

**PROPOSED BUDGET FOR FISCAL YEAR 2012 FOR
THE DEPARTMENT OF ENERGY**

HEARING
BEFORE THE
COMMITTEE ON
ENERGY AND NATURAL RESOURCES
UNITED STATES SENATE

ONE HUNDRED TWELFTH CONGRESS

FIRST SESSION

TO

RECEIVE TESTIMONY ON THE U.S. DEPARTMENT OF ENERGY'S BUDGET
FOR FISCAL YEAR 2012

FEBRUARY 16, 2011



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PROPOSED BUDGET FOR FISCAL YEAR 2012 FOR THE DEPARTMENT OF ENERGY

WEDNESDAY, FEBRUARY 16, 2011

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

The committee met, pursuant to notice, at 9:32 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. Why don't we get started here. Today's hearing will examine the President's proposed fiscal year 2012 budget for the Department of Energy. I'd like to welcome Secretary Chu, thank him for testifying today. I also want to just alert folks that we have a short business meeting that we will try to interrupt the proceedings to conduct when we get 12 members. So I've advised the Secretary of that, and we will not interrupt his testimony, but we will interrupt the questions portion of the hearing.

The President's proposed an overall budget for the Federal Government that reflects his desire for fiscal restraint, but he's made a strong statement that energy is a priority for his administration even within this constrained picture. The Department of Energy budget before the committee today represents a significant investment in our Nation's ability to compete in global clean energy markets, whether it is making solar energy cost competitive with other electricity sources or maintaining our Nation's lead in innovative nuclear power plant designs using small modular reactors.

There can be no doubt about the seriousness of the competitive challenge that we face in energy. I'd like to call everyone's attention to the 2 charts that we've got over here. The first chart shows that we actually spend less than China on energy R and D per unit of gross domestic product. China's investing heavily in manufacturing and deploying wind, solar, and nuclear power plants. These investments are already translating into global sales and domestic Chinese jobs in an area where the United States once led the world.

The second chart which is put up there shows that our investment in energy research and development is far below other areas of our Nation's research and development. The proposed fiscal year 2012 DOE budget for energy R and D brings us up from the 2007 figure of \$1.8 billion to \$4.8 billion, but still remains well below other areas of research.

So I compliment the Secretary for successfully advocating for a budget that contains much that I support. I hope the Senate can fully fund many of the research and development initiatives proposed, as well as that for the Energy Information Administration.

I do have a few concerns that I would like to mention and I'll pursue in the question period. First, the budget proposes to sell 500 million of oil from the Strategic Petroleum Reserve with very little in the way of justification that I could find. Second, the budget has a series of cuts to R and D in the Department of Energy's fossil energy programs. While I strongly believe in the clean energy objectives of the administration and this budget request, I believe that fossil energy sources can be made much cleaner by the application of appropriate research and development, and that needs to be a priority as well.

In any case, we face a long period of transition from our dependence on fossil fuel, so continuing research related to advanced coal technologies and natural gas and unconventional sources of fossil energy is a sensible part of an overall energy strategy. We can discuss that further. I do not want any shortcomings in this area to obscure the fact that the majority of calls made in this budget request for the Department of Energy in my view are the right calls.

So again, thank you, Mr. Secretary, for being here.

Let me call on Senator Murkowski for her statement.

Senator MURKOWSKI. Thank you, Mr. Chairman. I am glad to be with you this morning. I also welcome the new members to the committee. We had an opportunity to welcome them one by one. Hopefully, today we'll see everybody together so we can get to a business meeting.

I think it is a testament to the good work that goes on in this committee that when members were making their choice, at least on the Republican side, what I heard was they wanted to come to this committee, not only because of the importance of the work, but how this committee has conducted itself over the course of the years, and I thank you for your leadership.

I think it is appropriate that our first official hearing today is with Secretary Chu regarding the Department of Energy proposed budget. I think that we should all agree, that while the challenge of providing our Nation with abundant, affordable, clean domestic energy is great, there is an endless number of technologies that might some day lead us to these goals, and during this Congress I'm sure that this committee will have a chance to consider the many different proposals for new programs that might very well be good ideas if time and money were unlimited. But I think we all know that is not the case today, that's not the world that we are operating in, when our time and our money are now scarce.

