing will cost the U.S. economy millions of jobs and billions of dollars with the reduction of our agricultural output, our mitigation costs, changes in our infrastructure and health costs associated with a rising potential of infectious diseases.

And it is amazing to me that economists will come to us and just totally ignore the costs of inaction. That is one point I want to make.

Second, it is also amazing to me that people come, economists will come and say that if we do investments in new technologies that are not incumbent industries with millions of lobbyists running around Washington, DC, those costs are going to ruin the U.S. economy; but we can go ahead and do the costs for the incumbent industries that do have millions of dollars of lobbyists running around Washington, DC, like the coal and the nuclear industry. Those costs are just hunky-dory. I find that very interesting and shocking, but that is life.

Mr. INSLEE [presiding]. And with that, I would like to adjourn this committee hearing. And I want to thank all the witnesses for joining us in this important discussion. We look forward to great progress. Thank you very much.

[Whereupon, at 4:24 p.m., the committee was adjourned.]

RESPONSES TO QUESTIONS FROM COMMITTEE MEMBERS:
SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

Responses by
Dr. Robert Pollin
Professor of Economics and
Co-Director, Political Economy Research Institute (PERI)
University of Massachusetts-Amherst

November 7, 2008

1. ***What is the single most productive action that Congress can do to stimulate the economy?***

By "productive action," I will assume you mean what can do the most to bring the economy out of recession, while also helping to create, in the long-term, more economic opportunity, higher productivity, greater stability, and a low-carbon environment. There is no single action that, in itself, best promotes all of these ends. That is why I support a stimulus that includes a large share of green investments but also expanded spending in other areas—including revenue sharing for state and local governments, which then end up supporting education, health care, child and elder care, and public safety. I am sending as an attaching an article I published in the current issue of *The Nation* that covers these issues. But I would also add now that green investments, especially in areas that will increase energy efficiency, offer a unique combination of benefits: 1) relative to other spending areas, this generates a large number of jobs per dollar of spending; 2) some green investments will also promote productivity, such as mass transit and a "smart grid" electrical transmission system; 3) they also will play an important role in fighting global warming.

2. ***Do you support including additional spending for the nuclear industry as part of a carbon-free portfolio?***

I do not support additional spending for the nuclear industry. Nuclear power has major drawbacks. The waste storage issues haven't been adequately resolved, and may never be. There are also unavoidable dangers associated with nuclear energy, even after we allow for the effective implementation of all available safety precautions. Building a new generation of plants would be hugely expensive, draining funds that could otherwise be available to promote renewable energy. The investment projects would be highly capital intensive, generating less than 25 percent the number of jobs per dollar of spending as investments in energy efficiency. And finally, if we are going to provide large-scale investment funds to promote new energy sources, why shouldn't we use the funds to advance the best long-term solutions to our energy problems, which are energy efficiency and renewables?

3. ***Many analyses studies show that imposing limits on carbon emissions will slow U.S. economic and job growth. How can imposing a cap and trade system to reduce GHG emissions which would tend to cause households and businesses to substitute more expensive renewable energy for lower cost fossil fuels have a positive impact on the economy?***

As I discussed in my testimony before your committee on September 18, the negative effects on GDP of cap-and-trade measures, as predicted by well-known computable general equilibrium models, such as those generated by the American Council on Capital Formation, are actually quite negligible. Moreover the negative effects they do show are *not* net of any benefits to the economy obtained through reducing GHG emissions. The ACCF model also does not take any account of the increases in labor intensity and

domestic content of investments that would occur through green investments, as opposed to fossil fuel spending. These factors will mean more jobs per dollar of expenditure on energy.

4. ***Did your model include the lost revenue and consumer spending that would result from higher energy prices? When households spend more money on renewable energy, how is other consumer spending influenced?***

As I discussed in my 9/18/08 testimony, 70 percent of the new investment spending I propose would be focused on increasing energy efficiency. These investments will produce lower levels of energy expenditure, and thus increased opportunities for consumer spending in non-energy areas. Investments in renewable energy should be focused on making these energy sources cost competitive with fossil fuels. Dramatic strides have already been made toward that end—some renewable sources, such as wind, are starting to achieve competitiveness with traditional coal, natural gas and oil. Moreover, one must always keep in mind that in comparing energy prices, the prices of fossil-fuel energy sources do not, to date, take account of the environmental costs of emitting GHG into the atmosphere.

5. ***You note the loss in construction jobs due to the housing downturn. How would a policy to stabilize the housing market decrease the need for additional government spending?***

A policy to stabilize the housing market would generate important benefits: 1) As noted above, it would counteract the losses of construction-industry jobs that have been experienced over the past two years; 2) It would stabilize the value of the most important single asset for most home-owners; and 3) It would counteract the losses to families, communities and financial institutions of people being forced from their homes. At the same time, the financial market crisis and recession have now moved well beyond the housing industry alone. A much broader set of initiatives is needed to reduce the severity of the recession.

6. ***In your testimony you commented that using the same model, you could compare job creation in alternative areas of spending, such as the oil industry or on household consumption. Did you look at other sectors in which to spend the money? Would the money be better directed towards shoring up the housing industry?***

The expenditures we include on home retrofitting do include spending within the construction industry. In my model, I do look at other spending targets as well, including the military budget, education, and health care. In my article for The Nation, I summarize some of these findings. I also am attaching another, related article, "The U.S. Employment Effects of Military and Domestic Spending Priorities," which covers in some detail education, health care, and military spending as well as mass transit and home weatherization/infrastructure. Returning to the issue of the housing industry, as I mentioned above, there are certainly actions that could be taken to limit the threat of foreclosures for many homeowners. But these are not a substitute for a broad program to create jobs in an efficient way, and also take seriously the need to begin reducing GHG emissions.

7. ***If the return on efficiency already exists for home upgrades, why should the government pay for the upgrades? Shouldn't the market set the return and drive money into the efficiency sector?***

Investments in home retrofits will have significant social benefits, beyond the benefits to the individual homeowners themselves. That is, raising energy efficiency will reduce GHG emissions and will be a major source of new job creation. These social benefits—which cannot be captured by individual homeowners themselves—justify government subsidies to encourage a higher rate of overall spending in these areas. That said, it is also true that in the longer run—after the recession has been passed—it is likely that high levels of spending on retrofits can be achieved through relatively low levels of government subsidy. We discuss this issue in some depth in an appendix to Green Recovery.

8. ***How would you allocate the $46 billion in direct government spending? What sort of formulas would you utilize to ensure the funding reached the areas that demonstrated the most need for the funds?***

The formula we used in Green Recovery was to allocate the funds equitably across all states of the U.S. The spending allocation per state is weighted according to two equal criteria: the relative populations of each state; and the relative share of total U.S. GDP generated by each state. This formula takes account of two basic considerations—equal shares of government support for all people; and recognition of different levels of economic development and activity within different states. There may be some justification for some states to receive funds based on additional considerations. However, in my view, to the extent possible, I believe a simple and equitable allocation approach is likely to yield the most fair results.

9. ***You state the case for investment in renewable energy and efficiencies to be a part of a stimulus, yet you also say, "over time, these expenditures would be covered primarily by the implementation of a carbon cap-and-trade program." Is it your intention to make these programs permanent or are they temporary programs to reinvigorate the economy?***

I believe these measures should represent major long-term initiatives to promote the transition of t he U.S. into a clean energy economy. These programs therefore have both short- and long-term justifications.

10. ***Since about 30 percent of U.S. households don't pay federal income tax because their taxable income is below the threshold in the current tax code, how much spending on retrofitting houses would a new tax credit generate?***

I haven't yet worked through the details of how best to structure a combination of loan guarantees and tax credits to generate the desired effects on individual family homes. We do consider in the study ways to create incentives for utilities and other potential intermediaries to undertake home retrofits on a basis that would be profitable for them. Another issue to consider is how to encourage landlords to undertake retrofits and share the energy savings they receive from government incentive programs with their tenants. Still, these initiatives are not likely to yield immediate action, as is needed to fight the recession now. That is why, within the short-term horizon, our proposal focused more on retrofitting public buildings, where action could be taken immediately through the allocation of public funds. As we report in *Green Recovery*, we estimate that there is about $26 billion in retrofits that could be done now on government buildings, schools and hospitals.

