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CURRENT ENERGY SECURITY CHALLENGES

HEARING

BEFORE THE

COMMITTEE ON ENERGY AND NATURAL RESOURCES UNITED STATES SENATE

ONE HUNDRED ELEVENTH CONGRESS

FIRST SESSION

TO

RECEIVE TESTIMONY ON CURRENT ENERGY SECURITY CHALLENGES

JANUARY 8, 2009

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CURRENT ENERGY SECURITY CHALLENGES

THURSDAY, JANUARY 8, 2009

U.S. SENATE,
COMMITTEE ON ENERGY AND NATURAL RESOURCES,
Washington, DC.

The committee met, pursuant to notice, at 9:35 a.m. in room SD–366, Dirksen Senate Office Building, Hon. Jeff Bingaman, chairman, presiding.

OPENING STATEMENT OF HON. JEFF BINGAMAN, U.S. SENATOR FROM NEW MEXICO

The CHAIRMAN. Ok. Why don't we get started? This is the first of our hearings in this new Congress.

Today we have a few members of the Senate who are expected to join the committee. But we have not yet, in the Senate, approved the next appointments resolution. So they are not officially members.

On the Democratic side that's Senators Bayh, Evan Bayh, Senator Stabenow, Senator Mark Udall, Senator Jeanne Shaheen. Senator Udall and Senator Shaheen are here this morning. In keeping with the long standing practice here in the committee where we have this kind of a circumstance, we've invited these soon to be members to sit in on the hearing and participate. But they'll be called on to ask questions after current members who are here have had a chance to ask their questions.

We're also expecting that a few of our long standing members on the Democratic side will be leaving the committee for other assignments.

Senator Salazar, of course, is moving to be Secretary of Interior. We have that hearing scheduled next week to confirm his nomination.

Senator Akaka, who's been a valued member of this committee since he came to the Senate in 1989, and has been the exemplary Chair of the Parks Subcommittee of our committee. He'll be greatly missed. He has chosen to go off the committee at this time. But I'm sure will stay very involved in parks and territorial issues which is a great interest of his.

Senator Tester, who has been a great contributor to our committee in the time he's been here in the Senate on Energy and public lands and forest issues, also is shifting his committee assignments. We'll be sorry to lose him from the committee.

But those are a few changes. I wanted to announce that so people were aware of it. Let me make a short opening statement and then call on Senator Murkowski to make any statement she has.

Obviously energy policy is very imminently interconnected with the state of our economy. I think we all know that. We see it at every turn. The historic oil price increase that we experienced last year was one of many factors that caused some of the economic difficulty we currently find ourselves in.

Even as we work to get the country's economy back on track we realize that we need to move forward in confronting the environmental challenges that we have as well. Of course that is global warming which is primarily a by-product of the energy that we use in this country and around the world. We need to not only move energy policy in the right direction, but we need to be sure that we do so in a way that's responsible with regard to global warming.

We experienced ground breaking legislative successes in this last Congress. The Energy Independence and Security Act that we were able to enact here in the Congress increased fuel efficiency standards, set a new course for U.S. biofuels policy, developed a wide array of energy research and development programs in areas such as energy storage and enacted a large slate of new energy efficiency standards. The committee also got heavily involved in the America Competes Act legislation which set long term priorities to keep our country competitive in the world.

Our President-elect Obama has committed to support these initiatives. He also, of course, has made energy a very high priority for his new Administration. We look forward to working with him on that.

Today's hearing is intended to give us the broad overview of these issues. The witnesses today are representing organizations that have spent a great deal of time in energy trying to devise blueprints and plans that we could follow in this country to reduce our dependence on foreign oil and meet our future energy needs in an environmentally responsible way. So we wanted to get the benefit of their views at the beginning of the legislative session before we went into the process of trying to craft legislation to address these issues.

We have had discussions. Senator Murkowski and I have had discussions about the importance of trying to get consensus, bipartisan consensus, on energy legislation early in this Congress. We hope that this hearing contributes to that effort.

So let me call on Senator Murkowski.

STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator MURKOWSKI. Thank you, Mr. Chairman. I appreciate your, kind of, not wrap up here, but the preview of the new committee members. Welcome those of you that are here today to the committee.

I think you'll find that this is a committee that is involved in exceptionally interesting and challenging issues. I think it's fair to say, Mr. Chairman, we've had a reputation here that we work together pretty well. Think you will enjoy the opportunity to be contributors on this issue of such incredible importance to this country and really, to the world. So much of it is about energy.

I want to thank you, Mr. Chairman, for the hearing today and really starting the committee off early, hitting the ground running.

We know that the focus right now is really on the economy and how the failing economy is impacting so negatively American families out there. We appreciate the connection between energy policy and our economy.

We can't begin to fix the economy without addressing the need to how we're going to run our factories. How we're going to power our cars. How we're going to heat our homes.

While we have seen lower gas prices that have provided some relief. We recognize that it's only temporary until we can find a long term solution to our Nation's dependence on foreign energy sources. That's one of the reasons we're here this morning to consider the proposals to address the nation's tremendous energy security challenges.

We've got to find ways to power our lives that are cleaner, that are more efficient and of course, more environmentally protective. We know that this is not an easy task. If it was easy we would have figured it out by now.

But we hope that what we will hear from you this morning will help us as we work to craft yet another comprehensive energy bill. We need to show real leadership in developing legislation that builds this bridge to our energy future while helping to right the economy here. I have no doubt that this committee can provide the leadership that is necessary.

With the two comprehensive energy bills that have been introduced and enacted over the past 4 years. This committee is known for operating in a bipartisan fashion and getting things done. The 2005 Energy Policy Act, the 2007 Energy Independence Security Act, they did a great deal to advance our nation's energy policy.

We championed clean energy resources, like wind and nuclear. We increased the CAFE standards. We promoted biofuels. We directed the Federal Government to lead on conservation issues. Then last year the Congress addressed production by lifting the moratorium on off shore leasing.

We addressed such a magnitude of these issues in these bills that the Federal agencies are still implementing many aspects of them. We're still waiting for example, for the nation's first off shore wind project to receive Federal approval. While many of the programs authorized by EPACT and ESA have not received appropriations yet, the stimulus package, which is under development, will likely fund a number of these existing authorizations, everything from making our electrical grids smarter to increasing R&D work on alternative technologies, to providing energy efficiency block grants to schools and local communities.

As the committee moves to build upon its recent work, we must continue to monitor the Federal implementation of our comprehensive energy bills. We know that there are certainly areas that we can improve on this. To reach a secure energy future there is no question that we will need to produce a much greater amount of our energy. We must do it here at home. That means developing all of our domestic natural resources, both renewable and non renewable.

I have had an opportunity to discuss so many of my priorities with chairman, with other committee members. There's so much that we can do and we should do, whether it's working to expand

Federal revenue sharing, pushing for coal gasification, carbon sequestration, other technologies that will allow us to make better use of our abundant domestic resources. We also need to pass improvements to the loan guarantee program that was created by EPACT to advance climate friendly and late energy projects like emission free, nuclear power.

I appreciate those of you who have joined us this morning to provide your testimony. Look forward to your contributions and to working with you, Mr. Chairman and the other committee members in this 111th Congress.

The CHAIRMAN. Thank you very much. Why don't we go ahead with the witnesses at this point? Ask each witness to take 6 or 8 minutes and give us the main points or the highlights of the recommendations that they have come up with for the new Congress and the new Administration.

Let me just introduce the entire panel right now. Then we'll hear from them.

Dr. Kit Batten, who is a Senior Fellow with the Center for American Progress here in Washington. They've come up with several reports recently on this set of issues which we are anxious to know more about.

Mr. Eric Schwartz, who is a member of the Energy Security Leadership Council and is also former Co-CEO of Asset Management with Goldman Sachs, we welcome him here to the Committee.

Ms. Karen Harbert, who is the Executive Vice President and Managing Director for the Institute for 21st Century Energy at the United States Chamber of Commerce. We're glad to have you here. We know your organization has put a lot of effort into this effort, into this subject as well.

Dr. Dianne Nielson is an Energy Advisor with Governor Huntsman's office in Utah. Is here today speaking on behalf of the Western Governors Association that has developed an aggressive agenda for what they would like to see done on energy issues.

Dr. Batten, why don't you go ahead and start. We'll just go across the table here and hear from each of you for 6 to 8 minutes. Then we'll have questions.

STATEMENT OF KIT BATTEN, PH.D., SENIOR FELLOW, CENTER FOR AMERICAN PROGRESS ACTION FUND

Mr. BATTEN. Thank you. Good morning. Thank you, Chairman Bingaman, excuse me, Senator Murkowski and members of the committee. I am Kit Batten, Senior Fellow with the Center for American Progress Action Fund.

At CAPAF our work demonstrates that energy policy is economic policy. Reducing our dependence on volatile priced dirty sources of energy and increasing investments in low carbon energy and efficiency will serve three paramount national priorities: growing our economy, securing our nation's energy supplies and combating global warming. The Center for American Progress, the 501(c)(3) sister organization of the Action Fund has proposed a comprehensive clean energy and efficiency strategy to capture the energy opportunity associated by—afforded by the transition to a low carbon economy.

At the core of this strategy is a greenhouse gas cap and trade program that would provide tens of billions of dollars to help build a green economy and offset the cost of rising energy prices for low and middle income Americans. Also imperative are the complementary policies to increase research, development and deployment of low carbon and efficient technologies in our homes, businesses and transportation system, for use here at home and for export overseas. Green priorities must be at the center of both America's energy policy and each step of our economic policy: stabilization, stimulus, growth and recovery.

This investment can be a source of increased business opportunity, innovation, competitiveness, job creation, stronger, more prosperous communities and improved energy and national security. Furthermore, this comprehensive strategy can restore the leadership role of the United States in the International Climate Negotiations. This testimony focuses on the significant opportunities associated with transforming the U.S. economy to a low carbon model and the significant costs of not investing in this transition.

Our country is currently in a financial recession. The number of jobs in the United States has declined for 11 months in a row. The unemployment rate has increased to 6.7 percent. Even before this decline job growth has been meager since 2001.

We must reverse this trend. Investments in clean energy and efficiency as a part of the upcoming economic stimulus package will help kick start the clean energy economy and create millions of jobs. In collaboration with the Political Economy Research Institute at the University of Massachusetts CAP recently released a report detailing how $100 billion investment in clean energy and efficiency over 2 years would create two million jobs, nearly 4 times as many jobs as the similar level of investment in oil and gas. We must prioritize clean infrastructure investments including efficient green buildings, improved and scaled up low carbon energy production, transmission and distribution, mass transportation and rail systems and job programs to train Americans to run our clean energy future.

American families and businesses are facing high and volatile energy prices which makes it difficult to plan budgets, especially in the face of a recession. A significant short term benefit from investing in energy efficiency is keeping energy bills low. Building retrofits, incentives to adopt more efficient appliances, implementation of smart grid technologies and increasing vehicle fuel efficiency all can help stabilize American's energy bills.

Diversifying our Nation's sources of energy and investing in the development and broad deployment of low carbon and efficient technologies will afford consumers and business greater choice over their consumption of energy. Also help keep energy bills lower. For example, a 2008 Merrill Lynch and Company, Incorporated study found that increased bio fuel production was helping keep gasoline prices about 15 percent lower than they otherwise would have been.

If we do not put the right policies in place today to enable investments in a clean energy and efficient economy, the United States will lose the economic opportunities associated with regaining technological leadership in the global innovation marketplace. We must

ensure that America is a leader in the clean energy and efficiency market so that Americans have access to the best technologies and benefit from reduced energy costs via homegrown inventions. This in turn will improve our energy security.

The United States is currently dependent on oil to power its economy. But only has about 2 percent of global proved reserves as of January 2008. This dependence on foreign oil leaves us vulnerable to energy supply disruptions like what we're currently seeing in Eastern Europe and to price volatility as we experienced with summer gas prices.

The United States must make better use of the abundant energy resources we have here at home. But any action to increase domestic energy production must not ignore global warming consequences. We must invest in alternative fuels with lower life cycle greenhouse gas emissions than traditional gasoline.

We must also make improvements to our Nation's electricity transmission grid to ensure our energy security. Great expansion compatible with significantly scaling up renewable energy generation, improved connectivity between different United States regions, increased efficiency, improved security to ensure reliable supply and adoption of smart grid technologies are all essential.

Global warming has significant national security costs. In developing countries climatic shifts are expected to trigger or exacerbate food shortages, water scarcity, spread of disease and competition of our natural resources. All of which will fuel political turmoil, drive already weak states toward collapse, threaten regional stability and increase security risks.

Here in the United States costs associated with adaptation to global warming, disaster preparedness and response, human health and natural resource management are projected to be as high as 3.6 percent of GDP by 2100. The Intergovernmental Panel on Climate Change has found that in order to avoid the worst impacts of global warming, we need to see a peak in global emissions in the next few years. This certainly poses a challenge.

But this imperative can and must be met with smart policies that will not only put our nation on a path to a low carbon economy. But also creates a sustainable prosperity and growth and increase energy and national security. It is time for a new vision for the economic revitalization of our nation, the restoration of American leadership in the world and the movement toward a brighter, more prosperous future.

Thank you for your leadership on these pressing issues. I look forward to your questions.

[The prepared statement of Mr. Batten follows:]

PREPARED STATEMENT OF KIT BATTEN, PH.D. SENIOR FELLOW, CENTER FOR AMERICAN PROGRESS ACTION FUND

Chairman Bingaman, Senator Murkowski, and members of the Committee, thank you for the invitation to discuss the opportunities associated with investing in a clean energy today and tomorrow. Investments in the rapid deployment of existing clean and efficient energy technologies as well as investments in the research and development of new technologies will serve three paramount national priorities: growing our economy, securing our nation's energy supplies, and combating global warming.

I am Kit Batten, Senior Fellow at the Center for American Progress Action Fund, a nonpartisan multi-issue think tank focused on developing innovative policies that

build a more broadly shared prosperity. At CAPAF, our work demonstrates that energy policy is economic policy, that reducing our dependence on volatile-priced dirty sources of energy and increasing investments in low-carbon energy and efficiency are imperative to our nation's economic prosperity and security.

Our nation is currently poised to take action to fundamentally change the way we produce and consume energy, to significantly reduce our greenhouse gas emissions, and to create millions of jobs as a result of investing in a clean energy economy. It is my pleasure to participate in this discussion with you today, and I applaud your leadership on these public policy issues. CAPAF and I look forward to continuing to work with you all on these issues in the 111th Congress.

The Center for American Progress, the 501(c)(3) sister organization of the Action Fund, has proposed a comprehensive clean energy and efficiency strategy to capture the "energy opportunity" afforded by the transition to a low-carbon economy.[1] This comprehensive strategy must involve incentives and mandates to increase investment in low-carbon and efficient technologies in our homes, businesses, and transportation system; investment in research and development of new technologies for use here at home and to export overseas; capping and reducing greenhouse gas emissions across all sectors of our economy; and re-engaging in and taking on a leadership role in the international climate negotiations. At the core of this strategy is a greenhouse gas capand-trade program that would provide tens of billions of dollars to build a green economy and offset the cost of rising energy prices for low-and middle-income Americans.

The transition to a green economy—at home in the United States, and globally—can be a source of increased business opportunity, innovation, and competitiveness; job creation; stronger, more prosperous communities; and improved energy and national security. This transition must be at the center of both America's energy policy and each step of our economic policy—stabilization, stimulus, recovery, and growth. Investing in this transition—starting immediately, and putting us on a long-term low-carbon and energy independence pathway, will help to solve many of our nation's current interrelated challenges: a financial recession, job loss, rising and volatile energy prices, secure energy supplies, and a growing climate crisis.

This testimony focuses on the opportunities associated with transforming the U.S. economy to a low-carbon model and the significant costs of not investing in this transition or addressing global warming. Some make the case that we cannot afford to change the way we do business when in fact the exact opposite is true. We cannot afford not to act—in the short term, middle term, or long term.

Businesses and banks recognize this imperative to invest in a clean energy transition and the economic opportunities this transformation will create. In October, General Electric Chairman and CEO Jeff Immelt stated that GE eco-friendly products and energy efficiency technologies are a "green lining among the current economic storm clouds, and GE customers and investors are benefiting."[2] In October, sales of GE's Ecomagination products and services were projected to top $17 billion in 2008, a 21-percent gain over 2007. And end-of-year reports from Deutsche Bank and HSBC highlighted the opportunities associated with investments in clean energy and efficiency.[3, 4, 5]

Our energy and economic strategy must include short-term and long-term strategies, which we can and must embark on immediately. A green stimulus is an essential first step, especially for jump-starting the economy, creating more jobs (including more good jobs at higher wages), investing in the infrastructure necessary to facilitate the transition to a clean-energy economy, helping keep energy bills low, and acting as a first step in creating new markets for American business while reducing the overall cost of addressing our climate and energy crises.

Longer-term policies must also be put into place, including a cap-and-trade program designed to reduce our emissions and generate revenue to help fund a green

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[1] John Podesta, Todd Stern, and Kit Batten, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/11/energy_chapter.html

[2] Green Biz Staff, "Green Products Help GE Weather Rough Economic Times" GreenBiz.com, October 22, 2008, available at http://www.greenbiz.com/news/2008/10/22/green-products-help-ge-weather-rough-times

[3] DB Advisors, Deutsche Bank Group, "Investing in Climate Change 2009: Necessity and Opportunity in Turbulent Times" (Deutsche Bank 2008) available at http://dbadvisors.com/climatechange

[4] DB Advisors, Deutsche Bank Group, "Economic Stimulus: the Case for "Green Infrastructure, Energy Security, and "Green" Jobs" (Deutsche Bank 2008) available at http://dbadvisors.com/climatechange

[5] HSBC Global Research, "The Green-Collar President" (HSBC 2008) available at http://www.hsbcnet.com/hsbc/research

transition; incentives and mandates to invest in and develop low carbon and efficient technologies; and taking a leadership role in the international climate negotiations. We need this type of comprehensive strategy to ensure all of these goals are met, to take full advantage of the opportunities afforded by this low-carbon transition, and to avoid the significant economic and environmental costs of inaction. These costs of inaction entail everything from the price we would pay by missing the opportunity to lead the world in the development of new clean technologies for use at home and for export; to the costs of responding to and preparing for the effects of climate change domestically and internationally, including national security, disaster preparedness and response; and impacts on agriculture, natural resource availability and management, human health, and infrastructure.

JOB CREATION

Our country is currently in a financial recession, and a major indicator of our flagging economy is unemployment. The number of jobs in the United States has declined for 11 months in a row, and even before this decline, job growth has been meager since 2001.[6] Between the start of the recession in December 2007 and November 2008, our country lost 1.9 million jobs and the unemployment rate has increased to 6.7 percent, up 1.7 percent from last year.[7] In November 2008, 533,000 jobs were lost, the largest one-month decline in 34 years, and not only are people are losing jobs more quickly, but the average duration of unemployment has also risen—it is increasingly difficult to find a new job once a worker becomes unemployed.[8] December 2008 unemployment figures will be officially released on January 9, 2009 but are projected to reveal additional significant job losses and a possible unemployment rate of 7 percent.[9]

We must reverse this trend. Investments in clean energy and efficiency as part of the upcoming economic stimulus package will help kick-start the clean energy economy and create millions of jobs. In collaboration with the Political Economy Research Institute at the University of Massachusetts, CAP released a report in September 2008 detailing how a $100 billion investment in clean energy and efficiency technologies and infrastructure would create 2 million jobs over two years, nearly four times as many jobs created by a similar level of investment in oil and gas.[10]

Last month, my colleague Bracken Hendricks, Senior Fellow at CAPAF, testified before this committee on a report issued by the Center for American Progress outlining a plan to invest $350 billion in a one-year stimulus and recovery package, including significant investments in clean energy and efficiency.[11] This package includes four broad categories: $55 billion to spur demand and assist those most in need, $70 billion in aid for states and localities, $175 billion for infrastructure investments, and $50 billion for tax cut stimulus. Clean energy, efficiency, and environmentally beneficial projects comprise a large part of the infrastructure plan—over $100 billion. This approach will generate construction and manufacturing jobs, create new markets for technology and skilled labor, help reduce energy costs for American families and businesses, and implement new infrastructure and investments to enable our nation's clean energy transition.

INFRASTRUCTURE TO ENABLE A CLEAN-ENERGY TRANSITION

Prioritizing investments now in clean energy and efficient infrastructure is essential to transforming our economy to a low-carbon model and increasing prosperity and growth. Now is the time to wisely invest taxpayer dollars in a clean energy future, rather than continuing to invest primarily in infrastructure to support traditional sources of dirty energy which will have to be phased out as we meet the chal-

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[6] Christian Weller and Amanda Logan, "From a Trickle to a Flood: The Sharply Accelerating Contraction of an Already Weak Labor Market" (Washington: Center for American Progress, 2008), available at http://www.americanprogress.org/issues/2008/12/pdf/labor_contraction.pdf

[7] Bureau of Labor Statistics, Latest Numbers, (Department of Labor, 2009), available at http://www.bls.gov/

[8] Christian Weller and Amanda Logan, "From a Trickle to a Flood: The Sharply Accelerating Contraction of an Already Weak Labor Market" (Washington: Center for American Progress, 2008), available at http://www.americanprogress.org/issues/2008/12/pdf/labor_contraction.pdf

[9] Rich Miller, "Engines of Recovery Flame Out as Economy Seeks Obama-Fed Rescue," Bloomberg, January 5 2008, available at http://www.bloomberg.com/apps/news?pid=20601087&sid=anuuEj0tNs1Q&refer=home

[10] 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

[11] Bracken Hendricks, Testimony before the Senate Committee on Energy and Natural Resources, December 10, 2008, available at: http://www.americanprogressaction.org/issues/2008/pdf/green_recovery_testimony.pdf

lenge of significantly reducing greenhouse gas emissions. This clean infrastructure must include efficient green buildings; improved and scaled-up low-carbon energy production, transmission, and distribution; mass transportation and rail systems; and job programs to train Americans to run our clean energy future.

CAPAF has proposed investments ranging from programs to increase use and expand capacity of mass transportation and rail systems; expansion of weatherization assistance and building retrofitting; investments to green and improve energy efficiency in homes, businesses, federal buildings, and schools; programs to create and improve clean energy job training programs; increases in the use of renewable electricity in states, counties, and cities as well as in federal and tribal governments and electric cooperatives; investmentsto modernize the transmission grid including smart grid technologies; spurring carbon capture and sequestration technology; and manufacturing and consumer incentives to enable the transformation of the American auto industry's production of more fuel efficient vehicles. The full list and a more detailed description of these policy proposals are included in Bracken Hendricks' testimony.[12]

KEEPING ENERGY BILLS LOW THROUGH EFFICIENCY INVESTMENTS AND INCREASED CONSUMER CHOICE

American families and businesses are facing high and volatile energy prices. In July 2008, the price per gallon for regular, unleaded gasoline reached a record $4.11, but as of the week of December 29, 2008, the price had dropped to $1.61 per gallon.[13] 2008 also saw a rise in electricity prices due to a number of intersecting factors, including rising fuel costs, and the Energy Information Administration projects that electricity prices will rise an additional 5 percent in 2009.[14, 15] Price increases and volatility make it difficult for Americans to plan budgets, especially as pocketbooks are tightening in the face of a recession. For example, in 2007, gas price volatility led to families buying fewer other items or dipping into their savings because commutes and other driving responsibilities remained fairly constant.[16]

A significant short-term benefit from investing in energy efficiency is keeping energy bills low, even if energy prices increase. Building retrofits, incentives to adopt more efficient appliances, implementation of smart grid technologies, and increasing vehicle fuel efficiency can help stabilize American's energy bills in the face of rising energy prices.

For example, The Department of Energy has found that a $2,500 investment in home retrofitting can reduce average annual energy consumption in a typical American home by 30 percent. In 2006, average household income was approximately $60,000, and the average household spent about 5 percent of its income on household energy consumption,or $3,000 per year on energy. With a 30 percent improvement in efficiency and stable energy prices, the $2,500 could be recouped in saved energy costs in less than three years.[17]

Diversifying our nation's sources of energy will help keep prices lower and less volatile. For example, a 2008 Merrill Lynch & Co., Inc. study found that increased biofuel production was helping keep gasoline prices about 15 percent lower than they otherwise would have been.[18] It is critically important that new sources of renewable energy are further developed with targeted federal funds alongside already rising private sector investment. This includes renewable sources of electricity as

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[12] ABracken Hendricks, Testimony before the Senate Committee on Energy and Natural Resources, December 10, 2008, available at: http://www.americanprogressaction.org/issues/2008/pdf/green__recovery__testimony.pdf.

[13] Energy Information Administration, Weekly U.S. Regular All Formulations Retail Gasoline Prices, (Department of Energy, 2009) available at http://tonto.eia.doe.gov/dnav/pet/hist/mg__rt__usW.htm.

[14] Paul Davidson, "Price jolt: Electricity bills going up, up, up," USA Today, June 20, 2008, available at http://www.usatoday.com/money/industries/energy/2008-06-15-power-prices-rising__N.htm

[15] Energy Information Administration, Short Term Energy Outlook, (Department of Energy, 2008), available at http://www.eia.doe.gov/emeu/steo/pub/contents.html

[16] Amanda Logan and Christian Weller, "Pain in the Gas: Volatile Gas Prices Wreak Havoc on Household Financial Planning" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/05/pdf/gas__prices.pdf.

[17] 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.

[18] Kit Batten and Jake Caldwell, "Energy Diversity Dividends: BAiofuels Lower Oil Prices" (Washington: Center for American Progress, 2008), available at http://www.americanprogress.org/issues/2008/03/energy__diversity.html

well as sustainably produced biofuels with lower lifecycle greenhouse gas emissions than gasoline that do not raise food or feed prices.

Additionally, investing in the development and broad deployment of low-carbon and efficient technologies will afford consumers and business greater choice over their consumption of energy and will also help keep energy bills lower. As consumers and businesses faced rising gasoline prices and a weakening economy in 2008, they made changes in their behavior, reducing vehicle miles travelled by nearly 90 billion miles (or a 3.5-percent reduction) as of October 2008 [19] and reducing motor gasoline consumption by 3.4 percent (total petroleum product consumption decreased by 5.8 percent).[20]

Investments to increase the availability of alternative low-carbon sources of vehicle fuels (such as low-lifecycle carbon biofuels and electricity as plug-in electric hybrid vehicles make it to the marketplace), to provide more fuel-efficient vehicles, and to provide greater alternative transportation options via mass transit, all will help to increase consumer choice in the future and keep energy bills low, even in the face of volatile and rising energy prices.

DEVELOPMENT OF NEW TECHNOLOGIES FOR DOMESTIC AND INTERNATIONAL MARKETS

Typically, discussions of the costs of inaction—not investing in clean energy and efficiency and not reducing greenhouse gas emissions—focus on the impacts of global warming, including rising sea levels, more intense storms, changing weather patterns, increased incidence of human disease, reduced agricultural productivity, reduced clean water availability, etc.

These are of course very important costs of inaction, but they leave out an additional cost: If we do not put the right policies in place to enable investments in a clean and efficient economy today, the United States will lose the economic opportunities associated with regaining technological leadership in the global innovation marketplace. Moreover, we must ensure America is a leader in the clean energy and efficiency market so that Americans have access to the best technologies and therefore benefit from reduced energy costs via homegrown inventions. This, in turn, will also improve our nation's energy security.

The United States has already lost global market share in solar and wind technologies as a result of inconsistent policy.[21] In the last 10 years, the U.S. market share in photovoltaic cells dropped from 44 percent to 10 percent, while Japan and Germany have become solar leaders. Germany has seen significant employment growth in solar electricity: Firms that make photovoltaic panels and other components now employ 40,000 people, and 15,000 more work in the solar thermal business. In Germany and in some parts of Spain and Denmark, wind supplies more than 20 percent of electricity, while in the United States, wind currently stands at slightly over 1 percent of the electricity mix. U.S. government support for wind power has been erratic, marked by short-term extensions of the federal production tax credit, while in other countries wind power has taken off at a faster rate because of policies that provide renewable power producers with long-term purchase agreements at adequate prices.

IMPROVED ENERGY AND NATIONAL SECURITY

Energy security, national security, the economy, and global warming are integrally linked issues. The United States is currently dependent on foreign sources of oil to power its economy, but only has about 2 percent of global proved reserves as of January 2008.[22] This dependence results in economic, national security, and energy security concerns. New territorial disputes over oil and natural gas rights are erupting. As ice melts in the Arctic, several nations—including the United States, Russia, Canada, Denmark, Norway, Sweden, Iceland, and Finland—are racing to stake claim to oil, natural gas, and new shipping routes in our planet's north.[23]

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[19] Federal Highway Administration, October 2008 Traffic Volume Trends, (Department of Transportation, 2008), available at http://www.fhwa.dot.gov/ohim/tvtw/08octtvt/index.cfm

[20] Energy Information Administration, Short Term Energy Outlook, (Department of Energy, 2008), available at http://www.eia.doe.gov/steo

[21] John Podesta, Todd Stern, and Kit Batten, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/11/energy_chapter.html

[22] Energy Information Administration, World Proved Reserves of Oil and Natural Gas, Most Recent Estimates, (Department of Energy, 2008), available at http://www.eia.doe.gov/emeu/international/reserves.html

[23] Marsha Walton, "Countries in tug-of-war over Arctic resources," CNN, January 2, 2009, available at http://www.cnn.com/2009/TECH/science/01/02/arctic.rights.dispute/

America's dependence on oil leaves us vulnerable to energy supply disruptions and to price volatility. In order to better secure our energy and national security, the United States must invest to make better use of the abundant energy resources we have at home. But any action to increase domestic energy production must not ignore the global warming consequences. Thus, we need to make sure we are investing in fuels that have lower greenhouse gas emissions on a lifecycle basis than traditional gasoline. This imperative applies to biofuels and also to other unconventional petroleum fuels such as oil shale fuel. The Center for American Progress has published an article on the climate and environmental impacts of oil shale development. The considerable energy costs, significant water needs, large greenhouse gas emissions, and air and water pollution associated with oil shale fuel production all render this fuel a non-viable alternative.[24]

We must also make improvements to our nation's electricity transmission grid to ensure our energy security.[25] The current grid configuration cannot handle the growth in electricity demand expected over the next few decades unless we act quickly to modernize it. Grid modernization must be compatible with scaling up renewable energy generation—including the ability to incorporate intermittent renewable electricity generation—and carrying renewable power to city centers, which in many cases will require long-distance transmission. Additional important modernization efforts also include grid expansion, improved connectivity between different U.S. regions, increased efficiency of electricity transmission, improved security to ensure reliable supply of electricity, and adoption of smart grid technologies.

Global warming has significant national security implications and significant costs of inaction. If we do not substantially reduce greenhouse gas emissions in the near and long term, we will experience significant costs. For example, in developing countries climatic shifts are expected to trigger or exacerbate food shortages, water scarcity, the spread of disease, and natural resource competition.[26] Thus, global warming is a threat multiplier for instability and will fuel political turmoil, drive already weak states toward collapse, threaten regional stability, and increase security costs.[27]

These costs will not be limited to impacts experienced by developing countries; the Stern Review estimates that a robust set of policies aimed at holding greenhouse gas concentrations at around 550 parts per million of CO_2 equivalent are likely to cost about 1 percent of global gross domestic product per year by 2050, but that the economic costs of failing to significantly reduce emissions will be many times higher.[28] Here in the United States, costs associated with adaptation, disaster preparedness and response, human health, and natural resource management—just to name a few—are projected to be significant. The total cost of global warming in the United States could be as high as 3.6 percent of GDP, and hurricane damage, real estate losses, energy costs, and water costs alone may reach 1.8 percent of U.S. GDP by 2100.[29]

The International Governmental Panel on Climate Change has found that in order to avoid the worst impacts of global warming, we need to see a peak in global emissions over the next few years. This certainly poses a challenge, but this imperative can and must be met with smart policies that will not only put our nation on a path to a lowcarbon economy, but also create jobs; foster innovation, competitiveness, and sustainable prosperity and growth; increase energy and national security; and protect the economic and environmental health of our nation and globe.

It is time for a new vision for the economic revitalization of the nation, the restoration of American leadership in the world, and the movement toward a brighter, more prosperous future. Remaking the vast energy systems that power the nation

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[24] Alice Madden, "The Oil Shale Promise: A Trillion Tons Of Tater Tots" (Washington: Center for American Progress, 2008) available at http://wonkroom.thinkprogress.org/2008/07/09/oil-shale-potatoes/

[25] Kit Batten and Kari Manlove, "Identifying Hurdles to Renewable Electricity Transmission" (Washington: Center for American Progress, 2008) available at http://www.americanprogress.org/issues/2008/12/renewable_transmission.html

[26] John Podesta, Todd Stern, and Kit Batten, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/11/energy_chapter.html

[27] John Podesta, Todd Stern, and Kit Batten, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/11/energy_chapter.html

[28] John Podesta, Todd Stern, and Kit Batten, "Capturing the Energy Opportunity: Creating a Low-Carbon Economy" (Washington: Center for American Progress, 2007), available at http://www.americanprogress.org/issues/2007/11/energy_chapter.html

[29] Frank Ackerman and Elizabeth A. Stanton, "What We'll Pay if Global Warming Continues Unchecked," (Washington: Natural Resources Defense Council, 2008), available at http://www.nrdc.org/globalwarming/cost/cost.pdf

and the world are central to this opportunity. We must fundamentally change the way we produce and consume energy and end our dependence on oil. This transformation will provide enormous economic opportunities and security benefits and will enable us to comprehensively address global warming.

The time for action is now.

Thank you for your leadership on these pressing energy and economic policy issues. I look forward to your questions.

The CHAIRMAN. Thank you very much.

Mr. Schwartz, go right ahead.

STATEMENT OF ERIC SCHWARTZ, MEMBER, ENERGY SECURITY LEADERSHIP COUNCIL & FORMER CO-CEO OF GOLDMAN SACHS ASSET MANAGEMENT

Mr. SCHWARTZ. Good morning, Chairman Bingaman, Ranking Member Murkowski and members of the committee. I would like to thank you for giving me this opportunity to speak to you regarding one of the great challenges facing our country today, providing secure, sustainable and affordable energy to power the American economy.

As you know I come before you today as a member of the Energy Security Leadership Council, a non-partisan group of business executives and retired senior military officers who are concerned about the perilous state of the American energy system and our nation's obsessive reliance on petroleum. The Council is led by Fredrick W. Smith, Chairman, CEO and President of Federal Express and General P.X. Kelley, the 28th Commandant of the United States Marine Corps. The Council's members bring together decades of collective economic and national security experience and a firsthand knowledge of the importance of oil, energy and the challenges facing our country.

It is because of their experience and their knowledge of the dangers posed by our energy security vulnerabilities that the members of the Council have dedicated themselves to this issue. In December 2006, the Council released the report entitled, "Recommendations to the Nation on Reducing Oil Dependence." The report laid out a comprehensive blue print for energy security including demand reduction through reformed and increased fuel economy standards, expanded production of alternatives and increased domestic production of oil and natural gas.

The Council collaborated with Senators Byron Dorgan and Larry Craig to design legislation incorporating the principle elements of the recommendations. This resulted in the Security and Fuel Efficiency Energy Act of 2007, or the SAFE Energy Act. In December 2007, Congress passed and President Bush signed into law an energy bill that honored the recommendations by one, dramatically reforming and strengthening fuel economy standards.

Two, mandating a renewable fuel standard that will displace significant quantities of gasoline using advanced biofuels such as cellulosic ethanol. That was a significant accomplishment, but was only a first step. There is much more to do.

The reality is this. Our Nation's dependence on oil, much of it imported and the majority used in our transportation sector, still represents a grave threat to our economic and national security. Now that we are, as a nation, pointed in the correct direction. It

is time to help facilitate the transformation to the next generation of transportation technology that is as inevitable as it is necessary.

In September the Council released a comprehensive new plan that presents a long term vision for the dramatic transformation that our energy system requires. A national strategy for energy security offers a pathway toward a transportation system that is no longer dependent on oil. An electric grid that is flexible, clean and robust. That American research and development apparatus that sets the standard for the rest of the world.

The Council's plan has set a goal of reducing the oil intensity of the United States economy by 50 percent by 2030 and 80 percent by 2050. It will provide American manufacturing jobs, reduce the United States trade deficit, enhance the resiliency of the overall economy and reinforce our foreign policy priorities. The centerpiece of the Council's plan is the electrification of short haul ground transportation.

Deteriorating United States energy securities is largely due to transport's nearly complete reliance on oil whose price is set in a world market and is highly volatile. In contrast, electricity is produced in the United States from a range of largely domestic fuel sources whose price is less volatile and less effected by the geo-political factors that affect the price of oil. We believe that existing and emerging technologies are poised to allow the U.S. transportation sector to access this range of fuels providing Americans with a diverse, affordable, reliable source of energy to power their cars and trucks. In doing so electrification will substantially reduce U.S. oil consumption and our economy's vulnerability to volatile oil prices, thereby improving our national and economic security.

The Council's plan, however, is not just the recommendation for electric ground transport. It represents a strategic blue print for developing a 21st century energy infrastructure. In order to execute the long term shift to electrified ground transport, our plan outlines in great detail the necessary steps that must be taken to strengthen the nation's electrical transmission and distribution system and enhance our power generation capacity. Our approach reflects the reality that the build out of interstate transmission lines is among the most critical areas in which Federal Government leadership is required.

Our policies acknowledge the role of traditional base load power technologies like nuclear, advanced coal and natural gas while rapidly accelerating Federal research development and deployment efforts on carbon mitigation technologies like carbon capture and storage. In addition to policies to promote the development of the transmission distribution system, the Council also recognizes the need for more generating capacity to operate in a carbon constrained, regulatory environment. Accordingly, the national strategy also proposes specific measures to increase support for wind and solar power.

The electrification of short haul transport will require a decade's long initiative characterized by concentrated, sustained effort to improve national infrastructure. Deploy advanced technologies in a market friendly way. If properly executed, this process can produce a new U.S. transportation system that is fundamentally disconnected from oil dependence.

In the meantime, however, the Council has outlined a set of more immediate, temporary steps that can protect our economy and improve our national security. These policies including increased domestic production of oil and natural gas, a rationalized biofuels program and the implementation of fuel economy standards will allow our nation to reach its long term energy goals while keeping us strong and secure in the interim years. Underpinning all of America's efforts in energy policy must be a sustained, concentrated effort in energy research and development by the Federal Government. Technological advancement from energy storage to carbon sequestration will break down many of the most imposing barriers to a secure energy future.