Just like every other member of this committee, I'm concerned about our Federal spending, I'm concerned about the debt, I'm concerned about the deficit. To rein in Federal spending, we need to look at every program and at every agency. I think this Department of Energy is no exception.

This year's budget includes approximately \$30 billion in spending for DOE, which is roughly 25 percent more than just 5 years ago. This is on top of a tremendous amount of funding for DOE within the 2009 stimulus bill. Nearly all of those funds have now been ob-

ligated, but DOE has also reported one of the slowest spendouts of any Federal agency. As of yesterday, the Department's own web site showed that more than \$21 billion, or 65 percent, of its stimulus funding remains to actually be spent.

To put this into perspective, \$21 billion would have been almost 90 percent of DOE's total budget just 3 years ago. That does not factor in the \$3.5 billion that was taken away from DOE last Congress to help pay for Cash for Clunkers and the States aid bill.

This brings up one of my disappointments with this budget request, that even though DOE has grown significantly in recent years and even though it still has billions of dollars in stimulus funds, it is once again in line for a sizable increase. Now, I share the desire to promote clean energy technologies, but, given the very urgent need that we have to make tough budget decisions, I think that we need to draw a distinction between the programs that we want to fund and the programs that we need to fund, and I'm not entirely convinced that this budget request will move us in that direction.

Finding policies that will move us toward our energy goals within the budget constraints that we face is an enormous challenge, but it is certainly not insurmountable. One of the best ways that we can ensure that we do make continued progress on items within the budget and the legislation that comes before us is to make sure that they're fully paid for. When it comes to energy policy, one of the best ways that we can do that is to harness our own abundant resources and then apply the revenues to help develop more advanced technologies.

Mr. Chairman, I think we have some great members on the committee. We have some fresh ideas coming in. I look forward to the dialog that we will have as a committee and working with the Secretary to advance the energy goals of this country.

Thank you.

The CHAIRMAN. Thank you very much.

Secretary Chu, why don't you go right ahead and take whatever time you think is appropriate.

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

Secretary CHU. Thank you, Chairman Bingaman, and also thank you, Ranking Member Murkowski. Members of the committee: I want to thank you for the opportunity to appear before you today to discuss the President's fiscal year 2012 budget request for the Department of Energy. President Obama has laid out a plan for the United States to win the future by out-innovating, out-educating, out-building the rest of the world, while at the same time addressing the deficit.

Many countries are moving aggressively to lead in clean energy. We must rev up the great American innovation machine to create jobs, win the energy race, and secure our future prosperity. To that end, President Obama has called for an increased investment in clean energy research, development, and deployment. In addition, he has proposed a bold but achievable goal of generating 80 percent of America's electricity from clean energy sources by 2035. A clean energy standard will provide a clear long-term signal to industry

to bring capital off the sidelines and into the clean energy sector. It will grow the domestic market for clean energy sources of energy, creating jobs, driving innovation, and enhancing national security. By drawing on a wide range of energy sources, including renewables, nuclear, clean coal, natural gas, it will give utilities the flexibility they need to meet our clean energy goal while protecting consumers in every region of the country.

The Department of Energy's fiscal year 2012 budget request for \$29.5 billion supports these goals and strengthens the Nation's economy and security. Through programs to make homes and buildings more energy efficient, we will save money for families and businesses by saving energy. In addition, the budget supports the research, development, and deployment of renewable sources of energy, the modernization of the electric grid, and the advancement of carbon capture and sequestration technologies and it helps reduce our dependence on oil by developing the next generation of biofuels and accelerating electric vehicle research and deployment.

We're also requesting a new credit subsidy that will support approximately \$1 billion to \$2 billion in loan guarantees for renewable energy and energy efficiency technologies. We're also requesting \$100 million in credit subsidies for a new better buildings pilot loan guarantee initiative for universities, schools, and hospitals.

To jump-start the nuclear industry, the budget requests up to \$36 billion in loan guarantee authority, while also investing in advanced nuclear technologies, including small modular reactors.

To spur innovation, the President's budget invests in basic and applied research and keeps us on a path to doubling funding for key scientific agencies, including the Department's Office of Science. The budget invests \$550 million in Advanced Research Projects Agency for Energy, known as ARPA-E. The administration also seeks an additional \$100 million for ARPA-E as part of the President's wireless innovation and infrastructure initiative. This investment will allow ARPA-E to continue the promising early stage research projects that aim to deliver game-changing clean energy technologies. ARPA-E's projects are generating excitement both in the Department and in the private sector.