11. US DOE EIA data show that the subsidies provided to the oil industry in 2007 was $2.1 billion, not $9 billion as stated in your testimony. Renewables received $4.9 billion in subsidies in 2007. Where did the $9 billion come from?

The relevant passage in *Green Recovery* reads as follows: "Over the longer term, the government could generate in the range of another $6.6 billion annually by eliminating domestic subsidies that are now funneled to the oil and gas industries," (p. 16). My 9/18/08 testimony includes this sentence: "An important additional source of funds would come through eliminating the nearly $9 billion in federal subsidies and incentives now provided annually to the oil industry," (p. 9). The difference between these two figures is in my 9/18/08 testimony, I included $2 billion in estimated subsidies for foreign operations in addition to the roughly $6.6 billion in domestic subsidies.

Why the much larger discrepancy between the EIA estimate and the ones I reported? There are a number of difficult accounting issues involved in generating an accurate figure for total subsidies to the oil and gas industry. Here is a summary analysis of the main factors:

The 2007 Center for American Progress study by Podesta, Stern, and Batten *Capturing the Energy Future* estimates that eliminating subsidies for oil and gas would generate "more than $6 billion annually over 10 years," (2007, p. 36). This figure is about three times larger than the $2 billion per year estimate reported by the U.S. Energy Information Administration (EIA), working from U.S. Treasury estimates of existing tax benefits. A wider range of organizations and researchers have also examined the question. Most of them have concluded that the total value of government subsidies for fossil fuel producers is even larger than that suggested by Podesta et al.

The Podesta et al. estimate is basically in line with the figure generated by the Joint Congressional Committee on Taxation, in their estimate of the total value of federal tax expenditures. A study by Friends of the Earth (FOE) has generated a similar figure for total subsidies. The FOE figure takes account of tax expenditures along with other forms of subsidies, including royalty relief, research and development subsidies, and accounting gimmicks. According to the FOE, total oil and gas subsidies for 2006 – 2010 is scheduled to be around $32.5 billion (in 2007 dollars). This amounts to an average of $6.5 billion per year.

Why are the differences so large between the EIA/Treasury and those figures derived from the Joint Taxation Committee, including Podesta, Stern and Batten, and the FOE? To summarize, considering both sets of figures for the five-year period 2006-10, the differences amount to five basic factors:

1. Divergent estimates of identical tax expenditures--$3.2 billion difference. Both the EIA and FOE provide estimates of six different categories of tax expenditures. The FOE figures, drawn from the Joint Committee on Taxation's estimating model, are consistently higher than the estimates coming from the U.S. Treasury, and included in the EIA estimates. For these six tax expenditure categories, the EIA estimate is $9.2 billion for 2006-10, while the FOE estimate is $12.4 billion.

2. Differences in Tax Expenditures included--$3 billion difference. There is one category of tax expenditures included in the EIA estimate, valued at $819 million over 2006-10 that is not included in the FOE estimate. The FOE estimate includes four categories of tax expenditures, valued at $3.8 billion, that are not covered by the EIA.

3. Royalty relief--$9 billion difference. The EIA estimate includes no provisions for royalty relief. By contrast, the FOE estimate includes $9.8 billion for 2006-10 for deep water royalty relief. Additional royalty relief is included in the Energy Policy Act of 2005 (EPACT), but neither the EIA or FOE studies estimate the likely size of these subsidies.

4. R&D Subsidies--$1.9 billion difference. The EIA estimate does not include any figures for R&D subsidies, while the FOE figure totals to $1.9 billion over the five-year period.

5. Accounting gimmicks--$4.4 billion difference. The EIA estimate doesn't address this, while the FOE estimates that the oil and gas companies receive $4.4 billion in benefits over 2006-10 because they are able to use Last-In/First-Out (LIFO) accounting to reduce their reported taxable profits.

11/17/2008

Byron Kennard's responses of the Center for Small Business and the Environment to questions posed by the Select Committee on Energy Independence and Global Warming,

(1) What is the single most productive action that Congress can do to stimulate the economy?

Congress should start by acknowledging that small business is the engine of the American economy and that it holds the key to much of the recovery.

- ***Job Creation:*** The record is clear: for decades small businesses have created virtually *all* net new jobs. According to the U.S. Small Business Administration, small businesses have generated 60 to 80 percent of net new jobs annually over the last decade. In the most recent year with SBA data (2005), small businesses created 979,102 net new jobs, or 78.9 percent. It follows that if new jobs – including *green* jobs – are to be created, small business will have to create them. A huge added benefit is that small businesses can respond in "real time" to the challenge.

- ***Clean Energy:*** Today, innovation is the main driver of new wealth. Here again, small business plays a central role. This community produces fully two-thirds of all innovations, including most of the innovative clean energy technologies now entering the market. Eighty percent of clean tech companies are small.

The Single Most Productive Action: The present crisis presents an opportunity to get capital *now* to small businesses so they can create jobs *now,* starting with the next stimulus package. The swiftest path to this end is through presently-existing, presently-funded Federal programs that have already been authorized by Congress to assist small businesses.

These programs include SBA loans, Small Business Innovation Research (SBIR) grants (all agencies), USDA Rural Utility Service and Farmers Home Loan Administration loans, Department of Energy Loan Guarantees, DHS State Grants, the Energy Star Small Business program and DOE/EPA State Grants. We should aim to orchestrate these programs with State Grant programs that are also already funded, and we should do so in a short-term, focused way.

These programs could assist large numbers of small businesses by immediately enabling them to lower energy and water use, thereby lowering operating costs.

Thus, we strongly recommend that these programs be directed to prioritize small businesses and green businesses as their near term recipients.

This initiative should target (a) small businesses seeking increased energy efficiency; (b) small businesses seeking energy independence through use of renewable energy micropower devices and distributed generation; and (c) small businesses that have green products or services and that need funds to expand.

We recommend directing these resources to the energy efficiency, renewable energy and micropower industries because they are trying to scale-up, lower costs, and improve delivery chains to their growing customer base. These resources will nurture the green energy/small business sector enabling it to meet expanding market demand.

(2) Do you support including additional spending for the nuclear industry as part of a carbon-free portfolio?

The Center for Small Business and the Environment takes no position on this. We focus only on issues where the interests of small business and environmental protection strongly converge.

(3) Many analyses show that imposing limits on carbon emissions will slow U.S. economic and job growth. How can imposing a cap and trade system to reduce GHG emissions which would tend to cause households and businesses to substitute more expensive renewable energy for lower cost fossil fuels, have a positive impact on the economy?

The Center for Small Business and the Environment has no position on this. However, Scott Sklar, a member of our Federal Policy Task Force, offers this comment:

"The question is based on misconceptions. Energy efficiency and certain renewables are absolutely cost effective today, such as insulation, double and triple pane windows, solar water heating, solar day-lighting, and ground-coupled heat pumps. Photovoltaics and small wind can be less expensive in offsetting uniquely high electric rates expressed as demand charges, peak power rates, and ratchet rates. In 2008, the American Solar Energy Society using NREL analysis and Greenpeace using DLR (Germany's NASA) analysis showed that energy efficiency and the portfolio of renewables can realistically reduce greenhouse gases cost-effectively."

(4) What percentage of small business R&D is currently being directed towards development of new clean energy technology?

Our estimate: less than 5 percent.

Clean energy technology for small business appears mainly in the Federal Small Business Innovation Research (SBIR) programs of the following agencies: National Science Foundation (Biotechnology and Chemistry), Environmental Protection Agency, U.S. Departments of Agriculture, Energy and Defense. In each agency, clean energy technologies is a small part of their programs.