Mr. Chairman, members of the committee, I can speak for every business and military leader on the Council when I say that we are unanimously, unambiguously committed to this cause. The proposal we have put forward represents much more than a laundry list of energy policies. The national strategy is an integrated plan that relies on a variety of measures, short, medium and long term, in order to transform the American energy system and secure this nation's future prosperity.

If we as a nation fail to address the vulnerabilities that exist due to our excessive reliance on oil, the American economy will remain vulnerable to debilitating shocks driven by geopolitical events outside of our control. Our national security will be imperiled by a weakened foreign policy that is forced to tread lightly when dealing with those who wish us harm. Our challenges are great. But so are our opportunities.

It is time for America to act. Thank you. I look forward to your questions.

[The prepared statement of Mr. Schwartz follows:]

PREPARED STATEMENT OF ERIC SCHWARTZ, MEMBER, ENERGY SECURITY LEADERSHIP COUNCIL & FORMER CO-CEO OF GOLDMAN SACHS ASSET MANAGEMENT

Good morning, Chairman Bingaman and members of the Committee. I would like to thank you for giving me this opportunity to speak to you regarding one of the great challenges facing our country today: providing secure, sustainable and affordable energy to power the American economy.

As you know, I come before you today as a member of the Energy Security Leadership Council (Council), a non-partisan group of business executives and retired senior military officers who are concerned about the perilous state of the American energy system and our nation's excessive reliance on petroleum. The Council is led by Frederick W. Smith, Chairman, President and CEO of FedEx, and General P.X. Kelley (Ret.), the 28th Commandant of the United States Marine Corps.

The Council's members bring together decades of collective economic and national security experience, with a profound first-hand understanding of the importance of oil and energy and the challenges facing our country.

Our military members have commanded U.S. armed forces as they patrol the waterways and shipping lanes so crucial to the global oil trade. They have been on the front lines of the battle against violent extremists, who are often funded by dangerous regimes awash in oil and natural gas revenue. And they have spent countless hours strategizing with American allies on the best approaches to safeguarding the thousands of miles of global energy infrastructure that is dangerously vulnerable to sabotage and political manipulation.

The Council's business members manage multinational companies that have shaped the modern global marketplace. If the world is in fact increasingly interconnected, it is because innovation, technology and accessible transportation have made it so. The Council's companies ship goods and services around the world, linking together consumers and small businesses on every continent. They manage net-

works of data, financial and investing platforms, and they make it possible for Americans to travel easily across the country on a moment's notice.

It is because of their experience and their knowledge of the dangers posed by our energy security vulnerabilities that the members of the Energy Security Leadership Council have dedicated themselves to this issue.

In December 2006, the Council released a report entitled Recommendations to the Nation on Reducing U.S. Oil Dependence. The report laid out a comprehensive blueprint for energy security, including: demand reduction through reformed and increased fuel-economy standards; expanded production of alternatives; and increased domestic production of oil and natural gas. The Council collaborated with Senators Byron Dorgan (D-ND) and Larry Craig (R-ID) to design legislation incorporating the principal elements of the Recommendations. This resulted in the "Security and Fuel Efficiency Energy Act of 2007 (SAFE Energy Act)."

In December 2007, Congress passed and President Bush signed into law an energy bill that honored the Recommendations by (1) dramatically reforming and strengthening fuel-economy standards and (2) mandating a Renewable Fuel Standard that will displace significant quantities of gasoline using advanced biofuels such as cellulosic ethanol.

That was a significant accomplishment, but was only a first step. There is much more to do. The reality is this: our nation's dependence on oil—much of it imported and the majority used in our transportation sector—still represents a grave threat to our economic and national security. Now that we are, as a nation, pointed in the correct direction, it is time to help facilitate the transformation to the next generation of transportation technology that is as inevitable as it is necessary.

All of the Council's members are acutely aware of the magnitude of the American energy challenge. We have seen first-hand how American oil dependence undermines U.S. foreign policy when our diplomats deal with oil exporters like Russia, Iran and Venezuela. We understand that America can never succeed in the war on terror as long as we fund both sides of the conflict.

Speaking to you today as one of the Council's business leaders, however, I must tell you that the threats posed to the U.S. economy by our dangerous dependence on oil are equally as dire as those posed to our national security. If we continue down the current path, economic weakness and decay at home will continue to threaten American power and influence abroad.

Recent events provide a useful benchmark for gauging both the vulnerability of our transportation system and the consequences of an actual energy crisis. Between January 2003 and July 2008, benchmark crude oil prices increased nearly five-fold, from about $30 per barrel to almost $150 per barrel. The run-up in prices was made worse by significant short-term price volatility. Between May 2 and July 3, 2008, oil prices spiked by $30 per barrel—an increase of 25 percent.

Indeed, while we are all aware of the sharp financial burden on U.S. households that face resets in their adjustable rate mortgages—a legitimate and significant concern—the increases in energy costs have been on the same, or even a greater, order of magnitude.

A typical subprime borrower with a poor credit history who bought a $200,000 house in 2006 with a 2 year/28 year ARM with a 4 percent teaser interest rate for the first two years would have seen monthly mortgage payments increase from about $950 a month before the reset to about $1,330 after the reset—an increase of about $4,500 a year. Meanwhile, the median household in America saw its household energy costs increase by roughly $1,600 a year during the same two-year period. But this type of increase in energy costs affected all U.S. households—not just the one household in 20 that held a subprime mortgage.

All of these developments stemming from higher oil prices caused a noticeable slowing of economic growth. The U.S. economy lost more than 700,000 jobs between December 2007 and the beginning of September 2008, and the unemployment rate increased from 4.5 percent to 6.1 percent—all before the financial crisis truly hit later in September. In fact, as early as last August, many economists believed the U.S. economy was already on the verge of recession, largely driven by sharply rising and volatile oil prices. This put banks and Wall Street firms in a weakened financial state, with sharply eroded profit positions, even before the credit situation reached its crisis point.

What is so striking about this series of events is its near inevitability—it was an entirely predictable disaster. Just as they warned of the impending collapse of mortgage institutions like Fannie Mae and Freddie Mac, experts also warned that global oil demand was rising unchecked while easy access to cost-effective oil supply was plateauing or falling. This basic dynamic eroded the practical buffer between world oil production capacity and daily oil consumption, leaving the oil market prone to damaging volatility.

Despite these well-known dangers, the American economy continued to operate at risk, with almost no substitutes for petroleum products and very few alternatives to driving. Today, 97 percent of our transportation energy needs are met by petroleum, and the transportation sector accounts for 70 percent of U.S. oil consumption.

Our mistakes have been costly. Sharply higher oil prices had a devastating effect on household, business, and public sector budgets, and effectively functioned as a tax on the economy. One recent estimate by researchers at the Oak Ridge National Laboratory placed the combined cost of foregone economic growth and economic dislocation at nearly $300 billion in 2008. Rising fuel prices also significantly weakened U.S. automakers, whose relatively inefficient but high-margin large vehicles were virtually unsellable for a period of several months.

Finally, the U.S. exported hundreds of billions of dollars to pay for imported oil. Based on initial estimates, the U.S. trade deficit in petroleum products probably reached an all-time high of $350 billion in 2008—exceeding the combined cost of the wars in Iraq and Afghanistan for that year. This massive financial burden accelerated the deterioration of the American balance of payments and contributed to a weaker U.S. dollar.

Today, oil prices are near the bottom of a record slide. One hundred and fifty dollar oil and U.S. gasoline prices over $4.00 per gallon led to demand destruction, which was reinforced by the financial and economic crises and the resulting recession in which we today find ourselves. What is absolutely crucial to remember, however, and what history has taught us time and again, is that these economic conditions are temporary. As the economy recovers, and drivers return to the roads, our dependence will once again put us at the mercy of rising oil and gas prices—particularly if the existing vehicle fleet is fundamentally the same as it is today.

Despite some initial signs that consumer behavior had changed over the summer, the Council is convinced that with prices back at a more palatable level, this country will return to its profligate use of oil. Indeed, early evidence supports my assertion: new vehicle sales once again shifted in favor of SUVs in December of 2008—for the first time since February of 2008. On New Year's Day, the Financial Times reported that U.S. sales of hybrid vehicles were down 53 percent in November compared to one year ago, and the decline is expected to steepen over the coming months.

To be blunt, we can no longer be slaves to the boom and bust cycle of oil prices. Mr. Chairman, members of the Committee: what is required here is a dramatic transformation, and what that transformation requires is leadership from Washington. The dynamism, ingenuity, and entrepreneurial spirit of the American economy can take us wherever we want to go, but government has to set the priorities.

In September, the Council released a comprehensive new plan that presents a long-term vision for the dramatic transformation that our energy system requires. A National Strategy for Energy Security offers a pathway toward a transportation system that is no longer dependent on oil; an electrical grid that is flexible, clean and robust; and an American research and development apparatus that sets the standard for the rest of the world. The Council's plan will reduce the oil intensity of the U.S. economy by 50 percent by 2030 and 80 percent by 2050. It will provide American manufacturing jobs, reduce the U.S. trade deficit, enhance the resiliency of the overall economy, and reinforce our foreign policy priorities.

The National Strategy establishes as a goal the electrification of the short-haul transportation system in the United States and provides a multifaceted set of proposals to help achieve that long-term goal. America's cars and SUVs consumed approximately 8 million barrels of oil per day in 2008—about 40 percent of the U.S. total. Aggressively transitioning this segment of the vehicle fleet to electrification has the potential to dramatically reduce U.S. oil consumption and fundamentally alter our energy profile. But it will require our national political leaders to embrace electrification not as a discrete and narrow initiative, but rather as a dominant policy theme to address our dependence on oil. And it will require a comprehensive, well-integrated approach.

Deteriorating U.S. energy security is largely due to the nearly complete absence of transportation fuel diversity. Not only are ever-greater amounts of oil required to fuel the U.S. transportation system, which is almost entirely dependent on oil, but the world oil market increasingly relies on supplies from hostile and/or unstable foreign producers. Electrification of transportation would allow cars and light trucks to run on energy produced by a diverse set of sources—nuclear, natural gas, coal, wind, solar, geothermal and hydroelectric. The supply of each of these fuels is secure, and the price of each is less volatile than oil. In the process, electrification would shatter the status of oil as the sole fuel of the U.S. ground transportation fleet. In short, electrification is the best path to the fuel diversity that is indispen-

sable to addressing the economic and national security risks created by oil dependence.

Of course, the transportation sector encompasses a broad range of components that extends beyond short-haul travel. Air transport, long-haul freight shipping, and heavy-duty trucks are not likely to be candidates for electrification. The Council, therefore, supports an aggressive program to develop and deploy third generation biofuels—identical on a molecular level to oil-based fuels—that can be used in air transport and heavy-duty trucks. These advanced biofuels can be transported using existing infrastructure and will substantially increase the flexibility of the broader transportation sector.

Central to the success of such an approach will be the manner in which we, as a nation, manage the consequences of oil dependence while we transition to electrification. The upgrades in infrastructure and technology that are required are on the order of trillion dollar investments. Our ability to finance this commitment will be directly related to our economic well-being and national security. Therefore, what the Council has put forward is not simply a laundry list of energy policy items. It is, instead, a strategy for mitigating oil dependence through practical measures in the short-and medium-term while we simultaneously invest in a post-oil transportation system for the long term. The more near-term steps include increasing domestic production of oil and gas, rationalizing the biofuels program, and aggressively improving fuel-economy standards for conventional vehicles.

Achieving the Council's goal of developing an electrified ground transportation system will place an added burden on the electric power infrastructure. With time-of-use pricing, we believe some demand for charging vehicles can be shifted to overnight hours, when the grid has surplus capacity. Still, electrifying a hundred million vehicles over 25 years will require the U.S. to make much-needed upgrades to the U.S. electric power systems at the generation, transmission and distribution levels. In fact, the Council would not recommend electrifying transportation if we are unwilling to make the necessary changes and improvements to these systems to enhance their robustness and reliability so that we do not make the mistake of exchanging one security threat for another.

The weakest link in our nation's electric power system is the transmission grid. The grid is currently insufficiently robust to support the unconstrained movement of power from generators to consumers, particularly location-constrained power (including renewables), and insufficiently reliable for an economy with a growing need for highly reliable power. Over burdened transmission lines increase the probability of service failures and prevent efficient redistribution of power from surplus to deficit regions. Recent studies of the transmission system have concluded that congestion on the transmission grid is costing consumers billions of dollars each year by preventing them from accessing low cost power.

Moreover, rather than constituting a national network, the transmission grid is in effect a patchwork that is not subject to the jurisdiction of any common regulator—indeed, some areas are wholly unregulated at the federal or state level. This balkanized structure makes it difficult to site and finance transmission lines.

The Council's National Strategy suggests that national leaders must treat grid expansion as a national security imperative. Grid expansion is necessary to ensure the reliability of the grid in an environment of ever-growing demand for power, including that needed for short-haul transportation. Grid expansion also will be necessary to fully exploit the opportunities presented by wind and solar energy, production of which is most promising in sparsely populated areas distant from significant electrical loads, and nuclear power and coal with carbon sequestration, which are also location constrained, though to a lesser extent. A recent report from the Department of Energy on wind energy, for instance, included estimates that identified the need for about 20,000 miles of transmission lines at a cost of about $60 billion to take full advantage of the available wind resource.

In order to develop a truly national grid, the federal government needs to play a more prominent role in the development of the nation's transmission grid. The Council believes that Congress should grant the Federal Energy Regulatory Commission the same primary siting authority for high voltage electric transmission lines under the Federal Power Act that it already possesses for interstate natural gas pipelines under the Natural Gas Act. Congress could establish that authority for all transmission lines otherwise subject to FERC's jurisdiction under the Federal Power Act or limit it to lines that exceed a specified voltage. In the alternative, Congress could expand FERC's existing backstop siting authority to all transmission lines and not just those in National Interest Electric Transmission Corridors.

Congress also must establish or designate an entity to undertake the responsibility of transmission grid planning on a nationwide basis, at least for the highest voltage lines that constitute the backbone of the transmission system. Current plan-

ning is done nearly exclusively on a regional basis and fails to adequately meet the nation's needs. Congress should then dictate that the cost of the new high voltage lines identified in the national planning process be allocated across the entire interconnects in which they were built. The advantages of those lines in terms of reduced congestion, enhanced access to lower cost power, enhanced reliability, and improved access to low-carbon power benefit all consumers of electricity, and they should all share in the cost.

The Council also recognizes the need to upgrade the distribution system, the lower voltage lines that deliver power to customers and the systems with which customers interact, which is where most of the technology necessary to establish a "smart grid" will be installed. Congress should require that all electric meters installed after 2014 are smart meters, capable of communications with utilities and consumers, and capable of metering for time of day or real time pricing. Congress also needs to provide support for the development of a network of publicly accessible recharging stations so that consumers using PHEVs and EVs will be able to recharge them away from home to extend their range and avoid using gasoline. The Council believes that ensuring that utilities may recover their investments in smart grid technology and providing slightly higher returns on equity for such investments will provide ample incentive for private investors to invest in smart grid technology while placing minimal additional burden on consumers.

The deployment of smart grid technology will enable the implementation of time of day pricing for electric power, one of the most important goals for managing our electric power system in the coming decades. Power costs more to generate during periods of peak demand, but most consumers pay the same price around the clock, undermining demand management programs that could shift some of that demand to lower peak times. Time of day pricing would promote more efficient use of our power systems, decrease the need for new generating capacity, lower emissions, and enhance reliability. While this is an area currently within state authority, the Council suggests that Congress require states to implement time-of-day pricing for all sales of electricity to customers that consumed more than a specified number of kilowatt hours of electricity per month (which should be established to exclude residences that consume low and moderate levels of power). In the alternative, Congress could at least require states to implement time of day pricing for all sales of electricity to charge vehicles.

In addition to policies to promote the development of the transmission and distribution systems, the Council also recognizes the need for more generating capacity to operate in a carbon-constrained regulatory environment. Accordingly, the National Strategy proposes increased spending and regulatory support for wind and solar power. The Council strongly supports the continued development of renewable sources of electric power generation. These fuel sources can help meet our growing electricity demand by producing clean and secure power with few if any safety concerns. Moreover, since they possess a risk profile that is very different from fossil-fuel or nuclear generation, renewables can contribute to the diversification of our power sector.

However, even the most optimistic projections for the growth of renewables will not support our demand for power. With coal providing half of our power and nuclear providing another 20 percent, we believe that we can not abandon these sources of power, which are both reliable and abundant.

Deployment of the next generation of nuclear power plants is currently underway, with over 20 license applications pending at the Nuclear Regulatory Commission. These plants, however, may not be built without the government loan guarantees created in EPACT 2005. The Council's National Strategy, therefore, recommends increasing the loan guarantee for nuclear power to account for the growing price of reactors since passage of the law and extending the deadline for the program to ensure that utilities can take advantage of it as Congress originally intended.

The Council also proposes to increase the loan guarantees available under the same program for demonstrating a fully functional integrated gasification combined cycle (IGCC) coal plant with carbon capture and storage. The International Energy Agency (IEA) recently reported that, globally, at least 20 carbon capture and storage demonstration projects are urgently needed by 2020. The United Nations Intergovernmental Panel on Climate Change (IPCC) has reported that carbon capture and storage can eventually satisfy between 15 and 55 percent of the world's carbon mitigation needs while reducing total mitigation costs by 30 percent. The Council believes America must take the lead on accelerating deployment of this critical technology, which cannot happen without government loan guarantees.

To achieve any of our energy goals, U.S. investment in energy research, development, demonstration and commercialization/deployment must be significantly enhanced.

Today, the United States ranks 22nd among developed nations in the fraction of GDP that is devoted to non-defense research. As the governmental share of U.S. R&D spending has declined from two-thirds to one-third of the total, industry has taken up the slack—yet by spending development, not research, dollars. The failure to focus on the research side of the R&D equation has had predictable consequences. Only four American companies made the 'top 10' list for patents issued in 2005. Not coincidentally, the U.S. trade balance in high technology manufactured goods went from positive $40 billion in 1990 to negative $50 billion in 2001.

Within the energy sector, the picture is even bleaker. Shortly after the energy crisis of 1973, U.S. energy R&D soared from $2 billion annually to more than $14 billion, with public-sector investment peaking at just under $8 billion and private-sector investment topping out at nearly $6 billion. By 2004, private-sector energy R&D funding was below $2 billion and government funding had dropped to roughly $3 billion. DOE's current applied research and development budget is about $3.1 billion, less than one half its level in the late 1970s.

This trend must be reversed. Given the importance of energy to our collective quality of life, the Council recommends that the U.S. research, development, demonstration and commercialization/deployment investments be at least on par with public health-related research. For public funding alone that would entail a ten-fold increase, as the 2008 enacted program level for the National Institutes of Health was $29.4 billion.

But we not only must spend more, we must establish new institutions to help guide the spending to increase the effectiveness of our investment. Rather than channel the increased spending through the existing offices at the Department of Energy, with their attendant shortcomings, the Council supports the establishment of a new institution either inside or outside of DOE. This institution should be funded, at least in part, by an independent budget stream that avoids the annual earmarks and appropriations battles in Congress and interference by the Office of Management and Budget. Moreover, all funding should be distributed entirely on the basis of merit, while still maintaining the appropriate level of Congressional oversight. One division of the institution should be established to offer significant R&D grants-based support for early-stage research following a peer-review process that examines all grant requests on an ongoing basis. Another division of the institution should also provide financial assistance in a manner similar to a bank to support the deployment of new technologies, whether in the form of loan guarantees or other means that it deems appropriate. Without such institutional reforms, the Council remains skeptical that the United States can achieve the R&D progress necessary to transform our energy system.

As Congress debates support for American automakers, it is worthwhile to speak briefly to the effects this plan—and the status quo—would have on them.

If the long-term trends suggest the increasing possibility of more severe and frequent oil price spikes, then the U.S. automobile sector cannot survive against foreign competitors positioned to offer consumers highly fuel efficient vehicles. Without change in the composition of products offered by the Detroit Three, each period of higher prices will be accompanied by an industry crisis and new demands for government intervention. At the same time, the United States has every interest in a competitive domestic automobile manufacturing sector, which cannot be easily or quickly replaced by foreign transplants in the event of the collapse of any significant portion of the domestic industry.

For the American companies to survive and make the transition to producing more fuel efficient vehicles, the public will have no choice but to provide meaningful assistance. Therefore, the National Strategy proposes an $8,000 tax credit for the first two million highly efficient vehicles sold in the United States. A similar measure was included in legislation passed by Congress in late 2008. The National Strategy also calls for direct assistance to the automakers to assist in their retooling to produce the transformative cars of the future. The Council recognizes that Congress provided some assistance last fall, but believes that additional assistance may be necessary in the future. This would not be limited to the Detroit Three, but to any automaker that produces cars in the United States.

The electrification of short-haul transport and the deployment of advanced biofuels will require a decades-long initiative characterized by a concentrated, sustained effort to improve national infrastructure and deploy advanced technologies in a market-friendly way. If properly executed, this process can produce a new U.S. transportation system that is fundamentally disconnected from oil dependence.

In the meantime, however, the United States can take more immediate, temporary steps to safeguard our economy and improve our national security. For this reason the National Strategy also includes crucial interim policies—including increased domestic supply of oil and natural gas, increasing the blend wall for conven-

tional ethanol, and the implementation of fuel economy standards—to help us reach our long-term goal while keeping our nation strong and secure in the interim years.

While it is often noted that the United States holds just three percent of the world's proved oil reserves, this figure is highly misleading. In fact, the U.S. possesses substantial reserves of oil that have yet to be exploited. Current undiscovered technically recoverable reserves are at least 100 billion barrels, according to numerous U.S. government reports. Just as the U.S. possesses vastly greater natural gas reserves than conveyed by proved reserves data, we have access to a large quantity of oil resources that currently sit undeveloped.

In some cases, the constraints on U.S. oil and gas development are economic and technical. In the Deepwater Gulf of Mexico, for example, projects take years to develop and rely on a global infrastructure chain that was overburdened during the run-up in oil prices that began in 2003. In other cases, however, the government has constrained the oil and gas industry's access to reserves on Federal lands. In particular, the ability of the industry to access high-potential areas of the Federal Outer Continental Shelf (OCS) has been restricted by long-standing congressional moratoria and presidential withdrawals. Proponents of these restrictions have historically justified them on environmental grounds, but the most accurate and up-to-date data suggest that this position is no longer accurate.

According to the Minerals Management Service (MMS), the offshore oil and gas industry produced 10.2 billion barrels of oil between 1985 and 2007 with a spill rate of just .001 percent. In recent years, as standards and technology have improved, the rate of incidents has steadily declined. A recent report by the Congressional Research Service found that the annual number of oil spills in U.S. coastal waters declined by 50 percent from 1995 to 2004. In fact, nearly two-thirds of the oil that enters the North American coastal waters each year comes from natural seeps, with only 5 percent coming from oil extraction and transportation.

During the turbulent 2005 Atlantic hurricane season, when Hurricanes Katrina and Rita tore through the Gulf of Mexico, approximately 75 percent of the 4,000 federal OCS oil and gas facilities in the Gulf of Mexico were subjected to 175 mile-per-hour winds and other hurricane conditions. Despite serious damage to 168 platforms, 55 rigs, and more than 560 pipeline segments, the U.S. Coast Guard and MMS reported no major oil spills. Total OCS petroleum spillage from the two storms has been estimated at 14,676 barrels—about the size of a single Olympic swimming pool.

Now that Congress has allowed the OCS moratoria to expire, the Council believes that it is time to put a rational offshore energy development program in place that leverages advances in technology to produce the most cost-effective oil supplies while safeguarding the environment. Techniques such as extended reach drilling (ERD) can access reserves within 10 miles of the shoreline while essentially eliminating surface disruptions offshore. In other cases, allowing a temporary surface presence can enable energy producers to construct sea-floor wellheads that tie-in to infrastructure farther afield or onshore, thereby protecting the sanctity of coastal vistas.

Today, the federal government collects significant royalties from the extraction of oil and gas resources in federal waters. In 2008, the Minerals Revenue Management Service reported $8.3 billion in offshore royalty receipts plus an additional $9.7 billion in lease rents and bonuses associated with bids. While estimates vary widely depending on assumptions, expanding access to the OCS areas currently off-limits should significantly increase government revenue from royalties. One recent study, which assumed full access to all OCS waters by 2012, estimated cumulative increased royalties at $41 billion through 2025. Another study, carried out by ICF International, estimated lifecycle government revenue of over $300 billion for opening the full OCS.

The Council clearly sees the value of royalty requirements for all offshore leasing activity and supports a structure that factors the current price of oil into the MMS process for determining royalty requirements. Moreover, rather than depositing the federal share of OCS royalty payments in the general fund of the Treasury, these revenues should be dedicated to energy research, development, and deployment. Transportation electrification should be a priority, with funds available for both consumer incentives and manufacturer assistance.

To be clear, the long-term goal of any U.S. energy policy should be to replace oil with low and zero carbon domestic energy sources. In the medium-term, however, U.S. oil demand will continue at least at current levels for many years until plug-in electric vehicles and electric vehicles constitute a significant portion of the domestic light-duty vehicle fleet. In other words, even if one is very bullish about electric vehicles and the ability of the U.S. to generate low carbon electricity to power them, the U.S. will still need adequate oil supplies for many years to come. Opening up

the OCS for environmentally responsible development can help supply that oil, while at the same time, providing American jobs and helping to improve our balance of payments. In the event that the OCS is not opened, this new oil will likely come from four main sources: Brazil, the Middle East, West Africa, and the Canadian Oil Sands, in order of increasing environmental and climate damage.

The bulk of the oil that the OCS would likely be displacing would come from the Canadian Oil Sands. Because the oil sands rely on heat and energy-intensive processes, a significant amount of carbon is emitted during the extraction phase. Even though the carbon emitted when the oil is burned in a car is the same for OCS and oil sands, the carbon emitted in the course of producing the oil is much higher for the non-traditional source.

Just as we can produce more oil in the near-term, we can also consume less. The time required for the U.S. vehicle fleet to ramp up to widespread electrification will be measured in decades. In the meantime, light-duty vehicles powered by conventional internal combustion engines must be as efficient as technologically and economically feasible. The Energy Independence and Security Act of 2007 (EISA) contained much-needed provisions that increased car and truck fuel-economy standards for the first time in 30 years and reformed the CAFE system to make it more market friendly. By 2020, the new fuel-economy standards could reduce U.S. oil consumption by nearly 700,000 barrels per day.

As we move forward, it will be critical for the Secretary of Transportation and the National Highway Traffic Safety Administration (NHTSA) to implement fuel-economy rules that give consideration to the seriousness of the national security threat facing the United States. By increasing standards for light-duty vehicles at a rate of 4 percent per year beyond 2020, U.S. oil consumption would be reduced by nearly 3.5 million barrels per day in 2030.

EISA also mandated the issuance of fuel-economy standards for medium- and heavy-duty trucks for the first time in U.S. history. This structural reform is of great importance for reducing fuel demand in the transportation sector. However, the legislation did not set specific standards for these vehicles, as it did for cars and light trucks. Instead, the bill left NHTSA with statutory authority for setting the medium- and heavy-duty fuel-economy standard as part of its rule-making process. The Council continues to recommend that NHTSA pursue an aggressive and expeditious rule-making process with regard to medium- and heavy-duty trucks as part of implementing EISA and, where possible, consolidate and streamline statutorily-required processes to result in maximum oil savings at the earliest possible date.

I can speak for every business and military leader on the Energy Security Leadership Council when I say that the Council is unanimously, unambiguously committed to this cause. The proposal we have put forward represents a commitment to transforming our transportation systems. It will be controversial. We have no illusions about that. But we would not be members of this Council if we had shied away from big ideas in the past. We can do this. We can end our transportation system's reliance on petroleum. We can ensure the robustness of the nation's electric power sector by promoting a diverse range of technologies. We can expand the research, development, and deployment of critical new technologies.

If we as a nation fail to meet this challenge, the American economy will remain vulnerable to debilitating shocks driven by geopolitical events outside of our control. Our national security will be imperiled by a weakened foreign policy that is forced to tread lightly when dealing with those who wish us harm.

We cannot continue to react to events as they happen, risking our economy every time an insurgent attacks a pipeline or a hurricane threatens the Gulf. Continued delay carries unacceptable risks. We believe that we are at a unique moment, where the recent run-up and collapse of the price of oil, and its consequences for consumers, the automakers and the economy, has left Americans thirsty for bold and transformative policies to address our addiction to oil. We must take advantage of this moment in time and act together while this priority remains prominent in our collective consciousness.

Our challenges are great, but so are our opportunities. It is time for America to act.

APPENDIX A: OUTLINE OF THE ENERGY SECURITY LEADERSHIP COUNCIL'S A NATIONAL STRATEGY FOR ENERGY SECURITY: RECOMMENDATIONS TO THE NATION ON REDUCING U.S. OIL DEPENDENCE

I. Diversify energy supplies for the transportation sector

A. Electrification of the transportation sector

1. Establish development of advanced battery technology as a top research priority and spend at least $500 million per year toward their development.

2. Replace existing vehicle tax credits with new tax credits of up to $8,000 per vehicle for the first two million domestically produced highly efficient vehicles.

3. Federal government should help create a market and exercise leadership by purchasing highly efficient vehicles.

4. Establish production tax incentives to aid in the retooling of U.S. vehicles manufacturing facilities and to create and maintain a domestic capacity to manufacture advanced batteries.

5. To encourage business participation, extend and modify federal subsidies for hybrid medium-duty vehicles (Classes 3–6) and heavy-duty vehicles (Classes 7–8) to 2012 and remove the cap on the number of eligible vehicles.

6. Grants to municipalities and tax credits to commercial real estate developers to encourage the installation of public recharging stations.

B. Enhancing the nation's electrical system

a. Increasing Nuclear Power Generation and Addressing Waste Storage

1. Continue licensing process for Yucca Mountain while initiating a program of interim storage as an alternative to Yucca Mountain.

2. Extend the deadline and increase the funding levels for loan guarantees for new nuclear generation.

b. Deploying Advanced Coal Technology

1. Significantly increase investment in advanced coal R&D including development of carbon capture and storage technology and policy framework.

2. Increase funding for loan guarantees for advanced coal generation.

c. Promoting Renewable Energy

1. Reform and extend the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) through December 31, 2013, while providing certain guidance for the transition to a fundamentally improved, next-generation incentives program.

d. Development of a Robust Transmission Grid to Move Power to Where It is Needed

1. Extend backup federal eminent domain for transmission lines to help expand the use of renewable power and to enhance reliability by moving power from surplus to deficit regions.

2. Require the Federal Energy Regulatory Commission (FERC) to approve enhanced rates of return on investments to modernize electrical grid system.

e. Transforming Consumer Demand for Electricity

1. Direct states to implement time of day pricing for electricity, and grant FERC backstop authority to implement time-of-day pricing if states will not.

2. Require utilities to install smart meters for all new installations after a specified date.

C. Reforming the biofuels program

a. Shift focus of biofuels deployment by concentrating on R&D and commercialization efforts on next-generation biofuels, fostering competition among fuels derived from differing feedstocks.

b. Require increasing production of Flexible Fuel Vehicles (FFVs).

c. Accelerate Department of Energy and Environmental Protection Agency testing and performance validation of unmodified gasoline engines running on intermediate-levels, first- and second generation biofuels blends.

d. Replace the 45-cents-per-gallon ethanol tax credit with a 'smart subsidy'.

e. Eliminate tariffs on imported ethanol over a period of three years.

II. Increasing energy access: expanding domestic supply

A. Target federal policy and resources to encourage the expanded use of carbon dioxide for enhanced oil recovery.

B. Support federal investment in technologies that can limit the adverse environmental impacts of oil shale and coal-to-liquids (CTL) production to ensure long-term viability before undertaking public investment in production.

C. Increase access to U.S. oil and natural gas reserves on the Outer Continental Shelf (OCS) with sharply increased and expanded environmental protections.

D. Increase access to U.S. resources in the Arctic and Alaska.

E. Federal support for construction of a natural gas pipeline from Alaska to the continental United States.

F. Expand federal R&D initiatives studying the opportunities to exploit methane hydrates, including the initiation of small-scale production tests.

III. Accelerating the development and deployment of new energy-related technology

A. Annual public investment in energy R&D should be increased by roughly an order of magnitude to approximately $30 billion.

B. Reform the existing institutions and processes governing federal R&D spending.

C. Develop a more effective federal R&D investment strategy.

D. Establish new institutions to provide funding for early-stage R&D and for later-stage deployment and commercialization.

E. Invest in the next-generation workforce for the energy industry.

IV. Reducing demand for oil: improving efficiency

A. Aggressively implement fuel-economy standards established in the Energy Independence and Security Act of 2007 (EISA).

B. Increase allowable weight to 97,000 lbs. gross vehicle weight for tractor-trailer trucks that have a supplementary sixth axle installed but which replicate current stopping distances and do not fundamentally alter current truck architecture. In addition, government should study further the safety impacts of significantly longer and heavier tractor-trailers used in conjunction with slower speed limits.

C. Require the Federal Aviation Administration (FAA) to implement and fund improvements to commercial air-traffic routing in order to increase safety and decrease fuel consumption.

V. Managing risks and global issues

A. Direct the Department of Energy to develop workable guidelines for the use of the Strategic Petroleum Reserve and evaluate its proper size based on those criteria.

B. Work with foreign governments to eliminate fuel subsidies.

C. Promote a robust China-U.S. partnership on carbon capture and storage that focuses on private-sector collaboration and sharing of best practices.

D. Establish a National Energy Council at the White House to coordinate the development of the nation's energy policy and to advise the president with regard to energy policy.

E. The National Intelligence Council should complete a comprehensive National Intelligence Estimate on energy security that assesses the most vulnerable aspects of the infrastructure critical to delivering global energy supplies and the future stability of major energy suppliers.

F. Working with the Department of State, the Department of Justice should bolster programs designed to train national police and security forces to defend and secure energy infrastructure in key countries.

G. As called for in its recent Maritime Strategy, the U.S. Navy should leverage the maritime forces of other countries to provide protection against terrorists and pirates for oil tankers in vulnerable regions.

H. The Department of Defense should engage NATO and other allies in focused negotiations with the intention of creating an architecture that improves the security of key strategic terrain.

I. The intelligence community should bolster collection and analysis capabilities on potential strategic conflicts that could disrupt key energy supplies. The State Department should improve its capacity to intervene diplomatically in conflicts that impact U.S. energy security.

J. The intelligence community should expand the collection of intelligence on national oil companies and their energy reserves in order to allow policymakers to make better decisions about future alliances and the nation's strategic posture on energy suppliers.

The CHAIRMAN. Thank you very much.

Ms. Harbert, go right ahead.

STATEMENT OF KAREN A. HARBERT, EXECUTIVE VICE PRESIDENT AND MANAGING DIRECTOR, INSTITUTE FOR 21ST CENTURY ENERGY, CHAMBER OF COMMERCE

Ms. HARBERT. Thank you, Chairman Bingaman and Ranking Member Murkowski and members of the committee for holding this very important hearing. Thank you for the opportunity to appear once again before this committee.

I'm Karen Harbert. I'm the Executive Vice President of the Institute for 21st Century Energy at the United States Chamber of Commerce which is the largest business federation representing more than three million businesses across the entire United States of every size, sector and region. Forth rightly addressing our Nation's complex energy challenges is one of the most urgent economic and national security challenges of this century.

In the past year a surging global economy led to record oil and commodity prices which ultimately contributed to our current economic crisis. We've witnessed the most volatile energy market in history. Dramatic reduction cuts from OPEC.

New energy projects being canceled as we speak and growing instability in many producing countries. While oil and gasoline prices have temporarily decreased. These lower energy prices should not lull us into a sense of complacency or several years from now, we will pine for four dollar a gallon gasoline.

At the Institute we believe these daunting challenges actually represent a historic opportunity to change course and drive our economic recovery. Over the past year the Institute has worked to develop a comprehensive, long term and pro-growth energy strategy that includes nearly 90 recommendations and time tables for the incoming Administration and Congress to consider. Each of your offices and the President-elect and his team have received copies.

With most of Washington focused on a stimulus plan the Institute's transition plan is just that, an economic, national security and energy stimulus plan. These recommendations, if adopted, will produce new investment and revenue here at home. Reduce the $400 to $700 billion we spend on imported oil last year alone.

It will create new and affordable, reliable American energy sources which are necessary for our economic recovery. It will create new industries that grow our economy and produce sustainable American jobs. It will demonstrate the strength of American innovation by creating breakthrough technologies. It will reduce our dependence on energy from unstable regions of the world. Ultimately it will put us on a path for a much more secure energy future.

Our plan focuses on four principle areas.

First, to promote energy efficiency across all sectors of the economy.

Second, to increase and diversify our energy supplies.

Third, to invest and modernize and protect our energy infrastructure.

Fourth, to improve our environmental stewardship.

In the next 180 days are very important steps this Congress should take. Technology will be the cornerstone of our energy future. However, current funding for energy R&D is about half of what it was 30 years ago. Federal R&D funding should be doubled within the next 5 years and concentrate in the areas that are high risk, high return and best suited for the government research enterprise.

To get these cutting edge technologies out into the marketplace, we recommend creating a Clean Energy Bank of the United States, which would be a quasi government entity with sufficient capital to invest in and accelerate market penetration of advanced clean energy technologies. The Bank would become self sustaining by its own fees and products and services.

Working with the private sector the Congress and the Administration could establish a fund managed by fossil based utilities to support R&D for carbon capture and storage. That research should take place at private, academic and government entities. Funding would be raised through a small fee on fossil based utilities. It should not exceed a billion dollars over the next 10 years per year.

Congress should also increase funding at the Federal level for clean coal energy R&D at a level of a billion dollars per year. Nuclear power is currently the least cost and largest source of emissions free base load electricity and it must be expanded. However, Congress should increase the Department of Energy's Loan Guarantee Program to support the construction of more than just two or three nuclear power plants.

We also need to find an appropriate home for the Loan Guarantee Program. We might want to think placing that at the Clean Energy Bank that I just outlined above. Each new nuclear plant will support 1,500 sustainable jobs in the communities in which they operate. The Congress should also ensure that the Nuclear Regulatory Commission has enough staff and resources to appropriately approve the combined construction and operating licenses in a timely manner for these new nuclear power plants.