For example, through a combined total of \$24 million from ARPA-E six companies have been able to advance their research efforts and show the potential viability of cross-cutting technologies. This extremely valuable—and I might add that they were able to then go out, after doing this research, and secure private funding at a ratio of 4 to 1, 4 times more private funding. This additional valuable early support enabled those companies to achieve R and D milestones that in turn have attracted \$100 million in private sector funds for the projects. This is precisely the innovation leverage that is needed to win the future.

Another key piece of our research effort is the energy innovation hubs. Through the hubs, we're bringing together our Nation's top scientists and engineers to achieve similar game-changing energy goals, but where a concentrated effort over a longer time horizon is needed to establish innovation leadership. The budget requests \$146 million to support these 3 existing hubs and to establish 3 new hubs in the areas of battery and energy storage, smart grid technologies, and systems and critical materials.

The energy innovation hubs were modeled after the Department of Energy's bioenergy institutes, which have established an outstanding 3-year track record.

Finally, the budget continues to support the energy frontier research centers, which are mostly university-led teams working to solve specific scientific problems that are blocking clean energy development. When you think of the EFRCs, think about a collaboration of teams of scientists such as Watson and Crick unlocking the secrets of DNA. When you think of ARPA-E, think of visionary risk-takers launching new technologies and starting companies out of their garages. When you think of the hubs, think of large mission-oriented research efforts such as the Manhattan Project, the development of radar at MIT's Radiation Laboratory during World War II, and the research in America's great industrial laboratories in their heyday.

To reach our energy goals, we must take a portfolio approach to R and D, pursuing several research strategies that have proven to be successful in the past. But I want to be clear. This is not a kitchen sink approach. This work is being coordinated and prioritized with a 360-degree view of how the pieces fit together. Taken together, these initiatives will help America lead in innovation.

In addition to strengthening our economy, the budget request also strengthens our security by providing \$11.8 billion for the Department's National Nuclear Security Administration. The request of \$7.6 billion for weapons activities provides a strong basis for transitioning to a smaller, yet still safe, secure and effective nuclear stockpile, without additional nuclear testing. It also provides much-needed resources to strengthen science, technology, and engineering capabilities, and to modernize the physical infrastructure of our nuclear security enterprise.

To support the President's goal of securing all vulnerable nuclear material around the world in 4 years, the budget invests \$2.5 billion in the Defense Nuclear Nonproliferation Program.

Through our investments, we're laying the groundwork for the Nation's future prosperity and security. At the same time, we're mindful of our responsibility to the taxpayer. We're cutting back in multiple areas, including eliminating unnecessary fossil fuel subsidies, reducing funding for fossil fuel energy programs and reducing funding for the hydrogen technology program. We're streamlining operations. We're making some painful cuts, including ending the operation of the Tevatron Accelerator and freezing salaries and bonuses for hard-working national lab employees, site and facility management contractor employees.

The United States faces a choice today: Will we lead in innovation and out-compete the rest of the world or will we fall behind? To lead the world in clean energy, we must act now. We can't afford not to.

Thank you and I'm pleased to answer any questions you may have.

[The prepared statement of Secretary Chu follows:]

PREPARED STATEMENT OF HON. STEVEN CHU, SECRETARY, DEPARTMENT OF ENERGY

Chairman Bingaman, Ranking Member Murkowski, and Members of the Committee, thank you for the opportunity to appear before you today to discuss the President's Fiscal Year 2012 budget request for the Department of Energy.

In his State of the Union address, President Obama laid out a plan for the United States to win the future by out-innovating, out-educating and out-building the rest of the world, while at the same time addressing the deficit. The President's budget request invests in much-needed programs while cutting back where we can afford to.

Many countries are moving aggressively to develop and deploy the clean energy technologies that the world will demand in the coming years and decades. As the President said, this is our generation's "Sputnik moment."

We must rev up the great American innovation machine to win the clean energy race and secure our future prosperity. To that end, President Obama has called for increased investments in clean energy research, development and deployment. In addition, he has proposed a bold but achievable goal of generating 80 percent of America's electricity from clean sources by 2035.