EISA 2007 created a priority status within the Small Business Innovation Research and Small Business Technology Transfer programs for small-business concerns participating in energy

efficiency or renewable energy research and development projects, but nothing much has happened.

In a letter to U.S. Senate Committee on Small Business and Entrepreneurship Ranking Member Olympia Snowe (R-Maine), the SBA states that it is "developing guidelines" for SBIR/STTR agency implementation and "will consult with agencies to review implementation and develop a summary report of awards."

SBA also notes that the DOE already has "issued an SBIR solicitation to improve energy efficiency and renewable energy research and the Department of Commerce is working to place more emphasis on biofuels in future solicitations."

(5) The Pennsylvania Small Business Development Center's Environmental Assistance program has conducted over 300 on-site energy assessment showing clients how to reduce their cost between 25 and 30 percent. How many of these businesses actually instituted these recommendations?

Of the 450 small businesses (updated number) assisted, approximately 58 percent of the clients have reported implementing at least one energy efficiency recommendation provided to them. Caveat, because the program provides a suite of recommendations from no-cost to higher cost/quick payback, these 58 percent may not be reaching the full 25-30 percent savings yet, but they are at least on the road.

(6) What amount of funding would you suggest for the Energy Star Small Business program?

$10 million. Here's why:

- One-half of the nation's economy consists of 27 million small businesses. These firms create more than half of the gross domestic product and employ about half of all private sector employees.

- The job creation prowess of small business is now seriously hampered by rising energy costs. In October 2008, 74 percent of small business owners said that higher energy prices were having a negative effect on their company, according to a survey by PNC Bank's Economic Outlook.

- According to recent surveys by the National Federation of Independent Business (NFIB), small business owners are now less willing than in previous years to expand or to hire new employees.

- Small business consumes an estimated one-half of all energy used for commercial and industrial purposes. The combined commercial and industrial use of energy by small businesses is estimated to cost $98.5 billion annually.

- Small business owners making energy efficiency upgrades can typically achieve *30 percent savings or more.* If all small businesses did so, they'd save approximately $29.6 billion annually. This is equivalent to reduced demand for 36 new coal-fired power plants.

- While it's impossible to calculate job creation by small business in general terms, it is possible to make such calculations for selected small business sectors. For example, if all the members of the National Restaurant Association (380,000 members), National Grocers Association (50,000 independent stores), and the National Association of Convenience Stores (140,655 stores) reduced energy consumption by 30 percent, they would save nearly $6 billion annually. That's enough money to pay the annual salaries of nearly 250,000 employees. It would also eliminate more than 46 million tons of greenhouse gas emissions each year, the equivalent of 10 coal fired power plants.

Despite all this, the excellent ENERGY STAR Small Business program toils in penury. Although the overall ENERGY STAR program received approximately $50 million in annual funding in each of the last five years, less than two percent of that amount was allocated to the small business program each year. And this tiny sliver of funding is supposed to finance outreach to the entire small business community *and* the nation's congregations.

We strongly urge the Federal government to increase its funding for the ENERGY STAR Small Business program to $10 million.

(7) How many years does an On-Bill Financing instrument typically last?

Institutional up to 10 years/ Commercial 2-5 years

(8) What is the default rate on On-Bill Financing?

In the two OBF programs that have been operating the longest, the history is this: United Illuminating – less than 1% / National Grid – around 2%.

(9) What is the biggest obstacle for increasing On-Bill Financing?

Background: Utility 0% Financing, called "On Bill Financing" (OBF), can use energy efficiency program funds to clear the "cash flow" hurdle and support comprehensive energy efficiency installations that can return precious capital away from wasted energy use back to help businesses grow.

Almost no other investment can equal the return on investment basic energy efficiency delivers through lighting, refrigeration, HVAC, motors and other energy use areas for just about any building nationwide.

Each state has a Public Utility Commission. Utilities function under the rules those regulators mandate that they follow. California and several New England states already offer On Bill Financing (OBF).

A new administration in Washington may well wish to accelerate efforts at using energy efficiency both for businesses and to help cities, counties, state and federal buildings lower energy use and costs comprehensively as one approach to help stimulate the economy, reduce

carbon emissions and diminish security concerns relating to the current overdependence on foreign sources of energy.

Obstacles: Utilities need to address identifying and managing On Bill Financing within their billing systems in order to develop and operate these programs. IT development can represent a barrier that slows some utility's willingness to adopt OBF. Another hurdle is the perception of defaults by small businesses and the negative ramifications that entails. This is in spite of several successful OBF programs with proven low default rates. Moreover, many states are just beginning or have yet to begin offering energy efficiency to their customers. Several state Public Utility Commissions are just learning how to manage balancing ratepayer and utility interests.

Remedies: The fastest way to accelerate the ability for more small businesses across the country to get access to OBF may be to start with a national concentration on developing programs first aimed at cities, counties, and state and federal buildings. Few things are certain but recent economic events seem to guarantee an unprecedented level of fiscal stress within all public budgets.

One tourniquet applied to help stop the fiscal bleeding to help stabilize our collective tax base should be a rapid move to accelerate investments in energy efficiency. Government buildings are really no different than any other commercial structure. Recovering up to 40% in annual energy costs with investments that require no budget hearings or other up front capital and that offer annual returns on investments from 50-150% should be at the front of the line in terms of what to do next.

Utilities can minimize risk and succeed with well designed energy efficiency programs using On Bill Financing for all taxpayer funded entities first. Once a utility has developed the IT and billing capability to deploy Institutional OBF, expanding to small business OBF programs as the next step becomes much easier.

Public policy on a national level can offer states with incentives to mandate that utilities develop Institutional OBF perhaps using much that same carrot approach uses access to additional funding in return for compliance.

(10) What percentage of the 1000 Small Business Development Center should offer technical assistance on environmental and energy matters? What would it cost?

In theory, all of them could and should do so.

We assume that small states, like Vermont or New Hampshire, could probably get started on a minimum of $150K but larger states would probably need $500K or more. Given the range of states, we estimate it costing between $15-18 million to get the national network started in providing energy efficiency assistance (NOTE: This estimate is limited to *energy efficiency assistance*. Getting into environmental compliance and sustainability would require additional resources and funding.)

(11) What are the primary sources of funding for The Center for Small Business and Environment?

The Center for Small Business and the Environment, a non-profit organization, is funded by grants from the Rockefeller Brothers Fund, the Changing Horizons Fund, and the Belvue Fund. CSBE is not the recipient of any government funds.

FOR MORE INFORMATION:

Byron Kennard, Executive Director
The Center for Small Business and the Environment
P.O. Box 53127
Washington, DC 20009

(Phone) 202.332-6875

(Fax) 202.332-8355

email: csbe2000@aol.com

www.aboutcsbe.org

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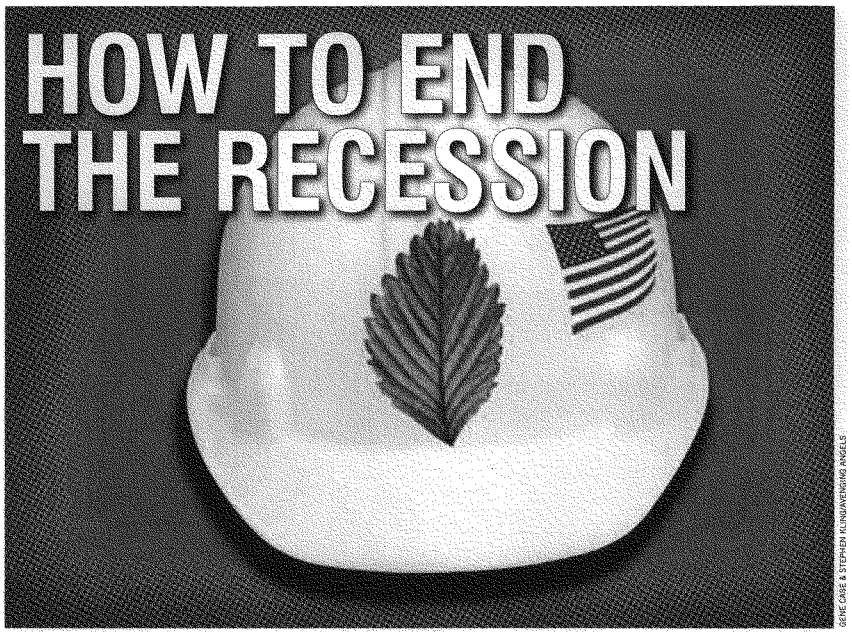