Over 80 percent of America's oil and gas reserves have been placed off limits for exploration for decades. We need to produce more oil and gas here at home. We should permanently end all the moratoria on exploration production for oil and gas in the Outer Continental Shelf and on Federal lands on shore and provide each state with 37 and a half percent of the royalty revenue from the OCS production off their shores.

Doing so will significantly reduce the billions of dollars we sent abroad each year for oil imports and create new royalty revenue, new investment and new jobs here at home. Over the next year we do strongly believe that a comprehensive energy legislation needs to come before this Congress. The recommendations above and outlined below should be included.

We should give the Federal Energy Regulatory Commission new authority to cite electricity transmission facilities, just like they have for natural gas pipelines. Our transmission infrastructure is inadequate to meet growing demand and completely incapable of

incorporating a significant expansion of desirable, renewable electricity.

We need to make the Blender's tax credit for biofuels variable by linking it to the price of gasoline or diesel fuel. We need to increase the credits for second generation biofuels. We need to extend renewable tax credits for the full 8 years. It should be for all renewable energy, not just solar energy. This would give investors the confidence they need to make long term capital investments.

We need to address climate change. We need to address it as part of an overall energy strategy that will support a healthy economy, emphasize efficiency gains, promote the development of new low and zero emitting technologies and recognize the global nature of this challenge. We should not seek to utilize inappropriate mechanisms like the Clean Air Act and the Endangered Species Act that were never designed to address the complexities of reducing greenhouse gas emissions.

Those are just a sampling of the recommendations, the 90 recommendations that we have put forward for your recommendation. I would hope that these recommendations would be included in the record. We should recognize the enormity of these challenges. But we should also recognize the government alone cannot and should not provide all the solutions. It will take public and private sector cooperation.

The Government must do its part to put more options on the table by providing fiscal and regulatory predictability, appropriate fiscal incentives and supporting a robust, advanced research agenda. The private sector has the expertise to mobilize technologies and the capital necessary to bring these solutions to the marketplace. We need to fashion a new and increasing complementary relationship between the public and private sector. We can turn today's energy challenges into tomorrow's economic and energy success stories.

At the Institute we stand ready to work and be an important part of this discussion. The private sector needs to be an important part of the solution. Thank you for your time.

[The prepared statement of Ms. Harbert follows:]

PREPARED STATEMENT OF KAREN A. HARBERT, EXECUTIVE VICE PRESIDENT AND MANAGING DIRECTOR, INSTITUTE FOR 21ST CENTURY ENERGY, CHAMBER OF COMMERCE

Thank you, Chairman Bingaman, Ranking Member Murkowski, and members of the Senate Energy and Natural Resources Committee. I am Karen Harbert, Executive Vice President and Managing Director of the Institute for 21st Century Energy (Institute), an affiliate of the U.S. Chamber of Commerce. The U.S. Chamber of Commerce is the world's largest business federation, representing more than three million businesses and organizations of every size, sector, and region.

I commend the Committee for holding a hearing on this issue so quickly in this new year and new Congress. It speaks to the high priority you and the American people are placing on securing our nation's energy future. This couldn't be more critical. From an economic, national security, and environmental standpoint, few things are as important to our nation's and our world's future than energy. Smart energy policy choices made now will help to drive the economic recovery our nation needs.

The members of this committee are well aware of the challenges we face. Between now and 2030, global demand for energy could increase by more than 50 percent, and by as much as 20 percent here in the United States. The International Energy Agency estimates that to meet global energy demand in 2030, more than $26 trillion in new investment will be needed. Of this, more than half will be required just to

maintain our current level of supply capacity, and much of the world's energy infrastructure will need to be replaced within the next 20 years.

The Institute has been working to build support for a comprehensive, long-term, and nonpartisan approach to addressing our nation's energy challenges. Since early last year, we have focused on developing, launching, and advancing an energy strategy with concrete steps we believe must be taken by the incoming Administration and Congress. This plan aims to put the United States on a secure and prosperous path for future generations and we are pleased that the Institute's work has attracted a broad array of support.

Last summer, we delivered an open letter to the next President and Congress that included 13 pillars upon which any comprehensive energy reform effort should be built. These pillars include:

1. Aggressively Promote Energy Efficiency;
2. Reduce the Environmental Impact of Energy Consumption and Production;
3. Invest in Climate Science to Guide Energy, Economic, and Environmental Policy;
4. Significantly Increase Research, Development, and Demonstration of Advanced Clean Energy Technologies;
5. Immediately Expand Domestic Oil and Gas Exploration and Production;
6. Commit to and Expand Nuclear Energy Use;
7. Commit to the Use of Clean Coal;
8. Increase Renewable Sources of Electricity;
9. Transform Our Transportation Sector;
10. Modernize and Protect U.S. Energy Infrastructure;
11. Address Critical Shortages of Qualified Energy Professionals;
12. Reduce Overly Burdensome Regulations and Opportunities for Frivolous Litigation; and
13. Demonstrate Global Leadership on Energy Security and Climate Change.

This letter was signed by 27 former members of the Cabinet and Congress from both political parties as well as by thousands of individuals across the United States. The signatories included former Senator Sam Nunn, retired General Cohn Powell, former White House Chief of Staff Mack McLarty, and former Secretaries of Energy James Schlesinger and Spencer Abraham to name a few.

Last fall, we unveiled a Blueprint for Securing America's Energy Future that provides detailed analysis of our 13 pillars and puts specific recommendations behind each one. In November, we further expanded our efforts by unveiling an energy transition plan, which presented a detailed implementation timeline for each recommendation and identified who in our government has the responsibility for action.

The Institute's work is unique in that it represents a comprehensive approach to energy policy that will be critical to achieving consensus and ensuring that needed reforms actually get done. America's business community is as diverse as it is large, representing different sectors, different sizes, and different regions of the country. Yet, it has come together behind this common vision for securing our country's energy future.

Now, we need the United States Congress and the incoming Administration to follow suit and implement a united vision for a long-term strategy for tackling our energy challenges.

At the Institute, we believe that the United States can best plan to meet its energy demands both now and in the future with affordable, reliable, and diverse supplies by focusing on four key principles:

1) Promoting Energy Efficiency
2) Increasing and Diversifying our Energy Supplies
3) Investing in Modernizing and Protecting our Energy Infrastructure
4) Improving Environmental Stewardship

Today, I'd like to outline some of the more specific steps that we believe must be done within each principle.

PROMOTING ENERGY EFFICIENCY

The easiest place to find new energy is by better harnessing the energy that we unintentionally waste every day.

The United States has improved its energy intensity—that is, energy use per unit of gross domestic product—at a steady rate since 1970. In 1970, it took roughly 18,000 btu to produce one dollar of GDP. Today, it takes a little less than half of

that. At the same time, the United States can and should make further improvements.

There is a tendency to think about energy efficiency only in terms of energy consumers. As a result, most efficiency efforts tend to focus on end users. But it is not enough to make our buildings, appliances, lighting, and automobiles more efficient; we must take steps to increase efficiency throughout the energy delivery chain—from production to delivery to consumption.

We believe Congress and the Administration could begin this process by allowing more rapid depreciation of capital equipment through the federal tax code. This would provide an incentive for new investment that would accelerate reductions in energy intensity and carbon intensity. This could best be accomplished through three revisions to the tax code:

- First, reducing the cost-recovery period for investment in electricity transmission lines and smart grid devices from 20 years to 10 years.
- Second, reducing by half the cost-recovery period for best available energy efficiency devices when they are installed by commercial facilities and small businesses.
- And third, providing for immediate expensing for investments that meet the standard for breakthrough low carbon technologies.

Another helpful change to the federal tax code would be to expand the tax deduction created in the Energy Policy Act of 2005 for commercial buildings that reduce energy consumption by one-half to a value of at least $2.25 per square foot. Residential and commercial buildings account for roughly 40 percent of our nation's energy consumption. So beyond changes to our tax code, we must also explore other ways to encourage and improve energy efficiency in our homes and businesses.

Advances in building equipment and appliances and the use of integrated smart energy systems could make it possible to achieve a 70 percent reduction in a building's energy use by 2025. Yet, the use of such smart technologies is still the exception rather than the rule. Why? Because building developers and owners are more focused on "first costs" rather than "life cycle" costs.

This could be overcome through the development of building codes that emphasize energy efficiency. While building codes are the responsibility of state and local governments, national model codes are developed by code-setting organizations and certified by the Department of Energy (DOE). In fact, DOE's Buildings Program is working with national code organizations, the construction industry, and state and local officials to develop and promote building codes that are 30 percent more energy efficient than the current national model.

To support these efforts, the Institute's Blueprint for Securing America's Energy Future recommends that Congress direct DOE to set energy-saving targets for national model building energy codes and encourage states to adopt such codes adapted for regional variances. Further, Congress should incentivize the adoption of these building codes by requiring that federal efficiency grants to states be conditioned on the adoption of such codes. Finally, we recommend increasing annual funding for DOE's Buildings Program from the current level of $110 million to $250 million.

INCREASING AND DIVERSIFYING OUR ENERGY SUPPLIES

While saving energy through increased efficiency is an important step, it alone is not enough to ensure we will have the energy supplies we need over the next twenty years without increasing and diversifying our energy resources.

To begin, we need to identify, develop, and deploy advanced clean energy technologies. But the development of these new technologies is going to require new investments.

The United States currently spends about 50 percent less on energy research and development (R&D) than we did during the 1970s oil embargo. New technologies are not a luxury; they are a fundamental requirement of any energy policy. Technology breakthroughs are required if we are to both meet our increasing energy demands and do so in an environmentally responsible manner.

The Institute strongly believes that there are important limits to what the United States government can do to solve our energy challenges. But there are also areas where government involvement and government resources are going to be required—energy R&D, particularly in high-risk, high-reward technologies, is one of them.

We are calling on Congress to double funding for federal energy technology R&D programs in real terms within five years, from $4 billion to $8 billion. We also recognize that not all new technologies pan out, so we encourage the federal government to support a broad portfolio of R&D projects including energy efficiency, new energy

sources, and advanced fuel and power delivery options. At this critical juncture, Congress does not have the luxury of choosing energy winners and losers. All energy technologies should be given a chance to succeed.

Beyond standard R&D, the United States must also encourage novel, high-risk research that could lead to breakthrough technologies. Currently, there is a strong aversion to such research, driven in part by fears of congressional oversight and the requirements of the Government Performance and Results Act.

The America COMPETES Act of 2007 authorizes the establishment of an Advanced Research Projects Agency for Energy (ARPA-E) within DOE, similar to the Department of Defense's successful Defense Advanced Research Projects Agency. However, DOE has never requested funding for the program, instead subsuming its function within existing programs. Therefore, we are calling on Congress to fund a new ARPA-E program or its equivalent to help support high-risk, exploratory research of innovative concepts and technologies. I would also add that funding for this program should be new funding, and not come at the expense of traditional or existing R&D programs.

The Institute also recognizes the critical role that the private sector plays in energy R&D. Indeed, nearly two-thirds of all R&D conducted in the United States is done by the private sector. The R&D tax credit has been an important financial incentive for businesses to invest more in important research. But the on-again, off-again nature of the tax credit has made R&D planning for businesses more difficult. Therefore, we are calling on Congress to make the R&D tax credit permanent so that companies have greater certainty to plan and implement R&D programs.

New technologies and new investments cannot happen without capital. Securing our energy future is undoubtedly tied to the degree with which we can formulate capital at an accelerated rate. This could pose a challenge in a strong investment climate, and thus will certainly prove to be difficult in these trying economic times. But it is critical that we generate this capital.

To generate capital for energy projects, the Institute is calling for the establishment of a new Clean Energy Bank of the United States (CEBUS), a domestic entity modeled after the Overseas Private Investment Corporation and the Export-Import Bank. CEBUS should have the authority to issue loans, loan guarantees, lines of credit, insurance, and other financial products and support the deployment of advanced energy technologies and products. Ultimately, CEBUS could become self-sustaining by charging fees for its products and services.

Developing clean energy technology is critical, and goes hand-in-hand with the development of renewable sources of electricity. Wind, solar, energy-from-waste, hydropower, geothermal, and biomass could all play an important role in meeting our demand for electricity, and could do so in a cost-competitive manner.

Renewable electricity, for example, already is enjoying robust growth. Wind power is now the fastest growing source of electricity in the United States. At the same time, renewable energy sources still only account for about nine percent of our overall electricity generation, and only about two percent if hydropower is excluded. Here, again, is an area where greater R&D funding and support could help.

The Institute is calling on Congress to increase annual funding for wind, solar, geothermal, and ocean energy programs at DOE from the current level of about $250 million to $450 million per year.

Congress must also do more to stabilize the investment climate for the private sector. The renewable energy tax credit can help incentivize the development and deployment of renewable sources of electricity, but there is no stability with the current program. The renewable energy tax credits expired in 2000, 2002, 2004, and almost again in 2008. This seemingly annual ritual of uncertainty has slowed capital formation, investments, and projects.

While Congress did enact an important eight year extension for the solar energy tax credit late last year, the Institute recommends that Congress take the same step and extend all the renewable energy tax credits and then phase them out over the succeeding four years. This eight year window will give the private sector the time needed to fully develop important renewable technologies, and the eventual phase-out will ensure that these technologies will sink or swim on their own merits, and not remain artificially propped up through government financing.

Beyond renewables, there are other critical and clean sources of electricity that the United States must expand. Chief among these is nuclear power.

Nuclear power is an emissions-free source of 20 percent of our nation's electricity supply, despite the fact that we have not licensed the construction of a new nuclear power facility in nearly 30 years.

Nuclear power is clean. It offers a huge emissions advantage over other baseload power generation sources.

Nuclear power is cost-effective. America's 104 operating nuclear reactors are the nation's cheapest source of baseload electricity on a per-kilowatt-hour basis.

But as the members of this committee know, nuclear power is also capital-intensive, requiring an estimated $6 to $8 billion dollars or more for a new plant. Most companies lack the size, financing, and financial strength to fund such a project on their own.

The loan guarantee program authorized in the Energy Policy Act of 2005 was intended to help utilities finance the construction of new reactors. Unfortunately, this program has encountered significant implementation delays, and the Congressional authorization of $18.5 billion dollars in loan volume is inadequate—funding only two, or at best three, new nuclear projects.

To develop the stable financing needed for new nuclear plants, Congress should transition the function of the Loan Guarantee Program to a more permanent, stable financing platform like CEBUS, which I outlined earlier. Until such a transition occurs, Congress should increase the size of the funds available to make it more closely align with the real capital costs associated with the construction of new nuclear power facilities.

One reason financing costs are so high for nuclear power plants is the extraordinary length of time—about 8 years—it takes to from submittal of a license application to the commencement of commercial power generation. Although new plants are currently being considered, the Nuclear Regulatory Commission (NRC) estimates it will take three and-one-half years just to review the first wave of license applications for new designs. This delay is unacceptable and must change.

Congress must ensure that NRC has the resources it needs to review and approve combined construction and operating licenses for new nuclear power facilities in a thorough and timely manner.

As the United States expands the use of nuclear power, we must also commit to a permanent solution to our nation's nuclear waste. Our current waste policy was designed at a time when no additional nuclear power plants would be built and the existing fleet would be phased out over time. As circumstances have changed, so must our strategy.

To finally move forward on a sensible nuclear waste strategy, the Institute recommends establishing a government corporation to manage the entire back end of the nuclear fuel cycle. This entity could help efficiently meld used fuel recycling with ultimate disposal of nuclear waste.

On the issue of nuclear waste, it is clear that under any scenario, the United States will need a high-level nuclear waste repository. Yucca Mountain has been designated by law, and has been ratified by both executive and legislative branches as that repository, yet Congress has consistently under funded efforts to build the site's infrastructure and transportation needs.

If the President and Congress will not fully commit to Yucca Mountain, then we believe they owe it to the American public and utilities that have paid fees and interest in excess of $27 billion into the Nuclear Waste Fund, to develop and pursue a parallel path of centralized interim storage, industrial deployment of advanced recycling technology, and accelerated governmental research and development to more quickly place the United States government into compliance with United States law.

Much like nuclear power, the United States cannot afford to ignore or sacrifice other existing sources of energy. Coal is the backbone of our nation's electrical generation, responsible for 50 percent of our nation's electricity supply. At our current production rates, the United States has enough coal to last for well over 200 years.

So it is imperative that we develop technologies such as carbon capture and storage (CCS) that allow us to use coal while minimizing air pollution and CO_2 emissions.

But given our nations' ample coal resources, we must find ways to develop and deploy CCS technology.

CCS development and deployment will require an extraordinary amount of investment, by both the government and private sector. At the Institute, we are recommending an increase in investments in clean coal technology to $20 billion over ten years, with half coming from the federal government and half from the private sector. We believe the private sector funds could be raised by administering a small fee on fossil-based utilities. We recognize the enormity of this investment, but an investment of this magnitude is needed to advance CCS technology.

By necessity, a comprehensive energy policy like the Institute's relies on a long-term approach. But we also cannot ignore the here and now. While clean energy sources like renewables, nuclear, and clean coal must be a part of our energy future, oil and natural gas will remain critical components of our nation's energy strategy for years to come.

The United States now imports roughly 60 percent of our oil from foreign nations, which is almost double the amount we imported in the 1970s. This has put our economy and our national security at risk. It is also a huge drain on our economic resources. In 2008, the United States sent between $400 and $700 billion overseas for imported oil. Think what could be accomplished if even a fraction of that money remained here at home. Fortunately, there is a way that it can—by increasing our exploration and production of domestic oil and natural gas.

It is estimated that America's Outer Continental Shelf (OCS) contains 86 billion barrels of oil and 420 trillion cubic feet of natural gas, and that estimate is conservative since previous surveys were conducted decades ago. Additionally, roughly 83 percent of federal lands onshore that are currently under exploration moratoria or face severe development restrictions could contain another 28 billion barrels of oil and 207 trillion cubic feet of natural gas.

Since moratoria were placed on the OCS, the technology utilized to extract oil and gas has evolved, significantly reducing the environmental impact. And our need for these domestic resources has only grown. Therefore, we believe that Congress and the President should permanently end the moratorium on exploration and production of America's oil and natural gas resources in the OCS and on federal lands onshore.

Beyond helping our nation meet its growing energy demands, such exploration would reap benefits for the government and the economy. A recent ICF International study found that the development of these resources could generate more than $1.7 trillion in government revenue and create 160,000 new jobs by 2030.

We recognize that states have an important say in offshore drilling as well, and we believe it is important that states are well compensated for any exploration or production taking place off their shores. Under current law, the federal government shares 27 percent or less of revenues from oil and natural gas production within 3 nautical miles of the state boundary and zero beyond that. We have recommended bringing all coastal states in line with Gulf of Mexico states, which were granted a higher percentage share of 37.5 percent of the revenue for new leases off its coast under the Gulf of Mexico Energy Security Act in 2006.

As we develop greater domestic sources of oil and natural gas, we must also be prepared to transport them to market. To that end, we are calling on Congress and the President to actively support construction of the Alaska natural gas pipeline. The need for such a pipeline underscores our nation's need for new energy infrastructure, but there is also a great need to modernize and protect our existing infrastructure. This brings us to our third principle.

INVESTING IN MODERNIZING AND PROTECTING OUR ENERGY INFRASTRUCTURE

Our nation's energy infrastructure is a ticking time bomb. Unless we make it an immediate priority to modernize it, blackouts, brownouts, service interruptions, and rationing will become more and more commonplace, with all that implies for lost productivity.

Various U.S. laboratories and others have evaluated the weak points in our energy infrastructure and have described numerous scenarios where a seemingly modest, routine occurrence could escalate into a debilitating energy supply disruption in very short order.

The Energy Independence and Security Act of 2007(EISA) supported accelerated modernization of our nation's electricity transmission and distribution system. By deploying smart power grid technology, our systems would be able to self-diagnose and repair problems, accommodate new demand-response strategies, and promote greater efficiency through advanced metering. Now, we need the incoming Administration to place a high priority on the implementation of the smart power grid requirements of EISA. This may include specific recommendations for state and federal policies and other actions necessary to facilitate the transition to a smart power grid.

Through the EISA and other legislation, Congress has played an important and appreciated role in pushing for the modernization of our electricity grid. But Congress must take further action to address some of the inherent weaknesses it built into current electricity siting regulations.

While Congress has granted the Federal Energy Regulatory Commission (FERC) the authority to site natural gas pipelines, including eminent domain authority, it has not given FERC sufficient authority to site transmission facilities. The Energy Policy Act of 2005 (EPAct 2005) provided FERC with some authority, but only under certain conditions. What has been done for natural gas needs to be done for electricity, and the Institute is calling on Congress to give FERC the same authority to site electric transmission facilities as it has to site natural gas pipelines.

We must also recognize that terrorist threats, resource nationalization, and natural disasters could cause a severe disruption in the U.S. oil supply at any time. In EPAct2005, Congress authorized the expansion of the Strategic Petroleum Reserve to 1 billion barrels of oil. Congress needs to fully fund that expansion to ensure that the SPR will be an adequate insurance policy against possible disruptions.

The term 'energy infrastructure' may conjure up images of pipes, wires, transformers, and power plants, but our nation's most important energy infrastructure are the energy industry professionals—the engineers, scientists, computer programmers, skilled tradesmen, etc.—who ensure that we have the energy we need today and in the future. Our energy industry employs millions of people today, but nearly half of this workforce is eligible to retire within the next ten years.

At the same time, our universities and trade schools are graduating fewer students in science, engineering, and trade crafts, leaving many to wonder from where tomorrow's energy professionals will come.

In the coming years, we need government at all levels to build incentives that will motivate U.S. students and adults to train for and enter science, technology, engineering, and trade careers. In the interim, we need to reform our nation's visa and immigration policies so that the United States can retain U.S.-trained, foreign-born scientists who are now being lured to other countries with less restrictive immigration and work policies.

IMPROVING ENVIRONMENTAL STEWARDSHIP

Our fourth principle that should guide our nation's comprehensive energy strategy is improving environmental stewardship. As the Committee has undoubtedly noticed, environmental concerns are underscored throughout the Institute's recommendations. Those recommendations—which include the expansion of clean energy such as renewables, nuclear energy, and clean coal, the further development of cutting-edge technologies such as CCS, and new efficiency efforts—all demonstrate that the United States can meet its growing energy needs while slowing and stopping the growth of emissions of greenhouse gases.

But the Institute and America's business community also recognize that we live in a global energy market, and the environmental decisions and policies of the United States will only make a small impact if they are not done in concert with other developed and developing countries.

The developing economies of the world are made up of individuals who want economic growth and abundant, affordable energy. Providing these individuals with energy is a priority for governments who wish to increase the standard of living for their citizens. U.S. policies must recognize and embrace these aspirations.

It is a simple fact that for the next several decades much of the energy needed to power economic growth will likely be supplied by fossil fuels. Many developing countries have large resources of coal, natural gas, and oil, and it would be naive to believe that they will not use it. However, the increased use of existing and advanced new technologies can limit the environmental impact of using these fuels, reduce demand for them through efficiency, and provide alternate sources of energy. That is a goal all countries can share.

We have seen with the Kyoto Protocol that top-down approaches do not work. The United States should work to promote a more bottom-up international approach to energy security and climate change that considers growing energy needs; sets realistic goals; ensures global participation, including major developing countries; promotes the development and commercialization of, and trade in, clean energy technologies and services; protects intellectual property; and maintains U.S. competitiveness.

To achieve true environmental progress, we must find ways to share U.S. best practices including technology, expertise, and regulatory approaches, with other countries. The Institute has made several recommendations on how that can best be done.

First, the U.S. should continue its leadership to expand the use of nuclear energy for peaceful purposes worldwide. Advanced nuclear technologies can help foster economic growth abroad, improve the environment, and reduce the risk of nuclear proliferation.

Next, the U.S. should work with other industrialized countries to establish an International Clean Energy Fund, housed at the World Bank, to reduce capital costs for clean energy projects in the developing world.

Furthermore, our country should examine all of its tools through the Export-Import Bank, U.S. Trade and Development Agency, and the Overseas Private Investment Corporation, and work closely with multilateral development banks to ensure that attractive instruments are made available for clean energy projects.

Finally, the U.S. government should elevate energy as a critical component of our trade agenda and lead an effort to eliminate tariff and nontariff barriers to clean energy goods and services. As part of that effort, we should utilize the World Trade Organization to ensure a level playing field for energy projects, access, and trade.

We must also acknowledge that the world has changed considerably since the establishment of many of the institutions that have a global focus on energy and environmental issues. We need to take a new look at these organizations and take steps to ensure they are best positioned to meet our current and future challenges.

The Institute recommends that the U.S. strengthen its support of the International Energy Agency and support expanding its membership to include key consuming countries such as China and India. We further recommend that the U.S. government engage NATO on energy security challenges and encourage member countries to support the expansion of its mandate to address energy security.

As this 111th Congress begins to consider energy legislation, we believe it will be well served by keeping in mind these four principles and the nearly 90 recommendations the Institute has made behind each one.

TIMELINES

As the Committee can see, the Institute has designed a robust energy plan. But we are keenly aware that America's energy challenges did not develop overnight, and they will not be solved overnight. Not all of these recommendations can be pursued within the next two years, nor should they be.

To help organize our recommendations, the Institute's Transition Plan for Securing America's Energy Future includes timelines for when and by whom we believe these different steps should be taken.

Some should be done immediately. For example, within the next 100 days, we believe Congress should permanently end the remaining moratoria on oil and gas exploration on the OCS and on federal lands onshore. We also believe Congress should begin to work on expanding DOE's Loan Guarantee Program for new nuclear facilities.

But there are other steps that should be pursued over the mid-to long-term. For example, we believe that the changes to the tax code allowing for more rapid depreciation of capital equipment should be enacted within the next year. And our recommendation that NRC be given more resources in order to safely review construction and operating licenses in a timely manner is something that should begin as the FY09 budget is finalized, but will require a sustained commitment over many years.

Implementing a comprehensive energy strategy will require Congress to set priorities, and with the Institute's timelines, we have suggested where these priorities should be. A copy of those timelines is attached to this testimony.

CONCLUSION

When it comes to energy, we recognize that Congress and the Administration face some extraordinary challenges. But we also recognize just as fervently that these challenges can be turned into extraordinary opportunities to better our nation and our planet.

So as you move forward in that process, please let me share three final thoughts on behalf of America's business community.

First, the government will be most successful in its energy efforts if it gets out of the business of picking winners and losers and instead focuses on a comprehensive approach. There is no magic bullet or one miracle technology that is going to solve our energy crisis. We need to support all existing and potential sources of energy, as we are going to need them all.

Second, when it comes to energy, our nation is in desperate need of a common vision and a united approach. There can be no question that existing, piecemeal approaches to energy reform have not worked. Comprehensive energy reform cannot be done with an eye toward 2-year political cycles; it must be done with an eye toward the next twenty or thirty years. This means working together in a bipartisan fashion and across the 13 federal agencies and regulatory commissions that have some responsibility for energy policy and the dozens of Congressional committees and subcommittees. It means putting the needs of the nation ahead of the desires of one particular interest group, business sector, or region of the country.

Finally, our energy challenges are vast and cannot be solved by the government alone. It will take the government and the private sector working together. This teamwork cannot be achieved if the government issues dictates, implements burdensome regulations, or imposes excessive new taxes. We must work in concert together: the government doing its part to provide regulatory predictability, put more

energy options on the table, and support advanced research; and the private sector doing its part to develop new technologies, invest in key projects, and get more sources of clean energy into the marketplace.

The decisions we make in the next few years will impact our nation's and our world's future for the next few generations. The Institute for 21st Century Energy looks forward to being a constructive and integral part of this important process.

The CHAIRMAN. Thank you very much.

Dr. Nielson, please go ahead.

STATEMENT OF DIANNE R. NIELSON, PH.D, ENERGY ADVISOR, OFFICE OF THE GOVERNOR, SALT LAKE CITY, UT

Mr. NIELSON. Chairman Bingaman, Senator Murkowski and members of the committee, thank you very much for the invitation to be here today on behalf of the Western Governors Association. On behalf of the chairman of that group, Governor Huntsman, I am pleased to be here to address you today on energy security and energy policy.

Western Governors are concerned that the United States lacks an effective, long term energy policy. Energy security is a critical component of that. Both energy efficiency to reduce demand and a diversity of energy resources and technologies must be part of the solution. Western Governors are working individually in their states and regionally together to meet those challenges.

With the publication of the Clean and Diversified Energy Initiative Report in June 2006, WGA announced its commitment to developing energy policy and programs that will provide affordable and clean energy to sustain our economy, stimulate greater energy efficiency, strengthen our energy security and independence and reduce greenhouse gas emissions. In the last 2 years WGA has been involved with a wide range of stakeholders in developing a number of reports including achieving greater energy efficiency in buildings, deploying near zero technologies for power plants fueled by coal resources, developing transportation fuels of the future and all of these reports are now forming the basis of work that we are doing moving forward to develop energy policy. For the past 8 months the Western Governors Association has been managing the Western Renewable Energy Zone Project in conjunction with the Department of Energy which is funding the effort.

By identifying the most developable renewable resource zones within the West and the Western Interconnect, load serving entities, transmission providers and state regulators will be able to make more informed decisions about the cost of renewable power, the optimum transition needed to bring that power to consumers. What entities might have the potential to form partnerships for developing the transmission to be able to accomplish those goals. By promoting a regional perspective in this effort we're blending the potential of balkanization of renewable markets while respecting each state's primary jurisdiction over citing generation and transmission facilities. We can pave the way for interstate collaboration on permitting of multi-state transmission lines and more equitable allocation and recovery of costs of new transmission.

On November 20th of last year WGA sent President-elect Obama a letter outlining goals, principles and immediate actions which they felt could form a national energy policy. As the Governors noted in that letter, transforming our energy infrastructure and

economy will require new policies, new incentives, market mechanisms and public/private partnerships. Most importantly it will require bipartisan partnership that can achieve a broad consensus among political leaders and with the American public.

Western Governors recognizes that while full transformation will take time. But there are a number of steps that we can implement immediately promoting energy efficiency in all forms. Including manufacturing of more fuel efficient vehicles, enhancing public transportation systems, adopting regulatory structures that reward utilities that achieve reduced energy use among their customers and manufacturing more efficient consumer goods.

With respect to greenhouse gas emissions we must quickly establish an aggressive and achievable national greenhouse gas reduction goal that will place the United States on a path to contribute to global climate stabilization. At the same time we propose a mandatory market based system that will induce reduction of greenhouse gases. To strengthen energy security and independence, we must establish an oil import reduction goad and to offset those reductions we should bring forward more fuel efficient and near zero emission vehicles to the market, increase the supply of domestic, low carbon fuels and reduce vehicle miles traveled and increase mass transit capabilities.

Finally we must create a substantial, long term public investment on the scale of tens of billions of dollars annually and encourage at least that same contribution from the private sector. In order to help prefect new near zero emission technologies for coal fired electricity to dramatically increase energy supply from wind, solar, geothermal, hydro, biomass and other energy sources and to expand and upgrade the electricity transmission grid. Finally we must advance vehicle and battery technologies in those alternative transportation fuels that will move us toward achieving the goals of a national energy policy.

But it's important to remember that we must do this while we're assuring affordability in terms of energy resources. Especially for lower income energy consumers and perhaps through proven weatherization and cost assistance programs which are already in place and working effectively. We recognize the potential for all these actions to create good, domestic jobs and to stimulate the economy.

As Western Governors noted in their letter, we must not repeat the mistakes of the past. We must have the collective political will and resolve to create and implement a long term, comprehensive energy policy despite short term political and market fluctuations. The future of our nation depends on it.

WGA stands ready to work with this committee, the Senate and the House and the new Administration to accomplish these goals. In fact we look forward to the challenge. I'd be happy to answer any questions. Thank you.

[The prepared statement of Mr. Nielson follows:]

PREPARED STATEMENT OF DIANNE R. NIELSON, PH.D., ENERGY ADVISOR, OFFICE OF THE GOVERNOR, SALT LAKE CITY, UT

Chairman Bingaman, Senator Murkowski, and Members of the Committee:

My name is Dianne Nielson. I am the Energy Advisor to Utah Governor Jon M. Huntsman, Jr., who serves as the Chairman of the Western Governors' Association. Thank you for the invitation to testify today on behalf of Western Governors' Association concerning current energy security challenges.

Western Governors are concerned that the United States lacks an effective long-term energy policy. Energy security is a critical component of that policy and essential to our Nation. Both energy efficiency, to reduce demand, and a diversity of energy sources and technologies must be part of the solution. Western Governors have worked in their individual states and together regionally to meet these challenges.

With the publication of the Clean and Diversified Energy Initiative Report in June 2006, http://www.westgov.org/wga/publicat/CDEAC06.pdf, the Western Governors' Association announced its commitment to developing energy policies and programs that will provide affordable and clean energy to sustain our economy, stimulate greater energy efficiency, strengthen our energy security and independence, and reduce greenhouse gas emissions.

In the last two years, the WGA has published important reports on achieving greater energy efficiency in buildings, http://www.westgov.org/wga/publicat/EnergyEfficiency07.pdf, deploying near-zero technologies for power plants fueled by coal resources, http://www.westgov.org/wga/publicat/zero-coal08.pdf, and developing transportation fuels for the future, http://www.westgov.org/wga/publicat/TransFuels08.pdf. All of these reports are being used as resource documents by western states as we work to develop a new energy economy.

For the past eight months, the WGA has been managing the Western Renewable Energy Zones Project, http://www.westgov.org/wga/initiatives/wrez/index.htm. WGA and the U.S. Department of Energy (DOE) launched this joint initiative, which is funded by DOE. By identifying the most developable renewable resource zones throughout the Western Interconnection, load-serving entities, transmission providers, and state regulators will be able to make more informed decisions about the costs of renewable power, the optimum transmission needed to move renewable power to consumers, and which entities might have the potential to form partnerships for developing transmission to access renewable energy. By promoting a regional perspective, we can blunt the potential balkanization of renewables markets, while respecting each state's primary jurisdiction in siting generation and transmission facilities. We can pave the way for interstate collaboration on the permitting of multi-state transmission lines and more equitably allocate and recover the costs of new transmission.

On November 20, 2008, the WGA sent President-elect Obama a letter* outlining recommended goals, principles, and immediate actions necessary to form the foundation for a National Energy Policy, http://www.westgov.org/wga/testim/obama-energy11-20-08.pdf. As the Governors noted in the letter, transforming our energy infrastructure and economy will require new policies, incentives, market mechanisms, and public-private partnerships. Most important, it will require a bipartisan partnership that achieves a broad consensus among political leaders and with the American people.

Western Governors' recognizes that while full transformation will take time, there are a number of steps we can take now. We must promote energy efficiency in all forms, including manufacturing more fuel-efficient vehicles, enhancing public transportation systems, adopting regulatory structures that reward utilities that achieve reduced energy usage among their customers, and manufacturing more energy efficient consumer goods.

With respect to greenhouse gas (GHG) emissions, we must quickly establish an aggressive and achievable national GHG reduction goal that will place the United States on a path to contribute to global climate stabilization. We must concurrently propose a mandatory market-based system that will induce reductions of greenhouse gas emissions.

To strengthen energy security and independence, we must establish an oil import reduction goal. To offset these reductions, we should bring more fuel efficient and near-zero emission vehicles into the market, increase the supply of domestically produced low carbon fuels, reduce vehicle miles travelled, and increase mass transit capabilities.

And finally, we must create a substantial, long-term national public investment on the scale of tens of billions of dollars annually, and encourage at least the same investment from the private sector. We must quickly perfect near-zero emissions technology from new coal-fired electricity and dramatically increase energy supply from wind, solar, geothermal, hydro, and biomass resources. It is of utmost importance that we expand and upgrade the electricity transmission grid. Finally, we

* Letter has been retained in committee files.

must advance vehicle and battery technologies and those alternative transportation fuels that will move us toward achieving national energy goals.

We need to do all these things while ensuring affordability for lower income energy consumers, especially through proven weatherization and cost assistance programs. And we recognize the potential for all these actions to create good, domestic clean energy jobs and stimulate the economy.

As Western Governors noted in their letter, "we must not repeat the mistakes of the past. We must have the collective political will and resolve to create and implement a long-term comprehensive energy policy despite short-term political and market fluctuations. The future of our nation depends upon it."

WGA stands ready to work on developing a strong national energy policy. In fact, we look forward to it. Thank you for the opportunity to talk with you about energy policy and energy security.

The CHAIRMAN. Thank you very much. Let me start, Dr. Nielson with a question to you. One of the issues that's been discussed by, I think all of you at least in your written testimony, relates to the need to build out the interstate transmission grid and make that a much more robust grid than is currently the case.

One of the suggestions we've received from the chairman of the Federal Energy Regulatory Commission as well as a lot of other people is that in order to get this done in a timely and rational way we really do need to give the Federal Energy Regulatory Commission more authority over the citing of transmission lines just as they have authority over the citing of interstate gas pipelines today. What's the position of the Western Governors on that issue?

Mr. NIELSON. Senator, thank you very much. I think the issue isn't so much more authority at the Federal level as much as it is more commitment to work together an opportunity to find solutions between the states and the Federal agency. I think there's sufficient authority at this point.

It becomes a matter of identifying the best locations, being able to ensure that those corridors are going to be acceptable, not only for impacts to wildlife and other environmental resources, but also to the individuals living in those communities and counties. So we wouldn't so much favor additional authority at the Federal level as we would additional commitment to sit down and work through these issues with states in partnership.

The CHAIRMAN. Ok. Let me shift to a different subject. We've got hundreds of subjects that have been put on the table for discussion here obviously.

We've got this perverse circumstance with regard to biofuels. I don't pretend to understand it all. But my impression is that as the price of oil has dropped, the price of gasoline has dropped.

Consumption of gasoline has declined. We are seeing less demand for biofuels to be blended with gasoline under the renewable fuel standard that we earlier adopted. That is reducing demand for biofuels in a way that's causing some ethanol plants and projects of that type to actually shut down and not proceed.

Part of the problem here, it seems to me, is this so called blend wall for ethanol which prevents the amount of ethanol or bio fuel that can be blended into gasoline from exceeded 10 percent. It can't go to E15. Can't go to E20.