A Clean Energy Standard will provide a clear, long-term signal to industry to bring capital off the sidelines and into the clean energy sector. It will grow the domestic market for clean sources of energy—creating jobs, driving innovation and enhancing national security. And by drawing on a wide range of energy sources including renewables, nuclear, clean coal and natural gas, it will give utilities the flexibility they need to meet our clean energy goal while protecting consumers in every region of the country.

The Department of Energy's FY 12 budget request of \$29.5 billion supports these goals and strengthens the nation's economy and security by investing in the following priorities:

- Supporting groundbreaking basic science, research and innovation to solve our energy challenges and ensure that the United States remains at the forefront of science and technology;
- Leading in the development and deployment of clean and efficient energy technologies to reduce our dependence on oil, accelerate the transition to a clean energy economy and promote economic competitiveness; and
- Strengthening national security by reducing nuclear dangers, maintaining a safe, secure and effective nuclear deterrent and cleaning up our Cold War nuclear legacy.

While we are investing in areas that are critical to our future, we are also rooting out programs that aren't needed and making hard choices to tighten our belt. Additionally, we are improving our management and operations so we function more efficiently and effectively.

LEADING IN THE GLOBAL CLEAN ENERGY ECONOMY

As the President said in his State of the Union address, investing in clean energy will strengthen our security, protect our planet, and create countless new jobs here at home. The Department's budget request invests \$3.2 billion in energy efficiency and renewable energy programs.

Through programs to make homes and buildings more energy efficient, including a new "Better Buildings Initiative" to make commercial buildings 20 percent more efficient over the next decade, we will save money for families and businesses by saving energy. That is money that can be re-invested back into the economy. In addition, the budget supports the research, development and deployment of renewable sources of energy like wind, solar and geothermal. It supports the modernization of the electric grid and the advancement of carbon capture and sequestration technologies. And it helps reduce our dependence on oil by developing the next generation of biofuels and accelerating electric vehicle research and deployment to support the President's goal of putting one million electric vehicles on the road by 2015. This includes a \$200 million competitive program to encourage communities to invest in electric vehicle infrastructure.

We're also focused on moving clean energy technologies from the lab to the marketplace. Over the past two years, the Department's loan programs have supported more than \$26 billion in loans, loan guarantees, and conditional commitments to guarantee loans for 23 clean energy and enhanced automotive fuel efficiency projects across the country, which the companies estimate will create or save more than 58,000 jobs. Building on this success, we are requesting new credit subsidy that will support approximately \$1 billion to \$2 billion in loan guarantees for innovative renewable energy and energy efficiency technologies. These deployment efforts build

on the substantial investment made in the clean energy sector by the Recovery Act, and are supplemented by tax incentives that have also played an important role in bringing clean energy projects to market, such as the 48C manufacturing tax credits and the 1603 cash grants in lieu of investment tax credits, which the 2012 budget also expands. We are also requesting \$100 million in credit subsidy for a new “Better Buildings Pilot Loan Guarantee Initiative for Universities, Schools, and Hospitals,” which will guarantee up to \$2 billion in loans to support energy efficient retrofits.

Nuclear energy also has an important role to play in our energy portfolio. To jumpstart the domestic nuclear industry, the budget requests up to \$36 billion in loan guarantee authority. It also invests in the research and development of advanced nuclear technologies, including small modular reactors.

SUPPORTING GROUNDBREAKING SCIENCE

To spur innovation, the President’s budget request invests in basic and applied research and keeps us on the path to doubling funding for key science agencies, including the Department’s Office of Science. As Norm Augustine, former Chairman of Lockheed Martin and former Under Secretary of the Army, has said, under-funding R&D in a time of austerity is like removing the engine of an aircraft to reduce its weight.

That is why the budget request increases support for the Department’s comprehensive research strategy to accelerate energy breakthroughs.

Through \$5.4 billion for the Office of Science, we’re expanding our investment in basic energy sciences, advanced scientific computing and biological and environmental sciences—all key areas for our future economic competitiveness.

The budget invests \$550 million in the Advanced Research Projects Agency-Energy, also known as ARPA-E. The Administration also seeks an additional \$100 million for ARPA-E from the Wireless Innovation Fund to support wireless clean energy technologies. This investment will allow ARPA-E to continue the promising early-stage research projects that aim to deliver game-changing clean energy technologies. ARPAAE’s projects are generating excitement both in the Department and in the private sector. For example, through a combined total of \$24 million from ARPA-E, six companies have been able to advance their research efforts and show the potential viability of their cutting-edge technologies. This extremely valuable early support enabled those companies to achieve R&D milestones that, in turn, have attracted more than \$100 million in private sector funds to the projects. This is precisely the innovation leverage that is needed to win the future.