GENE GASE & STEPHEN KLINGUVENGING ANGELS

The economy needs a shot of public investment—and if it's green, the payoff will be greatest.

by ROBERT POLLIN

The collapse on Wall Street is now decimating Main Street, Ocean Parkway, Mountain View Drive and I-80. Since January the economy has shed 760,000 jobs. In September alone, monthly mass layoff claims for unemployment insurance jumped by 34 percent. General Electric, General Motors, Chrysler, Yahoo! and Xerox have all announced major layoffs, along with the humbled financial titans Goldman Sachs and Bank of America. Fully one-quarter of all businesses in the United States are planning to cut payroll over the next year. State governments are facing a tax revenue shortfall of roughly $100 billion in the next fiscal year, 15 percent of their overall budgets. Because states have rules requiring balanced budgets, they are staring at major budget cuts and layoffs. The fact that the economy's overall gross domestic product (GDP) shrank between July and September—the first such decline since the September 2001 terrorist attacks—only confirms the realities on the ground facing workers, households, businesses and the public sector.

The recession is certainly here, so the question now is how to diminish its length and severity. A large-scale federal government stimulus program is the only action that can possibly do the job.

So far, our leaders in Washington have dithered. Treasury Secretary Henry Paulson and Federal Reserve chair Ben Bernanke continue improvising with financial rescue plans, committing eye-popping sums of money in the process. Paulson's original program for the Treasury to commit $700 billion in taxpayers' money to purchase "toxic" loans—the mortgage-backed securities held by the private banks that are in default or arrears—was at least partially shelved in favor of direct government purchases of major ownership stakes in the banks. But neither of Paulson's strategies has thus far helped to stabilize the situation, with global stock and currency markets gyrating wildly and investors dumping risky business loans in favor of safe Treasury bonds. The crisis has even hit the previously staid world of money market mutual funds, where the fainthearted once could park their savings safely in exchange for low returns. Money market fund holders have been panic-selling since mid-September,

dumping $500 billion worth of these accounts.

To stanch a money market fund collapse, Bernanke announced on October 21 that, on top of the Paulson bailout plan, the Fed stands ready to purchase $540 billion in certificates of deposit and private business loans from the money market funds. This action is in addition to two previous initiatives committing the Fed to buy up, as needed, business loans from failing banks. Until this crisis, the Fed had conducted monetary policy almost exclusively through the purchase and sale of Treasury bonds, rarely buying directly the debts of private businesses or banks. But the pre-crisis rules of monetary policy are out the window.

Even if some combination of Treasury and Federal Reserve actions begins to stabilize financial markets in the coming weeks, this will not, by itself, reverse the deepening crisis in the nonfinancial economy. A rise in unemployment in the range of 8 to 9 percent—upward of 14 million people without work—is becoming an increasingly likely scenario over the next year.

President-elect Obama as well as most members of the newly elected Democratic-controlled Congress seem to recognize the urgency of such a large-scale stimulus program above and beyond any financial bailout program. Even Bernanke, whose term of office continues through January 2010, has offered his endorsement. But despite the near consensus, questions remain, including: How should the stimulus funds be spent? How large does the stimulus need to be? Where do we find the money to pay for it?

A Green Public-Investment Stimulus

Recessions create widespread human suffering. Minimizing the suffering has to be the top priority in fighting the recession. This means expanding unemployment benefits and food stamps to counteract the income losses of unemployed workers and the poor. By stabilizing the pocketbooks of distressed households, these measures also help people pay their mortgages and pump money into consumer markets.

Beyond this, the stimulus program should be designed to meet three additional criteria. First, we have to generate the largest possible employment boost for a given level of new government spending. Second, the spending targets should be in areas that strengthen the economy in the long run, not just through a short-term money injection. And finally, despite the recession, we do not have the luxury of delaying the fight against global warming.

To further all these goals we need a green public-investment stimulus. It would defend state-level health and education projects against budget cuts; finance long-delayed upgrades for our roads, bridges, railroads and water management systems; and underwrite investments in energy efficiency—including building retrofits and public transportation—as well as new wind, solar, geothermal and biomass technologies.

This kind of stimulus would generate many more jobs—eighteen per $1 million in spending—than would programs to increase spending on the military and the oil industry (i.e., new military surges in Iraq or Afghanistan combined with "Drill, baby, drill"), which would generate only about 7.5 jobs for every $1 million spent. There are two reasons for the green program's advantage. The first factor is higher "labor intensity" of spending—that is, more money is being spent on hiring people and less on machines, supplies and consuming energy. This becomes obvious if we imagine hiring teachers, nurses and bus drivers versus drilling for oil off the coasts of Florida, California and Alaska. The second factor is the "domestic content" of spending—how much money is staying within the US economy, as opposed to buying imports or spending abroad. When we build a bridge in Minneapolis, upgrade the levee system in New Orleans or retrofit public buildings and private homes to raise their energy efficiency, virtually every dollar is spent within our economy. By contrast, only 80 cents of every dollar spent in the oil industry remains in the United States. The figure is still lower with the military budget.

What about another round of across-the-board tax rebates, such as the program the Bush administration and the Democratic Congress implemented in April? A case could be made for this in light of the financial stresses middle-class families are facing. However, even if we assume that the middle-class households will spend all the money refunded to them, the net increase in employment will be about fourteen jobs per $1 million spent—about 20 percent less than the green public-investment program (the main reason for this weaker impact is the lower domestic content of average household consumption). Also, it isn't likely that the households would spend all their rebate money. Just as with April's rebate program, households would channel a large share of the money into paying off debts.

The Matter of Size

This is no time to be timid. The stimulus program last April totaled $150 billion, including $100 billion in household rebates and the rest in business tax breaks. This initiative did encourage some job growth, though as we have seen, the impact would have been larger had the same money been channeled toward a green public-investment stimulus. But any job benefits were negated by the countervailing forces of the collapsed housing bubble, the financial crisis and the spike in oil prices. The resulting recession is now before us. This argues for a significantly larger stimulus than the one enacted in April. But how much larger?

One way to approach the question is to consider the last time the economy faced a recession of similar severity, which was in 1980–82, during Ronald Reagan's first term as president. In 1982 gross domestic product contracted by 1.9 percent, the most severe one-year drop in GDP since World War II. Unemployment rose to 9.7 percent that year, which was, again, the highest figure since the '30s.

The Reagan administration responded with a massive stimulus program, even though its alleged free-market devotees never acknowledged as much. They preferred calling their program of military expansion and tax cuts for the rich "supply-side economics." Whatever the label, this combina-

Robert Pollin is a professor of economics and founding co-director of the Political Economy Research Institute at the University of Massachusetts. He is co-author of Green Recovery: A Program to Create Good Jobs and Start Building a Low-Carbon Economy, *published in September by the Center for American Progress.*

tion generated an increase in the federal deficit of about two percentage points relative to the size of the economy at that time. In 1983 GDP rose sharply by 4.5 percent. In 1984 GDP growth accelerated to 7.2 percent, with Reagan declaring the return to "morning in America." Unemployment fell back to 7.5 percent.

In today's economy, an economic stimulus equivalent to the 1983 Reagan program would amount to about $300 billion in spending—roughly double the size of April's stimulus program, though in line with the high-end figures being proposed in Congress. A stimulus of this size could create nearly 6 million jobs, offsetting the job-shedding forces of the recession.