Do any of you think this is an issue that demands fairly quick attention or ought to be addressed by the Congress or regulatory agencies or what are your thoughts about this? Is this a problem? If so, what should we do about it? Any of you have thoughts?

Ms. HARBERT. I might offer two thoughts on that regard, Senator Bingaman.

The CHAIRMAN. Ok.

Ms. HARBERT. At the moment the Blender's tax credit is a static amount of money, a static subsidy that is provided for blending ethanol into gasoline. It was at 51 cents a gallon. It's now going down to 48 cents. That is whether oil is at $147 or whether it's at $47.

Our proposal is to vary that subsidy with the price of oil so that it actually makes the price of ethanol competitive with the price of gasoline. At the moment ethanol is going to be more expensive than gasoline. So the people selling it are asking for gasoline rather than blending in ethanol. So we should make it so that it is competitive with gasoline.

Secondly on the blend wall if you increase the blend wall clearly there has to be a lot of discussions with the automobile manufacturers to make sure that the engines are capable of doing it. But more importantly is the delivery infrastructure. With the huge increase of biofuels do we have the infrastructure there capable to deliver that?

Do we have the distribution capability? That currently will be lacking with the huge increase. We need to focus. Congress should look at that.

The CHAIRMAN. Ok.

Yes, Dr. Batten.

Mr. BATTEN. Thank you, chairman. The Center for American Progress has also proposed a variable tax credit for ethanol for similar reasons. I just wanted to say that another way in which to address the amount of biofuels that we have committed to producing under the Energy and Independence Security Act of 2007, we also should start scaling up a renewable fuel standard to make sure that our fuel supply for transportation in this country starts to move toward a greater renewable proportion.

Whether it's liquid biofuels. Whether it eventually becomes low carbon electricity to power our Nation's vehicles. We need to commit to a renewable fuel standard as well. The Center for American Progress has proposed a 10-percent renewable fuel standard by 2020.

The CHAIRMAN. Ok. I've used all my time.

Senator Murkowski.

Senator MURKOWSKI. Thank you, Mr. Chairman. Thank you all for your very specific proposals and the work that the groups that you're affiliated with have put into this issue. It's greatly appreciated.

I want to ask you for your input on production tax credits. Obviously one of the things that we can do around here is to provide for those policies that encourage the investment, certainly in the wind and the solar and a great deal of debate. Eventually we extended the production tax credits.

But now with all that is happening within the economy and really just the crash in the financial markets, what I'm hearing is that these production tax credits really aren't going to be the help that we had hoped or intended that they would be. That perhaps we might need to be tweaking them or doing something different.

What would your reaction be to a tax provision to make both the production tax credit and the investment tax credit refundable for those facilities that may have been put in place in 2008/2009? To allow generators, as perhaps an alternative to carry back the production tax credits earned in those years to offset income taxes?

I guess what I'm looking for from the panel here is—will the production tax credits that we put in place work as they are now given what has happened in the markets. If not, how do you think that we might be able to revamp them?

Mr. Schwartz, you look like you're leaning forward.

Mr. SCHWARTZ. I'll just make one comment. I'm sure the other members of the panel here will be happy to offer more. I just want to make one observation.

I think business people when we make investments are thinking about the long term. To the extent that these tax credits of any kind are variable over time because of changes in policy it makes it very hard to make long term investment decisions. So each time we have reasonably short horizons on these tax credit programs you're not getting the bang for the buck from the proposal.

Senator MURKOWSKI. But you know here, you know, in an effort to keep the score low, we want to keep it at a short window which doesn't help in the investment community.

Mr. SCHWARTZ. Exactly.

Senator MURKOWSKI. So we've got our mission here which is to keep the dollar amount down. You're trying to build things. Are we making any head way with this?

Mr. SCHWARTZ. I think that this is an example where your courage will be greatly appreciated. At the end of the day if you don't have longer term horizons on these tax credits we're not going to get the impact that you're looking to get.

Senator MURKOWSKI. Other comments?

Ms. HARBERT. You're not going to get the capital formation or the penetration of renewable sources of energy without extending the production tax credit for a longer period of time. These boom and bust cycles, every 2 years they expire, are not giving investors the confidence. We've proposed extending them for 8 years and then phasing them out over four. That way the investment community would actually have a great deal of surety in what they would be able to expect from the marketplace.

But it should be considered a package. The production tax credits will be even more successful if they are then partnered with expedited transmission citing. It's not enough for the wind to blow if we can't get it where it needs to be.

Senator MURKOWSKI. Right.

Ms. HARBERT. So we really do need to give the FERC some new authority to cite transmission lines. We have an example right here right near Washington where a transmission line from West Virginia to Virginia has taken 12 years to get cited. We don't have 12 years to wait.

So we really need to think long and hard about giving the FERC some authority to step in. They were given some additional authority, the DOE was, in the Energy Independence Act to cite and provide for national interest corridors. Every state for which they cited

those are now in litigation with the Department of Energy. So we're going to need to take some extraordinary measures.

Last we need to think about capital. A clean energy bank would provide that low cost, concessionary financing for these renewable technologies. So if you think about it as a suite together, the production tax credit, transmission and lower cost concessionary financing, you really have something that is workable and will accelerate renewable technology and the use thereof in the marketplace.

Senator MURKOWSKI. So what I'm hearing is that we don't necessarily need to revamp the production tax credits. What we need to do is provide for greater certainty through longer terms or longer extensions.

Mr. Batten.

Mr. BATTEN. May I also add that enacting a national renewable portfolio standard would also provide a degree of certainty in terms of the amount of renewable electricity that is required to get our nation onto a low carbon energy future, such as the one that was considered by the Senate last year, but did not in 2007, but did not make it into the Energy Bill.

Senator MURKOWSKI. Let me ask you that, Dr. Nielson. From the Western Governors Association is a renewable portfolio standard something that you all support? Would it work recognizing that in different areas you're simply able to do and meet certain standards where in others you are not? What's the response there?

Mr. NIELSON. Many of the States in the West already have State renewable energy portfolio standards. We recognize the benefit of the national standard.

But to go to your initial question on production tax credits. That extension of time the ability to match the credit to the exploration and development time period is critical coupled with being able to cite transmission and identify zones for renewable energy. That coupled with a renewable energy target at a national level will help to stimulate the additional resource and develop the transmission and the opportunity to bring those resources to market.

Senator MURKOWSKI. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator Barrasso.

Senator BARRASSO. Thank you very much, Mr. Chairman. I'd like to thank you personally as well as Senator Murkowski for taking the time before this Congress came together to visit with me about energy issues and energy concerns. What we can do in the best interest of the American public. I want to thank you for that consideration and your kindness.

I'd also like to welcome Senator Bayh to the committee and the other two new members, but not just to the committee, but to the Senate. So, welcome. I'm glad you're here.

Mr. Nielson, if I could. I'm from Wyoming. You're from Utah, Senator Udall here from Colorado.

Three States where there's quite a bit of oil shale. I don't think that really came out much in the discussion this morning. I know Governor Huntsman has been working in that area along with some members of the Senate from Utah. Can you talk a little bit about the role of oil shale in this is there's enough oil shale to help power our country for the next hundred years?

Mr. NIELSON. As you point out there's a significant resource in our three states. One that I think is important in terms of meeting our energy security needs. But we also recognize and the Governor has been firm in his statement that we need to develop that resource consistent with environmental requirements and in protection of the environment as well as maximizing the development of the resource.

That was the reason that the State of Utah encouraged and gratefully saw a removal of moratorium on establishing regulations. We need to be able to move forward with that process to provide some certainty to investors that there would be a path forward. But at the same time make sure that that's a path that's protective of the environment.

We're not there at this point either in terms of full evaluation of the resource or in terms of the full regulatory framework including leasing and evaluations at the lease stage of environmental management of that development. But we are on the right track. We encourage that moving forward.

Senator BARRASSO. Thank you. Anyone else want to comment on oil shale?

Ms. HARBERT. We think it's an incredibly important resource. We need to continue to move forward on the regulatory process that will allow the investment community to have that certainty so they can invest in the technologies that will allow us to use this valuable resource over time. If we don't provide the opportunity or at least the vision forward that there will be an opportunity to lease and to utilize this resource, no company is going to put money into research and development into those technologies to advance the technologies to use that resource.

So it's a very, very important. If we have the laudable goal of reducing our dependence on imported oil, we certainly should be using those resources here at home.

Mr. BATTEN. May I also comment?

Senator BARRASSO. Yes.

Mr. BATTEN. Thank you very much, Senator. As I stated in my testimony, as we are developing sources of energy here at home, we need to make sure that we're developing sources of energy that are compatible with our global warming emission reduction goals. At best, even with carbon capture and storage if we were to capture the carbon generated by oil shale liquid fuel development, we still would have to deal with the carbon emissions that come from burning that oil in our tailpipes.

The environmental pollution that results as a result of developing oil shale, whether it's air pollution, water pollution, greater salinity deposits and the extreme electricity costs that go into oil shale production, the extreme water costs that go into oil shale production, all make it in terms of our focus, a non-viable alternative.

Senator BARRASSO. You know, just kind of following up on this because Wyoming is a big coal state. Right now coal is the most affordable, available, reliable and secure source of energy. It's why electricity—it's a source of 50 percent of the electricity in the nation. It's what helps keep down the cost of electricity.

You talked about hundred billion dollars in clean energy projects possibly 2 million jobs from that, about $50,000 per job. What do

we tell the coal miners in Wyoming, the people that work for the trains and to transport the coal? It's a major part of our economy as those people want to continue to develop coal and work with investments and innovative approaches to make sure that coal is as clean as possible because all of us want to properly balance energy, the economy and the environment.

Mr. BATTEN. Absolutely. I admire those concerns and balancing all of those concerns at once. That's a very important priority for the Center for American Progress as well.

We've come out in support of an emission performance standard for all new coal fired facilities to ensure that the best available control technology is implementable at new coal facilities to capture carbon dioxide. In an effort to foster that type of development we've proposed using revenue from cap and trade auction to offset additional costs associated with the construction of coal plants that employ CCS or equivalent control technologies and in the additional costs associated with their maintenance and operation. So we are supportive of seeing these types of carbon capture technologies used in the future.

Senator BARRASSO. Mr. Schwartz.

Mr. SCHWARTZ. Yes, if I may, Senator. Thank you. I'd just like to offer the observation that SAFE, our organization, is focused solely on energy security. That's our job from our perspective.

So the central thrust of our commitment this year is on electrification of our short haul transportation. Because we think that's the most important aspect that will change our dependence on imported oil. That of course leaves us the diversity of fuel sources including of course, coal. So from our perspective having the opportunity to use domestic coal to power our transportation system is clearly a positive and good for the coal miners in Wyoming.

That said. We also recognize the need for a long term, durable, bipartisan approach to all this. That includes focusing not just on energy security, but also on economic security and environmental security.

So from our perspective, while we move toward the electrification of transportation we also need to try to make the sources of power that are used for the transportation sector to be as clean as possible. We think that the R&D budget should be dramatically increased at the DOE and that the process that that R&D budget gets outlaid should be dramatically changed. So that we have cleaner coal and your coal miners can keep working.

Senator BARRASSO. Thank you. Thank you, Mr. Chairman. My time has expired.

The CHAIRMAN. Thank you.

Senator Corker.

Senator CORKER. Thank you, sir. Thank all of you for coming before us. I'm going to focus most of my questions to you, Dr. Batten because my sense is that Administration listens a great deal to what you have to say. I appreciate so much to have the opportunity to ask you questions myself.

We here in Congress constantly pick winners and losers. I really appreciate the question the Senator from Alaska asked regarding production tax credits because we put them in place for 2 or 3 years. As many of you have said, there's no way to make invest-

ments and know that those investments are going to yield with such short term production tax credits and other kinds of things in place.

So my question is wouldn't it make sense if we just put a price on carbon, period. Did away with all other subsidies, all subsidies in energy? Wouldn't that be a more logical, simple way of making investments in the future? I'd just love to have your response to that.

Mr. BATTEN. Thank you, Senator. One of the reasons we're supportive of a cap and trade or a cap and auction approach to reducing carbon emissions is just that, to actually link the policy to the reductions of emissions according to what the science tells us is the level we need to be at in order to avoid the worst consequences of global warming. So by specifically linking the policy to those emission reductions we can ensure that we're moving forward on a low carbon energy path in a way that gets us to where we need to be scientifically.

Also at the same time of course, allows us to invest in the technologies that will help us regain technological leadership in the global marketplace, export these technologies overseas as part of the technology transfer provision in what will hopefully be the next International Global Warming Agreement.

Senator CORKER. So we can basically do away with all other subsidies in the energy world by just having a carbon standard. Is that correct?

Mr. BATTEN. Our proposal is that we need a cap and trade system. But then a whole suite of complementary policies including market based policies, including mandates and including other types of incentives. The idea is to make sure that we start to invest as quickly as possible in deploying the technologies that we already have available to us.

McKinsey and Company, the McKinsey Institute, as I'm sure you know, has shown that using existing technologies we can reduce global energy growth by 50 percent in the next 15 years by using existing technology. So we need to deploy those technologies as quickly as possible. We need to start investing in research and development of new low carbon and efficient technologies. We need to start addressing rising energy prices for low and middle income Americans using auction revenue from a cap and trade system.

Senator CORKER. Wouldn't we be much better off? I mean we've all spent a lot of time here on cap and trade. I'm actually open to it as long as every penny generated from that is returned to the citizens, a cap and dividend kind of program.

But wouldn't we be much better off just with a carbon tax and just be clean with the American people. Let them know we're taxing carbon. If you're going to burn carbon it's going to cost you money.

We saying we watch Europe and basically they really haven't produced emissions much. There's so much gaming. There's free allocations, offsets which make no sense whatsoever. Wouldn't we be much better off just having a carbon tax here in our country?

Mr. BATTEN. I want to comment first on your comments about the European trading system. The first phase of the EUTS was designed to be a learning phase.

Senator CORKER. Yes, I don't really——

Mr. BATTEN. As you know.

Senator CORKER. Let's just, since the time is limited. Why not just have a carbon tax and just be clean with the American people as to what we're doing. Return every penny back in a dividend form. But tax them when they use carbon.

Mr. BATTEN. Certain economists agree with you that a carbon tax is a clean, easy way to go about this. The problem with a straight carbon tax is it's not necessarily linked to the amount of emission reductions that need to occur in order to avoid the worst consequences of global warming. We need to make sure that this—any price for carbon is tied to scientifically based emission reduction targets. So that's why we're supportive of a cap and trade approach rather than a carbon tax approach.

In terms of returning the auction revenue to Americans, we agree with you. We need to return at least a portion of that auction revenue to Americans to help with rising energy costs. But we also very much believe that we need to invest another portion of that revenue in this series of incentives to start adopting technologies now, widespread adoption and in the development of new technologies to push us down this path to a low carbon future and if this public investment can actually help encourage and increase private investment.

Senator CORKER. Of course if you do that, in essence we're raising taxes on Americans directly. We certainly should state that.

Let me just—would you be in favor then of a cap and trade system that was really a cap and trade system and didn't have free allowances, everything was 100 percent auctioned and one that had no domestic or international offsets which in essence pollute a real cap and trade system and take it away from being market based.

Mr. BATTEN. The Center for American Progress has come out in support of 100 percent auction under a cap and trade system. We agree with you that offsets, excuse me, absolutely must be verifiable, additional and measureable in order to make sense as part of an emission reduction program. There have been examples, of course, of offsets that haven't met those requirements. So therefore have no place in a true emission reduction program, true cap and trade program.

Senator CORKER. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you very much.

Senator Udall.

Senator UDALL. Thank you, Mr. Chairman. Just a moment of personal privilege I want to tell you how honored I am to serve on the committee. Ranking Member Murkowski this is an area in which I've focused a lot of my attention in the House. It's an important area for all of us as Americans and particularly in the great State of Colorado.

So I did have a longer statement I would like to ask unanimous consent to include it in the record.

[The prepared statement of Senator Udall follows:]

PREPARED STATEMENT OF HON. MARK UDALL, U.S. SENATOR FROM COLORADO

Thank you, Chairman Bingaman. I am honored to join the hearing today and am looking forward to working with you and the other Members of the Committee this Congress.

You have been a leader on these issues for so many years, including on one issue near and dear to me—a national Renewable Energy Standard—and I am eager to work with all of you to get that and many other important things done. I know you and everyone here can teach me a lot.

Energy and natural resource issues have been a passion of mine for years. I grew in the West and spent more time under the stars than under the roof of my house.

I've climbed all of Colorado's 54 14,000 foot mountains and I'm intimately familiar with our Western lands.

In the House, I used this knowledge to work to build bridges between various stakeholders and find solutions that respect the many values of our lands.

I've tried to do the same with energy issues.

I worked with then Speaker of the Colorado State House, Lola Spradley, a Republican, to travel our state and urge passage of Amendment 37, which created a Renewable Electricity Standard in Colorado.

During my tenure in the House, I served as a co-chair of the Renewable Energy & Energy Efficiency Caucus with Congressman Zach Wamp. And I'm looking forward to working with Senator Dorgan and the other leaders of the Senate Caucus here on these issues.

My passion for energy and natural resource issues are one of the main reasons that I sought election to the Senate and sought to be on this Committee. I am very pleased to be a member of this Committee and have the opportunity to work with all of you.

The topic that brings us here today is certainly one of the most pressing challenges facing our nation. Energy is literally what powers our economy and our lives—yet our dependence on foreign oil threatens our national security and our environment.

The current crisis between Russia and Ukraine is a perfect example of how access to oil can become a national security issue.

And American dependence on oil from the Middle East has certainly contributed to the terrorism threat that America faces from Al Qaeda and other extremist groups.

So what do we do about this problem? Our witnesses here today have many good ideas on how to address our energy security challenge.

From promoting energy efficiency to responsibly increasing nuclear energy production, the only certain thing is that we must and we can work together to come up with a comprehensive solution.

Colorado is an excellent example of the diversity of energy sources we have across the U.S. Not only is Colorado a significant producer of oil, gas, and coal, but my state is also home a renewable energy industry that is growing by leaps and bounds.

We have traditional farms growing biofuels interspersed with wind turbines, along with cutting edge research at the National Renewable Energy Laboratory. Of course, research isn't limited to just NREL—companies are also working towards new potential energy sources ranging from oil shale to algae.

So I'm looking forward to hearing what our witnesses will say today. Thank you all for being here.

The CHAIRMAN. We'll include it in the record.

Senator UDALL. Thank you, Mr. Chairman.

If I might, just make a short comment on oil shale. I appreciate the comments that were made about the potential of oil shale. I did also want to associate myself with the remarks of Dr. Batten.

I think there are a lot of questions still about oil shale, the amount of energy that's needed to produce oil shale. Do you produce more energy at the end point than you actually put in? There are also grave concerns about the amount of water that's necessary to produce oil shale. There are at least five different experimental technologies being used when it comes to oil shale production.

So let's proceed, but let's proceed cautiously. I do think that the moratoria that was mentioned did make some sense until we know

the technologies that may well be utilized. How can you write regulations for that very production?

But thanks again to the panel. This has been very informative and important testimony. If I might I'd like to turn Mr. Schwartz and Ms. Harbert initially and ask you your thoughts on how we create a cost model for efficiency and conservation that equals the one that's in place today which is based much more on supply side model.

In other words the more electricity you produce, the greater your profit. We're trying to now reconfigure in the world of IOUs, independent or investor owned utilities in the RA world and the municipal power providers, a new cost model so that if you save energy you're rewarded just as much as you are producing energy. Mr. Schwartz, would you care to comment and then Ms. Harbert in turn?

Mr. SCHWARTZ. Thank you, Senator. To be perfectly frank with you it's not something that our organization has addressed explicitly. We'd be happy to follow up and work with you on it.

Senator UDALL. Ms. Harbert, do you have thoughts? We might ask the other panel members when you're done if they have thoughts as well.

Ms. HARBERT. Alright. You're absolutely right. We need to find business models that reward efficiency both at the supply side out on the consumer side. On the utility side those that get their revenue from producing more electricity we need to de-couple those profits from selling more electricity and rewarding them from making efficiency investments.

There are ways in fiscal policy to actually reward those investments. So that there is a tax benefit to making those investments that will then allow them to still recoup profits but to make them actually profitable for selling less electricity. We also need to look at the building environment.

The built environment here in the United States consumes a tremendous amount of electricity. There are no incentives for builders whether at the residential or commercial level to build more efficient buildings. After all it's the tenant that pays the utility bills, not the builder.

So currently we have a very low threshold of efficiency requirements in commercial buildings. We should raise that. We should reward them for efficiency improvements in those buildings.

Likewise, consumers, if they have the monitors in their homes where they can make smart choices. They are able to make the choice of when they're going to spend their money or not and same with the utilities at the different levels along the line. If they can more efficiently distribute electricity at different times and our energy becomes more affordable and we use less of it.

So there are multiple points along the supply chain and demand chain where we can reward efficiency, but not of the backbone solely of the taxpayer. It can be in the profit model of the utility itself. So we are in complete agreement. We have about ten recommendations in our transition plan specifically to that which we'd be happy to share with you.

Senator UDALL. Excellent. Dr. Batten, would you care to comment in the last 30 seconds I have?

Mr. BATTEN. I think that that's absolutely right. Improving efficiency, we've seen many examples of how de- coupling electricity sales from profits has been successful. For example in California we've seen static per capita energy consumption since the 1970s while the rest of the country has increased by 50 percent. At the same time a reduction in per capita CO_2 emissions in California of 30 percent.

Of course the cost associated with implementing these efficiency measures are 50 percent of that of putting in new generation. So, in complete agreement.

Senator UDALL. Thank you.

The CHAIRMAN. Before I call on the next questioner here, let me just say to Senator Bayh and Senator Tester, I spoke glowingly about our great enthusiasm about Senator Bayh coming back on the committee at the beginning of our hearing today. I also spoke about our great regret that Senator Tester is going off the committee. So I just repeat that for your edification.

The one other thing I said was that our general rule today would be that current members would be given the right to ask their questions before the soon to be members. So Senator Tester, you would be entitled to go ahead of Senators Shaheen and Bayh on that basis if you want to go ahead and do that.

Senator TESTER. I've just got to say first of all, Mr. Chairman, I want to thank you for all the good work that you've done over the last 2 years. I think you've done a skillful job. It's good to know that the 50 I slipped you did do some good. So, thanks for that.

Even though I'm very, very tempted to cut ahead of my good friend Senator Udall, I will not. I will wait until they're done. Then I'll go.

The CHAIRMAN. Alright. Senator Shaheen, we'll hear from you and then Senator Bayh. Ok.

Senator SHAHEEN. Thank you, Mr. Chairman and Ranking Member Murkowski.

I am also very excited to be part of this committee. As our panelists have so eloquently outlined how we address energy policy in the future is going to be a critical part of getting this economy moving again. So, I'm excited to be able to join in the good work that has been done by those of you who have been serving on this committee.

You know in New Hampshire and New England we have some particular challenges relative to energy policy. We are at the end of the tailpipe for the nation. So we get the emissions from the Midwest. Senator Bayh and I were just sharing that discussion.

We also are very dependent on foreign oil and foreign sources of fossil fuels. About 90 percent of our source of energy in New Hampshire and New England comes from foreign sources of fossil fuels. We also have a higher than normal percentage of individual buildings so that our efficiency costs for our buildings is more than in most States and more than 50 percent of people heat their homes with number 2 heating oil. So we have some significant challenges.

On the other hand, we are also seeing some initiatives in the state that show what can be done with an energy policy that promotes new energy sources. We've got a number of biodiesel plants that are operating. We have a very interesting new initiative

around carbon capture technology. We have some of the cutting edge work in the world on cellulosic ethanol using forest by products. So we can see people working and the new jobs that are going to be created in these new energy technologies already.

But one of the concerns that we have in New Hampshire as we look at what we need to do in the future is one that has been mentioned by every panelist and by a number of members of the committee. That is the need to upgrade our transmission system. To create a new grid system that's going to accommodate the new energy technologies.

A number of you have talked about the importance of citing. Giving FERC, or some other organization the ability to cite transmission. But do any of you have recommendations relative to how we pay for those costs or a sharing of costs for those new transmission lines?

In New Hampshire there's going to be a huge cost, one that our in state utilities are going to find it very difficult to pick up. We think that asking the rate payers of New Hampshire to pick up all of those costs for power that's going to be shared by other parts of New England and the Northeastern states may not be fair to New Hampshire rate payers. So do any of you, would any of you suggest how we should do that?

Mr. SCHWARTZ. SAFE would just—thank you, Senator. I just want to respond to your question that SAFE would suggest that given the priority of the issue and the beneficiaries of the issue that actually the cost ultimately should be borne by a different group of constituents than those who have currently be paying for expense when utilities make investments as it states today. Because generally speaking to date, things have been done on a local basis.

Unfortunately there are States and perhaps New Hampshire is one of them and I can't say for sure. Where you would argue that there's a lot of transitory electric power. If you develop incremental grid capacity where producers are on one side of the State then consumers are on a different side of the State, then the State is the place for some wires.

We can completely understand why citizens in that state should not feel like they should be paying all the burden when actually everybody in the country is benefiting. In some respects you can argue that people from outside the State of New Hampshire were benefiting even more. So from our perspective, we are sympathetic to the issue and would recommend that the cost of this kind of grid capacity increase will be shared in a different way than it's been to date than on a more broad basis.

If I may just offer one other commentary on this. From our perspective the Federal Citing Authority is important. Perhaps it's not necessary. If it's not necessary at the end of the day and all the right decisions get made without the Federal regulators getting involved, that's a good thing.

But if ultimately they have the power to make a final decision that would be better because in all likelihood you ultimately get to the right answer faster. One hundered years ago somebody laid out the railroad tracks around this country. Fifty years ago somebody laid out the highways around this country. Now it's time to have

a national electric grid. From our perspective the Federal authorities need to be involved.

Senator SHAHEEN. Anyone else?

Ms. HARBERT. I'll just add one comment on the key word that he mentioned which is reliability. I'll note that in New England there's been set up the New England Reliability Council which works with the FERC and also their counterpart authorities in Canada. I think it's very important as we move forward in the expansion of the electrical grid in New England that we make sure that it is done in an integrated fashion.

We are fully integrated with our ally to the north in Canada. As we seek to expand our electricity grid, rightly so, to accommodate expansions and all sorts of energy that we need to take that into account. Your comment on the lack of, you know, this is not the same in New England as it is in the Midwest. I think we really need to consider that as we and the Congress, as you in the Congress consider renewable portfolio standard because things are different across the country.

Senator SHAHEEN. Right.

Ms. HARBERT. That we need to think very carefully about the economic implications of putting forward a Federal mandate that all states must comply with. Currently the States have the power to do this. It hasn't been working so poorly. So we need to consider the regional implications of a Federal mandate that some regions of the country might not be able to comply with without severe economic dislocation.

Senator SHAHEEN. Thank you. Any further comments? Thank you.

The CHAIRMAN. Senator Bayh.

Senator BAYH. Thank you, Mr. Chairman. Thank you for your kind comments in my absence here. Your words will promote punctuality on my part in the future.

I look forward to reading them in the record. Thank you for that. It is good to be back in the committee. Senator Murkowski, I have memories. My first several years in this committee there was another Senator Murkowski who was the chairman. So I for one have no objection to children following their parents in the U.S. Senate. I don't know why.

[Laughter.]

Senator BAYH. It's just a particular thing of mine. But it's good to be serving with you and all of my other colleagues in the committee.

Mr. Chairman, I want to thank you for beginning with this hearing. There's no more important issue. I think this is going to be one of the defining challenges of our time. It touches upon every aspect of our economy, our national and global fiscal standing, the environment obviously and our national security which is the subject that we are focusing on here today.

Our time is limited so I'm going to be fairly direct in my questions. Mr. Schwartz, I'd like to begin with you. I love your outline. Very ambitious. As I understood it a reduction of 50 percent by 2030 in terms of oil consumption. Is that correct?

Mr. SCHWARTZ. Excuse me, Senator, oil intensity. So the amount of oil that used per unit of GDP.

Senator BAYH. Still very aggressive. It's a good target. My question, and again I'm focusing on sort of the practicalities of this.

Just roughly, what do you—that's 22 years. How much do you think we can increase our utilization of let's start with nuclear, wind, clean coal, biofuels. Could you touch upon each of those four areas? What's realistic in each of those four?

Mr. SCHWARTZ. I wish I could give you the direct answers to the direct question. I can't, Senator Bayh. I think that the key thrust of our argument is that if we can move the transportation sector off of oil and on to electricity we will be making a dramatic change in the oil intensity.

Senator BAYH. I agree with that. I'm just trying to figure out how we're going to get there and what is reasonable to expect in the different areas. Just any of you on nuclear. Any of you have any opinions about what we can expect over the next 20 years to——

Mr. SCHWARTZ. Excuse me. I just want to get to one aspect of the point and this may be partly the answer. I'm sure that my colleagues who are experts in the field more than I am can add into it.

But the generating capacity, of course, is substantially greater than what is currently used. It's just a question of time of day pricing in the electric utility generation business. So if we have electric transport undoubtedly we can use the current capacity as it stands and charge up at night.

So there's an overwhelming part——

Senator BAYH. Right, but we just got to get the electricity from someplace. So I'm trying to think how where realistically this additional capacity is going to come from and over what kind of timeframe. But in 2 minutes and 24 seconds we're unlikely to get into too great a detail there. So in any event that's how my mind and perhaps we can follow up with the staff level and get your thinking about these different areas.

Dr. Batten, I'd like to ask you a question. I think Ms. Harbert you, in the Chamber, had included this in terms of global leadership and the issue of climate change in your testimony about cap and trade. I followed with interest your colloquy with Senator Corker about some aspects of this.

My question to you is what are the prospects for the Chinese and the Indians in particular participating in some global regime of climate, CO_2 regulation. Because as you know China I think now in the aggregate emits more than the United States although not in a per capita basis. They are growing more rapidly.

My thought is these changes are necessary. We have to exhibit leadership. But all of it will go for naught if we don't find a way to include these will actually have, you know, economic sacrifices we're making without achieving the climate objectives we seek if we don't find a way to include these other nations in the process. What do you think the prospects for that are?

Mr. BATTEN. That's an excellent question and of course a great concern. We want to make sure that as we are working here in the United States to reduce our emissions that we're seeing similar levels of action and well, maybe not in all cases, similar levels of action since there is the differentiation between developed and devel-

oping nations currently as part of the negotiation process. But this is a very big concern.

I have a few points I'd like to make. First of all——

Senator BAYH. Very few, I'm down to 55 seconds.

Mr. BATTEN. Ok. The United States——

Senator BAYH. As a matter of fact I would just recommend that this should be an area that we focus on. Because if we're going to, you know, get to the environmental objective that we seek and do it in a way that rewards the sacrifice Americans are willing to make to get there.

We've got to include these other countries. There's a lot of work to be done there. So that's a job for the diplomats and some others.

Can I follow up with one other question to you? I thought your conversation with Senator Corker was very interesting. What did you mean by—I was fascinated by your thought that the cap and trade would actually generate more reductions than just a straight out price, you know, tax mechanism on carbon.

I will say I, along with Senator Corker, have an open mind on these things. Some of the proposals that have come before Congress have been sort of Rube Goldberg. Ask and you raise money here and then the Congress is allocating it there. You have offsets here. You pointed out they have to work.

But it's in some ways we had the political mechanism reallocating these resources instead of the market mechanisms. So I'm just—would like to revisit his question which I thought was excellent. Why is the cap and trade the most efficient way to achieve these reductions?

Mr. BATTEN. I just want to say first. I didn't say that carbon tax would achieve fewer greenhouse gas emission reductions than cap and trade. But cap and trade is linked directly to emission levels whereas a carbon tax wouldn't necessarily be.

So it's just a different mechanism.

Senator BAYH. It's not linked directly. But I think Ms. Harbert would probably agree that higher prices tend to lead to lower consumption therefore lower emissions. Don't you get to the same result just through a different way?

Mr. BATTEN. Sure, sure. In both options there's a price signal that helps drive behavior. Absolutely.

Senator BAYH. My time has expired, but I just get back to this question. Why is the cap and trade the most efficient way to get to where we want to go? Having seen some of the proposals that come up here that seem awfully complicated, very indirect and susceptible to leakage here and there, I'm just curious about your answer.

Mr. BATTEN. Sure. Let me just restate that our top priority in terms of implementing a price on carbon and implementing a cap and trade system is twofold.

First to reduce emissions to the level that the science says we need to.

Second to make sure that the revenue is available to invest in, not only alleviating rising energy costs for low and middle income Americans. But also to invest in the technological development that we need to really get us on this path to a low carbon economy and really start to be able to export technologies overseas and the like.

So this is the platform that we've found, due to our analysis, is the most efficient.

Senator BAYH. Thank you all very much. My time has expired.

The CHAIRMAN. Senator Tester.

Senator TESTER. Thank you, Mr. Chairman. I want to follow up on a question that Senator Shaheen had asked. It's to you, Mr. Schwartz.

It talked about transmission. You said there needs to be a different way of paying for it, a more broad based way. What are you saying?

I mean, what are you really saying? Are you saying the Northeast pays for the Northeast transmission or the country pays for the Northeast transmission?

Mr. SCHWARTZ. I can't really answer that question, Senator because I don't think we've worked that out. All we're trying to make the point on is we don't think the people in New Hampshire should pay for that which benefits people outside of New Hampshire completely.

Senator TESTER. If you were to——

Mr. SCHWARTZ. Excuse me.

Senator TESTER. Yes, go ahead.

Mr. SCHWARTZ. Let me finish. At the end of the day, from our perspective the effective development of a national grid——

Senator TESTER. Yes.

Mr. SCHWARTZ. Is for the benefit of everybody in the country.

Senator TESTER. I would agree.

Mr. SCHWARTZ. It benefits everybody because of its mitigating impact on energy security overall most importantly and if that's the case, from my perspective speaking as an individual because the organization has not taken a specific, formal position on a question that you specifically asked me.

Senator TESTER. Ok.

Mr. SCHWARTZ. I'd be in favor of making it a national.

Senator TESTER. Ok. Thank you. Dr. Nielson and Dr. Batten, I just was curious as to what your perspective is on the best way to scale up transmission for a renewable energy, particularly wind that is intermittent in nature over large areas of land, like a place like Montana. There's other too.

Mr. NIELSON. That's certainly an issue for wind, as well as for some of the other renewable resources. While they may be intermittent within an area, overall and as you bring on a larger volume of the resource from different areas that intermittency many times disappears or blends in the larger base.

The important thing, going back to your question of transmission, also is that as we bring those resources on we need to be able to build a transmission system particularly for renewables that is scaled to be able to accomplish new renewables coming online. So the idea of establishing renewable energy zones and perhaps building capacity in that line that rate payers won't pay for immediately. But will be able to pick up as additional capacity is needed for renewables. That also will help in terms of encouraging renewables and in terms of balancing the issue of cost and sizing of transmission.

Senator TESTER. Dr. Batten, did you have anything you'd like to add to that?

Mr. BATTEN. Absolutely. This is an extremely important issue. As you know, about 140,000 megawatts of wind are currently waiting to go online, but don't have the transmission to connect them to the grid.

Senator TESTER. Correct.

Mr. BATTEN. So it's a critical question. I would just like to add to Dr. Nielson's comments that it's not only the intermittency. But also the distributed nature of some of these renewable sources of energy that need to be put into consideration and managed by smart grid technologies in terms of looking at the overall generation, use and real time pricing of these different sources of renewable energy.

Senator TESTER. So what you're saying is it would help a lot if the energy, wind energy wasn't built all in one spot. If it wasn't huge amounts of megawatts in one spot, what if they were distributed more evenly throughout a region?

Mr. BATTEN. I think it's important to take advantage of where the natural resources are and if that leads to greater concentration of certain renewable generation in certain areas than we need to pay attention to that. But at the same time having more distributed generation certainly also contributes to the security of our energy supply.

Senator TESTER. Right. Ok. The line, just help me out. You may or may not know this. If you building line for wind energy, if you're building transmission lines, I would assume you would build that line for maximum output of those generators. Is that correct?

Mr. NIELSON. You would if you could afford to do so, sir. But in many cases the way the system is set now the first developer bears the brunt of the cost for development of that line even though they may not be utilizing the full capacity of development in the future. So it becomes a challenge of building the maximum size line to be able to accommodate full development of the resource and the amount of money that you can bring to it at this point and still be cost effective with your consumers.

Senator TESTER. Ok. I've almost ran out of time. I'd like to get into the transportation sector about electric cars and how they would apply to a State like Montana.

I think that it absolutely has merit. I think they could be. But I'd like to hear your vision for that. Mr. Schwartz will hopefully do that at another time.

I just want to thank the chairman. I want to thank the ability to be a part of this committee for the last 2 years. It's been a great experience. Thank you.

The CHAIRMAN. As I said in my earlier comments you've made a great contribution around here. We will miss you, but we're sure that we will have the opportunity to work with you on these issues in the larger context here in the Senate.

Senator Corker, you have additional questions?

Senator CORKER. I do sir, thank you. Senator Tester and I serve on a number of committees together and I've noticed he's getting off every one of those.

[Laughter.]

Senator CORKER. So I don't know what the signal is.

The CHAIRMAN. Think there's something personal then?

Senator CORKER. I don't think so. He's a good guy.

Mr. Batten, I want to follow up. Obviously I enjoyed Senator Bahy's line of questioning. I just want to point out that the notion of having cap and trade and then making investments if you will is really code for that Rube Goldberg type of situation we talked about where basically you're extracting money from the American public. Then really you're doing that without their knowledge in some ways through a cap and trade system.

Then again without their knowledge you're actually taking that money and appropriating money to investments that we, in our wisdom, choose to do. I want to say that I think that's what led to such a disastrous debate last summer as it relates to cap and trade. I would just say that in essence, the simple way of doing it would be to make sure that we either through cap and trade with 100 percent auctions, no offsets, return 100 percent of that money to the American public.

So basically we're saying that carbon is bad, but that the less—it's really net, not going to cost the American public anything or do so more transparently through a carbon tax. But I agree with Senator Bayh. I look forward to working with him. The simpler the better.

What role do you see for nuclear into the future? I know you were silent on that in your testimony.

Mr. BATTEN. If I may just very quickly to say as I said before, we do support returning some of the revenue back to the American consumer.

Senator CORKER. Which is code for money coming out of the American public's pockets and being appropriated in areas. It really is sort of non-transparent when you say some of the money coming back to the American public.