Another key piece of our research effort is the Energy Innovation Hubs. Through the Hubs, we are bringing together our nation’s top scientists and engineers to achieve similar game-changing energy goals, but where a concentrated effort over a longer time horizon is needed to establish innovation leadership. The Department has established three Energy Innovation Hubs in the areas of energy efficient buildings, modeling and simulation for nuclear reactors and fuels from sunlight. The budget requests \$146 million to support the three existing Hubs and to establish three new Hubs in the areas of batteries and energy storage, smart grid technologies and systems, and critical materials. The Energy Innovation Hubs were modeled after the Department of Energy’s BioEnergy Institutes, which have established an outstanding three-year track record.

Finally, the budget continues to support the Energy Frontier Research Centers, which are mostly university-led teams working to solve specific scientific problems that are blocking clean energy development.

The Energy Innovation Hubs, ARPA-E, and EFRCs represent three complementary approaches to advance groundbreaking discovery. When you think of the EFRCs, think about a collaborative team of scientists such as Watson and Crick unlocking the secrets of DNA. When you think of ARPA-E, think about visionary risktakers launching new technologies and start-up companies out of their garages. When you think of the Hubs, think of large, mission-oriented research efforts such as the Manhattan Project, the development of radar at MIT’s Radiation Laboratory during World War II and the research in America’s great industrial laboratories in their heyday.

We don’t know where the big energy breakthroughs are going to come from. To reach our energy goals, we must take a portfolio approach to R&D: pursuing several research strategies that have proven to be successful in the past. But I want to be clear—this is not a “kitchen sink” approach. This work is being coordinated and prioritized, with a 360-degree view of how these pieces fit together. Taken together, these initiatives will help America lead in science and technology innovation.

NUCLEAR SAFETY AND SECURITY

In addition to strengthening our economy, the budget request also strengthens our security by providing \$11.8 billion for the Department's National Nuclear Security Administration. The five-year FY 12 to FY 16 request of nearly \$65 billion for NNSA reflects the President's nuclear security priorities, as well as his commitment to modernize the U.S. nuclear weapons enterprise and sustain a strong nuclear deterrent for the duration of the New START Treaty and beyond.

The request of \$7.6 billion for Weapons Activities provides a strong basis for transitioning to a smaller yet still safe, secure and effective nuclear stockpile without additional nuclear testing. It also provides much-needed resources to strengthen science, technology and engineering capabilities and to modernize the physical infrastructure of our nuclear security enterprise.

The President has identified the danger of terrorists getting their hands on nuclear weapons or the material to build them as the greatest threat to global security. To support the President's goal of securing all vulnerable nuclear material around the world in four years, the budget invests \$2.5 billion in the NNSA Defense Nuclear Nonproliferation program. This is part of a five-year, \$14.2 billion commitment for the program.

The budget also requests \$1.2 billion to support the Navy's nuclear powered submarines and aircraft carriers. And it provides \$6.1 billion to protect public health and safety by cleaning up the nation's Cold War nuclear legacy.

FISCAL RESPONSIBILITY

Through our investments, we are laying the groundwork for the nation's future prosperity and security. At the same time, we are mindful of our responsibility to the taxpayer.

We are cutting back in multiple areas, including eliminating unnecessary fossil fuel subsidies, reducing funding for the Fossil Energy program and reducing funding for the hydrogen technology program. We're streamlining operations to reduce administrative costs. And we're making some painful cuts, including ending operation of the Tevatron accelerator and freezing salary and bonuses for hard-working National Laboratory, site and facility management contractor employees.

Finally, we continue to make progress on a management excellence agenda to improve our operations.

The United States faces a choice today: will we lead in innovation and outcompete the rest of the world or will we fall behind? To lead the world in clean energy, we must act now. We can't afford not to.

Thank you, and now I am pleased to answer any questions you may have.