Of course, the green public-investment stimulus will be much more effective as a jobs program than the Reagan agenda of militarism and upper-income tax cuts. This suggests that an initiative costing somewhat less than $300 billion could be adequate to fight the job losses. But because the green public-investment stimulus is also designed to produce long-term benefits to the economy, there is little danger that we would spend too much. Since all these investments are needed to fight global warming and improve overall productivity, the sooner we move forward, the better. Moreover, under today's weak job market conditions, we will not run short of qualified workers.

How to Pay for All This?

Let's add up the figures I have tossed around. These include the $700 billion bank rescue operation being engineered by the Treasury, the $540 billion with which Fed chair Bernanke has pledged to bail out the money market mutual funds, along with unspecified additional billions to buy unwanted business debts held by banks. On top of these, I am proposing $300 billion for a second fiscal stimulus beyond last April's $150 billion program. At a certain point, it is fair to wonder whether we are still dealing with real dollars as opposed to Monopoly money.

In fact, the whole program remains within the realm of affordability, albeit approaching its upper bounds. But major adjustments from the current management approach are needed. In particular, the Federal Reserve has to continue exerting control over the Treasury on all bailout operations. That is, we need more initiatives like Bernanke's $540 billion program to stabilize the money market mutual funds and less Treasury fumbling with taxpayers' money to buy either the private banks' bad assets or ownership shares in the banks.

We need to recognize openly what has largely been an unspoken fact about these bailout operations: that the Federal Reserve has the power to create dollars at will, while the Treasury finances its operations either through tax revenues or borrowed funds (which means using taxpayer money at some later time to pay back its debts with interest). The Fed does not literally run printing presses when it decides to inject more money into the economy; but its normal activity of writing checks to private banks to buy the banks' Treasury bonds amounts to the same thing. When the banks receive their checks from the Fed, they have more cash on hand than they did before they sold their Treasury bonds to the Fed. Especially during crises, there is no reason for the Fed to restrain itself from making good use (though of course not overuse) of this dollar-creating power.

The Fed is also supposed to be the chief regulator of the financial system. Now is the time to make up for Alan Greenspan's confessed failures over twenty years in this role. In exchange for the Fed protecting the private financial institutions from collapse, Bernanke must insist that the banks begin lending money again to support productive investments, while prohibiting them from yet another return to high-rolling speculation. Special measures are also needed to keep people in their homes.

The Deficit Looms

When the economy began slowing this year, the fiscal deficit more than doubled, from $162 billion to $389 billion. We cannot know for certain how much the deficit will expand. It could rise to $800 billion, $1 trillion or even somewhat higher, depending on how the bailout operations are managed. Of course, it would be utterly self-defeating for the United States to run a reckless fiscal policy, no matter how pressing the need to fight the financial crisis and recession. But in the current crisis conditions, even a $1 trillion deficit need not be reckless.

Let's return to the Reagan experience for perspective. In 1983 the Reagan deficits peaked at 6 percent of the economy's GDP. With GDP now around $14.4 trillion, a $1 trillion deficit would represent about 7 percent of GDP, one percentage point higher than the 1983 figure.

Of course, the global financial system has undergone dramatic changes since the 1980s, so direct comparisons with the Reagan deficits are not entirely valid. One change is that government debt is increasingly owned by foreign governments and private investors. This means that interest payments on that debt flow increasingly from the coffers of the Treasury to foreign owners of Treasury bonds.

At the same time, as one feature of the crisis, Treasury bonds are, and will remain for some time, the safest and most desirable financial instrument in the global financial system. US and foreign investors are clamoring to purchase Treasuries as opposed to buying stocks, bonds issued by private companies or derivatives. This is pushing down the interest rates on Treasuries. For example, on October 15, 2007, a three-year Treasury bond paid out 4.25 percent in interest, whereas this past October 15, the interest payment had fallen to 1.9 percent. By contrast, a BAA corporate bond paid 6.6 percent in interest one year ago but has risen this year to 9 percent. As long as the private financial markets remain gripped by instability and fear, the Treasury will be able to borrow at negligible interest rates. Because of this, allowing the deficit to rise even as high as 7 percent of GDP does not represent a burden on the Treasury greater than what accompanied the Reagan deficits.

There is, then, no reason to tread lightly in fighting the recession, with all its attendant dangers and misery. Indeed, severe misery and danger will certainly rise as long as timidity—the path of least resistance—establishes the boundaries of acceptable action. The incoming Obama administration can take decisive steps now to defend people's livelihoods and to reconstruct a viable financial system, productive infrastructure and job market on the foundation of a clean-energy economy. ■

The U.S. Employment Effects of Military and Domestic Spending Priorities

Robert Pollin and Heidi Garrett-Peltier
Department of Economics and
Political Economy Research Institute
University of Massachusetts, Amherst

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IPS
Institute for Policy Studies
1112 16th St NW, Suite 600
Washington DC 20036
202.234.9382 / info@ips-dc.org
www.ips-dc.org

POLITICAL ECONOMY RESEARCH INSTITUTE
PERI
Political Economy
Research Institute
University of Massachusetts
Amherst, MA 01002
413.545.6355 / peri@econs.umass.edu
www.peri.umass.edu

WAND
Women's Action for
New Directions
691 Massachusetts Avenue
Arlington, MA 02476
781-643-6740 / peace@wand.org
www.wand.org

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By Robert Pollin and Heidi Garrett-Peltier
Department of Economics and Political Economy Research Institute (PERI)
University of Massachusetts-Amherst

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The U.S. government spent an estimated $572 billion on the military in 2007. This amounts to about $1,800 for every resident of the country. The level of military spending has risen dramatically since 2001, with the increases beginning even before September 11, 2001. In total dollar terms (after controlling for inflation), military spending has risen at an average rate of 10 percent per year from 2000 – 2006, the full years of the Bush presidency to date. By contrast, the overall U.S. economy grew at an average annual rate of 2.7 percent. As a share of GDP, the military budget rose from 3.0 to 4.4 percent of GDP during the Bush Presidency. At the current size of the economy, a difference between a military budget at 4.4 rather than 3.0 percent of GDP amounts to $134 billion.

The largest increases in the military budget during the Bush presidency have been associated with the Afghanistan and especially the Iraq wars. The Iraq war alone now costs an average of $360 million a day (according to the Congressional Research Service), or $138 billion over the 2007 fiscal year. Thus, the $138 billion spent on Iraq in 2007 was basically equal to the total increase in military spending resulting from moving the military budget from 3.0 to 4.4 percent of GDP.

Amid the debates on the political and strategic merits of the Iraq war, one aspect of the current level of military spending by the U.S. government that has been largely neglected is its effects on the U.S. economy. $600 billion is a vast sum of money—greater than the combined GDP of Sweden and Thailand, and eight times the amount of U.S. federal spending on education. It is therefore reasonable to ask what the benefits might be to U.S. taxpayers if some significant share of the $600 billion now going to the military were instead devoted to alternative domestic purposes, such as health care, education, or the environment.

A view is often expressed that the military budget is a cornerstone of the U.S. economy. The Pentagon is often said to be a major underwriter of, and stimulus to, important technical innovations. It is also often cited as a major employer, providing good jobs—jobs that are stable and at least decently paid—to millions of Americans.

At one level, these claims cannot help but be true. If the U.S. government is spending upwards of $600 billion on maintaining and strengthening the military, how could the necessary expenditures on building technologically sophisticated weapons, along with transportation and communications systems, fail to encourage technical innovations that are somehow connected to these instruments of warfare? It is true that investments in military technology have produced important spin-offs for civilian purposes, the Internet being the most spectacular such example. At the same time, channeling $600 billon into areas such as renewable energy, mass transportation and health care would also create a hothouse environment supporting new technologies.

Parallel considerations arise in assessing the impact of the military budget on employment in the U.S. The $600 billion military budget creates approximately five million jobs, both within the military itself and in all the civilian industries connected to the military. And precisely because of the high demands for technologically advanced equipment in the military, a good proportion of the jobs created by the military budget will be well-paying and professionally challenging. But again, this will also be true when funds are spent in other areas that entail using and developing new technologies, such as for health care, energy conservation, or renewable energy.