Mr. BATTEN. We actually have been quite transparent in our policy recommendation. It's 45 percent——

Senator CORKER. True. It's just when it's implemented that the American people really don't see that happening. But and I'm not criticizing. I'm just saying that that's code for money coming out of American's pockets and going into——

Mr. BATTEN. Certainly.

Senator CORKER. Ok.

Mr. BATTEN. Our concern with returning 100 percent of the revenue is that we don't want to provide incentives. We want to make sure that the incentive is still there to actually start moderating behavior in terms of starting to reduce the amount of carbon produced by the energy consumption of American businesses.

Senator CORKER. The incentive would be there because if you use carbon it would cost you.

Mr. BATTEN. Sure. I just wanted to clarify.

Senator CORKER. Ok.

Mr. BATTEN. That's our distinction. That's why we made that recommendation.

In terms of nuclear power we certainly see nuclear power as being part of our electricity mix moving forward. There still are the, as of yet, unresolved issues having to do with nuclear waste

and proliferation concerns that need to be addressed. But certainly as a baseload———

Senator CORKER. Are you saying they should be addressed first or so we could go ahead with nuclear production now and be working on those as we go because that's also code for no more nuclear unless those are worked out first.

Mr. BATTEN. That's not what I'm saying. I'm not saying no more nuclear. I'm saying that we absolutely need to be working on those concerns at the same time as we're moving our entire electricity system toward a more low carbon future and that includes also additional and significantly ramped up investments in renewable energy production.

Senator CORKER. Thank you for your testimony. I think it's been very helpful. I'd like to ask Mr. Schwartz and Ms. Harbert, what about the notion of doing away with all this myriad of subsidies that we have in place for every type of energy production?

I know the grid itself needs to be dealt with. I look at that much like many other do. It's just like the interstate system. It's just like the rail system. That is something that benefits all.

But aside from that what about having a price for carbon and letting the market from that point forward make investments based on carbon itself and doing away with every other kind of energy subsidy. Wouldn't that be a saner way for business people into the future to make investments and know that those investments would yield returns?

Ms. HARBERT. Let's see if this works now.

First on the question of subsidies, it is our view that in some of the nascent or embryonic technologies as they come into the market warrant some market shaping support. But it should not go on forever. That all technologies over time should be able to stand up on their own two feet and compete against one another, eek out efficiencies and therefore deliver the lowest cost energy to the consumer.

With endless subsidies you get un-commercial sources of energy continue to exist in the market. So they should be able to stand on their own. They should be able to compete as long as you recognize that in the era in which we live we are going to have to provide some temporary support to some of these newer technologies.

Also to your point about nuclear power. You know, nuclear power provides 50 percent of our energy. Coal provides 20 percent. Renewable energy provides—wind provides 1 percent. So we can't imagine over a very short period of time transitioning to wind power getting up to supplant 70 percent of our electricity supply.

So we have to be rational in our approach to this. We can't mandate in a cap and trade program or any other program what technology or what reality won't deliver. So we have to be very thoughtful about this.

The investment community and the business community does want transparency. They want to know what's expected of them. They want to know where the money is going so they can make long term capital investments. Energy is a very capital intensive, long term business. Without that predictability, they can't deliver what's expected to them of their shareholders and the consumers.

Mr. SCHWARTZ. Senator Corker, SAFE, the organization SAFE, has in our proposal booklet if you will, has included a variety of suggested changes to the current subsidy program, but not broad based elimination of them which is what you're asking about. Of course if I'm not mistaken you're asking about it in a context of putting a price on carbon.

Senator CORKER. Right. That's correct.

Mr. SCHWARTZ. We would, I think, ultimately conclude that it's just basic economics. I'm a capitalist. You're a capitalist. If there's a price for carbon it's going to make a difference in people's behavior.

We would—so I need to speak personally as opposed to on behalf of the organization because the organization has not taken a public stance on carbon tax or gasoline tax. A couple of things. First of all, I personally would agree with you on the notion that a tax is a lot cleaner and simpler and more honest to the American people than a cap and trade system.

Second of all, a gasoline tax is different from a carbon tax. From our perspective while they ultimately are clearly related, they ultimately solve different issues. You can't use the same exact tool to solve two different issues and think that you're doing it efficiently and effectively.

So from my perspective at least as an individual, if you're going to go down that route I hope you go down that route in two different places.

Senator CORKER. Mr. Chairman, I want to join Senator Bayh and others in thanking you for your leadership. My sense is you're going to play a much bigger role this year in any debate as it relates to cap and trade.

I watched the regional polls that we have here in Congress and look at some of the silly, silly subsidies that we keep in place for technologies that are never going to bear fruit. I just hope that as we debate cap and trade or debate carbon tax or debate whatever we're going to debate that we also simultaneously look at the subsidies that are in place. So that what we do is something that really ties all of this together in a coherent way because without that we're going to continue to have these production tax credits that are on and off.

Sometimes I feel it's the Finance Committees way of keeping us all at bay so that they can deal with this every couple of years. I just don't think that's productive. I thank you very much for having these wonderful witnesses. I thank them. Thank you for your leadership.

The CHAIRMAN. Thank you for your insights and participation in this important set of issues.

Senator Udall did you have additional questions?

Senator UDALL. I do, Mr. Chairman. I wanted to acknowledge the important points the Senator from Tennessee has made. Look forward to having additional conversations with you, not only about a carbon tax, but about subsidies and seeing if we can limit the number of subsidies that work across purposes.

I know that SAFE and I think, Mr. Schwartz I can use this term appropriately, Green Hawks, that are a part of the SAFE effort. The retired admirals and generals in part are motivated by the un-

derstanding that they have that we have enormous subsidies in effect in protecting oil supplies lines. A significant portion of the defense budget goes to protecting those oil supply lines.

So I look forward to working with you and Senator Bayh and everybody to get this right. Appreciate the tenacity that you talk about the carbon tax efficiency and market mechanisms verses political mechanisms as Senator Bayh suggested. So thank you.

If I might I'd love to, given the old saying there's no limit to virtue. There's so much we could do here if I could work down the line starting with Dr. Batten. Given the tough economic situation that the country faces, but also the fiscal concerns that we have in the Congress, what would be the single initiative you would first support?

What would be your number one priority to move us to this energy security goal that we all want to reach? I'll start with Dr. Batten.

Mr. BATTEN. Thank you for the question. I think that my first priority would be to invest, make sure that the economic stimulus package that the Congress enacts includes significant investments in low carbon and energy efficiency infrastructure, not only to create jobs now and to start reducing American energy bills now. But also to put us on a path to a low carbon future that will be sustainable and more prosperous.

Senator UDALL. Do you see real utility opportunity in the stimulus package?

Mr. BATTEN. Absolutely, as a first step in a much broader comprehensive strategy.

Senator UDALL. Mr. Schwartz.

Mr. SCHWARTZ. We would agree. We would also of course focus on the grid investments that we've all been talking about all morning. I would just like to make one other observation that hasn't been raised yet.

The credit crunch has truly impacted in a very negative way a lot of companies that are already in business. So these aren't R&D projects. These are real companies.

Now with real employees and who are supplied by other real companies with real employees. In other words people who are currently at work where the lack of access to capital which afflicts all of corporate America will be particularly troublesome because these are fragile companies given the fact that they just started in business. I would hope that as part of the stimulus package, again speaking personally, there is a focus on getting credit access for those companies in the form of loan guarantees and the like.

Senator UDALL. Do you think there's a way in which the discussion about the TARP second tranche ought to be applied as well, Mr. Schwartz?

Mr. SCHWARTZ. TARP, of course has had a storied existence at this point from my perspective at the end of the day the money is fungible. It's for you to decide where it goes. All I mean to be suggesting is that while it's important to be supporting the banking system and it's important to be supporting the economy at large, there is a segment of the economy with which we are all, your committee and on this panel, very concerned about.

I think that there's a way the stimulus package can be used to nourish those companies at a time of great pain. If we don't do it and we lose supply lines, these companies, etcetera. I think that you may have sort of a brown out, if you will, to use an unfortunate mixed metaphor.

Senator UDALL. Ms. Harbert.

Ms. HARBERT. I think in this time of economic crisis and energy challenges we don't have the luxury of picking just one. We can do more than one thing at the same time. I'm convinced of that.

We don't have the luxury of picking one source of energy. We have never been successful in picking winners and losers. I would say there's four things that we should do simultaneously.

We should permanently end the moratorium on gas and signal to the energy community that they are able to invest here at home to produce energy and jobs here at home. We should raise the ceiling on the loan guarantee program so we can get more nuclear power plants built. We have $122 billion of requests out there for loan guarantees and only $18.5 billion. They're ready to go projects.

We should also extend the renewable tax credit for now. We have solar with 8 years and wind with one. That's incongruous. So we should make them harmonize.

Last, we really should get busy about increasing our R&D budget for that next set of technologies. So I think we can do more than one thing at once. I don't think we should mislead the American people by saying if we just do this one thing, we solve it.

They're hoping for that. It's just simply not true.

Senator UDALL. That's well said.

Dr. Nielson.

Mr. NIELSON. Senator, I also would suggest that we need to do multiple things at this point. The Western Governors Association responded to this question in early December. The response was first of all that we fund State energy efficiency programs and clean energy projects.

That we extend the production tax credit to 2018, that we expedite Federal reviews on clean energy and transmission projects, an issue that we haven't talked about much today. That we invest in alternative fuels for transportation. Thank you.

Senator UDALL. Thank you. Even though the last two witnesses didn't answer my question with one response, you still would get a very high grade because it is important to do everything.

But Dr. Batten, thank you also for making the point that we have to focus on this near term opportunity both in the stimulus package and in the TARP. Governor Shaheen and I both come from states where you use tarps to keep the rain off your head and to survive long nights in the winter and in the summer. So the tarp has to cover the right opportunities here and safeguard the economy.

So I think there's additional utility there. So thank you again, Mr. Chairman. This has been a very, very important hearing and worthwhile. Thank you.

The CHAIRMAN. Thank you.

Senator Shaheen.

Senator SHAHEEN. Yes, I don't have another question but only a comment given the discussion about cap and trade. That is that we

just had an auction with the Regional Greenhouse Gas Initiative which I think is one of the first efforts in the country. It might be instructive to hear from some of those folks how that went and what kinds of challenges they're seeing as the result of that.

The CHAIRMAN. I agree. I think that's a very good suggestion.

Senator Bayh.

Senator BAYH. Thank you, Mr. Chairman. Just one comment and then one very brief question. I sometimes enjoy playing the role of skeptic or devil's advocate. Dr. Batten I think I was playing that role with you here today. I'm sorry our colleague Senator Corker left.

But the reason for my question was I do believe that global warming is a significant challenge that we have to address. We have to exert global leadership. But because I believe strongly about that I think we have a particular responsibility to make sure that our proposed solution actually works.

We have a responsibility to the American taxpayers to make sure it's the most efficient mechanism possible, so hence my interest in China and India. We focused a lot more on our domestic challenge than we have in terms of how to include them. I think we need to step up our efforts there if it's actually going to be effective in the long run.

If Senator Corker were still here I would kind of answer my own question to you by saying I think the direct tax mechanism. If I'm not mistaken, Mr. Chairman was maybe tried back in 1993 in the first years of the Clinton Administration. I think then Vice President Gore sort of floated a carbon tax proposal or an idea.

So my answer to my own question was sometimes things that the economists would say are optimal are not politically realistic. Therein lies the real debate we have here. So how do you take a solution that gets you to the same result, it may not be ideal from a theoretical standpoint.

But how do you make it substantively efficient enough to be supportable? I think therein lies the challenge we face. That was the reasoning for my questions to you. I think we need to follow up on both of those.

How do we include the developing countries? How do we, if we have to go with the cap and trade—and I support where I think you were coming from. We have to find a way particularly for more resources for more R&D technological development.

That involves, you know, the government. Although I personally would be a little more inclined toward the tax credit mechanism as opposed to getting the appropriators involved. When you get our good friends on that committee involved sometimes things can go off in a variety of directions or maybe some combination of the 2.

In any event I understand where you're coming from. I think you understand where I'm going from. It is just some highly complicated thing that relies on government appropriations very heavily—impale the efficiency of the solution. That's the reason for my comment.

My question, Mr. Chairman. One last thing for you, Mr. Schwartz. I really followed with some interest T. Boone Pickens campaign this year to elevate the public's awareness in this area. As I understood it he wanted to increase the use of wind power for

electricity backing out the use of natural gas to produce electricity and instead using natural gas to power motor vehicles. Is that correct?

Mr. SCHWARTZ. Broadly speaking——

Senator BAYH. Right. So my question to you is you've chosen the electrification mode. He was sort of advocating the gasification mode. Why did you choose differently than he did?

Mr. SCHWARTZ. First of all just to make sure the point is clear. We're completely constructive on the concept of increasing the use of wind power in the United States. So that part there's no debate on.

I think the issue with natural gas is with the structure required to begin to use natural gas as the key source of fuel for transportation. We don't have it now. It would cost trillions of dollars to have it that way.

We already have broad distribution of electric power. It's from that perspective that from our perspective it's a reasonably simple question.

Senator BAYH. So it's the timeliness and efficiency of the distribution.

Mr. SCHWARTZ. There's plenty of places to spend trillions of dollars. You don't need more.

Senator BAYH. Why do you suppose he chose to go the other way?

Mr. SCHWARTZ. Couldn't tell you.

Senator BAYH. A subject for another day. Thank you, Mr. Chairman. Thank you very much ladies and gentlemen.

The CHAIRMAN. Are there any other questions? If not, we appreciate the good testimony we've received. Thank you very much. This gives us a lot to think about as we proceed to try to craft energy legislation.

So that will conclude our hearing. Thank you.

[Whereupon, at 11:23 a.m. the hearing was adjourned.]

APPENDIX

RESPONSES TO ADDITIONAL QUESTIONS

RESPONSES OF ERIC SCHWARTZ TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Could you comment on whether it is possible to develop robust renewable fuels industries without high prices for traditional fossil fuels? Can we realistically expect to move toward a low carbon energy future without considerable energy price increases? Now that energy prices have fallen from their recent peaks, how do we keep from reversing the consumption reductions and consumer demand for greater energy efficiency?

Answer. It will be extremely difficult to develop a robust renewable fuels industry unless alternative sources of energy become cost competitive with traditional fuels. To the extent that research and development (R&D) can accelerate technological growth, it can bring down the cost of renewable fuels by increasing their generation efficiency, thereby making these sources of energy more cost competitive with fossil fuels over time. For that reason, the Council has proposed significant increases in public spending on government R&D.

With regard to energy consumption, the nation will undoubtedly struggle to maintain recent increases in efficiency as long as energy prices remain low. Simply stated, low energy prices make investments in energy efficiency less cost effective by increasing their payback times. Given the current status of the U.S. economy, consumers are much less likely to make investments in energy-efficient goods and technologies that require significant capital upfront in exchange for savings over an extended time.

The most important role for government in this environment is to be diligent in pursing cost-effective public policies that establish efficiency as a market requirement. Market-friendly standards and mandates, including fuel-economy standards, can help insulate consumer choices from the vagaries of the global oil market. To be sure, the Council believes that government intervention through standards and mandates should be a last resort. But given the nature of the global oil market-combined with the climate and environmental goals of the nation-we believe that external costs are not fully reflected in end-user energy prices today. Therefore, government must set the priorities and parameters.

Question 2. There is broad agreement that the short-term extensions of the production tax credit have not provided sufficient regulatory certainty for the robust growth of that industry. In the current investment climate, tax credits do not seem to be enough to propel projects forward. What policy tools would you recommend for supporting renewable energy projects in the current economy?

Answer. The current problem with the production tax credit (PTC) is that financial markets are unable to provide a path for developers of renewables to monetize the tax credit. Proposals to shift the tax credits to a grant-based program that could be funded by appropriations for a period of two or three years until the economy recovers are probably the most important means to support the development of renewables previously reliant on the PTC in the short term.

Over the medium term, it makes sense to extend the PTC for a longer period of time so that the renewable fuels industry can plan more confidently for its future. At some point, however, the Council believes that the PTC should phase out, as it is not sound policy to essentially subsidize the production of energy from certain sources on an open-ended basis. The Council also believes that as a general matter the PTC and the investment tax credit (ITC) should be revisited, and probably eliminated, in the event that either a renewable portfolio standard or a plan to regulate carbon emissions is enacted, as either policy would create significant demand for renewable power, largely obviating the need for ongoing government subsidies.

Question 3. In your written testimony, you made a very compelling point that the financial burden of 2008's energy price increases arguably exceeds the financial burden associated with subprime mortgage lending. However, you suggested that this

oil price spike demonstrated "both the vulnerability of our transportation system and the consequences of an actual energy crisis." Could you explain how you interpret the oil price spike as the result of an "actual energy crisis"? To what "actual energy crisis" are you referring? Would you agree that a market that has become divorced from its underlying fundamentals constitutes an "actual energy crisis"?

Answer. The oil price spike was, indeed, the result of an actual energy crisis. However, perhaps a more instructive term would be "oil shock." Indeed, in its recently released World Energy Outlook 2008, the International Energy Agency (IEA) noted that "the surge in oil prices since 2003, and especially since 2007, can legitimately be described as an oil shock, albeit a slow motion one." Unlike previous oil shocks, most experts have come to believe that the events of the past several years were characterized by a demand shock. Beginning with highly unexpected rates of oil demand growth in China and the U.S. in 2004, global oil demand rose at an aggressive pace through 2007, placing a heavy strain on the global oil market, which in recent history has been characterized by at least three endemic, fundamental weaknesses.

The first weakness has been inadequate investment in production capacity growth by members of the Organization of the Petroleum Exporting Countries (OPEC). OPEC nations are home to the largest, lowest-cost reserves of oil in the world. As demand grew rapidly from 2004 to 2007, OPEC production capacity growth failed to keep pace, resulting in very low levels of spare capacity (lower than 1 million barrels per day at times). Second, many of the most prolific oil producers are plagued by political instability, violence, and terrorism, all of which can generate unexpected oil supply disruptions. In a low-spare-capacity environment, this leads to a considerable risk premium in oil prices. Finally, oil production growth outside of OPEC in the world's most developed nations (OECD countries) has dramatically slowed while marginal costs have risen.

These basic factors left the global oil market essentially unprepared for the surge in demand-the demand shock-from emerging markets, which became evident in 2004. Equipment costs skyrocketed, extremely expensive non-OPEC oil projects began to enter development (Canadian oil sands have a marginal cost estimated at $80-$90/bbl), and institutional investors flocked to commodities, which arguably exacerbated price movements. The result was an oil price that briefly overshot the price of demand destruction, touching $147/bbl. Record high oil prices substantially increased the nation's energy-related expenses, affecting household and business budgets and undermining several industries, including airlines, shipping, and the automotive manufacturing sector.

The crisis nature of this phenomenon was exacerbated in the United States because of the structure of our transportation system. Nearly 70 percent of U.S. oil consumption occurs in the transportation sector, which is 96 percent reliant on oil-based fuel for energy. At the same time, demand for oil is inelastic in the short term because consumers cannot quickly moderate their use of oil in response to higher prices. Moreover, as noted above, there is often virtually no spare capacity in the system to compensate for any production shortfall, whether due to natural disasters, political instability, or any other reason. Ultimately, one might consider the structure of our transportation system to be part of the crisis. At a minimum, it facilitates the onset of our recurring "energy crises."

Finally, whatever the role of institutional investments in commodities, the market fundamentals did, in fact, drive the underlying price movements. Moreover, it is absolutely critical to realize that oil market fundamentals have not appreciably altered during the past six months. In fact, investment in oil production capacity worldwide has been further constrained, which will likely lead to a sharp correction in oil prices when demand recovers.

Question 4. There seems to be a near-consensus that, over the long term, we need to move beyond even "second generation" biofuels, such as cellulosic ethanol, to a "third generation" of biofuels, developing technologies such as biocrude from algae. Can you comment on the preferred policy options for ensuring that we develop this third generation of biofuels? How does the existing RFS fit with this goal of establishing a third generation biofuels industry? And, should the RFS extend beyond passenger vehicles, and, for instance, include jet fuel?

Answer. At this point, the Council believes that the best means to accelerate the development of a third generation of biofuels is to increase R&D funding for its development. The existing renewable fuels standard (RFS) does call for the development of "advanced biofuels," but it differentiates these fuels based on their carbon profile alone and essentially defines them largely as cellulosic ethanol, the production of which is mandated by the RFS. As it stands, the RFS is biased substantially in favor of ethanol, regardless of feedstock.

The Council has raised concerns about several aspects of the current biofuels program broadly and the RFS specifically. As is now well known, the current production mandate will exceed the 10 percent blend wall in a few short years. In the absence of a sudden wellspring of E85 refueling stations and flex-fuel vehicles, the nation will be producing more ethanol than it needs. The Council, however, does not support the construction of a national infrastructure for transporting alcohol-based fuels. At best, this would be a costly endeavor that would still leave the nation dependent on liquid fuels, the price of which will be set by the marginal gallon, which will be oil-based fuel for the foreseeable future. Instead, the Council has advocated for expeditiously determining the extent to which the blending cap for ethanol in conventional gasoline can be increased, perhaps to E15 or E20.

We agree that the government should focus on the development of biofuels that can be transported in existing pipelines and dispersed via conventional pumps. Biocrude from algae and other biofuels that mimic the molecular structure of conventional fossil fuels can help meet climate-mitigation goals and will minimize government expenditures on redundant infrastructure. In fact, by withholding public funds for alcohol-based infrastructure, government can send a powerful signal about the future of the U.S. biofuels market while more aggressively investing in necessary research.

Again, however, it should be noted that these fuels will essentially be direct substitutes for petroleum, and will therefore be priced on the same curve. The diversity of the electric power sector offers transportation a far more long term, permanent shift toward energy security.

Question 5. In your written testimony, you identified regulatory uncertainty as a reason for the cancellation of many advanced coal projects. Could you please elaborate on exactly what those regulatory uncertainties are?

Answer. The primary regulatory uncertainty is the uncertainty regarding the timing and means of regulating carbon emissions, which makes it difficult to forecast the long term financial viability of coal-based projects. Until rules governing carbon emissions are established, it will be virtually impossible to forecast the costs of operating a coal plant and compare it to the cost of other types of generating plants with any meaningful degree of confidence.

Question 6. In written testimony, SAFE recommended expanding federal R&D initiatives that study the opportunities to exploit methane hydrates. The DOE currently has a highly functional methane hydrate program that is being run collaboratively with other Agencies and private industries. They are poised for reauthorization in 2010. Beyond the work that has already been completed, do you have any further suggestions as to how to maximize the investment in this area of research?

Answer. SAFE agrees that DOE's interagency program is staffed by highly competent civil servants and has made some progress in conducting portions of two field projects. However, as noted in the 2007 Methane Hydrate Advisory Committee Report to Congress, "the program is grossly underfunded." SAFE is aware that, per the Energy Policy Act of 2005, Section 968, the National Academies of Sciences is conducting a study of the progress made under DOE's methane hydrate R&D program and will make recommendations for future methane hydrate R&D needs.

In addition to careful consideration of those recommendations, SAFE urges that the R&D budget for methane hydrates research should be dramatically increased. FY 2007 funding for the program was $12 million dollars. By contrast, funding for DOE's fusion research program in FY 2007 was more than $311 million. As the Advisory Committee notes: "Either the United States should downgrade the expectations outlined in the Methane Hydrate R&D Act, or the program should be funded at the levels authorized in the Act to enable achievement of the stated goals." Even at those authorized levels, the methane hydrate R&D would be funded at levels between one-sixth and one-eighth of the fusion program.

Responses of Eric Schwartz to Questions From Senator Murkowski

Question 1. Our reliance upon foreign nations for a great deal of our energy needs is a problem we must solve. Our energy policy and our economy are inextricably linked. While lower gas prices are providing some relief, it will only be temporary unless we can find a long-term solution. Moreover, those low oil prices brought about by recession, along with continued difficulty in the credit markets, now threaten to delay or halt a wide range of renewable energy projects. I believe this is a clear indication of the need to increase domestic oil and gas production. Do you agree that side-by-side with our efforts to increase conservation and develop new energy sources, we also have to produce more secure sources of domestic oil and gas? If so, where should we be producing?

Answer. Over the long term, it is the Council's position that the most effective means for achieving true energy security is the electrification of short-haul transportation. America's cars and light-duty trucks consumed approximately 8 million barrels of oil per day in 2008, about 40 percent of the U.S. total. Aggressively transitioning this component of the vehicle fleet to high rates of electrification will dramatically reduce oil consumption and thereby reduce the oil intensity of the U.S. economy. To support this effort, the Council has outlined a number of policy steps the federal government must implement, including vehicle tax credits, increased R&D spending for batteries, and a substantial investment in electricity generation, transmission, and grid management.

The Council recognizes that widespread electrified ground transport will require a dramatic shift in consumer choice, technology and infrastructure. This transformation will only be achieved if we commit to a decades-long, sustained national effort that leverages smart, aggressive public spending with private ingenuity and flexibility.

If we as a nation take the necessary steps, reductions in oil consumption from electrification of short-haul travel will reach meaningful levels within the next two decades. However, we must take steps to protect our economy and national security in the short term while we work to fulfill the promise of electrification. Therefore, the Council has outlined a series of intermediate measures to provide domestic energy to drive our economy. Among these measures, the Council supports expanded access to oil and gas resources on the Federal Outer Continental Shelf (OCS) and in the 1002 area of the Alaska North Slope. The principal benefit of increased domestic oil production will be reduced pressure on the U.S. current account due to imported petroleum. Based on initial statistics, net U.S. petroleum imports increased the 2008 trade deficit by more than $350 billion. Additional benefits include increased revenues for the Federal government and additional volumes of stable oil supply in the global market.

It is important to note, however, that increased domestic oil production will not shield American households and businesses from the volatility of petroleum prices. There is a fungible global market for oil, and incremental U.S. production from expanded access will not fundamentally alter this dynamic.

Ultimately, the largest benefits to the U.S. economy will accrue from reduced oil consumption, which can partially be achieved through improved vehicle efficiency today. Therefore, the Council has also made recommendations on expeditiously completing the fuel economy rule-making for medium- and heavy-duty trucks. Over the long term, the fuel diversity offered by electrification of transportation will reduce oil consumption much more substantially.

Question 2. There are very significant energy reserves on lands owned by Alaska Natives and American Indian tribes, who want to develop the potential of these reserves. Do you agree that our country's energy security would be enhanced if these resources were to be developed?

Answer. While it has not taken an explicit position on this issue, the Council would agree that increased production of domestic oil and gas resources offers a number of economic benefits. In its report, the Council also clearly states that the development of oil and natural resources within the United States must be balanced by a range of considerations, including environmental sustainability and economic viability. As a general rule, the Council supports the development of the highest potential, lowest environmental-impact resources first. Assuming resources on lands owned by Alaska Natives and American Indian tribes meet these considerations, increased production would benefit the entire nation, and increased royalty revenues would benefit the holders of the resource-rights.

Question 3. Last year, the price of oil rose dramatically before declining to its lowest level since 2004. In light of this volatility, would you change or alter any of the recommendations included in your reports? Would you make any adjustments if today's relatively low oil prices persist?

Answer. Oil prices are determined in open markets based on supply and demand. However, the supply of oil itself is completely removed from free market principles. The largest reserves are held by members of the OPEC cartel, who meet to determine output in a process that is often influenced by inherently political considerations. As a result, contrary to market principles, the highest-cost resources (U.S. deepwater, Canadian oil sands, North Caspian, etc.) are actively developed while lower-cost resources in OPEC sit idle. Moreover, as evidenced in a recent analysis from PFC Energy, as much as 90 percent of global oil and gas reserves are held by national oil companies (NOCs), whose investment decisions are based on a range of social and political considerations.

As a result, the global oil market is extremely susceptible to boom and bust cycles. Investment and operational decisions in key nations are uneven and inefficient,

often based on short-term considerations. Therefore, the Council has long recognized the need for market-friendly standards and mandates in the United States, regardless of oil price. As long as oil prices fluctuate unpredictably, the nation faces a near-impossible investment climate for alternatives to oil and for technologies that use oil more efficiently. Our recent report reflects this measured approach to energy policy, and was not motivated simply by high oil prices.

Question 4. Washington Post columnist Charles Krauthammer wrote an article last week in support of what he calls a "net zero gas tax." He calls for a $1 per gallon increase in the federal gas tax, which would be accompanied by a $14 per week reduction in the payroll tax. According to Krauthammer, such a shift would reduce global oil prices and domestic greenhouse gas emissions by restraining gasoline consumption. It is also described as revenue neutral. What are your thoughts on this proposal, particularly as an alternative to a tax on carbon, a cap-and-trade system, and/or higher CAFE standards?

Answer. I would like to offer my personal views on this matter. I will refrain from speaking for the entire Energy Security Leadership Council as a whole, though I would note that the Council has not explicitly opposed a gas tax as a matter of policy. In the past, the viability of a gas tax has been hampered by political considerations. Perhaps, however, the political viability of a gas tax will have improved in the environment of bipartisanship and great change in Washington today.

Ultimately, a gas tax represents a tool for supporting other policy measures, like improved fleetwide fuel-economy standards and promoting alternatives. It must not supplant or replace them. This is true if for no other reason than the fact that demand for gasoline is highly inelastic, meaning a stand-alone gas tax would have to be extremely aggressive to be effective. But it is also true that individuals are notoriously bad at evaluating long-term efficiency savings in the face of increased upfront expenditures, and this impacts the amount of fuel-economy for which they are willing to pay.

Nevertheless, I believe that the key to a successful gas tax is implementing it in a way that does not simply enlarge government coffers at the expense of consumers while providing them with no meaningful alternatives. Two options exist for addressing this issue. Mr. Krauthammer has identified the first, which is to refund the gas tax via an alternative fiscal tool-in this case the payroll tax. I believe this type of gas tax can help end-user fuel prices reflect the true costs of oil and compel some consumers to use gasoline more efficiently either through conservation or the purchase of more fuel-efficient vehicles. It will also send a signal to automotive manufacturers that demand for efficient cars will be driven by more sustained price signals. In this case, if properly executed and managed, a gas tax could achieve behavioral modifications with no net cost to the consumer.

A second option for implementing a gas tax, I believe, is to deposit a portion of the revenues in dedicated government accounts to be used solely for the purpose of research and development on critical energy technologies. This will have the same benefits of the first approach in terms of sending appropriate price signals, but will have one additional factor. Investments in energy R&D could yield break-through technologies that will greatly benefit all consumers and the broader economy. However, there is always the risk that R&D would yield too few benefits or only provide them over a long timeframe, and therefore this system has a higher risk/reward ratio than a simple refund.

As a final point, it should be noted that a gasoline tax does not deal with electricity, so it is not a substitute for a carbon tax or a carbon cap and trade system. The electric power sector is currently the most cost-effective sector for dealing with carbon emissions, because the sources are generally large and stationary. A carbon tax would raise prices in this sector substantially, while a gas tax would have no impact. Alternatively, a carbon tax would trickle down to end-users of petroleum, but only at modest levels not likely to induce behavioral changes. (A CO_2 price of $200 per ton would raise gasoline prices by 25-50 cents at most, and $200 per ton would generally be considered to be at the upper range of estimates for permit prices.) Ultimately, some combination of increased prices and other government policies will be needed.

Question 5. Alternative energy companies have an incredibly difficult time securing the financing necessary to become viable and productive. DOE's Loan Guarantee program, established by the 2005 Energy Policy Act, has proven woefully inadequate for addressing this problem thus far. Do you believe that there have been short-comings in the way that program has been administered? If so, what would you have done differently? Do you believe that loan guarantees are the most effective financial instrument for advancing private-sector, clean energy technology ventures?

Answer. There have been shortcomings in the way the program has been developed, administered and funded. From the beginning, appropriations for the pro-

gram-to develop guidance and regulations, to set up the administrative oversight, and to authorize loan guarantee volume amounts-have been both delayed and inadequate. The Department's guidance and regulations for the program currently require greater levels of project sponsor funding than the statute requires, contain unrealistic requirements for fees and credit subsidy payments-both as to amounts and the timing of the payments-and require credit ratings that are unrealistic for projects deploying innovative, noncommercial technologies.

All of these requirements are at a minimum inconsistent with congressional intent and in some cases appear to clearly contravene congressional intent. The program should have been structured more like a commercial transaction with respect to the level and timing of fees, adhered more directly to congressional intent with respect to project sponsor funding levels, and emphasized funding guarantees for projects that cannot secure normal commercial funding due to technology risk. In short, the DOE needs to recognize that some projects will default due to technology risk; they are not merely intended to administer an alternative financing pathway for robust projects with little or no risk of technology failure.

In the current liquidity crisis, loan guarantees may not be the most effective instrument for advancing the deployment of innovative energy technologies, although they should be among the items in the toolbox of financial incentives. During these credit-constrained times, it may be that a system of direct loans, or grants that convert to loans, or a loan guarantee program that requires little if any equity involvement from project sponsors, would be the "most effective" financial instrument for achieving rapid deployment of innovative energy technologies.

Question 6. Several pieces of legislation were introduced last Congress to create a self-funding federal bank to assist start-up, clean energy companies. As envisioned by those bills, such an entity would be able to issue not only loan guarantees, but direct loans and insurance products as well. Additionally, this federal bank would, in some instances, be allowed to assume a financial stake in clean energy technology firms and issue publicly-traded stock. In the context of what has taken place at Fannie Mae and Freddie Mac, do you believe it is appropriate for the federal government to back start-up, clean energy technology firms in this manner?

Answer. What occurred at Fannie Mae and Freddie Mac was a failure of oversight and management, rather than a failure of proof of concept. As long as taxpayers will be made whole through repayment, and until a clear carbon pricing system exists to send desired signals to the marketplace, government assistance will be necessary to facilitate the rapid deployment of more costly clean and secure energy technologies.

Question 7. We all know that coal supplies 50 percent of our nation's electricity supply. The Chamber of Commerce's Institute for 21st Century Energy testified that the U.S. has enough coal to last for well over 200 years. What role do you see for coal in the nation's energy mix going forward? Compared to commercial-scale carbon capture and sequestration, how important do you believe incremental efficiency improvements within the existing coal fleet are?

Answer. The United States has the largest reserves of coal in the world and is the second largest consumer and producer of coal globally. Half of the electric power generated in the United States is generated from coal. It is virtually impossible to imagine any scenario in which coal is not a critical part of our energy future through at least 2050. Moreover, while coal has many fierce opponents, few have offered viable plans to replace the power generated by coal.

To be sure, the Council is mindful of the challenge that our nation faces in reducing carbon emissions and the role that coal plays in contributing to those emissions. For that very reason we have proposed significant increases in R&D, including significant spending on technologies to capture and sequester carbon from coal-fired power plants, in addition to promoting other baseload power solutions like nuclear. While we certainly value the incremental reduction in emissions that we can achieve by increasing the efficiency of existing coal-fired power plants, we believe that efficiency gains on existing sites alone will not allow us to address our carbon problems, and that commercial-scale carbon capture and sequestration (CCS) is a critical part of our energy future.

However, as the government and private industry work to demonstrate commercially viable CCS, it is worth noting that integrated gasification combined cycle (IGCC) is a coal generation platform/technology that exists today. Although capital costs are substantially higher, these highly-efficient coal facilities do offer a means of power production from an abundant domestic source of fuel. To the extent that these facilities are deployed in the coming years, the Council recommends they be made CCS-ready with access to storage space.

Question 8. It would seem that more output from the same amount of fuel input is a win-win for the environment, the consumer, and the success of companies that

operate electric power generation facilities across the country. And yet, these efficiency improvements are consistently not undertaken. What, specifically, gets in the way of incremental efficiency improvements at power generation plants in the existing fleet? What can this Congress do to remedy such a shortcoming?

Answer. The Council was unaware that efficiency improvements are "consistently not undertaken" at power plants. While the Council is not expert on that issue, and has a sense that most efficiency upgrades that were cost-effective were occurring, it has heard complaints that the New Source Review (NSR) program has been an obstacle. Specifically, we have heard complaints that certain efficiency upgrades that would have been cost-effective in their own right were rendered too costly by the additional cost of environmental upgrades required by NSR. (I will direct SAFE staff to do additional research and provide follow-up.)

Question 9. Are you concerned about any unintended geopolitical consequences associated with a transition away from oil, given the producing nations that rely so heavily on revenue from the sale of their oil and other energy commodities to the United States?

Answer. The Energy Security Leadership Council counts among its ranks a number of individuals who have served at the highest levels of leadership within the U.S. armed services. Having commanded U.S. operations in every corner of the world, the Council's military members are acutely cognizant of the broad security risks associated with resource dependency in many oil producing nations. In nations like Iran and Venezuela, oil revenues provide the vast majority of government revenue, which is in turn used to finance massive social spending programs. More broadly, a striking characteristic of the largest petroleum exporters in the world is the one-dimensional nature of their economies. In 2006, oil export revenues accounted for 40 percent of GDP in Saudi Arabia and 46 percent in Nigeria.

While we appreciate that a decline in oil revenue represents a significant challenge for many exporters, we believe that both they and the international system will be best served by diversifying their economies. Countries with more diversified economies tend to be more open and less susceptible to the resource curse-defined as the paradox by which countries with an abundance of raw materials tend to have slower economic growth and are less developed than countries that are not resource dependent.

Therefore, while we have endeavored to remain mindful of potential unintended consequences of our policies, the Council believes that this concern should not keep us from implementing policy reform. In fact, one could argue that American foreign policy and foreign aid programs could be dramatically bolstered by diverting funds currently exported for oil to instead be invested in a range of economic activity in these countries to help diversify their economies. Of course, over the long term, foreign policy prudence obligates American leadership to carefully monitor the impact of our energy policies on the international system and make responsible mid-course corrections if our policies have negative unintended consequences.

Question 10. Electrifying the transportation sector has received considerable attention as a means to reduce dependence on foreign energy sources, as well as to eliminate an important source of domestic greenhouse gas emissions. The industry is already aggressively pursuing battery technology development and grid interface issues. In order to avoid increasing greenhouse gas emissions from the electric generation sector, do you believe it will be important to increase the contribution of non-emitting sources of electrical generation such as nuclear energy?