HIGHLIGHTS OF THE FY 2012 BUDGET REQUEST

In his State of the Union address, President Obama said that America faces "our generation's Sputnik moment" and that we need to out-innovate, out-educate and outbuild the rest of the world to capture the jobs of the 21st century. "In America, innovation doesn't just change our lives. It's how we make our living." Through innovation in promising areas like clean energy, the United States will win the future and create new industries and new jobs. To lead in the global clean energy economy, we must mobilize America's innovation machine in order to bring technologies from the laboratory to the marketplace. The Department of Energy (DOE) is on the front lines of this effort. To succeed, the Department will pursue game-changing breakthroughs, invest in innovative technologies, and demonstrate commercially viable solutions.

In addition to energy advances that spark economic growth, national security remains fundamental to the Department's mission. Through bipartisan ratification of the New START treaty with Russia, America and its global partners are leading by example in implementing the focused expansion of domestic and international activities to reduce the threat of nuclear weapons, nuclear proliferation, and unsecured or excess weapons-usable materials. The National Nuclear Security Administration (NNSA) supports the international effort to secure all vulnerable nuclear materials around the world within four years. The NNSA also fulfills the President's commitment to modernize the nation's nuclear stockpile until a world without nuclear weapons can be realized.

The Department's Fiscal Year (FY) 2012 budget request is \$29.5 billion, an 11.8 percent or \$3.1 billion increase from FY 2010 current appropriation levels. The FY 2012 request 6 supports the President's goals to increase America's competitiveness by making strategic investments in our nation's clean energy infrastructure and to strengthen our national security by reducing the global threat of nuclear materials.

The President has called for advancing research on clean energy technologies and manufacturing, doubling the share of electricity generated from clean energy supplies by 2035, and putting one million electric vehicles on the road by 2015. The Department's request prepares for a multiyear effort to address these interconnected objectives and prioritizes research and development of renewable energy technologies to expand sustainable energy options for the United States.

The FY 2012 budget builds on the intense planning, execution, and oversight of the \$35.2 billion from the American Recovery and Reinvestment Act of 2009. By the end of FY 2010, the Department successfully obligated \$32.7 billion of Recovery Act funds, including all funding that was set to expire. In developing the FY 2012 budget request, the Department has taken these investments into account and will oversee execution of these funds with value to the taxpayer in mind. Recovery Act investments are focused on: energy conservation and renewable energy sources (\$16.8 billion), environmental cleanup (\$6 billion), loan guarantees for renewable energy and electric power transmission projects (\$2.4 billion), grid modernization (\$4.5 billion), carbon capture and sequestration (\$3.4 billion), basic science research (\$1.6 billion), and the Advanced Research Projects Agency—Energy (\$0.4 billion). The Department's Recovery Act activities are strengthening the economy by providing much-needed investment, saving or creating tens of thousands of jobs, cutting carbon pollution, and reducing U.S. dependence on oil.

The President's FY 2012 Budget supports three strategic priorities:

- **Transformational Energy.**—Accelerate the transformation to a clean energy economy and secure U.S. leadership in clean energy technologies.
- **Economic Prosperity.**—Strengthen U.S. science and engineering efforts to serve as a cornerstone of our economic prosperity and lead through energy efficiency and secure forms of energy.
- **Nuclear Security.**—Enhance nuclear security through defense, nonproliferation, naval reactors, and environmental cleanup efforts.

As the President has articulated, innovation is essential to America's economic competitiveness. To meet the challenge of 'our generation's Sputnik moment,' the Department supports a coordinated strategy for research and development across all of its programs. With every initiative the Department undertakes, sound science is at the core. In FY 2012, we will increasingly emphasize cross-cutting initiatives to link science throughout the Department, specifically with energy and national security programs in order to deliver results to the American taxpayer. In the Office of Science, the Department requests \$5.4 billion, a 9.1 percent or \$452 million increase over the FY 2010 current appropriation levels, to support an elevated focus on the advancement of the United States' leadership in fundamental research. Advanced Research Projects Agency—Energy (ARPA-E) is building on established gains since its initial funding in FY 2009 through the Recovery Act to perform transformational research and create gamechanging breakthroughs for eventual market adoption. The FY 2012 budget request includes \$550 million for ARPA-E to sustain investment in new energy technologies.