Thus, if we want to give a balanced account of the impact of military spending on the U.S. economy, including the employment situation, the only appropriate way to do this is to examine the issue in relative terms—i.e. what is the impact of spending a given sum of money on the military versus spending the same funds on some combination of non-military alternatives?

This study is focused on the employment effects of military spending versus channeling some significant part of the military budget into alternative purposes. We begin by introducing the basic input-output modeling technique for considering issues such as these in a systematic way. We also review the results of earlier efforts to compare the employment effects of military spending versus alternative government spending priorities.

We then present some simple alternative spending scenarios, namely devoting $1 billion to the military versus the same amount of money spent for five alternatives: tax cuts which produce increased levels of personal consumption; health care; education; mass transit; and construction targeted at home weatherization and infrastructure repair. We have included tax cuts/personal consumption in this list since it is the most straightforward alternative spending use—that the money freed up from a reduction in military spending goes back directly to taxpayers for them to use as they see fit. We have also, reluctantly, excluded a category for renewable energy investments. This is only because the data now available to us are not adequate to make reliable estimates as to the employment effects of investments in renewable energy projects.[1] As a provisional substitute, one can consider the categories of mass transit and construction on home weatherization as constituting investments in energy conservation.

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[1] One of the ongoing projects at PERI is to create a reliable data base showing the employment effects of investments in renewable energy. We expect that we will have such data available by Spring 2008.

How many jobs are created by each of these alternatives and what is the quality of the jobs being created? Our first conclusion in assessing such relative employment impacts is straightforward: $1 billion spent on personal consumption, health care, education, mass transit, and construction for home weatherization and infrastructure will all create more jobs within the U.S. economy than would the same $1 billion spent on the military.

But this conclusion raises an obvious question: do we create more jobs through these non-military spending targets simply by substituting well-paying jobs associated with the military with poorly-paid jobs associated with the alternatives? In fact, spending on personal consumption does produce a preponderance of poorly-paid jobs, such that the total compensation flowing to workers will be lower than through $1 billion going to the military. However, the opposite is true with education as the spending target. Here, both the total number of jobs created as well as the average pay are both higher than with the military. The situations with health care, mass transit and home weatherization/infrastructure construction are less clear-cut. More jobs will be created than with military spending, and the total compensation will also be significantly higher than with military spending. But the average pay for a health-care worker or those engaged in mass transit or construction will be lower than with the military. After presenting these findings, we examine them in a broader context —i.e. assessing the overall welfare impacts of the alternative employment outcomes.

We conclude the study with a brief series of summary observations.

Previous Studies of Job Effects of Alternative Spending Priorities

The basic tool for estimating the net overall employment effects of alternative government spending priorities is the input-output model of the U.S. economy, produced every five years and updated annually by the Department of Commerce. The input-output analytic framework was first developed in the 1930s by Nobel Laureate economist Wassily Leontief, with many subsequent refinements by Leontief and others. An input-output model traces through all of the factors—i.e. inputs—that go into producing a given output. For example, we can observe through the input-output model of the U.S. economy how many and what types of workers, how much and what types of equipment, and how much energy (all inputs) are needed to produce a military fighter airplane, tank or warship (outputs). We can also observe what the equivalent requirements would be to keep an existing elementary school or hospital functioning or to build a new school or hospital.

To estimate the overall employment effects of any given spending target, such as a warplane or a school, we have to consider three factors within the overall the input-output model:

1. *Direct effects*—the jobs created by producing the warplane or school

2. *Indirect effects*—the jobs associated with industries that supply intermediate goods for building a warplane, school, or any other direct spending target. These would include the steel, glass, tire, and electronic industries for building a warplane; and concrete, glass, and trucking industries for a school.

3. *Induced effects*—The expansion of employment that results when people who are paid to build a warplane or school spend the money they have earned on other products in the economy.

How could one spending target create more jobs for a given amount of expenditure than another? If we compare, for example, military spending with education, there are three possibilities:

1. The average pay for all of the industries associated with education—including direct, indirect, and induced effects—is lower than the average pay for the military-related industries.

2. The average "labor intensity" of the education-related industries—i.e. number of jobs created per dollar of spending, as opposed to the amount spent on machinery, buildings, energy, land and other inputs—is higher than the labor intensity of military-related industries.

3. The overall job creation effects within the U.S. economy—as opposed to the rest-of-the-world—are higher for education than the military. For example, we roughly estimate that U.S. military personnel spend only 43 percent of their income on domestic goods and services (including import purchases in this calculation) while the U.S. civilian population, on average, spends 78 percent of their income on domestic products.

To enable the input-output model to address specific questions both on the quantity of jobs created, the classification of these jobs by category, and the compensation levels associated with them, we have to then incorporate data from the U.S. labor force surveys into the input-output framework. Operating this kind of economic model clearly entails large numbers of technical manipulations and calculations. At the same time, the U.S. economy is a $13 trillion operation, involving millions of interactions, operations, and innovations on a daily basis. There is no model—input-output model or otherwise—that can capture with precision every detail of what is actually happening on the ground. Still, the input-output model can accurately capture broad parameters of economic reality, including those relating to the question on which we are focusing, the relative employment effects of military versus non-military spending initiatives.

In 1961, Professor Leontief himself used input-output modeling to study the effects of demilitarization on the economy. In his essay entitled, "The Economic Effects of Disarmament," Leontief estimated how employment and overall output would change as a result of a shift in spending from the defense industry to non-defense. He showed that while cutting military spending would eliminate a substantial number of jobs, twice as many jobs would be created in expanding spending on alternative domestic purposes.

Professor Seymour Melman, an industrial economist and engineer, also examined the employment and output effects of military versus non-military spending alternatives in a series of research projects over the 1960s – 1980s.[2] Melman demonstrated repeatedly that the net effects of increasing the proportional share of non-military spending would be beneficial in terms of jobs and overall output. He also stressed that investment in non-defense industries would offer large benefits in terms of encouraging new technologies and raising average living standards in the United States.

In the 1990's, two separate studies were published which used input-output analysis and supplemental modeling techniques to estimate the effects of conversion. One was a 1993 paper by

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[2] See, for example, *The Demilitarized Society: Disarmament and Conversion*, 1988.

Professor James Medoff, entitled "Smart Stimulus: More Good Jobs." The other was a 1990 study by Marion Anderson, Greg Bischak and Michael Oden entitled "Converting the American Economy."

Medoff used the 1987 input-output model of the U.S. economy to estimate the relationship between different types of spending—for example, military, state government, private investment and consumption—on employment, that is, focusing on the same questions that we are addressing here. Medoff created a number of indices to illustrate the job quantity and job quality effects of alternative types of spending—looking specifically at the number of jobs created through alternative spending targets and the average compensation associated with the various types of jobs created.

Medoff found that personal consumption expenditures had the lowest positive impact on his index that combined both the number of jobs created and the wages and benefits of jobs. Defense spending was the next to last by this combined job quality/quantity index. Medoff found that spending for education, health care, transportation infrastructure and construction all performed substantially better than military spending by this combined job quantity/quality index.

Anderson et al. use a somewhat different technique than Medoff. They relied on a model developed by the Employment Research Associates and Regional Economic Models Incorporated (REMI) that combines an input-output model with other statistical techniques to estimate the relative employment effects of military versus alternative domestic spending.[3] This study was conducted in 1990, but offers projections of employment effects through 1994. It reports detailed projections of the net job impacts by occupation – both within the military and civilian sectors and also within branches of the military and sectors of the civilian economy. For example, they found that the impact of a gradual reduction in military spending, starting with $35 billion in 1990 and reaching $105 billion in 1994, would produce a net gain of 477,000 jobs within the U.S. economy.