Answer. To those concerned about carbon emissions, I would suggest that increasing the contribution of non carbon-emitting electric power generation will be critical to our nation's future even if we do not electrify the transportation sector. If we do electrify the transportation sector, it becomes even more vital. This is because, in addition to reducing U.S. oil consumption, electrification offers the advantage of consolidating a substantial portion of transportation energy demand into the electric power sector.

Our national leadership must be mindful of the dangers of increasing electric power demand (from electrification) without providing for diverse sources of power generation. If current trends are allowed to persist, a great deal of incremental U.S. power generation could be derived from natural gas. Despite recent developments in onshore unconventional gas production, there remains a very real possibility that America will be forced to import greater quantities of liquefied natural gas (LNG) in the coming decades. We must not trade one national security risk for another.

Accordingly, the Council strongly supports greatly expanding R&D to improve the efficiency of non carbon-emitting renewables. We have also proposed extending the existing tax credits for energy production from renewable fuels, and we have called for changes to the DOE loan guarantee program to improve its ability to help the nuclear industry begin construction of the next generation of nuclear power plants.

We believe that new nuclear plants are critical to our future as they are the only existing technology that is non-emitting, non-intermittent and scalable.

Finally, it is useful to note that consolidating transportation energy demand into the electric power sector will also consolidate carbon emissions into that sector. Most analysts believe that because electric power facilities are large and stationary, addressing carbon mitigation in this sector will be more cost-effective than regulating tailpipe emissions.

Question 11. Your report emphasizes how important domestic oil and natural gas production is to energy security. Can you elaborate on some of the ways Congress can help increase domestic production here at home, and what effects you would expect those actions to have?

Answer. It is important to note that the regulatory landscape has shifted since the Council finalized its report in early September 2008. At that time, up to 80 percent of the lower-48 OCS was off-limits to leasing or preleasing activity due to longstanding congressional moratoria. Later that month, the Continuing Resolution funding government operations through March 2009 omitted these provisions, leaving open the possibility of new offshore development. Based on these and other events, the Minerals Management Service (MMS) initiated a draft proposed program for 2010-2015, which was made public in January 2009. Initial reactions to the MMS draft proposed program by the Obama administration and some members of Congress suggest that it may be revised significantly.

The Council believes that, working together, congress and the administration must proactively set clear legal and regulatory parameters governing future offshore development. A wide range of options exist for responsible production of oil and gas on the OCS, nearly all of which require a new set of guidelines. Some critical issues that must be addressed in any system are:

a. Treatment of the Eastern Gulf Planning Area: Section 104 of the Gulf of Mexico Energy Security Act (GOMESA) currently restricts access to most of the Eastern Gulf through 2022. The Council recommends that this section be repealed.

b. Revenue sharing for states adjacent to newly accessible planning areas: Congress must decide whether to extend revenue-sharing benefits to states in the Atlantic and Pacific planning areas. If so, a system for allocating revenues must be codified. The Council recommends that all States be given the same revenue sharing provisions provided to the Gulf States in GOMESA, which would begin in 2017. A formula for determining individual State shares will likely be needed on the Atlantic and Pacific coasts, and Florida will need to be incorporated into the Gulf allocation system.

c. Mileage limits and buffer zones: As the debate about offshore oil and gas production has evolved over the past several months, a number of legislative proposals have incorporated mileage limits on offshore development, some as restrictive as 100 miles. Such limits could substantially reduce the available resources in many planning areas.

In order to protect coastal vistas, the Council is supportive of permanent surface restrictions within 15 miles of each state's seaward boundary. Resources that can be accessed via extended reach drilling (ERD) from structures onshore would not, however, be off-limits. Between 15 miles of each state's seaward boundary and 25 miles of its coast, the Council has recommended that a temporary surface presence be allowed so that subsea production networks can be installed. Beyond 25 miles of each state's coastline, the Council does not support surface restrictions.

The Council is also supportive of efforts by MMS to encourage expeditious development of leases. Measures such as escalating rents have proven to be effective in some cases, though a recent report by the Government Accountability Office (GAO) found that MMS could do more to encourage development.

Outside of the OCS, Congress could grant access to resources within the 1002 Area of the Alaska North Slope. A recent analysis from the Department of Energy found that incremental Alaskan production from opening this area would peak at roughly 780,000 barrels per day in 2027 (in the mean USGS resource case). The project would substantially extend the lifetime of the Trans-Alaska Pipeline System, which will soon reach its minimum flow rate.

Finally, the Council supports measures to encourage miscible CO2 enhanced oil recovery (EOR). Ultimately, putting a price on carbon may be the most effective means for accelerating these projects. In the meantime, the Council supports giving EOR equal treatment to deep saline formations as a tool for sequestering carbon in publicly funded programs such as FutureGen. One recent analysis from the Society of Petroleum Engineers found that CO_2 EOR could produce an incremental 1.2 mil-

lion barrels per day of domestic crude oil and sequester 5 billion cubic feet per day of CO_2 by 2030. The study was based on an average real crude oil price between $45 and $60/bbl.

Question 12. To create a low carbon economy, the Center for American Progress has proposed the elimination of tax breaks and subsidies currently available to domestic oil and gas producers. With oil at approximately $50 per barrel, can you describe the impact this action might have on domestic production?

Answer. As a general rule, greater stability and regulatory certainty are vital for businesses to thrive. According to the Baker Hughes rig count, roughly 40 percent of the active rigs in the world are exploring and producing in the United States, despite the fact that U.S. resources are among the most costly to develop in the world. In part, this is because the U.S. is the world's single largest market for petroleum products. However, it is also reflective of the fact that the United States currently maintains one of the most stable, favorable regulatory and tax environments in the world for oil and gas producers.

At the same time, there is probably no more important factor than oil prices in determining the output of existing domestic oil wells. Roughly 20 percent of U.S. oil production currently derives from stripper wells-defined as those wells which produce less than 15 barrels of oil per day. A recent analysis from Sanford Bernstein suggested that the majority of this production is likely to shut down in 2009 as a result of today's low-price environment. Beyond the onshore stripper wells, deepwater production in the Gulf of Mexico is among the most expensive oil to produce in the world, with marginal cost estimated at $75 per barrel. In other words, oil prices at $40 per barrel put intense pressure on producers who are highly leveraged to such costly production. At a minimum, low oil prices are likely to force many operators to postpone investing in new, more costly production.

It is also worth noting that the most promising growth in domestic natural gas production is derived from relatively costly shale, tight, and deep gas. As natural gas prices have collapsed in tandem with oil prices, domestic producers of unconventional gas have been forced to slash capital spending and re-evaluate future production plans.

Given these considerations, the Council believes that Congress must carefully consider the implications of reforming the tax code as it relates to oil and gas producers. While it is true that many of the provisions extending tax credits and subsidies to domestic oil producers appear unnecessary in a $140/bbl oil price environment, our leaders must be mindful of the fact that oil prices are extremely volatile. Over the long-term, the secular price trend for oil and natural gas is clearly headed upward, but there will many bumps along the road.

It is the Council's position that alternative measures for increasing government revenue from oil and gas production should be considered. Chief among these measures would be a progressive royalty structure that extracted greater resource rents in a high price environment. The Council has recommended the implementation of a pilot program by MMS in order to gauge the efficacy of progressive royalties.

RESPONSE OF ERIC SCHWARTZ TO QUESTION FROM SENATOR LINCOLN

Question 1. In your testimony, you discuss how the drastic decline in oil prices is only temporary. While we all want the price of gas at the pump to stay down, how do Members of Congress keep the attention of the American people in pursuit of a national energy policy as prices fall?

Answer. First, I would suggest that the most important thing our leaders can do is to move quickly to put policies in place that will promote energy security and safeguard the economy. We know from polling that Americans are not ideological on the energy issue. If presented with an honest assessment of the challenges we face, they support a realistic plan that balances efficiency and increased energy supply with a long-term transition away from oil and other fossil fuels to the extent feasible. What we must not do is continue to put off the hard choices while clinging to the tired rhetoric of "energy independence" and the inert sloganeering of "drill baby drill."

A truly reformed national energy system will require a sustained and concerted effort on the part of America's political leaders. In turn, this will require the ongoing support of American voters as the nation implements an energy policy that reduces dependence on oil and makes greater use of cleaner and/or renewable fuels. No doubt, this represents a daunting challenge. It is one we have largely failed to meet to date, because after each price spike or "energy crisis" subsides, national attention shifts to other issues and willingness to spend money to address a problem that appears to have passed becomes a lower priority. In this sense, lower prices at the pump are a substantial part of the problem.

Because of the size and the scope of the existing oil related infrastructure, solutions to our energy problems will take years to address. To the extent that the public loses interest in energy security as a result of low fuel prices, it is difficult to sustain support for sound energy policies. Then, by the time we face a "crisis," it is too late to act. The Obama administration appears to have decided to respond to this challenge, at least in part, by creating an "energy czar" whose responsibilities will presumably include helping to maintain a commitment to addressing our challenges no matter the price of oil.

RESPONSES OF ERIC SCHWARTZ TO QUESTIONS FROM SENATOR SESSIONS

Question 1. It appears that there will be a sizable economic stimulus package enacted by Congress shortly. That package will likely include funding for numerous environmental projects. Considering that most thoughtful observers believe that in addition to a short term stimulus, projects should also have long term value for the country, would you please list 5 or more projects that you believe would be particularly cost effective in the long term for our nation? I would also request that you please state the amount that is necessary to be spent on the projects that you have listed above.

Answer.

a. Build new transmission lines.—There is broad consensus that we need to upgrade the capacity of the nation's electrical grid and modernize its operation. Many of the obstacles to doing so, however, are not related to a lack of federal funds. One critical issue is that the existing regulatory process was not designed to plan and build a national electrical grid. The best use of federal funds to assist in upgrading the grid would be to provide funds to the federal power marketing agencies (BPA, SWPA, and WAPA) to construct new transmission lines. While most high voltage transmission lines are built and owned by private or municipal utilities or cooperatives, these power marketing agencies do, in fact, build and own transmission lines-primarily in the West. At Congress' first opportunity, it should establish an interconnect-wide grid planning process that would develop a transmission plan, grant federal siting authority for the plan, and allocate the cost of the transmission lines built pursuant to the plan across all customers in the relevant interconnect.

b. Smart grid.—In addition to upgrading the grid's capacity, we need to modernize its operation. Advanced digital technology can operate the grid more efficiently and reliably, enable new demand response technologies and programs, and expand access to the grid to distributed generation and renewables. Most of the technology required to develop the smart grid can be paid for by utilities' customers under existing cost allocation practices. However, the government should fund pilot programs that deploy new technology so that the market can more quickly determine which technologies and practices work best in the marketplace and deploy that technology in the shortest time frame possible. The government should provide at least $5 billion for such programs, which will create jobs and accelerate the deployment of critical technologies.

c. Early infrastructure for electrification of transportation.—In order to take full advantage of the oil savings possible through the use of plug-in hybrid electric or fully electric vehicles, drivers will need access to recharging stations not just at their homes, but also at other places where they park their cars-particularly at work. Yet, until there is a critical mass of plug-in electric or fully electric vehicles, installation of public recharging stations may not be a high priority for local governments or commercial real estate developers.

Public recharging stations are estimated to cost $700 to $1,000 per outlet. Congress should establish grants to municipalities for installing outlets, provided that a minimum number of units are installed. The minimum number of units required to become eligible for the credit should be a function of city size. Congress should also provide tax credits to commercial real estate developers that install recharging facilities accessible to at least 5 percent of theirparking spaces and make those spaces available to PHEVs and EVs. Promoting the establishment of at least one million recharging stations will facilitate the deployment of PHEVs and EVs and enhance our energy security.

To be sure, an aggressive program to deploy EV charging stations may outpace widespread availability of the electric vehicles themselves. However, the Council supports this approach on the grounds that it serves stimulus job-creation goals while laying the groundwork for consumer acceptance of EVs down the road. The design of stations should be coordinated with relevant automakers.

d. Invest in battery R&D.—The absence of batteries with sufficient capacity that can be recharged quickly and manufactured at a reasonable price is the primary stumbling block for the electrification of our short-haul transportation. The Council believes this is the most critical step the nation can take toward reducing our dependence on oil. Congress should allocate $2 to $3 billion over three years to fund advanced battery research.

e. Federal purchases of highly efficient vehicles.—As the largest consumer in the nation, with a presence that extends throughout the economy, the federal government is well situated to help establish the market for electric vehicles. Either Congress, by statute, or the President, by Executive Order, should direct government agencies with a minimum size fleet to purchase either PHEVs or EVs if they are available and meet agency requirements. By doing so, the government can provide an early guaranteed market for PHEV and EV producers. This will accelerate scaling of EV production and may facilitate access to capital for automakers seeking collateralize debt.

If suitable PHEVs and EVs are not available, agencies should be required to choose among the three most efficient vehicles for each class of car as defined by the Environmental Protection Agency for the purpose of calculating fuel-economy standards. Doing so will promote the development of markets for vehicles that will enhance our energy security.

f. Restructure tax credits for renewable energy.—Because they are relatively new and are involved in a very capital-intensive industry, most renewable energy companies do not have enough taxable income to utilize existing tax credits intended to incent investments in renewable energy facilities. Moreover, the institutional investors with whom the renewable companies entered into partnerships to allow them to monetize the credits have disappeared in the recent financial crisis. Congress should establish a grant program as an alternative to the existing tax credits to allow the renewable companies to monetize the value of the tax credits. Otherwise, there is likely to be a severe collapse of the renewable industry until the economy recovers and tax equity partners are once again able and willing to partner with companies to build renewable generating capacity.

g. Launch a weatherization program.—Increasing energy efficiency in homes through weatherization is among the most cost-effective means to reduce energy consumption. Moreover, it utilizes existing technology, can begin immediately, and is labor intensive. Congress should increase funding for weatherization by $5 billion and expand eligibility for lower income households to participate in the program.

RESPONSES OF KIT BATTEN TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. In your testimony, you recommended that even as we consider further development of domestic fossil fuels, we should consider the greenhouse gas footprint of those new fuels. Clearly, this makes a lot of sense in a world that is moving toward constraining carbon emissions. However, the science of assessing the full lifecycle greenhouse gas emissions of a particular fuel remains a work in progress. How we can gain a fuller understand of lifecycle greenhouse gas assessments?

Answer. America's dependence on oil leaves us vulnerable to energy supply disruptions and to price volatility. What's more, climatic shifts in developing countries are expected to trigger or exacerbate food shortages, water scarcity, the spread of disease, and natural resource competition. Thus, global warming is a threat multiplier for instability and will fuel political turmoil, drive already weak states toward collapse, threaten regional stability, and increase security costs. Committing to investments in fuels that have lower greenhouse gas emissions on a lifecycle basis in comparison to traditional gasoline is imperative to reduce our global warming emissions and ultimately avoid or lessen these risks and associated costs.

The Center for American Progress has proposed a low-carbon fuel standard to reduce lifecycle emissions from transportation fuels by 10 percent by 2020 and an alternative fuel standard to require that low-carbon alternative fuels (including electricity) supply 25 percent of our transportation fuels by 2025.

We have reliable, scientific data measuring the lifecycle greenhouse gas emissions for a range of fossil fuel sources. In the Center for American Progress' report Capturing the Energy Opportunity we note that on a lifecycle basis, alternatives such as tar sand, liquid coal, and oil shale emit more greenhouse gases in the production phase than does crude oil.

For example, in the absence of carbon capture and sequestration, liquid coal fuel results in about 50 pounds of CO_2 emissions per gallon-nearly double that from

crude oil on a lifecycle basis. Even if the carbon associated with liquid coal production is captured and stored, liquid coal produces 4 to 8 percent greater global warming emissions than gasoline. When our economy is dependent on fossil fuels, whether on oil or alternative fossil sources, we increase our greenhouse gas emissions, which ultimately threaten our economic, environmental, and national security.

In the past few years, the body of scientific research and evidence surrounding the lifecycle greenhouse gas emission of a range of alternative biofuels has also grown. For example, in 2008 two studies published in Science criticized the use of biofuels, particularly corn-based ethanol, as causing more greenhouse gas emissions than conventional fuels. The studies also note that clearing natural habitats to grow crops for biofuels generally leads to more carbon emissions, and that clearing large areas of land in general can lead to food and water shortages and reduced biodiversity. This type of scientific analysis of lifecycle greenhouse gas emissions can help us design the most effective standards to promote only those fuels with the lowest emissions and the greatest sustainability.

These findings point to the urgent need for national and international certification standards for biofuels. Such standards must be part of effective policy for producing biofuels as a means to diversify our transportation fuels and ensure that these fuels generate fewer greenhouse gas emissions over their lifecycle of production to consumption and are sustainably produced. Biofuels that are part of the solution include cellulosic ethanol—which is less energy-intensive and made from agricultural plant waste—or dedicated crops such as switchgrass or algae. Another key source for biofuels with low lifecycle greenhouse gas emissions is municipal waste, which is largely untapped today. With the right standards, biofuels can play a direct role in diversifying our energy sources and contributing to economic growth and development, particularly in rural communities in the United States and the rest of the developed and developing world.

Question 2. The cap and trade program proposed by the Center for American Progress supports the use of international carbon offsets for avoided deforestation. Currently, the EU does not recognize this type of carbon offset. Why should the U.S. differ from the EU on this point? How could we be certain that this type of offset is both additional and verifiable?

Answer. Carbon offsets must be measurable, additional, verifiable, and permanent if they are to be part of any rigorous emissions reduction program, nationally or internationally. In some cases, existing offsets have not met these criteria, so we must ensure that any offsets allowed under a U.S. cap-and-trade program and international agreements truly reduce emissions. Efforts that typically take place within unregulated or voluntary markets and that fall short of full compliance threaten to undermine the integrity and actuality of the reductions.

In addition to providing flexibility in terms of the costs of emissions reductions, a central advantage of carbon offsets is that they permit and encourage reductions to take place outside of the sources covered by a mandatory cap-and-trade program. A well-designed carbon offset program must ensure that entities selling offsets can meet rigorous, uniform standards and verify their emission reductions.

Ensuring the compliance of offset projects in the forestry and agricultural sector, including avoiding deforestation, can prove difficult. However, addressing emissions from deforestation is essential because the Intergovernmental Panel on Climate Change (IPCC) estimates that deforestation contributes close to 20 percent of global greenhouse gas emissions. As such, reducing emissions from deforestation remains a major thrust of the international climate negotiations and of the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme). Thus designing an offset program that can help gain emission reductions from avoided deforestation is an imperative part of the global effort to fight global warming.

In Getting Credit for Going Green, by David J. Hayes, the Center for American Progress discusses the creation of a two-tiered Climate Change Incentive Program to ensure real and verifiable emission reductions. The program proposes creating two tiers of incentives to reduce emissions. Tier 1 offsets—otherwise known as Compliance Credits—would be certified by the Environmental Protection Agency and would meet stringent measurement, verification, and permanence requirements via the application of rigorous EPA methodologies and protocols. These credits would count as reductions contributing to meeting the overall cap on U.S. emissions.

Tier 2 offsets would comprise the Targeted Carbon Reduction Program. This Tier 2 program would include program-or project-based activities that may not satisfy the stringent tests required to earn Tier 1 compliance credits but still reduce emissions. These activities would earn other financial rewards, including tax credits, rebates, grants, or other financial incentives. Emission reductions resulting from the Tier 2 program would count as additional emission reductions beyond those required

by the cap. Once Tier 2 programs develop a track record and more data has been collected on their resulting emission reductions, some of them may qualify to move up into Tier 1, where they can generate marketable compliance credits. In this way, Tier 2 may serve as an "incubator" of projects and programs that ultimately may qualify for compliance credit status under Tier 1. Programs that encourage carbon-enhancing forestry or agriculture practices, for example, could be included in Tier 2, with some practices in those sectors also likely qualifying for compliance credits under Tier 1. The Tier 2 Targeted Carbon Reduction Program should be actively explored in international settings, where program financial support may be effective, at least at the outset, in reducing overall emissions from some types of emission sources, such as tropical deforestation.

One of the benefits of such an offset program is that it can encourage emissions reductions in sectors that are not currently covered under a cap-and-trade program. This type of comprehensive offset program would provide more information about the nature and scope of unregulated emissions and set the stage for their potential official inclusion in a cap-and trade program at a future date.

Question 3. In your testimony, you referenced Merrill Lynch's 2008 estimate that gasoline prices were 15% lower than they would otherwise have been, because comparatively less-expensive ethanol was helping to offset the price increase in crude oil. This is a great example of how high prices for conventional fuels benefit renewable alternatives. Could you comment on whether it is possible to develop robust renewable fuels industries without high prices for traditional fossil fuels? Can we realistically expect to move toward a low carbon energy future without considerable energy price increases? And, now that energy prices have fallen from their recent peaks, how do we keep from reversing the consumption reductions and consumer demand for greater energy efficiency?

Answer. We need a mix of market-based mechanisms, mandates, and incentives to rapidly and effectively transition to a low-carbon economy. A smart mix of policies will ensure diversification of energy supplies and investments in energy efficiency-all of which will reduce energy bills and serve to create and increase consumer demand for renewable alternatives and more efficient technologies.

Once businesses have to factor the cost of emitting CO_2 (and other greenhouse gases) into their bottom lines, the power of the marketplace will start to push toward efficiency, lowcarbon fuels, renewable energy, and carbon capture and storage technologies for coal-fired power. For that reason, the Center for American Progress recommends adopting an economy-wide cap-and-trade program to put a cap on emissions and a price on carbon. We recommend auctioning all the carbon permits available under the cap-and-trade system. Allocation of auction revenue involves a transfer of substantial wealth and must be handled wisely to ensure equitable and efficient distribution to help low-and moderate income Americans offset energy price increases and to increase investment in research, development, demonstration, and deployment of new low-carbon and efficient technologies.

Even though oil and gas prices have fallen since their record highs this past summer, they will surely rise again. In order to keep energy prices low, it is necessary to invest in energy efficiency and increased consumer choice. Price increases and fluctuations in both the electricity and transportation sectors have made it difficult for Americans to plan budgets, especially as pocketbooks are tightening in the face of a recession. A significant short-term benefit from investing in energy efficiency is keeping energy bills low, even if energy prices increase. Diversifying our nation's sources of energy will increase consumer choice and also help keep prices lower and less volatile.

Question 4. There seems to be a near-consensus among the witnesses that, over the long term, we need to move beyond even "second generation" biofuels, such as cellulosic ethanol, to a "third generation" of biofuels, developing technologies such as biocrude from algae. Can you comment on the preferred policy options for ensuring that we develop this third generation of biofuels? How does the existing RFS fit with this goal of establishing a third generation biofuels industry? And, should the RFS extend beyond passenger vehicles, and, for instance, include jetfuel?

Answer. The next generation and a "third generation" of biofuels have roles to play in diversifying our energy needs. But, we must move forward on biofuels in a more innovative and efficient manner. Preferred policy options must begin to reward performance characteristics of advanced biofuels and not simply the sheer volume of production levels.

We must build on the goals and performance incentives of the current renewable fuel standard (RFS) and strive to produce only advanced biofuels that deliver measurable lifecycle greenhouse gas reductions, minimize the use of food-based feedstocks, and adhere to certifiable environmental and land use safeguards. Wherever

possible, future feedstocks should be drawn from waste streams or produced on semi-arable land that does not compete with food or feed.

The current RFS establishes ambitious targets and makes an unprecedented contribution to incorporating the criteria noted above into the production of domestic or imported biofuels. Lifecycle greenhouse gas reductions, emissions from land use changes, and land use safeguards are all key components of the current RFS. In its target of 21 billion gallons of advanced biofuels by 2022 and its emphasis on these and other performance-based criteria, the RFS provides appropriate flexibility to allow producers to meet the RFS mandate with significant contributions from third generation biofuels without dictating a specific type of biofuel product or technology.

An RFS based increasingly on performance rather than volume, will contribute to a technologically-neutral standard. For example, biocrude from algae and other third generation biofuels have shown recent promise in small-scale testing and production. Algae has tremendous potential due to its capacity to capture significant quantities of carbon, be grown on non-arable land using salt water rather than fresh water, deliver high bioenergy yields compared with other plants, and provide secondary products such as animal feed. On the other hand, numerous questions remain regarding algae's scalability, reproductive growth, and cost.

Similarly, any proposal at this time to extend the RFS to jetfuel requires further analysis. The use of an advanced low-carbon biofuel that is a more economical and high quality 'drop in' (ready to use in all existing infrastructure and fuel systems) replacement for petroleum and that meets all safety standards may yield significant benefits. Indeed, the Federal Aviation Administration (FAA), the International Air Transport Association (IATA) and several airlines have shown interest in developing and demonstrating the use of advanced fuels. (IATA has set a goal of ten percent alternative fuels in the jetfuel mix by 2017 and several airlines have been testing alternative fuels in their fleets). Further consultation with appropriate stakeholders, including national and international trade associations, airlines, aircraft manufacturers, fuel producers, jet engine manufacturers, members of the public, and others is required. In addition, several challenges remain to applying advanced biofuels to jetfuel, including the capacity to meet large-scale needs, overall cost savings and predictability, and the risk of relying on carbon intensive fossil fuels such as coal to produce alternative jetfuels.

In order to accurately assess the true cost and viability of these advanced biofuels, we need to bring them to commercial scale on as rapid a timetable as possible. The current RFS calls for 100 million gallons of advanced biofuels in 2010, 1 billion gallons in 2013, and 21 billion gallons by 2022. These targets will simply not be met without redoubling efforts to coordinate the research, development, and deployment of sustainable advanced biofuels production among DOE, USDA, EPA, CEQ, and others. Existing energy and farm legislation contains numerous programs that can further this effort, including the Biomass Crop Assistance Program and numerous grant programs.

Question 5. The Center for American Progress has identified regulatory issues surrounding Carbon Capture and Storage (CCS) that need to be addressed for it to take its place as a vital piece of our energy infrastructure. One of these key regulatory issues concerns liability for the stored CO_2 after the well has been closed. How does the Center recommend that issues of liability be dealt with, after the closure of the wells?

Answer. The issue of long-term liability for maintaining and operating sequestration sites is critical to the success and deployment of CCS. It is necessary to identify who will bear responsibility for permanent storage at sequestration sites.

There has been some discussion of a government-funded insurance program (akin to the Price Anderson Act for nuclear plants) to protect private owners and operators against serious financial exposure in the event of CO_2 leaks. But there is no consensus as yet that such insurance protection is needed to encourage power generators to commit to long-term CO_2 capture and storage programs.

The EPA has long regulated underground injection at oil and gas wells under the Safe Drinking Water Act and recently proposed new regulations for CO_2 injection at sequestration sites. Yet it is unclear whether EPA's existing authority is broad enough to encompass all the issues raised by CO_2 injection under a carbon control regime. Thus, a new national legislative framework may well be needed to create long-term public confidence in CCS systems.

RESPONSES OF KIT BATTEN TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Our reliance upon foreign nations for a great deal of our energy needs is a problem we must solve. Our energy policy and our economy are inextricably linked. While lower gas prices are providing some relief, it will only be temporary

unless we can find a long-term solution. Moreover, those low oil prices brought about by recession, along with continued difficulty in the credit markets, now threaten to delay or halt a wide range of renewable energy projects. I believe this is a clear indication of the need to increase domestic oil and gas production. Do you agree that side-by-side with our efforts to increase conservation and develop new energy sources, we also have to produce more secure sources of domestic oil and gas? If so, where should we be producing?

Answer. The fastest, cheapest way to reduce our oil dependence is to reduce demand. In our recent report, A Framework for Achieving Energy Security and Arresting Global Warming, Ken Berlin outlines how to reduce oil dependence via development of new low-carbon alternative sources of fuels and increased efficiency.

Increased oil production from conventional fuels, even including the areas previously under moratorium, has the potential to increase oil supplies by about 1.8 million barrels per day in 2030. By contrast, reducing demand for oil has the potential to reduce consumption by 9 to 10 million barrels per day while greatly reducing greenhouse gas emissions. It is clear that we have more to gain by investing in efficiency and low-carbon alternatives than expanding domestic oil and gas production.

The United States possesses only 2-3 percent of the estimated world oil reserves, but it consumes 25 percent of the world's oil, and U.S. oil production has dropped relentlessly for the past 20 years. In September 2008, Congress let a long-standing moratorium on leasing and drilling for oil in certain offshore areas expire, yet this will have little effect on oil production between now and 2030. According to the Energy Information Agency, opening the areas of the lower 48 states' outer continental shelf that were formerly closed to leasing would increase oil production by only about 200,000 barrels per day between now and 2030.

The Energy Independence and Security Act includes two key provisions designed to reduce demand for oil, but these measures will not be sufficient in themselves to significantly lower oil consumption. The first, increasing fuel efficiency for passenger and non-passenger automobiles from 25 mpg to 35 mpg by 2020, will decrease oil use by 2.5 million barrels per day by 2030. The second, increasing biofuel production from 6 billion gallons per year at the time of the Act's passage to 36 billion gallons per year in 2022, would reduce oil use by about 1.3 million barrels per day. These two measures will together decrease oil consumption in the United States by about 3.8 million barrels per day in 2030.

Congress and the administration should set a goal of reducing demand for oil by another 5 million to 6 million barrels per day by 2030 beyond the projected 3.8 million barrel per day reductions that will result from the passage of the EISA. This more aggressive goal is achievable given the potential of new technologies such as hybrid vehicles, plug-in hybrids, and advanced low lifecycle carbon biofuels.

Even though oil and gas prices have fallen since their record highs this past summer, they will surely rise again. In order to keep energy prices low, it is necessary to invest in energy efficiency and increased consumer choice. Oil and gas price increases and fluctuations have made it difficult for Americans to plan budgets, especially as pocketbooks are tightening in the face of a recession. Significant short-term benefits from investing in efficiency and in diversifying our nation's sources of energy include increasing consumer choice and helping keep energy prices lower and less volatile.

Question 2. There are very significant energy reserves on lands owned by Alaska Natives and American Indian tribes, who want to develop the potential of these reserves. Do you agree that our country's energy security would be enhanced if these resources were to be developed?

Answer. Energy development is certainly central to economic growth. Alaskans are already experiencing dramatic effects of global warming, including thinning sea ice and melting permafrost. As such, Alaskans face decisions about how best to scale up sustainable energy production, mitigate greenhouse gas emissions, and adapt to the effects of climate change while at the same time generating jobs and creating economic prosperity.

As discussed in the answer above, we must reduce our dependence on oil—for many different reasons, including energy security, national security, economic growth, and reducing greenhouse gas emissions. Taking steps to develop renewable and low-carbon energy resources as well as investing in low-carbon energy are key to enhancing energy security and transitioning to a low-carbon economy.

The transition to a green economy—at home in the United States, and globally—can be a source of increased business opportunity, innovation, and competitiveness; job creation; stronger, more prosperous communities; and improved energy and national security. This transition must be at the center of both America's energy policy and each step of our economic policy—stabilization, stimulus, recovery, and growth. Investing in this transition and starting immediately to put us on a long-term, low-

carbon and energy independence pathway, will help to solve many of our nation's current interrelated challenges: a financial recession, job loss, rising and volatile energy prices, secure energy supplies, and a growing climate crisis. We cannot afford not to act—in the short-term, middle-term, or long—term.

Investments in clean energy and efficiency will help kick-start the clean energy economy and create millions of jobs. In collaboration with the Political Economy Research Institute at the University of Massachusetts, CAP released Green Recovery in September 2008 detailing how a $100 billion investment in clean energy and efficiency technologies and infrastructure would create 2 million jobs over two years, nearly four times as many jobs created by a similar level of investment in oil and gas.

Question 3. Last year, the price of oil rose dramatically before declining to its lowest level since 2004. In light of this volatility, would you change or alter any of the recommendations included in your reports? Would you make any adjustments if today's relatively low oil prices persist?

Answer. Energy policy is economic policy, and we must lessen our dependence on the volatility of fossil fuel prices. The current low oil prices are unlikely to persist; today's oil and gas prices contrasted with the summer's highs serve as very real and tangible examples of such volatility. The fastest, cheapest way to reduce our oil dependence is to reduce demand, which, in addition to increasing investments in low-carbon energy and efficiency will serve three paramount national priorities: growing our economy, securing our nation's energy supplies, and combating global warming.

CAP's recommendations for the transition to a low-carbon economy include both shortand long-term strategies that work toward these goals. This comprehensive strategy must involve incentives and mandates to increase investment in low-carbon and efficient technologies in our homes, businesses, and transportation system; investment in research and development of new technologies for use here at home and to export overseas; capping and reducing greenhouse gas emissions across all sectors of our economy; and re-engaging in and taking on a leadership role in the international climate negotiations. At the core of this strategy is a greenhouse gas cap-and-trade program that would provide tens of billions of dollars to build a green economy and offset the cost of rising energy prices for low-and middle-income Americans.

Question 4. Washington Post columnist Charles Krauthammer wrote an article last week in support of what he calls a "net zero gas tax." He calls for a $1 per gallon increase in the federal gas tax, which would be accompanied by a $14 per week reduction in the payroll tax. According to Krauthammer, such a shift would reduce global oil prices and domestic greenhouse gas emissions by restraining gasoline consumption. It is also described as revenue neutral. What are your thoughts on this proposal, particularly as an alternative to a tax on carbon, a cap-and-trade system, and/or higher CAFE standards?

Answer. The Center for American Progress advocates an economy-wide cap-and-trade system with a 100 percent auction of carbon credits as a central component of a national strategy to grow our economy with low-carbon energy and efficiency and to combat global warming. But market-based policies to put a price on carbon will not be enough to fully solve global warming or to quickly transition to a low-carbon economy. We will also need to put in a set of complementary policies to require and promote emission reductions in all sectors of the economy, including measures such as performance standards, tax incentives, and targeted research, development, and demonstration projects.

Question 5. Alternative energy companies have an incredibly difficult time securing the financing necessary to become viable and productive. DOE's Loan Guarantee program, established by the 2005 Energy Policy Act, has proven woefully inadequate for addressing this problem thus far.

Do you believe that there have been short-comings in the way that program has been administered? If so, what would you have done differently? Do you believe that loan guarantees are the most effective financial instrument for advancing private-sector, clean energy technology ventures?

Answer. The Center for American Progress strongly supports increasing the flow of new, public capital investment into renewable energy and energy efficiency projects as a catalyst for large-scale private investment in our nation's transformation to a clean energy future. Loan guarantees are among the handful of financing options that work toward this end, but no option should be pursued in isolation. In a 2008 report, A New Strategy to Spur Energy Innovation, CAP recommended a suite of research, development, and deployment pathways to pursue in order to mobilize innovation, invention, and demonstration.

In order to transform our economy to one powered by low-carbon and secure sources of energy, the United States must undergo an innovation revolution. The

rate at which the United States is able to develop and deploy new energy technologies will, to a great extent, determine the ultimate speed and cost of the economic transformation. Large-scale carbon capture and sequestration, advanced batteries, plug-in hybrid vehicle technologies, next generation biofuels for the transportation sector, and a number of other innovations will be vital to achieving a low-carbon economy, and the United States must not only develop but deploy these technologies. The benefits of such innovation will accrue to other countries as well, for U.S. technical assistance programs and trade will carry these advances abroad.

Over the years, the U.S. government has spent more than $300 billion in direct expenditures on energy research, development, and demonstration (RD&D) that have been combined with a variety of indirect financial incentives such as tax credits, loan guarantees, guaranteed purchase, and even equity investments. In addition, the government has adopted a patchwork quilt of regulations designed to speed the adoption of various energy technologies.

Unfortunately, the resulting pace of innovation generated by this public investment has not been sufficient given the urgency and scale of today's energy challenge. The various measures that it has employed (including direct federal support for RD&D, indirect financial incentives, and mandatory regulations) have been developed and implemented individually with too little regard for technological and economic reality and too much regard for regional and industry special interests. There has not been an integrated approach to energy technology innovation that encompasses priority areas of focus, the responsibilities of various funding agencies, and the mix of financial assistance measures that are available. If the United States simply continues to pursue energy innovation as it has in the past, then the path to a low-carbon economy will be much longer and costlier than necessary. The Center for American Progress proposes a new approach for energy RD&D in the United States that will set in motion an innovation revolution by:

1. Creating an interagency Energy Innovation Council to develop a multiyear National Energy RD&D strategy for the United States.
2. Increasing the energy RD&D program budget to more than twice its current level.
3. Launching a sustained and integrated energy R&D program in key areas.
4. Establishing an Energy Technology Corporation to manage demonstration projects.
5. Creating an energy technology career path within the civil service.

Question 6. Several pieces of legislation were introduced last Congress to create a self funding federal bank to assist start-up, clean energy companies. As envisioned by those bills, such an entity would be able to issue not only loan guarantees, but direct loans and insurance products as well. Additionally, this federal bank would, in some instances, be allowed to assume a financial stake in clean energy technology firms and issue publicly-traded stock. In the context of what has taken place at Fannie Mae and Freddie Mac, do you believe it is appropriate for the federal government to back start-up, clean energy technology firms in this manner?

Answer. The Center for American Progress strongly supports increasing the flow of new capital investment into clean energy projects, for example retrofitting our built environment to deploy clean renewable energy and advanced energy efficient technology and weatherization. Proposals to establish a green bank can be supportive of this work, creating a new pool of dedicated capital that will make sure that real projects break ground, and ensuring that new investment flows into communities. By aggregating funds, and by reducing the risk of these investments, federal underwriting and expanded lending authority can reduce the cost of capital for this work, increasing the speed with which we transform our energy use, and expanding the job creating benefits clean energy investments.

In Capturing the Energy Opportunity, the Center for American Progress recommends the creation of four innovative entities that can help enable the research, development, and deployment of new clean energy and efficient technologies:

1) Energy Innovation Council

The United States needs a fresh approach to energy RD&D that successfully integrates the efforts of the numerous departments and agencies that are engaged in energy-related work, including the Department of Energy, the Department of Agriculture, the Department of Commerce, the Department of Defense, the National Science Foundation, and the Environmental Protection Agency. This new approach will need to address the shortcomings that have frequently plagued energy RD&D efforts, such as the practice of spending significant resources on demonstration projects that provide little useful information to the private sector.

The Apollo and Manhattan Projects are sometimes held up as models of innovation to be emulated, but the energy innovation challenge is fundamentally different because it requires the private sector to adopt new technologies that can succeed in the competitive marketplace. These were not considerations in our country's efforts to put a man on the moon or to build a nuclear weapon. Consequently, we recommend at least doubling the size of the federal energy RD&D budget and creating a new interagency group, the Energy Innovation Council, or EIC, that will be responsible for developing a multi-year National Energy RD&D Strategy for the United States.