Energy Innovation Hubs play a key role in solving specific energy challenges by convening and focusing top scientific and engineering talent to focus on those problems. The Hubs bring together multidisciplinary team of researchers in an effort to speed research and shorten the path from scientific discovery to technological development and commercial deployment of highly promising energy-related technologies. The Department is proposing to double its commitment to this research approach by requesting three new Hubs to focus on batteries and energy storage, critical materials, and Smart Grid technologies and systems. The Department will continue funding the three Energy Innovation Hubs introduced in FY 2010 to focus on developing fuels that can be produced directly from sunlight, improving energy efficient building systems design, and using modeling and simulation tools to create a virtual model of an operating advanced nuclear reactor. Complementing the Hubs, the Department plans in FY 2012 to continue coordination with the Office of Science's Energy Frontier Research Centers, which exemplify the pursuits of broad-based science challenges for energy applications.

Energy Security: Promoting America's Energy Security through Reliable, Clean and Affordable Energy

In his State of the Union address, the President outlined clearly to the American people his roadmap for transforming our nation's energy economy to meet the demands of future generations. "Instead of subsidizing yesterday's energy, let's invest in tomorrow's," he said. To meet the President's challenge, the Department must recruit the sharpest research minds and build on its aggressive discovery agenda

across all programs to achieve breakthroughs on the most pressing energy challenges facing the United States.

In his address, President Obama laid out a goal for clean energy sources to account for 80 percent of America's electricity by 2035. In FY 2012, the Department requests funds to help achieve this Presidential objective and address many of the energy delivery challenges facing American families and energy providers.

- **Applied Research, Development and Deployment.**—Meeting the President's goal of making America the first country to have one million electric vehicles on the road by 2015, the Department will research cost competitive methods to develop electric vehicles, increase the adaptability and capacity of the grid to enable vehicle charging, incentivize communities to invest in electric vehicles and infrastructure and send these vehicles to the nation's roadways. The Department will also launch competitive manufacturing research for breakthrough technologies in energy efficiency diagnostics and retrofits to help business owners around the country save money on energy costs.
- **Loan Guarantees.**—The Loan Programs Office (LPO) is a vital tool for promoting innovation in the energy sector across a broad portfolio of clean and efficient energy technologies. In FY 2012, the Department is requesting credit subsidies to support approximately \$1 to \$2 billion in loan guarantees for renewable energy deployment and up to \$36 billion in additional authority to loan guarantees for nuclear power projects. The Department will also continue to streamline and prioritize the issuance of loan guarantees to leverage private sector investment in clean energy and energy efficiency projects that will save and create jobs.
- **Better Buildings Initiative.**—Last year, commercial buildings consumed roughly 20 percent of all energy in the U.S. economy. Improving energy efficiency in our buildings can create jobs, save money, reduce our dependence on oil, and make our air cleaner. The President's Better Buildings Initiative will make commercial buildings 20 percent more energy efficient over the next decade through initiatives that include: re-designing the current tax deduction for commercial buildings and upgrades to a credit that is more generous and that will encourage building owners and real estate investment trusts (REITs) to retrofit their properties; improving financing opportunities for retrofits through programs including a new Better Buildings Pilot Loan Guarantee Initiative for Universities, Schools and Hospitals, for which the Department of Energy requests \$100 million in credit subsidy to guarantee up to \$2 billion in loans for energy efficiency retrofits for these facilities; creating a \$100 million Race to Green competitive grant program for state and municipal governments to implement innovative approaches to building codes, performance standards, and regulations so that commercial building efficiency will become the norm in communities across the country; and calling on CEOs and university presidents to join the Department of Energy and other Federal partners in a Better Buildings Challenge to make their organizations leaders in saving energy. The Better Buildings Initiative builds on our investments through the Recovery Act and our continued commitment to passing "HOMESTAR" legislation to encourage American families to make energy saving upgrades in their homes.
- **Electricity Reliability and Energy Management.**—Reliable, affordable, efficient, and secure electric power is vital to expanding economic recovery, protecting critical infrastructures, and enabling the transition to renewable energy sources. The FY 2012 request invests \$238 million to bring the next generation of grid modernization technologies closer to deployment and commercialization, to assist states and regional partners in grid modernization efforts, and to facilitate recovery from energy supply disruptions when they occur. The request includes a new Smart Grid Technology and Systems Hub that will address the total electricity system, covering applied science, technology, economic, and policy issues that affect our ability to modernize the grid. The FY 2012 request also plans an expansion of the Home Energy Score program that provides homeowners with information on how their homes can be more energy efficient and guidance for saving on home energy costs. This is in addition to the President's support for passage of the Home Star rebate program in 2011.