Employment Effects of $1 Billion in Spending for Alternative Purposes

We present in Table 1 our estimate of the relative effects of spending $1 billion on alternative uses, including military spending, health care, education, mass transit, and construction for home weatherization and infrastructure repair. Our estimates are derived from the 2005 U.S. input-output model, along with other data sources on national income and employment within the United States. We show the full list of our data sources in the Appendix.

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[3] In principle at least, the approach of the REMI model addresses a significant limitation of the input-output model. This limitation is that the input-output model assumes that the overall structure of the economy will remain the same despite any changes in the level of spending. For example, if spending on the military were to decline and construction spending increase, it is likely that, in reality, prices of construction materials would rise as a result. Wages for construction workers could also rise. Such effects are not incorporated into the input-output model. The input-output model rather works from a simplifying "fixed coefficient" assumption, meaning that the model assumes the basic price and wage relationships would stay fixed despite changes in spending. The REMI model is among the type of models that tries to incorporate such effects. In principle, the REMI-type model provides a fuller picture of what actually happens when spending priorities in the economy change. In practice, these changes are very difficult to model accurately. As such, in many cases, the simpler input-output model provides as good as approximation of the overall effects as one is likely to generate from this sort of exercise.

Table 1. Overall Employment Effects of Spending $1 Billion for Alternative Spending Targets in U.S. Economy, 2005

	(1) # of jobs created	(2) # of jobs relative to defense spending	(3) average wages and benefits per worker	(4) average wages and benefits relative to defense	(5) total wages and benefits from employment in millions	(6) total wages and benefits relative to defense
spending targets						
1. defense	8,555	---	$65,986	---	$564.5 million	---
2. tax cuts for personal consumption	10,779	+26.2%	$46,819	-29.1%	$504.6 million	- 10.7%
3. health care	12,883	+50.2%	$56,668	-14.2%	$730.1 million	+29.3%
4. education	17,687	+106.7%	$74,024	+12.2%	$1,309.3 million	+131.9%
5. mass transit	19,795	+131.4%	$44,462	-32.6%	$880.1 million	+55.9%
6. construction for home weatherization/ infrastructure	12,804	+49.7%	$51,812	-21.5%	$693.7 million	+22.9%

Sources: See Appendix

The table first shows in column 1 the data on the total number of jobs created by $1 billion in spending for alternative end uses. As we see, defense spending creates 8,555 total jobs with $1 billion in spending. This is the fewest number of jobs of any of the alternative uses that we present. Thus, personal consumption generates 10,779 jobs, 26.2 percent more than defense, health care generates 12,883 jobs, education generates 17,687, mass transit is at 19,795, and construction for weatherization/infrastructure is 12,804. From this list we see that with two of the categories, education and mass transit, the total number of jobs created with $1 billion in spending is more than twice as many as with defense.

We next consider the differences in the compensation in the jobs associated with our alternative spending targets. If the only way that more jobs are created is by lowering pay levels, then we can question whether the net job impact of an alternative use of funds is superior to spending on defense. As we see in columns 3 and 4 of Table 1, the average wages and benefits from defense spending are higher than all the alternative uses other than education. The average overall compensation for defense, at $65,986, is almost 33 percent higher than for mass transit, 29 percent higher than for personal consumption, 22 percent higher than for home weatherization/ infrastructure construction, and 14 percent higher than health care. Education is the only spending target generating a higher average compensation level, at $74,024.

Is it better for overall economic welfare to generate more jobs, even if they are low-paying, or a fewer number of well-paying jobs? There isn't a single correct answer to this question. It would depend on the magnitude of these differences—i.e. how many low-paying jobs are being generated, and how bad are these jobs? How many high-quality jobs would be sacrificed through a transition out of the military, where, as we have seen, at least, the average wage is generally high?

One simple standard is to compare the total amount of compensation that is received by workers through these alternative end uses. This would simply be the figure generated by the total number of people employed by each of the end uses multiplied by the average total compensation package for each job.[4] We see these figures in columns 5 and 6 of Table 1. As we see, the total compensation from $1 billion in defense spending generates $564.5 billion in total compensation. Personal consumption is the only spending target that is lower than defense in overall compensation, at $504.6 million. In other words, with personal consumption spending, even though it creates 26 percent more jobs than defense, because the average compensation is 29 percent lower, the effect for the overall economy is 10 percent less in total compensation.

The picture is reversed with the other alternative spending targets. With all four of these, the total amount of compensation generated ranges between 23 – 132 percent more than the $1 billion spent on defense. Education has the strongest overall effect, generating $1.3 billion in total compensation from the 17,687 jobs created.[5]

Beyond looking at average and total compensation for each spending category, it will also be useful to consider more fully the specific types of jobs that are linked to each of the spending areas and the proportions of poorly-paid and highly paid jobs in these various areas.

In Table 2, we show the breakdown of the distribution of jobs that will be generated through $1 billion in spending in each of the targeted areas. These job effects are broken down into 15 separate industries within the U.S. economy. We can also observe the same effects through a more fine-grained, 65-industry breakdown. But for our purposes here, the 15-industry categories are sufficient to show overall patterns. We will refer below to some of the more specific figures from the 65-industry breakdown.

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[4] This is the basic standard considered by Medoff in developing his "relative job quality" index. In fact, Medoff's terminology here is a bit misleading, since the relative job quality index is actually the product of multiplying total number of jobs created by total compensation—i.e. it combines a quantity and quality measure. It is not a quality measure alone.

[5] How is it possible for $1 billion in new spending to generated more than $1 billion in total compensation? The answer is that we have to recognize again that the overall employment effects combines three factors—the direct spending increases within the targeted industry itself; the indirect spending increases from industries that supply inputs to the target industry; and the induced increase in spending, generated by those who are newly employed spending their wages in the economy. It is through the combination of direct, indirect, and induced spending injections that, for the direct $1 billion increase in education spending, the overall effect on increased compensation will be $1.3 billion.

Table 2. Jobs Created through $1 Billion in New Spending: Comparison of Alternative Spending Targets

	defense	tax cuts for personal consumption	education	healthcare	mass transit	construction for home weatherization/ infrastructure
total jobs	**8,555**	**10,779**	**17,687**	**12,883**	**19,795**	**12,804**
agriculture, forestry, fishing, and hunting	24	237	32	52	18	172
mining	18	41	13	16	46	64
utilities	13	58	15	17	10	15
construction	193	83	192	69	27	7,715
manufacturing	1,240	1,219	396	537	675	1,700
wholesale trade	218	424	113	148	333	340
retail trade	38	1,391	50	52	76	651
transportation and warehousing	230	366	151	180	16,692	315
information	218	221	175	117	95	100
finance, insurance, real estate, rental, and leasing	203	846	309	282	244	224
professional and business services	1,748	1,361	1,237	1,380	1,102	1,059
educational services, health care, and social assistance	166	2,148	14,515	9,364	10	10
arts, entertainment, recreation, accommodation, and food services	171	1,364	147	325	92	115
other services, except government	172	870	201	179	262	247
government	3,902	151	141	165	114	77

Sources: See Appendix

We see in Table 2 that, with defense, by far the largest number of jobs created will be with the government—3,902 out of a total of 8,555 jobs (46 percent). The next largest area of job creation with defense is professional and business services, with 1,748 (20 percent).

Of the alternative spending areas, personal consumption has the largest dispersion of jobs created—with large numbers in retail, health care, education, professional services, and accommodations/food services. Education, health care, mass transit, and construction for home weatherization/infrastructure are all heavily concentrated in a few areas—education itself, health care itself, construction itself, and transportation/warehousing.

What about the distribution of wages in the various job areas? It is difficult to obtain a precise sense of this, because the detailed data on wages aren't categorized in the same ways as the input-output industry categories. Moreover, to obtain a clear sense of the wages in various activities, one needs a more detailed breakdown of industries than the 15-industry categories.

In Table 3, we present some relevant figures that draw selectively on the more detailed 65-industry occupational categories. Though we still do not have exact matching between the employment categories for wages and the industry categories for the input-output model, this table nevertheless provides some relatively accurate perspective on job quality related to the various spending priorities.