The mandate of the EIC would be to construct a plan that integrates the RD&D programs of the involved federal agencies over a multi-year period. The National Energy RD&D Strategy would provide direct expenditures to support technology development and demonstration and indirect financial incentives or regulations to promote new technology.

2) Energy Technology Corporation

The government should also establish a quasi-public Energy Technology Corporation to manage large-scale energy demonstration projects in alternative, low-carbon technologies. The ETC would finance and execute select large-scale, commercially-credible demonstration projects. This new organization would be governed by an independent board nominated by the President and confirmed by the Senate, composed of individuals with expertise in market forecasting and industry requirements.

Due to its quasi-public status, ETC projects would be free from the federal procurement regulations and mandated production targets that currently make it difficult to demonstrate the commercial viability of new technologies under real market conditions. In order to limit the influence that Congress and special interest groups would have on its decisionmaking, the ETC should be funded in a single appropriation.

3) Clean Energy Investment Administration

CAP also supports the Apollo Alliance recommendation to create a Clean Energy Investment Administration modeled on the Small Business Administration to reduce investment risk in clean energy projects with loan guarantees. The CEIA would provide up to $25 billion in federal loan guarantees over 10 years, directed toward both commercial prototypes and mass-market deployment of proven technologies. In addition, CEIA would authorize up to $2 billion to cover the high risks associated with commercialization projects. This entity would help create jobs, reduce emissions, and diversify production by fostering successful private commercial ventures that promote energy efficiency and renewable energy technologies.

4) Clean Energy Jobs Corps

CAP has called for the creation of a Clean Energy Corps that would link public underwriting of energy efficiency finance with programs for workforce investment in green jobs and increased commitments to clean energy as an outlet for national service. Launching a green bank could anchor these broader efforts to create a Clean Energy Corps to put America back to work, doing the work that most needs to be done to advance clean, efficient, and renewable energy in our nation's communities. The Clean Energy Jobs Corps can provide new pathways out of poverty, service learning, and support for training and apprenticeship programs to help workers move into "green collar" jobs and clean energy industries that provide family-supporting wages and benefits. To do this, the federal government should marshal the resources of agencies like the Corporation for National and Community Service that has run the highly successful AmeriCorps program, along with job training resources administered by the Department of Labor under the Workforce Investment Act. This new agency will ready a workforce with new skills and assist in the transition of any workers displaced from high-carbon industries.

Question 7. We all know that coal supplies 50% of our nation's electricity supply. The Chamber of Commerce's Institute for 21st Century Energy testified that the U.S. has enough coal to last for well over 200 years. What role do you see for coal in the nation's energy mix going forward? Compared to commercial scale carbon capture and sequestration, how important do you believe incremental efficiency improvements within the existing coal fleet are?

Answer. Capturing the Energy Opportunity highlights the importance of investment both in carbon capture and storage and efficiency technologies.

Coal represents a critical part of the challenge in building a low-carbon economy. Because it is cheap, plentiful, and widely distributed around the world, it plays a large role in the production of energy and is projected to continue doing so for decades. And the quantities of recoverable coal are enormous. The United States, with

the world's largest reserves (27 percent of the world's total) has enough to last over 200 years at current production rates. Sizable reserves can also be found in Russia, China, India, and Australia, among other places.

However, coal-fired power plants today account for 80 percent of all greenhouse gas emissions from power plants. A dramatic increase in coal-fired power generation without capture and storage of CO_2 threatens to overwhelm global efforts to stabilize and reduce atmospheric carbon concentrations and avoid the worst consequences of global warming. In China and other developing countries experiencing strong economic growth, demand for power is surging dramatically, with low-cost coal the fuel of choice for new power plants. Emissions in these countries are now rising faster than in developed economies in North America and Europe.

The Center for American Progress recommends several policies to spur rapid development and deployment of new carbon capture and storage technologies that allow power plants to burn coal for energy while sequestering carbon emissions in underground geologic reserves across the country. We recommend the establishment of an emission performance standard for all new coal-fired facilities equivalent to the best available capture and store technology, and the provision of federal funds to help offset additional costs of implementing carbon capture and storage technology in the near-term.

Energy efficiency is the cheapest, fastest way to reduce the carbon intensity of our economy and must be a large part of the solution. The United States currently uses nearly twice as much energy per dollar of gross national product than other industrialized countries, so there is much we can do to reduce the inefficiencies of our energy generation, transmission, and consumption. To this end, we propose a National Energy Efficient Resource Standard to require electricity and natural gas distributors to meet a 10 percent energy savings threshold through efficiency upgrades by 2020, and a major upgrade of the U.S. electricity grid to increase energy and national security, encourage distributed generation, and increase the efficiency of transmission. Additional significant gains in efficiency can be made by requiring efficiency upgrades for our appliances and private, commercial, and federal buildings.

Question 8. It would seem that more output from the same amount of fuel input is a winwin for the environment, the consumer, and the success of companies that operate electric power generation facilities across the country. And yet, these efficiency improvements are consistently not undertaken. What, specifically, gets in the way of incremental efficiency improvements at power generation plants in the existing fleet? What can this Congress do to remedy such a shortcoming?

Answer. Increasing the efficiency of electricity production, transmission, and consumption are winwin steps for consumer energy bills, global warming and other environmental concerns, and for the success of companies that operate electric power generation facilities across the country.

In Capturing the Energy Opportunity, the Center for American Progress highlights ways in which California has demonstrated that efficiency investments are a win-win proposition. Since 1975, California's energy efficiency programs have kept the state's per capita energy consumption flat at around 7 megawatt hours per person, while the rest of the nation's energy consumption has increased by almost 50 percent. During this same time period, California per capita CO_2 emissions have decreased by 30 percent, while national per capita CO_2 emissions have remained level. Moreover, implementing these energy efficiency programs has cost less than half what it would cost to increase electricity generation in the absence of such programs and has added over $4 billion to California's economy.

To enable these same sorts of efficiency improvements nationally, the Center for American Progress recommends the following policy steps:

1. Create a National Energy Efficient Resource Standard to require electricity and natural gas distributors meet a 10% energy savings through efficiency upgrades by 2020.
2. Decouple utility sales from profits to make it easier for utilities to make efficiency upgrades.
3. Upgrade the U.S. electricity grid to increase energy security, encourage distributed generation, invest in smart grid technologies, and increase the efficiency of transmission.
4. Require appliance energy efficiency improvements.
5. Increase building efficiency through improving building codes, creating incentives for home and public building retrofits, encouraging deployment of distributed energy technology, and providing energy efficient housing energy grants and mortgages.

Question 9. Are you concerned about any unintended geopolitical consequences associated with a transition away from oil, given the producing nations that rely so

heavily on revenue from the sale of their oil and other energy commodities to the United States?

Answer. There are severe geopolitical consequences from continuing dependence on oil and from the global warming effects resulting from continued dependence on oil. Capturing the Energy Opportunity details the national security concerns that will only increase with continued dependence on oil and increasing greenhouse gas emissions.

Oil dependence and climate change present the United States with multiple foreign policy challenges.

Beyond the macroeconomic risk of price shocks, oil represents a large chunk of our balance of payments deficit. Additionally, our dependence on oil-producing countries inevitably affects the conduct of our foreign policy-both our perceived need to use military force to protect our access to overseas oil supplies and the freedom of action with which we pursue our foreign policy objectives.

Other challenges include, for example, increased border stress resulting from the impact of climate change-induced storms and droughts in Mexico and the Caribbean. Or consider the complications posed by ever-scarcer water supplies to political progress in the Middle East.

Perhaps the greatest climate change-induced geopolitical challenge in the short-term, though, will arise in the developing countries in the earth's low latitudes. In these countries, even a relatively small climatic shift can trigger or exacerbate food shortages, water scarcity, the spread of disease, and natural resource competition. Such conditions fuel political turmoil, drive already weak states toward collapse, and threaten regional stability.

Nigeria, Africa's most populous country, will confront intense drought, desertification, and sea-level rise in the coming years. Lagos, the largest Nigerian city, is one of the West African coastal megacities that the IPCC identifies as at risk from sea-level rise by 2015. These conditions, coupled with rapid population growth projections, are likely to force significant human migration and contribute to regional political and economic turmoil.

The threat of regional turmoil is higher yet in East Africa because of the concentration of weak or failing states, numerous unresolved political conflicts, and the severe effects of climate change. Climate change will likely create large fluctuations in the amount of rainfall in East Africa during the next 30 years. In Darfur and elsewhere in Sudan, Ethiopia, and Kenya, water shortages have already led to the desertification of large tracts of farmland and grassland. Fierce competition between farmers and herdsmen over the remaining arable land, combined with simmering ethnic and religious tensions, helped ignite the first genocide of the 21st century. This conflict has now spilled into Chad and the Central African Republic. Meanwhile, the entire Horn of Africa remains threatened by a failed Somalia and other weak states.

The IPCC warns that "coastal areas, especially heavily populated mega-delta regions in South, East and Southeast Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers." In South Asia, this will generate political tension as displaced people traverse the region's many contested borders and territories, such as those between Bangladesh, India, Pakistan, and China.

Climate change will also pose a growing political and economic challenge to China, which could have significant national security implications for the United States. Unless China's pattern of energy consumption is altered, its carbon emissions will reinforce or accelerate several existing domestic environmental challenges-ranging from desertification to water shortages to unhealthy air in urban areas.

Question 10. Earlier this week the Center for American Progress published a study titled "The Staggering Cost of New Nuclear Power" in its Climate Progress blog. This study claims that electrical generation costs from new nuclear power will be as much as 30 cents per kilowatt-hour in spite of the fact that current nuclear generation provides the cheapest electric generation rates at less than 1.8 cents per kilowatt-hour. How sensitive do you think such calculations are to modeling assumptions such as the capital recovery period and capacity factors for new construction? Can you explain why you think the assumptions made in your study are more valid than comparable industry studies?

Answer. Dr. Joseph Romm, the author of The Staggering Cost of New Nuclear Power and editor of the blog Climate Progress, provides the following response to your question:

> One cannot compare the cost of new nuclear power plants, which have seen a tripling of capital costs since 2000, with the cost of power from existing power plants, many of which were sold off at fire sale prices in recent

years. The average historical cost for nuclear power has been considerably higher than 1.8 cents/kWh.

The author, power plant costing expert and CPA, Craig Severance explains, "I also used the 85% number for my "Low Cost" scenario, and the midpoint (80%) as "Most Likely." I noted that I know recent average capacity factors with old generation reactors are just recently reaching the 90's, however this took decades of "tinkering & training" to reach this result. You can see a history of capacity factors for U.S. nuclear power plants at: http://www.eia.doe.gov/aer/txt/ptb0902.html."

So the results are not terribly sensitive to the choice of capacity factor since the author used a relatively high number to start with.

The author also explains, "[Someone] raised the question about plant lifetimes of 40 years vs. an additional 60 years. My analysis is first and foremost a concern for the financial well-being of the utilities and their ratepayers. If the first 40 years (or even 20 -25 years, at an even higher initial cost per Kwh as suggested by David Bradish) are at a cost far in excess of what the utility can collect in revenues to support the plant, will the utility still be solvent? That is the financial perspective, which I address. I care about the electric utility industry and its financial health. If you wanted to open a movie house, and it cost so much to build the new theater that you would have to charge $50 a ticket, it makes little difference that your mortgage might be paid off after 25 years and then you can lower your prices—you won't get past your opening night. The economists' perspective (as expressed in levelized life cycle cost studies) is that once you get that far in the future and bring it back into present dollars, those far-distant years make little difference in decisionmaking. For instance, in the MIT study the difference between assuming a 40 year life and a 25 year life cycle resulted in only a 4.3% difference in overall levelized costs/kWh using the MIT levelized cost methodology."

So the results are not terribly sensitive to the choice of plant lifetime since the author assumed a 40-year lifetime.

Recent reports show very high costs for new nuclear power. Moody's detailed cost analysis from May 2008 put it at over $.15 per kWh. A recent Time magazine report put it at 15 to 20 cents. This study is one of the most comprehensive and public analyses of the cost of the nuclear power plants now being considered for deployment in the U.S.

The industry has not to our knowledge put out a detailed study based on the recent explosion in nuclear power plant capital costs. We welcome such a study. More important, we welcome any major utility or nuclear provider publishing a detailed cost analysis with transparent assumptions that it will stand behind in a Public Utility Commission rate case. Until that happens, it is difficult to put much faith in their hand-waving statements about various assumptions used in the CAP study.

Question 11. The Department of Energy estimates that with adequate investment and grid infrastructure development it may be possible to expand the contribution of wind power from its current level of approximately 1% of domestic electric generation to 20%. But to do so will require twenty years. Nuclear energy already provides 20% of emission-free domestic electricity generation. Given the urgency associated with global climate change wouldn't investment in both of these technologies be the wisest course of action?

Answer. The Center for American Progress supports investment in a wide variety of low-carbon energy technologies-we need to make use of all of the tools in our toolkit to solve global warming. Existing nuclear power provides a valuable low-carbon energy source; however, nuclear waste storage and the dangers of proliferation remain serious unsolved concerns. Nuclear power will continue to be part of our low-carbon energy mix, but we will also need to vastly and rapidly scale up the production of renewable sources of electricity that do not share the same waste and proliferation concerns.

Question 12. You project that adding $100 billion to the stimulus package for clean energy projects will create 2 million jobs in the United States. Is 2 million a "net" number? Does it number reflect the displacement of existing jobs in traditional industries, such as oil and gas, that could be lost over the same time period? Are these permanent jobs? Did you account for the possibility that some of the new jobs, or existing jobs that are displaced by new jobs, may be exported to other nations?

Answer. The 2 million job figure that comes from our analysis is the result of a $100 billion investment over two years. The analysis is of short-term and additional

spending. Because of this, it is does not include a plan to substitute out fossil fuels for clean energy, and therefore the employment expansion figures do not reflect displacement.

This study finds that $1 million spending on green investments will create around 17 jobs, while the same amount of spending in the oil industry will only create 4.5 jobs. If over the long term, the $1 million comes from reduced spending in the oil industry, there would still be a net gain of 12.5 jobs on the part of that amount of spending.

One of the reasons why the net job creation is so high in comparison to oil industry jobs is that the domestic content of green jobs is in fact higher. In other words, virtually all the spending on green investment stays in the U.S. economy, while only 80 cents of every dollar of oil spending stays in the U.S. The question of domestic content versus imports is included in the calculations of employment effects.

Question 13. President-elect Obama has stated that his stimulus bill will "create or preserve" up to 3 million jobs, and the cost of that entire bill is expected to be between $800 billion and $1.3 trillion. On the other hand, your report claims that it is possible to create 2 million jobs by spending $100 billion on clean energy projects—a considerable amount at just a fraction of the cost. Can you help reconcile the significant difference between these projections?

Answer. The House version of the American Recovery and Reinvestment Act (H.R. 1), passed by a vote of 244—188 on January 28, 2009, contains spending proposals spanning a diversity of sectors, including health care, education, and energy, and for a wide variety of programs. Similarly, two bills passed out of the Senate Appropriations and Finance Committees contain a diverse set of spending programs. As such, the spending and job creation potential in the still-in-process stimulus package are not comparable on a dollar-per-dollar basis with the proposals CAP outlines in Green Recovery.

However, the H.R. 1 invests $71 billion on clean energy programs and another $20 billion on clean energy tax incentives. To date, the Senate Appropriations Committee passed the American Investment and Recovery Plan, S. 336, which includes $78 billion in clean energy spending as part of its $365 billion recovery package, and the Senate Finance Committee passed a $522 billion tax package that includes $31 billion in tax incentives for renewables and energy efficiency. Insofar as these programs align with the six energy efficiency and renewable energy strategies we model in Green Recovery, they will leverage a proportional amount of job creation, and will constitute a good percentage of the millions of jobs created or preserved by the stimulus package.

Question 14. To supplement your "Green Economic Recovery Program" report, CAP released state-by-state allocation projections for clean energy funding from the stimulus. I understand that developing an allocation formula must have been difficult—but I'm concerned that the formula you did use excludes several major factors from consideration. You based your projections on state population and GDP, but appear to have left out competition and potential. Alaska, of course, has tremendous potential, but would receive just 0.3 percent of the $100 billion. If we are serious about accelerating the use of renewable and alternative resources, why wouldn't we allocate a much greater proportion of funds to states that can serve as pioneers in their development and deployment?

Answer. Appendix 3 of Green Recovery explains how we allocated funds on a state-by-state basis:

Our green investment program is designed to benefit all communities throughout the country-to create good jobs and help businesses grow. To get a sense of how these national numbers translate into the lived experience of Americans, and how they offer concrete opportunities for economic development, it is important to examine the effects of our program at the state level as well as the national level.

For this reason, we have estimated how the benefits of our program could be distributed across the states, not just at a national economy-wide level. We present here our calculations for a representative sample of 34 of those states.

Calculating the consequences of our green infrastructure investment program on a state-bystate basis requires us to make some assumptions as to what share of the $100 billion in federal support should be allocated to each state. There is no obvious formula as to how this should best be modeled, but to approximate the distribution of jobs and investment we have made some simplifying assumptions here, and present the results in a table in Appendix 3.

One way to allocate the flow of investment funds would be to make a determination as to which states have advantages in various investment areas, such as solar or wind power, urban density for mass transit investments, or with agriculture to produce targeted advances in next-generation biofuels. But whatever funding alloca-

tions we establish on that basis would inevitably be highly sensitive to our assumptions. More to the point, we don't have an empirically rigorous way to balance the importance of these geographic or climate advantages for any given state or region relative to the needs of the different states for the spending from the $100 billion green economic recovery program.

With this in mind, we considered two approaches to assigning investment levels for each state based on easily observable and measurable traits for each state to distribute the overall investment budget of $100 billion. We then settle on a solution that combines the two approaches to estimate an allocation for each of the states we looked at.

First, we examine the effects of distributing green investments on the basis of each state's share of national gross domestic product. This allows us to model the distribution of the green energy investments based on existing patterns of financial investments and current economic development trends. This provides an accurate measure of how our green infrastructure investment would flow if it followed current patterns of state-level economic development.

Then we examine an allocation based solely on each state's population, to achieve a highly equitable per capita distribution of resources. Calculating the distribution of $100 billion in new green recovery funds on the basis of population is, of course, the most egalitarian approach, with each person in the country having an equal dollar claim on the overall pool of investment funds. We then try to balance these two approaches, recognizing that retrofits, for example, will in part follow a pattern based on population density, but that capital investment will also naturally flow toward areas of pre-existing capital investment in industry, infrastructure, and building stock.

We recognize that each approach, both a GDP-share and a population-based allocation of funds, represents a reasonable argument for determining state investment allocations and hence job creation numbers. Accordingly, we calculate what the allocation of investment should be under both the GDP-and population-based approaches, and use the midpoint of these two calculations as our figure for each state's allocation of the $100 billion for the overall green stimulus program. In this way we offer an estimate of how job growth and investment levels would be experienced on the ground in the states as a result of a green investment package.

In addition to calculating the levels of investment and job creation by state, we also looked at the broader impact of job growth on the state economies through the reduction in the rate of unemployment that these job gains would provide. State unemployment levels are presented in a table in Appendix 3, alongside the potential unemployment level if job gains from a green investment package were realized.

Every state in the country is facing deteriorating economic conditions, even though some states, such as Michigan and Ohio, are worse off than, say, Virginia or Iowa. At the same time, we have shown how each state is now poised to gain substantial benefits through our economic recovery program to promote green investments in both the private and public sectors. Regardless of a state's topography or climate, major opportunities for green investments exist now and will grow with time. These investments, in turn, will become a powerful engine of job creation as the United States advances toward building a lowcarbon economy.

Question 15. In November 2007 your organization outlined a number of actions the United States could take to transition to a low carbon economy. Do you have an estimate for how much it would cost to pursue, implement, and realize all of the steps you recommended in that report?

Answer. In our 2007 report, Capturing the Energy Opportunity, the Center for American Progress proposed a comprehensive clean energy and efficiency strategy to capture the "energy opportunity" afforded by the transition to a low-carbon economy. This comprehensive strategy must involve incentives and mandates to increase investment in low-carbon and efficient technologies in our homes, businesses, and transportation system; investment in research and development of new technologies for use here at home and to export overseas; capping and reducing greenhouse gas emissions across all sectors of our economy; and re-engaging in and taking on a leadership role in the international climate negotiations. At the core of this strategy is a greenhouse gas cap-and-trade program with a 100 percent auction of carbon credits that would provide tens of billions of dollars to build a green economy and offset the cost of rising energy prices for low-and middle-income Americans.

This entire effort would be self-financed, supported by the revenues generated by the capand-trade auction process and the elimination of federal tax breaks, subsidies, and other handouts to the oil and gas industry.

Our 2007 study calculated projected auction revenue under different cap-and-trade legislative proposals, and estimated that an economy-wide cap-and-trade program would generate at least $75 billion per year. The federal government currently

invests billions of dollars annually in tax breaks and other subsidies for oil and gas, including royalty relief and research and development subsidies. It is time to shift this federal investment away from high-carbon, dirty sources of energy and towards the clean energy necessary to power a low-carbon economy.

RESPONSE OF KIT BATTEN TO QUESTION FROM SENATOR LINCOLN

Question 1. I represent the state of Arkansas, which has a large number of hard-working, low to-middle-income families. It is important to me that in transforming our energy economy to a green energy economy, we pay attention to the economic impact it could have on these families. In what ways can we make sure that low-to-middle income families are able to participate in a green economy without detrimental costs?

Answer. Solving the mounting energy and global warming crises is an extraordinary opportunity to reinvigorate the economy through investment in clean, sustainable, low-carbon energy sources. Indeed, the transformation of our antiquated energy infrastructure around the platforms of efficiency and reduced carbon emissions represents perhaps the great potential driver of American innovation, economic growth, and job creation of coming decades.

Moreover, this transition to a clean energy economy can be structured to ensure that green economic growth be a tide that lifts all boats-and reinvests in strong urban and rural communities. This investment can offer pathways into the middle class, skills training, and help to rebuild career ladders by creating jobs with family-supporting wages in the construction trades and in manufacturing within the industries of the future.

In Capturing the Energy Opportunity, CAP lays out a comprehensive strategy to transform our economy to a low-carbon model. This strategy involves incentives and mandates to increase investment in low-carbon and efficient technologies in our homes, businesses, and transportation system; investment in research and development of new technologies for use here at home and to export overseas; capping and reducing greenhouse gas emissions across all sectors of our economy; and re-engaging in and taking on a leadership role in the international climate negotiations. At the core of this strategy is an economy-wide greenhouse gas cap-and-trade program. Allocation of cap-and-trade auction revenue involves a transfer of substantial wealth and must be handled wisely to ensure equitable and efficient distribution to help low-and moderate-income Americans offset energy price increases and to increase investment in research, development, demonstration, and deployment of new low-carbon and efficient technologies

A significant short-term benefit from investing in energy efficiency is keeping energy bills low, even if energy prices increase. Building retrofits, incentives to adopt more efficient appliances, implementation of smart grid technologies, and increasing vehicle fuel efficiency can help stabilize American's energy bills in the face of rising energy prices. Diversifying our nation's sources of energy will help keep prices lower and less volatile.

Additionally, investing in the development and broad deployment of low-carbon and efficient technologies will afford consumers and business greater choice over their consumption of energy and will also help keep energy bills lower.

The primary objectives of the proposals outlined in CAP's Green Recovery report-and embodied in the green infrastructure spending in the American Recovery and Reinvestment Plan-are creating good jobs and lowering energy costs for American families by increasing affordable transportation options, diversifying our energy supplies, and increasing the efficiency of our buildings. Moreover, increasing public investment and production of advanced clean energy technologies will lower their costs by achieving economies of scale, ultimately making them more accessible to the general public. And, because the stimulus money will be channeled towards programs that put working-class citizens to work, this clean energy transition will result in higher employment and economic growth.

Additionally, the costs of not transforming the way we produce and consume energy and not addressing global warming are high. These costs of inaction entail everything from the price we would pay by missing the opportunity to lead the world in the development of new clean technologies for use at home and for export; to the costs of responding to and preparing for the effects of climate change domestically and internationally, including national security, disaster preparedness and response; and impacts on agriculture, natural resource availability and management, human health, and infrastructure.

RESPONSES OF KIT BATTEN TO QUESTIONS FROM SENATOR SESSIONS

Question 1. It appears that there will be a sizable economic stimulus package enacted by Congress shortly. That package will likely include funding for numerous environmental projects. Considering that most thoughtful observers believe that in addition to a short term stimulus, projects should also have long term value for the country. Would you please list 5 or more projects that you believe would be particularly cost effective in the long term for our nation? I would also request that you please state the amount that is necessary to be spent on the projects that you have listed above.

Answer. The House version of the American Recovery and Reinvestment Act (H.R. 1), passed by a vote of 244—188 on January 28, 2009, and two bills passed out of the Senate Appropriations and Finance Committees contain spending proposals spanning a diversity of sectors, including health care, education, and energy. The proposed spending on lowcarbon energy and efficiency programs in these plans is a good start to putting the U.S. on a low-carbon path to grow our economy, create jobs, increase prosperity, and improve security.

However, we cannot stop with the stimulus package. Green priorities must be at the center of both America's energy policy and each step of our economic policy-stabilization, stimulus, recovery, and growth.

In our 2007 report, Capturing the Energy Opportunity, the Center for American Progress proposed a comprehensive clean energy and efficiency strategy to capture the "energy opportunity" afforded by the transition to a low-carbon economy. This comprehensive strategy must involve incentives and mandates to increase investment in low-carbon and efficient technologies in our homes, businesses, and transportation system; investment in research and development of new technologies for use here at home and to export overseas; capping and reducing greenhouse gas emissions across all sectors of our economy; and re-engaging in and taking on a leadership role in the international climate negotiations. At the core of this strategy is a greenhouse gas cap-and-trade program with a 100 percent auction of carbon credits that would provide tens of billions of dollars to build a green economy and offset the cost of rising energy prices for low-and middle-income Americans.

This entire effort would be self-financed, supported by the revenues generated by the cap and-trade auction process and the elimination of federal tax breaks, subsidies, and other handouts to the oil and gas industry.

Five examples of projects in which significant investment should begin in the stimulus and extend into the future include the following. The funding proposed for green and efficient infrastructure and programs in the stimulus package is a good start, but we must encourage further public and private investment in clean and efficient technologies through additional smart recovery and growth policies, as outlined in Capturing the Energy Opportunity.

1. Energy efficiency measures to retrofit federal buildings, which not only set a national example of efficiency but would also result in long-term savings for taxpayers. Additional measures to encourage weatherization and efficiency retrofits across our nation's homes and businesses are also an important component of this plan to maintain low energy bills—in the near-and long-term—and invest in a clean energy future.
2. A smart grid to lay the foundation for an energy efficient economy while also empowering consumers to make real-time, market-based decisions regarding their energy consumption In the near-and long-term, our investments in the grid also must also enable greater access to distributed and intermittent sources of renewable electricity generation, improved energy security, and improved efficiency of electricity generation, transmission, and distribution.
3. Transit capital assistance funds for new transit construction to reduce our dependence on oil, improve traffic congestion and air pollution, as well as expand affordable mass transit options for commuters. Investments to improve mass transportation options, encourage smart growth, and reduce vehicle miles traveled are essential components of a short-and long-term low-carbon energy strategy.
4. Advanced battery research loans and grants to help establish a vibrant battery manufacturing sector in the United States, make strides to electrify our vehicle fleet, reduce greenhouse gas emissions from the transportation sector, and dramatically reduce the cost of electric and plug-in hybrid vehicles.
5. Green jobs training to prepare the American workforce for employment opportunities and development in energy efficient construction and in manufacturing within the clean tech industries of today and the future.

RESPONSES OF DIANNE R. NIELSON TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. Does the Western Governors' Alliance have any concerns with the Renewable Fuel Standard as passed in the Energy Independence and Security Act of 2007?

Answer. While WGA does not have specific policy on the Renewable Fuel Standard, on April 17, 2008, we sent a letter to the Senate Committee on Energy and Natural Resources conveying our request to revisit the definition of renewable biomass in the Energy Independence and Security Act of 2007. The letter noted the "tremendous wildfire and forest health problems that the West faces" and requested that the definition of renewable biomass be modified to include biomass from hazardous fuels reductions on federal lands. WGA believes that this modification will help us to reduce the threat of wildfire while diversifying our energy sources.

Question 2. Do you anticipate that the Western Governors Association will recommend that the western states work with CCS early mover project stakeholders to expedite the permitting process for long-term CO_2 storage and/or offer indemnification of the CO_2 storage sites (by the states where the storage is occurring)?

Answer. As the Western governors indicated in their letter to President Barack Obama, quickly moving to establish a national greenhouse gas emissions reduction goal that contributes to global climate stabilization is critically important. The governors also noted the need to invest in research and technology that will result in near-zero greenhouse gas emissions from new coal-fired electricity generation in 10 years and from existing generation no later than 2030. We firmly recognize that we will not be able to achieve either of these objectives without an effective regulatory program for safely and permanently sequestering carbon. The Western Governors support the work of the Regional Carbon Sequestration Partnerships, but believe they have not moved quickly enough to complete the kind of testing that will make carbon sequestration a viable regulatory option. We strongly support increased funding for CCS demonstration projects so that we can craft effective national legislation on the long term storage of carbon dioxide. We believe that in the absence of national legislation, it will be left to the individual states to determine rules to govern CCS, expedite permits or deal with liability concerns.

Question 3. In the stimulus package passed earlier in 2008 by the Congress, there were tax incentives developed to entice CCS early mover projects. Were these tax incentives useful for projects occurring in your state(s) or would you have any other suggestions for funding assistance to early movers?

Answer. WGA is unaware of specific projects that had increased viability as a result of tax incentives in the stimulus package. We would emphasize that it is critical to craft national legislation for the regulation of CCS. In general we support incentives that induce more rapid application of CCS; however, it must be done within the context of a regulatory structure that ensures permanent, safe storage of carbon dioxide.

RESPONSES OF DIANNE R. NIELSON TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Our reliance upon foreign nations for a great deal of our energy needs is a problem we must solve. Our energy policy and our economy are inextricably linked. While lower gas prices are providing some relief, it will only be temporary unless we can find a long-term solution. Moreover, those low oil prices brought about by recession, along with continued difficulty in the credit markets, now threaten to delay or halt a wide range of renewable energy projects. I believe this is a clear indication of the need to increase domestic oil and gas production. Do you agree that side-by-side with our efforts to increase conservation and develop new energy sources, we also have to produce more secure sources of domestic oil and gas? If so, where should we be producing?

Answer. The Western Governors encourage adopting policy strategies, such as the proposed Alaska natural gas pipeline, that will stabilize oil and natural gas prices to the benefit of the consumer. This includes considering responsible way to increase domestic production. Concerns for security of supply, adequacy of the resource and protection of the environment require that we adopt policies that encourage energy efficiency and alternative energy sources with an emphasis on increasing incentives for domestic, renewable resources and conservation. We should focus on domestic production sites that provide development with a minimum of environmental impact.

Question 2. here are very significant energy reserves on lands owned by Alaska Natives and American Indian tribes, who want to develop the potential of these reserves. Do you agree that our country's energy security would be enhanced if these resources were to be developed?

Answer. WGA recognizes the sovereign status of Native American tribes and has consistently worked with the tribes to explore regional considerations on energy and environmental issues. We will continue to offer our assistance as the tribes consider development of their energy resources. As we noted in the answer to 1. above, we support development of domestic resources in an environmentally responsible way.

Question 3. Last year, the price of oil rose dramatically before declining to its lowest level since 2004. In light of this volatility, would you change or alter any of the recommendations included in your reports? Would you make any adjustments if today's relatively low oil prices persist?

Answer. Many economists believe the current low prices are not a result of long-term supply gluts, but a reflection of the serious downturn in the global economy. As such it would be dangerous to assume they will persist beyond economic recovery. We have been consistent in our call for a comprehensive national energy policy, noting that it is essential to our domestic economic and environmental security. WGA's Transportation Fuels for the Future notes that the boom-bust cycle in oil prices and investment in alternative fuels has led to complacency in forming a national policy for increasing our supply of domestically produced fuels. We would not change our report recommendations at this time, and we would continue to advocate for the programs cited in our letter to the new President.

Question 4. Washington Post columnist Charles Krauthammer wrote an article last week in support of what he calls a "net zero gas tax." He calls for a $1 per gallon increase in the federal gas tax, which would be accompanied by a $14 per week reduction in the payroll tax. According to Krauthammer, such a shift would reduce global oil prices and domestic greenhouse gas emissions by restraining gasoline consumption. It is also described as revenue neutral. What are your thoughts on this proposal, particularly as an alternative to a tax on carbon, a cap-and-trade system, and/or higher CAFE standards?

Answer. The WGA has not sufficiently analyzed this proposal to offer a consensus opinion.

Question 5. Alternative energy companies have an incredibly difficult time securing the financing necessary to become viable and productive. DOE's Loan Guarantee program, established by the 2005 Energy Policy Act, has proven woefully inadequate for addressing this problem thus far.

Do you believe that there have been short-comings in the way that program has been administered? If so, what would you have done differently? Do you believe that loan guarantees are the most effective financial instrument for advancing private-sector, clean energy technology ventures?

Answer. Loan guarantees have been successfully applied in many programs, and WGA believes that they could effectively be a part of a national energy strategy if constructed and managed correctly. We would be willing to work with DOE to help fix any short-comings in the current program, and to develop better applications for the future.

Question 6. Several pieces of legislation were introduced last Congress to create a self-funding federal bank to assist start-up, clean energy companies. As envisioned by those bills, such an entity would be able to issue not only loan guarantees, but direct loans and insurance products as well. Additionally, this federal bank would, in some instances, be allowed to assume a financial stake in clean energy technology firms and issue publicly-traded stock. In the context of what has taken place at Fannie Mae and Freddie Mac, do you believe it is appropriate for the federal government to back start-up, clean energy technology firms in this manner?

Answer. The WGA believes that such a program, if managed properly, could provide significant stimulus to clean energy. According to renewable energy developers, getting financial incentives will allow development to proliferate along a much faster track than would be possible otherwise. Because the WGA believes we need to move more quickly to achieve energy security and reduce carbon emissions, programs that will enable that must be a part of our strategy.

Question 7. We all know that coal supplies 50% of our nation's electricity supply. The Chamber of Commerce's Institute for 21st Century Energy testified that the U.S. has enough coal to last for well over 200 years. What role do you see for coal in the nation's energy mix going forward? Compared to commercial-scale carbon capture and sequestration, how important do you believe incremental efficiency improvements within the existing coal fleet are?

Answer. The Western Governors agree that coal-fired facilities that more efficiently use energy make sense. We believe every clean energy source should be considered as a means of meeting future energy demand. However, the primary policy of the WGA with respect to coal is to achieve near-zero emissions. In their letter to the new President, the governors stated the need to invest in research and technology that will result in near-zero greenhouse gas emissions from new coal-fired

electricity generation in 10 years and from existing generation no later than 2030. While short-term improvements in the operating efficiency of existing plants will have an impact on emissions, the governors believe that the solution is to have 100% of the coal burning electrical generation facilities have near-zero emissions within the next 20 years.

Question 8. It would seem that more output from the same amount of fuel input is a win-win for the environment, the consumer, and the success of companies that operate electric power generation facilities across the country. And yet, these efficiency improvements are consistently not undertaken. What, specifically, gets in the way of incremental efficiency improvements at power generation plants in the existing fleet? What can this Congress do to remedy such a shortcoming?

Answer. The WGA agrees that any plant improvements that result in lower emissions of air pollutants or greenhouse gases are desirable. It is often that case that these "efficiency improvements" actually represent significant changes to operating permits under current EPA rules, thus requiring facilities to undergo permit modification procedures. While WGA believes the states and EPA should continue to be responsible for determining facility permitting rules, we would conceptually support streamlined processes recognizing the value of plant modifications that result in lower emissions. We would further support asking EPA to determine the best way to streamline processes without compromising the critical function of the permitting programs.

Question 9. Are you concerned about any unintended geopolitical consequences associated with a transition away from oil, given the producing nations that rely so heavily on revenue from the sale of their oil and other energy commodities to the United States?

Answer. WGA has not specifically analyzed this issue. In their letter to President Obama, WGA asked that the United States "Establish an oil import reduction goal that strengthens energy security and independence." We believe that by creating that goal, oil producing nations will have sufficient notice of our intent, and time to adjust accordingly. Regardless, considering all major consequences, whether they are environmental, economic, or geopolitical must be part of the development of a national energy policy.

Question 10. Utah is blessed with significant energy potential, some of which is located on Indian reservations. I understand that the Northwestern Band of Shoshone Nation is currently constructing a 100-megawatt geothermal power plant to deliver renewable energy to Riverside, California, and that the Northern Ute Tribe is currently in the planning stages of a large-scale crude-oil refinery on its reservation lands. Has there been any dialogue between the Governor's office and these tribes relative to these projects to develop their energy potential? Is there support in the State of Utah for these projects?

Answer. With respect to the Utah-specific question, there have been discussions between tribal representatives and the Governor's office regarding both of the energy projects. In general, governors regularly have government to government discussions with the tribes on environmental, energy, and other issues. The Western Governors support efforts by the tribes to responsibly develop their natural resources. We have also partnered with the tribes on issues of overall importance to the West, most significantly the Grand Canyon Visibility Transport Commission and the Western Regional Air Partnership.

Question 11. The Center for American Progress has listed a national Renewable Electricity Standard of 25 percent by 2025 as one of its top ten energy and environmental priorities for the 111th Congress. Do you believe the members of the WGA would be able to comply with that standard if it was enacted into law? Can you describe the costs you would expect states to face, and the potential impact such a standard could have on the reliability of the electrical grid?

Answer. The West is blessed with enormous renewable resource potential. If we can upgrade and expand the existing transmission grid, improve procedures for integrating variable sources like wind and solar, and continue to develop technologies that will reduce the price of energy from renewable sources, it is certainly technologically and economically feasible to achieve 25% renewables by 2025. We believe the costs of upgrading and expanding the transmission grid will be substantial, but that in partnership with the federal government achievable. This upgrade of the transmission grid can also be done to accommodate higher levels of renewables and maintain high reliability. However, even given current technologies, most grid experts believe it is possible to maintain a reliable grid at 25% renewables. One issue of concern to the Western Governors is federal preemption. WGA would recommend that FERC use agency discretion to provide that prior to preempting a state siting law in a designated NIETC, the Federal Energy Regulatory Commission must find that the proposed transmission project is needed to transport location-constrained,

low-carbon generation and the line is properly sized to capture economies of scale and minimize environmental impacts.