Table 3. Percentage of Low- and High-Paying Jobs in Activities Linked to Spending Targets

	percent of new employment	percent below $20,000/year	percent below $32,000/year	percent between $32,000 and $64,000/year	percent above $80,000/year
defense					
federal government	44.1	5.3	28.0	61.3	4.7
professional/business services	20.4	4.5	22.9	62.2	14.6
manufacturing	14.5	4.0	7.3	85.8	5.8
personal consumption expenditures					
retail trade	12.9	40.0	70.6	27.3	1.4
food services	8.9	68.1	95.3	4.3	0.3
hospitals and nursing care	8.2	15.3	46.3	43.2	4.8
education					
educational services	82.1	11.7	31.8	59.1	1.2
professional/business services	7.0	4.5	22.9	62.2	14.6
health care					
hospitals/nursing care/ambulatory care	72.5	15.3	46.3	43.2	4.3
professional/business services	7.0	4.5	22.9	62.2	4.8
mass transit					
transportation	76.4	5.8	36.5	60.2	1.0
professional/business services	10.6	4.5	22.9	62.2	4.8
weatherization and infrastructure repair					
construction	66.8	8.6	26.9	60.1	1.8
professional/business services	9.6	4.5	22.9	62.2	4.8

Sources: See Appendix

As the table shows, we present data for each of the job categories on the percentage of jobs paying annual incomes below $20,000 per year, below $32,000, between $32,000 and $64,000, and above $80,000. A wage below $20,000 would mean, on an hourly basis, less than $10 per hour for a full-time, year-round worker. This would be below any reasonable definition of a "living wage" in any

community in the U.S.[6] The $32,000/ year would correspond to a $16 per hour wage for a full-time worker. This is a reasonable threshold wage for defining a minimally decent basic needs income standard. The $32,000 - $64,000 category incorporates a broad range of middle-class jobs. We finally present figures on the proportions earning above $80,000 per year. This will enable us to see the proportion of well-paying jobs in the different categories, and will therefore help address the issue of whether, if resources are moved out of the military, there would be a significant loss of good professional and technical job opportunities.

As the table shows, personal consumption spending is the only area where there are a substantially higher proportion of low-paying jobs relative to defense. In the cases of health care, mass transit, and construction for weatherization/infrastructure, our rough figures show about 5 – 10 percent more jobs paying below both $20,000 and $32,000 than with the military. Still, if we consider all the main categories of job expansion through spending on health care, mass transit and weatherization/infrastructure, a substantial majority of the jobs pay more than $32,000 per year, our threshold figure for a minimally decent income for a full-time worker. With education, the differences are smaller, reflecting the fact that, overall, education as a spending target will generate a higher average increase in compensation than defense in addition to creating more jobs.

How can spending on education generate both higher average wages as well as more new jobs per $1 billion in spending? The answer is straightforward. For one thing, the high average wage reflects the fact that a large proportion of people in the sector operate with relatively high credentials and skills, and their incomes reflect this. In addition, education is a relatively labor-intensive industry. This means that, compared with the other industries we are examining, for every $1 billion in new spending in education, proportionally more money is spent on hiring new people into the industry and relatively less is spent on supplies, equipment, buildings.

By contrast with respect to personal consumption, health care, mass transit or home weatherization/infrastructure, what is clear again in Table 3 is that part of the way that more jobs are created per dollar of spending in these industries is that a higher proportion of low-paying jobs will be created than through military spending. This situation is most serious with respect to personal consumption. This is a good reason for avoiding tax cuts as a means of promoting job creation. For example, using the savings from a reduction in the military budget to lower taxes primarily for the wealthy—which has been a major domestic policy priority under the Bush Administration—would primarily produce more consumption for the well off along with a relatively weak payoff in terms of promoting decent jobs.

The situation is different with health care, mass transit and construction for home weatherization/infrastructure. All of these should be high public priorities independent of their employment effects. In all three areas, unlike personal consumption, shifting funds from the military will create both more jobs and an increase in overall income for workers. The overall level of compensation per job will fall, and a higher proportion of low-paying jobs will increase. But these effects can be

[6] See the discussions on living wage standards in Pollin 2007 and Pollin et al. 2008.

counterbalanced through combining these spending priorities with education, where, as we have seen, the general level of pay is high. It will also be the case that wages are likely to rise somewhat in the areas that become targets for increased spending. For example, a rising demand for construction workers to work on home weatherization projects should lead to rising wages in that industry.

Conclusion

The U.S. government now operates with a military budget of nearly $600 billion per year. This is a 66 percent increase (in real dollars) relative to the level of spending in 2000. It amounts to 4.4 percent of GDP. An expenditure level of this magnitude will necessarily have a major impact in establishing the country's policy priorities and overall economic trajectory.

We have shown what are the employment effects of spending on the military in contrast with five domestic spending categories. Specifically, we have shown that spending on personal consumption, health care, education, mass transit, and construction for home weatherization and infrastructure repair all create more jobs per $1 billon in expenditures relative to military spending.

It is true that jobs generated by military spending tend to pay relatively well, which is part of the reason that fewer jobs are created per dollar of expenditure than through alternative spending targets. However, we have also seen that $1 billion in spending on education, on average, generates more than twice the number of jobs as does military spending, and higher-paying jobs. Spending on health care, mass transit, and home weatherization/infrastructure creates jobs at a lower average level of pay than military spending. But these three spending targets do create substantially more jobs than military spending, with an overall level of pay, combining all workers' paychecks and benefits, higher than the military. Moreover, a substantial majority of the jobs generated through a health care, mass transit or construction expansion pay more than $32,000 per year, our rough threshold for a minimally decent income level. The majority of jobs pay between $32,000 - $64,000, a rough middle-income pay range. Health care, mass transit, weatherization, and infrastructure repair are all also high priority areas for social spending. More spending in these areas could be combined with improving the average level of pay, while still creating more jobs per dollar of expenditure than the military.

Increased personal consumption resulting from tax cuts is the only alternative spending target that we examined that is inferior to military spending along two dimensions—both the average pay and the total amount of compensation per $1 billion in expenditures are lower. There is also no reason why expanding personal consumption expenditures—particularly of the already affluent, whose level of expenditures have risen sharply since the early 1990s—should be considered as a primary focus of social policy.

Overall then, there is a great deal at stake as policy makers and voters establish public policy spending priorities. As we have seen, by addressing social needs in the areas of health care, education, education, mass transit, home weatherization and infrastructure repairs, we would also create more jobs and, depending on the specifics of how such a reallocation is pursued, both an overall higher level of compensation for working people in the U.S. and a better average quality of jobs.

The Authors

Robert Pollin is Professor of Economics and Co-Director of the Political Economy Research Institute (PERI) at U Mass Amherst. Heidi Garrett-Peltier is an Economics Ph.D. student and Research Assistant at PERI.

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Appendix: Data Sources

	Source	Table Name/Number	Location of Data Source
input-output tables	BEA	2005 Annual Industry Tables, Summary Level (65 industry)	http://www.bea.gov/industry/iotables/prod/table_list.cfm?anon=1650
employment	BEA	NIPA Table 6.8D, 2005	http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=198&FirstYear=2004&LastYear=2005&Freq=Year
output	BEA	GDP by Industry: Gross Output by Industry, 2005	http://www.bea.gov/industry/gdpbyind_data.htm
wages and benefits	BLS	Employer Cost for Employee Compensation	http://data.bls.gov/cgi-bin/dsrv?cm
	Census Bureau	Federal Government Employment and Payroll data	http://ftp2.census.gov/govs/apes/05fedfun.pdf
	BLS	Current Employment Statistics	http://www.bls.gov/ces/home.htm
occupational data	BLS	May 2005 National Industry-Specific Occupational Employment and Wage Estimates	http://www.bls.gov/oes/2005/may/oessrci.htm

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