RESPONSES OF DIANNE R. NIELSON TO QUESTIONS FROM SENATOR SESSIONS

Question 1. It appears that there will be a sizable economic stimulus package enacted by Congress shortly. That package will likely include funding for numerous environmental projects. Considering that most thoughtful observers believe that in addition to a short term stimulus, projects should also have long term value for the country. Would you please list 5 or more projects that you believe would be particularly cost effective in the long term for our nation?

I would also request that you please state the amount that is necessary to be spent on the projects that you have listed above.

Answer. Based on the Western Governors letter to President Obama and adopted WGA policy, the following would be high priority projects for stimulus funding:

- Upgrade of the existing transmission grid and construction of new transmission from high quality renewable resource areas to population centers
- Advanced vehicle and battery technologies, and clean transportation fuels research
- Investments in our forests will create jobs in struggling rural areas and reduce the average $1 billion the federal government spends every year fighting wildfires. The nation's forests have been devastated by disease, overcrowding and are even beginning to show stress due to drought and climate change. Investments in forests create jobs for hazardous fuels reduction projects (the removed small diameter materials during thinning can be used as biomass for energy production), planting trees to restore fire and insect damaged forests, thin overstocked forests to protect communities and watersheds, upgrade or decommission roads, and improve trails are needed. These funds could be channeled through Community Wildfire Protection Plans and federal agencies.
- Research, development and deployment of next generation energy efficiency technologies
- Research for improving predictive capabilities for climate change and related impacts, and for analysis of all alternatives regarding the reduction and mitigation of greenhouse gases, adaptation policies and other global climate change measures.
- Research, development and deployment of advanced coal plants with near-zero emissions

The WGA has suggested that at least $15 billion per year for the next ten years needs to be available for research and construction, and that this should be matched by an equivalent amount of private money.

ADDITIONAL RESPONSE TO QUESTION FROM SENATOR BINGAMAN

At the January 8, 2009 hearing, Chairman Bingaman asked whether the Federal Energy Regulatory Commission should be granted the same authority to permit electric transmission lines as it has to permit natural gas pipelines. As I noted in my response, what is needed to enable the construction of needed transmission is a partnership between states and the federal government. There are eight steps the federal government should take to build that partnership

1. Enact legislation authorizing the Secretary of Energy to pay for the incremental costs of optimizing the size of new electric transmission lines to reach areas with large amounts of location-constrained, low-carbon generation.

—In exchange for financing the incremental cost of a new line, the federal government would receive the increased transfer capacity. The government could then sell the incremental capacity as demand increases.

—This will capture economies of scale in transmission construction and reduce environmental impacts by eliminating the need for future lines to the same area.

2. Redirect the implementation of Section 368 of the Energy Policy Act of 2005, which requires the federal government to establish energy corridors over lands managed by the Department of Energy, Bureau of Land Management, Forest Service, and Department of Defense. The focus should be on the designation of energy corridors across federal land to facilitate transmission reaching location-constrained, low-carbon resource areas. The results of the WGA Western Renewable Energy Zones project should be used as a basis for designating corridors in the Western Interconnection.

3. Revise agency implementation of Section 1221 of the Energy Policy Act of 2005 to:

—Limit the designation of National Interest Electric Transmission Corridors by DOE to those corridors that are necessary for moving large amounts of location-constrained, low-carbon generation.
—Require DOE to conduct a more rigorous analysis of transmission congestion and whether corridor designations are needed more than was done in the 2006 DOE congestion study. The analysis should consider future congestion that would result from the deployment of location-constrained, low carbon generation.
—Consistent with the need to coordinated with state permitting processes, require federal permitting agencies to process within one year permits for proposed transmission lines carrying large amounts of location-constrained, low-carbon generation.
—Require agencies to consider the results of the WGA Western Renewable Energy Zones project when designating National Interest Electric Transmission Corridors in the Western Interconnection.

4. Use agency discretion to provide that prior to preempting a state siting law in a designated NIETC, the Federal Energy Regulatory Commission must find that the proposed transmission project is needed to transport location-constrained, low-carbon generation and the line is properly sized to capture economies of scale and minimize environmental impacts.

5. Use agency discretion to refocus incentives for transmission investment granted by the FERC to proposed projects that carry large amounts of location-constrained, low-carbon generation and are optimally sized over the long-term.

6. Use agency discretion under FERC Order 890, to require transmission owners, in cooperation with states, to develop interconnection-wide transmission expansion plans to move large amounts of low-carbon electricity generation. In granting incentive rates of return on transmission investments, FERC should give priority to projects that comport with such plans and carry large amounts of low-carbon generation.

7. Continue the DOE's support for the WGA Western Renewable Energy Zones project and determine if this approach should be applied in the Eastern Interconnection.

8. Enact legislation to provide that income from bonds issued by state transmission infrastructure authorities is exempt from federal taxation.

[These 8 points are from the WGA Issue Brief for the Obama Administration title "Expand Renewable Electricity Generation and Modernize the Grid."]

RESPONSES OF KAREN A. HARBERT TO QUESTIONS FROM SENATOR BINGAMAN

Question 1. There is broad agreement that the short-term extensions of the production tax credit have not provided sufficient regulatory certainty for the robust growth of that industry. However, in the current investment climate, tax credits do not seem to be enough to propel projects forward. What policy tools would you recommend for supporting renewable energy projects in the current economy, when income is too low for the tax credit to be useful?

Answer. I understand that in certain economic conditions, as we are in now, potential recipients of targeted tax incentives will not have requisite federal income tax liability to make the credits a useful tool for their business. In the current environment we know many businesses in the renewable energy industries find themselves in this conundrum. In such circumstances we do believe that novel policy approaches merit consideration and employment to catalyze private sector investment into projects that in more favorable economic circumstances would be commercially viable. Such approaches include making tax credits refundable for the recipient and allowing their conversion to other more useful forms like direct grants.

I would recommend Congress move cautiously when employing such a direct funding mechanism as you lose one of the threshold determinants for whether the project, technology, or firm is commercially viable at all. Specifically, if a business is not generating enough profit so as to incur federal income tax liability, Congress should consider whether that business will ever be commercially viable without the infusion of direct governmental subsidies.

I would also note that Congress can help catalyze greater deployment of renewable energy projects by addressing the regulatory impediments that delay and prevent private investment into these projects. Specifically, renewable electricity projects are continually hampered by the difficulty of siting and licensing new trans-

mission lines. Without the ability to readily transmit power from renewable generation facilities to the market, private investors will be much less likely to finance their construction. If Congress were to provide the Federal Energy Regulatory Commission with federal siting authority similar to that provided for natural gas pipelines, the entire country would benefit by additional capital investment into the transmission grid. Such a change would particularly benefit renewable power projects like wind and solar which are typically built in higher concentrations in areas that are not near population centers where the electricity is needed.

Question 2. There seems to be a near-consensus that, over the long term, we need to move beyond even "second generation" biofuels, such as cellulosic ethanol, to a "third generation" of biofuels, developing technologies such as biocrude from algae. Can you comment on the preferred policy options for ensuring that we develop this third generation of biofuels? How does the existing RFS fit with this goal of establishing a third generation biofuels industry? And, should the RFS extend beyond passenger vehicles, and, for instance, include jetfuel?

Answer. In our pursuit of third and fourth generation biofuels it is critical that we do not get ahead of what is technologically and commercially viable to do. The Department of Energy (DOE) is working hard in promoting the development of viable non food alternatives, such as ethanol from cellulosic feedstocks. While we have made progress toward broad commercialization a breakthrough has yet to materialize.

Programs sponsored by DOE range from research to develop better cellulose hydrolysis enzymes and ethanol-fermenting organisms, to engineering studies of potential process, to co-funding initial ethanol from cellulosic biomass demonstration and production facilities. This research is being done by various national laboratories, including the National Renewable Energy Laboratory (NREL), Oak Ridge National Laboratory (ORNL) and Idaho National Laboratory. Universities and the private sector are also conducting this research. DOE is engaging in full court press to make cellulosic ethanol a valuable addition to the nation's energy portfolio as soon as practicable.

Jet biofuels are in various stages of developing economically viable plant-based fuels. The solution would be blending of algae fuels with existing jet fuel.

Just this past November, Green Flight International and Lake Erie Biofuels conducted the first flight to successfully cross the U.S in a jet powered predominately on biofuel. Of the 2,386 total miles flown 1,776 miles were powered on 100 percent biofuel. Only 710 miles of the flight were powered by a mixture of 50 percent biofuel and 50 percent standard jet fuel thus, showing the potential viability of the use of renewable fuels in aviation.

A year earlier, Green Flight International and Biodiesel Solutions teamed up and made history with the first jet flight powered solely by 100 percent biodiesel fuel. Other examples of expanding the options of fuels for aviation include: Boeing and Air New Zealand are collaborating with a leading Brazilian biofuels maker Tecbio and Aquaflow Bionomic of New Zealand and other jet biofuel developers around the world.

Virgin Atlantic successfully tested a biofuel blend made from 20 percent babassu nuts and coconut and 80 percent conventional jet fuel fed to a single engine on a 747 flight from London to Amsterdam.

Continental Airlines completed the first test flight of a Boeing 737-800 partly powered by biofuel derived from jatropha plant oil (47.5%) and algae(2.5%) in January 2009.

Again, we must be careful to avoid mandates for which technologies are not yet commercially viable. Extending the RFS to jet fuel would be premature at this time. We need to first invest in developing the technologies necessary to give us more fuel options.

Question 3. The Institute for 21St Century Energy supports developing ARPA-E as proposed. What relationship do you believe that it should have with the Department of Energy? Also, the Institute supports doubling energy R&D over the next four to five years. In what areas should this increased funding be targeted so it has the greatest public impact?

Answer. The Institute believes there is a need for an organization within the Department of Energy (DOE) where high risk research with a potentially high payoff is not discouraged, but rewarded. Many research and development programs are adverse to risk, driven in part by fears of Congressional oversight and the requirements of the Government Performance and Results Act. A cultural change is needed both within DOE and the Congress to make such an organization work.

The Institute supports the establishment within DOE of an Advanced Research Projects Agency for Energy (ARPA-E), or its equivalent. We are less concerned with what it is called, and more concerned that it have a considerable degree of inde-

pendence from the rest of the Department and provide a home for novel, highrisk ideas and cross-cutting technology development. Congress should provide full funding, as authorized in the America Competes Act, for ARPA-E or a similar organization. This funding should not, however, come at the expense of other more traditional R&D—both are needed. Further, project funding decisions should be based on a competitive process, not legislated.

The Institute believes a broad portfolio of technologies is needed as a hedge against failure because R&D programs are by their very nature subject to a degree of risk. Technology programs should focus in three broad areas: (1) Short-term development and deployment activities focused on energy efficiency and renewable energy, such as wind and biofuels; (2) longer-term R&D on clean coal/carbon capture & storage, nuclear, and advanced transportation technologies; and enabling technologies, such as advanced grid and storage technologies, that will be needed if many of these other technologies, particularly intermittent renewable power and plug-in hybrid vehicles, are to make significant headway in the market.

Complementary policies—such as tax credits, loan guarantees, etc.—also need to be part of the mix. Accelerating the market penetration of new technologies will be tied in large part to the degree we are able to accelerate the commercial adoption of new technologies, and that will take an accelerated rate of capital formation. The Institute proposes establishing a new Clean Energy Bank of the U.S. (CEBUS), a quasigovernmental entity combining the functions and modeled after the Export-Import Bank and Overseas Private Investment Corporation. As we view it, CEBUS would operate to lower capital costs, mitigate market risks impeding investment, and address market inefficiencies rather than compete with existing market players. The bank would offer risk management, debt, equity and securitization products (e.g., concessionary financing, direct loans, loan guarantees, lines-of-credit, and insurance products), and it could take equity positions, similar to a venture capitalist, in clean energy projects judged commercially viable. More about the CEBUS proposal can be found in the Institute's Blueprint.

RESPONSES OF KAREN A. HARBERT TO QUESTIONS FROM SENATOR MURKOWSKI

Question 1. Our reliance upon foreign nations for a great deal of our energy needs is a problem we must solve. Our energy policy and our economy are inextricably linked. While lower gas prices are providing some relief, it will only be temporary unless we can find a long-term solution. Moreover, those low oil prices brought about by recession, along with continued difficulty in the credit markets, now threaten to delay or halt a wide range of renewable energy projects. I believe this is a clear indication of the need to increase domestic oil and gas production. Do you agree that side-by-side with our efforts to increase conservation and develop new energy sources, we also have to produce more secure sources of domestic oil and gas? If so, where should we be producing?

Answer. The Institute for 21st Century Energy (Institute) and the U.S. Chamber of Commerce fervently believe that the country must employ an energy policy centered around the goal of increasing our energy security for generations to come. By this, I mean ensuring more efficient production and use of our energy; greater production of energy from a more diverse portfolio of sources; increased development and deployment of advanced energy technologies; and continued reduction of the impact our production and use of energy has on the environment. The Institute lays out a plan to achieve these goals in our Blueprint to Secure America's Energy Future through the adoption of recommendations organized by 13 pillars we believe a sound energy policy must address. Implementing policies to achieve anything less than all 13 is nearsighted and will risk condemning future generations to the same problems and debates we have witnessed for the past 3 generations.

A necessary part of the balanced approach is to ensure greater use of the energy resources we are blessed with domestically. The self-imposed policies that have limited production of our oil, natural gas, and other energy sources have seriously diminished our energy security. Every year, Americans send hundreds of billions of dollars overseas to foreign energy companies, predominantly owned by foreign governments. Those funds would certainly be more beneficial to the country's economic prosperity if kept at home and invested in the production of tax-payer owned energy resources.

Moreover, the argument supporting policies that, until last year, prevented production on some 85% of federal lands was to prevent environmental impact of producing these resources. Not only does this argument fail to recognize the current technologies and processes used by America's energy industry which significantly reduce environmental impact, but it also fails to consider the relatively weak environ-

mental protection afforded by most of the countries from whom we must purchase oil and natural gas, in lieu of producing it ourselves.

Oil and natural gas will continue to be dominant sources of energy in the U.S., and around the world, for the foreseeable future. Every year that goes by where we continue to limit the production of such vast quantities of these domestic natural resources, is another year of lessening energy security.

We believe that all federal lands not currently precluded from oil and natural gas exploration and production should be made available for lease. Additionally, some areas in Alaska and the Rocky Mountains should also be made available lease. A recent study produced by ICF International estimates that opening these areas for leasing could result in an additional 2 million barrels per day being produced domestically by 2030, offsetting 20% of projected imports. An additional 5.34 billion cubic feet of natural gas per day could be produced, offsetting more than 60% of projected imports. The study also finds that this could create 160,000 jobs by 2030 and provide almost $1.7 billion in additional revenues to the federal government from royalties and fees.

By utilizing our own energy resources after decades of neglect, we not only produce jobs and revenue, but we will also keep trillions of dollars in our domestic economy instead of unnecessarily supporting other economies around the world.

Question 2. There are very significant energy reserves on lands owned by Alaska Natives and American Indian tribes, who want to develop the potential of these reserves. Do you agree that our country's energy security would be enhanced if these resources were to be developed?

Answer. Yes, additional production of oil and natural gas from tribal lands will increase our energy security by eliminating the need to import the amount produced from other countries. Utilizing oil and natural gas from stable trading partners like Native American tribes, as well as North American partners like Canada and Mexico, is far more beneficial to our energy security than imports from less reliable countries around the world.

Question 3. Last year, the price of oil rose dramatically before declining to its lowest level since 2004. In light of this volatility, would you change or alter any of the recommendations included in your reports? Would you make any adjustments if today's relatively low oil prices persist?

Answer. The volatility of oil prices last year, as well as other energy commodities, is precisely the type of situation the adoption of our recommendations will avoid. The U.S. relies on petroleum for 96% of the energy used in the transportation sector. American drivers have virtually no choice in the fuel they use to power their vehicles. To mitigate the volatility of oil, or any one single energy source, we must diversify the fuels that power our cars and trucks. The Transition Plan to Secure America's Energy Future we delivered to the incoming Congress and Obama Administration last year offers nine specific recommendations to transform our transportation sector. These recommendations will catalyze commercial penetration of vehicles powered by sources other than petroleum, ranging from advanced biofuels, electricity, frontier hydrocarbons, and natural gas.

Many of these technologies are on the verge of commercial viability, and we believe it is the federal government's role to catalyze their deployment for commercial use. By diversifying the vehicles and fuels used in our transportation sector, we will dampen the effects, as well as the causes of additional volatility of the price of oil.

Question 4. Washington Post columnist Charles Krauthammer wrote an article last week in support of what he calls a "net zero gas tax." He calls for a $1 per gallon increase in the federal gas tax, which would be accompanied by a $14 per week reduction in the payroll tax. According to Krauthammer, such a shift would reduce global oil prices and domestic greenhouse gas emissions by restraining gasoline consumption. It is also described as revenue neutral. What are your thoughts on this proposal, particularly as an alternative to a tax on carbon, a cap-and-trade system, and/or higher CAFE standards?

Answer. Reducing carbon dioxide emissions from the transportation sector is very challenging and expensive. A $1 per gallon increase in the gasoline tax, such as that proposed by Mr. Krauthammer, translates into a carbon price of roughly $110 per ton of CO_2.

While I do not wish to comment on this specific proposal-which leaves to the imagination the types of polices that would cover other sectors-the Institute's position is that climate policies cannot provide a revenue windfall to the government. Revenues generated from climate policies should be returned to the taxpayers, for example through offsets of other sources of federal revenue that inhibit capital formation, with perhaps only a small portion being used to supplement federal R&D efforts on advanced energy technologies.

The proposal has the virtue of transparency, a quality lacking in many climate change proposals where the costs largely would be hidden. However, like most proposals to address climate change, the impacts would fall unevenly. For example, consumers who do not pay payroll taxes and businesses would not receive the payroll reduction. Moreover, the payroll reduction would apply only to 14 gallons per week, which means that those in rural areas who must travel long distances to and from work, shopping, and other activities would be subject to what amounts to a highly regressive tax, while many urban dwellers who travel much shorter distances would receive a payroll tax benefit.

Question 5. Alternative energy companies have an incredibly difficult time securing the financing necessary to become viable and productive. DOE's Loan Guarantee program, established by the 2005 Energy Policy Act, has proven woefully inadequate for addressing this problem thus far.

Do you believe that there have been short-comings in the way that program has been administered? If so, what would you have done differently? Do you believe that loan guarantees are the most effective financial instrument for advancing private-sector, clean energy technology ventures?

Answer. Congress demonstrated forward-thinking commitment to the deployment of clean energy technologies by creating the Title 17 loan guarantee program in the Energy Policy Act of 2005. This program represents the single greatest tool the federal government has to offer developers of clean energy projects. The program is inherently designed around mitigating the risk of the "first movers" who find it difficult to secure adequate financing at competitive rates. By providing the full faith and credit of the U.S. Government as collateral on a loan, many more institutions are able to provide financing to projects that are otherwise too risky for a responsible lender to support. Moreover, for the very capital intensive projects like nuclear reactors, the federal loan guarantee enables a lender to provide a higher ratio of debt to equity, significantly reducing the debt service cost for the project sponsor since debt is measurably cheaper than equity.

The loan guarantee program has been hampered by several issues which have created the delay in issuing even a single guarantee in the three and one half years since the legislation was enacted. Many of these delays were due to Congress not appropriating the initial funds to stand up the office and not authorizing DOE to issue a guarantee as required under the Federal Credit Reform Act of 1990.

One method I would suggest Congress consider to cultivate greater private investment in the deployment of clean energy projects is to establish a Clean Energy Bank similar to the Overseas Private Investment Corporation (OPIC) and the Export Import Bank (Ex-Im Bank) to support the financing and deployment of clean energy projects domestically. Both OPIC and Ex-Im Bank have long track records of responsibly providing financing in support of qualifying projects (including clean energy facilities) in other countries. However, they do not have the authority to provide similar support for domestic projects. A Clean Energy Bank could do exactly that. It could be given authority to utilize the same tools OPIC and Ex-Im Bank utilize including loan guarantees, credit insurance, and direct loans to name a few. Moreover, such a bank could harness private capital markets to expand the pool of funds available for projects.

Question 6. Several pieces of legislation were introduced last Congress to create a selffunding federal bank to assist start-up, clean energy companies. As envisioned by those bills, such an entity would be able to issue not only loan guarantees, but direct loans and insurance products as well. Additionally, this federal bank would, in some instances, be allowed to assume a financial stake in clean energy technology firms and issue publicly-traded stock. In the context of what has taken place at Fannie Mae and Freddie Mac, do you believe it is appropriate for the federal government to back start-up, clean energy technology firms in this manner?

Answer. The Institute for 2lst Century Energy fully supports the creation of an independent federal bank with tools similar to the Overseas Private Investment Corporation (OPIC) and the Export Import Bank (Ex-Im Bank) to support the financing and deployment of clean energy projects domestically. Both OPIC and Ex-Im Bank have long track records of responsibly providing financing in support of qualifying projects (including clean energy facilities) in other countries. However, they do not have the authority to provide similar support for domestic projects. A Clean Energy Bank could do exactly that. It could be given authority to utilize the same tools OPIC and Ex-Im Bank utilize including loan guarantees, credit insurance, and direct loans to name a few. Moreover, such a bank could harness private capital markets to expand the pool of funds available for projects.

While the immediate history of Fannie Mae and Freddie Mac should provide a cautionary note against governmental entities encouraging an ostensibly private financial institution from incurring risk above and beyond its corporate mandate, it

should not preclude the creation of a Clean Energy Bank. A more appropriate comparison to the Clean Energy Bank concept is OPIC and Ex-Im Bank. Both institutions have long track-records of responsible investment into projects that find it difficult to secure competitive financing from the private sector.

It is important to note, that a Clean Energy Bank would not be in the business of competing with the private sector. Its existence would be to bridge the gap in supporting projects and technologies the private sector deems too risky from a financial, political, technological, or regulatory perspective to provide competitive and useful financing. This is especially true for the "first movers" of a specific technology or application.

While the technology a "first mover" seeks to deploy may be worthwhile, and longterm commercial viability may be favorable, many find it difficult to secure financing terms suitable for their project solely because they cannot demonstrate a record of commercial success. It is understandable why responsible lending institutions would be hesitant to risk their investors' deposits on a technology or project in this risk category. However, it is vital to the nation's energy security that advanced technologies be deployed to deliver different forms of energy more efficiently, more cheaply, and more cleanly. That is why we support the federal government providing such a unique service while utilizing risk management practices like OPIC and Ex-Im Bank to mitigate financial risk to tax payers.

Question 7. We all know that coal supplies 50% of our nation's electricity supply. You testified that the U.S. has enough coal to last for well over 200 years. What role do you see for coal in the nation's energy mix going forward? Compared to commercial-scale carbon capture and sequestration, how important do you believe incremental efficiency improvements within the existing coal fleet are?

Answer. Coal will remain a vital part of our energy mix well into the future to meet large baseload power needs. Many other fuels and technologies are being developed as alternatives to coal, but coal-fired plants will be a mainstay of power generation for many years to come. Carbon capture and storage technologies on a commercial scale are still many years off. In the meantime, improved energy efficiency at existing coalfired power plants can have a significant impact on emissions.

Improved technology can raise the generating efficiencies of existing plants. The efficiency of coal-based electricity generation plants has increased from about 5 percent in 1900 to around 35 percent today, which means that we are extracting about 700% more useful energy from coal. DOE has estimated that every 1% gain in efficiency translates into about 2% less CO_2 per kilowatt hour. If the existing coal fleet in 2007 produced the same amount of power 5% more efficiently, CO_2 emissions from coal plants would have been nearly 200 million metric tons lower, equivalent to a reduction in CO_2 emissions of over 3% for that year. The National Coal Council estimates that raising the efficiency of existing plants can deliver the equivalent of more than 40,000 megawatts of new, cleaner, low-cost power.

Question 8. It would seem that more output from the same amount of fuel input is a win win for the environment, the consumer, and the success of companies that operate electric power generation facilities across the country. And yet, these efficiency improvements are consistently not undertaken. What, specifically, gets in the way of incremental efficiency improvements at power generation plants in the existing fleet? What can this Congress do to remedy such a shortcoming?

Answer. The Clean Air Act prohibits the construction or modification of a major source of air pollution unless; among other things a permit has been issued for the proposed facility. Efficiency improvements at existing power generation plants would likely trigger the Clean Air Act's New Source Review (NSR) program. This would result in significant delays in construction of any efficiency improvement modifications as utilities would be required to obtain pre-construction permits.

The generator would also be subject to BACT (best available control technology) requirements. This is an expensive and lime-consuming process that requires an assessment of all possible control options even before the technological option is implemented. NSR serves as a disincentive for utilities to invest in efficiency improvements.

NSR is a costly, convoluted, and burdensome regulation. Instead of erecting barriers to efficiency improvements, we need to explore and encourage innovative new models that reward utilities—and ultimately their customers—for saving electricity through energy efficiency programs and new approaches to the deliver of energy services.

Electric companies are working with state regulators to treat investments in energy efficiency in essentially the same manner as investments for generation, transmission, and distribution. Many state legislatures and public utility commissions (PUCs) are implementing policies to remove disincentives and reward efficiency.

Policies which have had measurable success include (1) cost recovery from the rate base for implementing efficiency programs or to compensate lost marginal revenue that results, (2) separating fixed-cost revenue recovery from the volume of energy provided, and (3) creating financial incentives for efficiency investment by utilities. We need to make demand reduction as profitable for utilities as increasing supply.

Likewise, we need to remove technological and economical impediments to maximizing energy efficiency.

Question 9. Are you concerned about any unintended geopolitical consequences associated with a transition away from oil, given the producing nations that rely so heavily on revenue from the sale of their oil and other energy commodities to the United States?

Question 10. Your transition guide recommends that the United States "should promote a global approach to energy security and climate change" that "sets achievable and realistic goals." If Congress re-considers a cap-and-trade system, what do you consider an achievable target for emissions by 2025? What do you think the cost associated with such a system would be?

Answer. This is a very complex question. In the international discussions, a goal of a reduction in global emissions (from base years ranging from 1990 to 2005) by 2050 has gained traction. However, modeling work done by a number of groups suggest this goal is not practicable. It would require huge emissions reductions and emissions avoidances over a relatively short period, especially in developing countries where the lion's share of future emissions are expected to come.

While the "50-by-50" goal is being thought of as an aspirational one, it would be used nonetheless to drive the mid-term goal, which would be binding. Many governments, for example, are pushing for developed countries to adopt a mid-term goal of a 25% to 40% reduction in emissions from the 1990 level by 2020, a goal not contemplated in any U.S. legislation.

Meeting a 50-by-50 global goal would require transformation of the global energy system on a scale that has never been attempted before and at significant economic cost. To give you an indication of the challenge, modeling work done under the auspices of the U.S. Climate Change Science Program and the International Energy Agency, among others, suggests that if developed countries achieved an 80% reduction in CO_2 emissions by 2050 (compared to a 2000 baseline), emissions from developing countries in 2050 would have to be about where they are today. And with significantly higher populations, CO_2 emissions per capita in developing countries would have to be lower than they are today. These types of global changes, over so short a period and during a time when energy demand is expected to perhaps double, are hard to imagine.

Looking at the U.S., a reasonable target in 2025 would depend largely on the availability of low-emitting technologies, their costs, and the policy environment. Policies and goals should not get ahead of the technologies needed to meet them-we must not set targets for which cost-effective technology options do not exist In the power sector, for example, energy efficiency and renewables can help slow the growth in emissions in the short term and at little or no cost, but to achieve significant reductions will require carbon capture and storage (CCS) technologies and nuclear power. But CCS is still many years away from commercial-scale deployment (probably 2020 at the earliest), and significant expansion of nuclear power still faces a number of hurdles, not least of which is the waste issue. If CCS technology does not pan out and nuclear power plants do not go forward as planned, even a seemingly modest goal would be very difficult to achieve at a cost that would be politically and economically acceptable.

The scale of the changes required for significant emissions reductions are not well understood. In the U.S., an emissions cut on the order of 80% below the 2005 level by 2050 would require reductions and avoidances of about 6 to 7 gigatons of CO_2 equivalent. To put this in perspective, reduction of a single gigaton of CO_2 would require construction of (in lieu of a typical coal-fired power plant) either 130 1-gigawatt nuclear power plants, 170,000 1 .5-megawatt wind turbines operating at a capacity factor of 45%, or coal plants equal to nearly half U.S. coal-fired nameplate generating capacity equipped with carbon capture & storage.

Further, we should learn from the experience of other countries about what works and what does not. The European Trading System-which unlike many U.S. legislative proposals in not an economy wide system-has been largely unsuccessful. I would note that many parties to the Kyoto Protocol do not have a cap & trade system and are generally doing as well as those countries that do. There are, therefore, many avenues to emissions reductions.

Indeed, the pursuit of emission reductions should not occur in isolation from efforts to address energy security and economic growth. Meeting our energy security

challenge-through greater energy efficiency and conservation, supply diversification, and advanced technologies-can complement efforts to reduce GHG emissions. Encouraging greater energy conservation and efficient use of all forms of energy (including fossil fuels) and diversifying energy supplies (through greater use of nuclear, wind, and solar power; biofuels; flex-fuel and plug-in hybrid vehicles; clean coal; smart grid; and other technologies) make sense from both an energy security and an environmental perspective. Our focus, therefore, should be less on targets and timetables and more on policies that produce these types of win-wins by: accelerating the development of advanced, clean, and cost-competitive energy technologies; promoting greater energy efficiency; and creating the market and regulatory conditions whereby clean energy technologies can pay an increasingly bigger role in the energy mix, such as through the creation of a Clean Energy Bank of the U.S. and streamlining siting and permitting processes.

Question 11. I was pleased to see the Chamber's support for the Alaska Natural Gas Pipeline. Can you recommend additional actions that can be taken at the federal level to support the construction of the pipeline?

Answer. It is imperative that the proposed Alaska National Gas Pipeline be completed to connect stranded U.S. reserves to Alaskan and Lower 48 consumers. Certainly, the Energy Institute supports the pipeline's completion in a timely and environmentally responsible manner.

Congress could make a valuable contribution to this infrastructure project—and, others—by streamlining the National Environmental Policy Act (NEPA) and setting strict timelines for final action. Currently, under NEPA, opponents to an infrastructure project can employ dilatory tactics and court injunctions, to endlessly delay or even stop a needed structure dead in its tracks.

Streamlining NEPA is not a devious strategy to circumvent environmental rules and regulations that protect the environment. Environmental responsibility and meeting our nation's growing energy demands are not mutually exclusive, can and do co-exist. It does mean, however, that neither opponents nor proponents of a project should be able to manipulate the permitting process.

Likewise, Congress could streamline the processes under the Endangered Species Act (ESA) without compromising environmental protections.

Additionally, frequent meetings with stakeholders along the right-of-way and regular status reports to the general public on the project would provide transparency and accountability.

And, business communities can continue to support the project publically to help move the ball forward.

Question 12. It is becoming increasingly clear that many other countries are planning to expand their current civilian nuclear energy programs while some countries without nuclear energy programs are considering starting new programs. Do you believe that it is important for the U.S. to remain engaged in this global expansion of nuclear energy from the standpoint of national and energy security?

Answer. It is absolutely critical that the United States not only engage in the discussion on the global expansion of nuclear energy, but it must regain its leadership role that was seeded to countries like Japan and France decades ago. This goal led to the creation of the Global Nuclear Energy Partnership (GNEP) in 2007.

In proposing the GNEP concept to the international community, the U.S. Government acknowledged that most countries that currently utilize civilian nuclear power, as well as a number of countries with no existing civilian nuclear power industries, were coming to the same practical realization many in the U.S. have: nuclear power is the only baseload source of electricity that can expand to meet projected growth in demand without any air or greenhouse gas emissions. This realism has led dozens of countries to move towards the construction of new nuclear power facilities in every region of the world.

With expansion of nuclear power, especially to new countries, come potential problems. It is in the national security interest of the U.S., as well as the global community, to ensure those pursuing civilian nuclear power establish and maintain the necessary regulatory structures to provide the highest levels of safety and security and to minimize any potential threat of proliferation of nuclear technologies for weapons purposes.

The partnership currently has 25 member countries that all support the need to expand nuclear power globally in a secure and safe manner. By actively participating in GNEP the United States can lead the discussion on how to minimize the possibility of sensitive nuclear materials falling into the hands of bad actors that seek to harm the U.S. or its partners. Specifically the GNEP partnership advocates the creation of a reliable fuel serves mechanism, whereby countries without existing enrichment or reprocessing technologies would agree to forgo those processes in return for be assured reliable sources for enriched fuel on the front end and a party

to retrieve the used fuel for recycling and disposal on the back end. By minimizing the number of countries with access to these processes and technologies, the possibility of the technologies or their byproducts being compromised is greatly diminished.

As nuclear power expands, the need for international cooperation on waste disposal issues only becomes more acute. GNEP provides an avenue to foster cooperative research, development, and deployment of advanced recycling technologies between partner countries. As the nuclear industry ceased building new reactors in the 1970s, the research and development infrastructure began to evaporate. The U.S. Government, and industry alike, can learn much from partner countries that continued to develop advanced nuclear technologies while we were on the sidelines, in addition to using their facilities that often have capabilities not resident in the U.S.

Additionally, as nuclear power begins to expand across the globe, new trading opportunities also become available for U.S businesses to design and build nuclear facilities, as well as export materials ranging from fuel to reactor components. This advent may spur the rebirth of the domestic nuclear industry that largely atrophied over the past several decades. China's announcement that it had contracted with U.S.-based Westinghouse Electric Company to design and build four advanced nuclear reactor is a great example of the new trade avenues the global expansion of nuclear power provides to the U.S market.

RESPONSES OF KAREN A. HARBERT TO QUESTIONS FROM SENATOR LINCOLN

Question 1. Especially given the sharply increased consumption of oil by the economic development in China and India, what tools are available at our disposal to help us address the stress of energy demand at an international level?

Question 2. I strongly believe that as a country, we must lessen our dependence on foreign oil. Part of this process includes the development of new and innovative biofuels, such as cellulosic biomass and algae-based fuels, and even waste-based fuels. Could you describe for us the role that biofuels will play in increasing our energy supply and becoming energy independent?

Answer. Biofuels are already playing a significant role in the nation's quest to lessen our dependence on foreign oil and will play an even bigger role as third and fourth generation biofuels are developed and commercialized.

The Department of Energy is working hard in promoting the development of viable non food alternatives such as ethanol from cellulosic feedstocks. While DOE has made progress toward broad commercialization a breakthrough has yet to materialize.

That is one reason that the Institute has recommended that the President and Congress accelerate and increase funding from the current level of roughly $400 million to $600 million for transportation technologies and bio-based fuel technology R&D programs at DOE to support the transition to unconventional vehicles and alternative fuels.

We also encourage that Congress to make the blenders' tax credit for bio fuels variable by linking it to the price of gasoline or diesel fuel, as appropriate, so that as the e price for these conventional fuels rises, the value of the tax credit falls proportionately. A reasonable and rational floor price should be set.

Second generation biofuels, like cellulosic ethanol, should be included in the blenders/tax credit; however, because these technologies are not as mature or economically competitive as other eligible fuels, believe that Congress should increase the allowable credits for these fuels with a definite phase-out after 10 years.

Moreover, we recommend that the President direct the Secretary of Transportation, in consultation with the secretaries of Agriculture and Energy, and the administrator of the EPA, to commence a comprehensive review of the impacts of biofuels production on U.S. competitiveness, the environment, and global food supplies. The departments should enter into an agreement with the National Academies to produce an analysis of scientific findings relating to current and future biofuels production and the domestic effects of a dramatic increase in such production activity.

We also recognize the importance of the potential to increase international market opportunities and recommend that the departments of State and Energy, the Office of the U.S. Trade Representative, and the private sector develop harmonized standards for biofuels to enhance these opportunities.

Finally, given the essential role that oil plays in our national security, we encourage DOE and the Department of Defense to continue to work in partnership to develop and deploy technologies to ensure a domestic supply of alternative fuels for military use.

RESPONSES OF KAREN A. HARBERT TO QUESTIONS FROM SENATOR SESSIONS

Question 1. It appears that there will be a sizable economic stimulus package enacted by Congress shortly. That package will likely include funding for numerous environmental projects. Considering that most thoughtful observers believe that in addition to a short term stimulus, projects should also have long term value for the country. Would you please list 5 or more projects that you believe would be particularly cost effective in the long term for our nation?

I would also request that you please state the amount that is necessary to be spent on the projects that you have listed above.

Answer. The Institute believes that there are a number of energy projects that would provide long-term value to the U.S. economy. Our energy infrastructure is increasingly inadequate for our growing demand and economy. Blackouts, brownouts, service interruptions, and rationing could become commonplace without new and upgraded capacity. The Energy Independence and Security Act of 2007 (EISA2007) supports the accelerated modernization of the nation's electricity distribution and transmission system. With the rapid deployment of smart power grid technology, our systems could self-diagnose and repair problems, accommodate new demand-response strategies, and promote greater efficiency through advanced metering and appliances that can interact with the grid using communications protocols that can be layered with electricity delivery.

Our energy sector also suffers from a lengthy, unpredictable, and needlessly complex regulatory maze that delays, if it does not halt completely, construction of urgently needed new energy infrastructure. Even if we had access to unlimited supplies of renewable biofuels for transportation or wind for electricity, without the ability to deliver these products to customers, we would not be any better off. Siting and permitting roadblocks and "build absolutely nothing anywhere near anything" sentiment have sidelined the construction and expansion of everything from transmission lines to power plants—and the economic activity and high-paying jobs that go with them. Indeed, there are many instances across the country where green energy projects are being held up by, ironically, environmental regulation. We believe Congress should simplify siting for electric transmission facilities and other energy facilities in interstate commerce (such as pipelines for carbon capture and storage) by giving the Federal Energy Regulatory Commission (FERC) the same authority as it has to site natural gas pipelines under Section 7 of the Natural Gas Act.

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