Investing in energy efficiency, renewable energy generation, and grid modernization are fundamental steps necessary for creating a clean energy economy. We must also invest in the improvement of existing sources of energy that will provide a bridge between current and future technologies. These technologies are already a major segment of the energy mix and will play a critical role in providing a solid foundation that will make possible the creation of a new energy economy.

- **Leadership in Nuclear Energy.**—Nuclear energy currently supplies approximately 20 percent of the Nation’s electricity and 70 percent of the Nation’s clean, non-carbon electricity. The request for the Office of Nuclear Energy includes \$380 million for research and development, in addition to key investments in supportive infrastructure. In addition, the Department is engaging in cost-shared activities with industry that may help accelerate commercial deployment of small modular reactors. The request includes funding for costshared design certification and licensing activities for small modular reactors, the deployment of which holds promise for vastly increasing the generation of clean energy on a cost competitive basis. The Department will also promote nuclear power through the Loan Guarantee Program, which is requesting up to \$36 billion in additional loan guarantee authority in FY 2012.
- **Advanced Fossil Energy.—Experience in Carbon Capture and Storage—**The world will continue to rely on coal-fired electrical generation to meet energy demand. It is imperative that the United States develop the technology to ensure that base-load electricity generation is as clean and reliable as possible. The Office of Fossil Energy requests \$452.9 million for research and development of advanced coal-fueled power systems and carbon capture and storage technologies. The Budget focuses resources within the fossil energy program on activities that can reduce carbon pollution and have potential benefits for both the existing fleet and new power plants —specifically, post-combustion capture R&D and geologic carbon storage R&D.
- **Ending Tax Subsidies to Fossil Fuel Producers.**—In accordance with the President’s agreement at the G-20 Summit in Pittsburgh to phase out subsidies for fossil fuels so that we can transition to a 21st century energy economy, the Administration proposes to repeal a number of tax preferences available for fossil fuels. Tax subsidies proposed for repeal include, but are not limited to: the credit for oil and gas produced from marginal wells; the deduction for costs paid or incurred for any tertiary injectant used as part of a tertiary oil recovery method; the ability to claim the domestic manufacturing deduction against income derived from the production of oil and gas and coal; and expensing the exploration and development costs for coal.

Economic Security: Sharpening America’s Competitive Edge through a Clean Energy Economy

To meet “our generation’s Sputnik moment” and promote economic competitiveness, the U.S. must demonstrate leadership in clean energy technologies. “We’ll invest in biomedical research, information technology and especially clean energy technology—an investment that will strengthen our security, protect our planet, and create countless new jobs for our people,” said President Obama before Congress in the State of the Union address. President Obama outlined his comprehensive vision to lead our nation’s clean energy economy and provide economic security to Americans. As the Administration seeks to reduce federal government spending, the Department recognizes its role and has tightened its expenditures in several areas such as oil and natural gas. The FY 2012 budget request acknowledges the Department’s missions to achieve these imperative goals while setting forth a clean energy economy for entrepreneurs and manufacturers to reclaim their competitive edge in clean energy innovation.

The Department plans to promote economic security by building on the progress made through the over \$32 billion in grants and contracts under the American Recovery and Reinvestment Act of 2009, which made historic investments in the nation’s economy and has put the country on target to double renewable energy generation by 2012. The Recovery Act helped create tens of thousands of jobs and, combined with the FY 2012 request, will help the Department accelerate the transition of our nation to a clean energy economy.

The President’s FY 2012 Budget supports the plan to rebuild our economy through clean energy research and development by:

- **Expanding ARPA-E to spur innovation.**—The President’s request proposes \$550 million for the Advanced Research Projects Agency—Energy (ARPA-E) program, plus an additional \$100 million for the program from the Wireless Innovation and Infrastructure Initiative for a total of \$650 million. ARPA-E performs transformational and cutting edge energy research with real-world applications in areas ranging from grid technology and power electronics to batteries and energy storage. The budget also supports programs with significant promise to provide reliable, sustainable energy across the country, such as the SunShot initiative aimed at making solar energy cost competitive. With focused investment in manufacturing innovation and industrial technical efficiencies, the Presi-

dent's proposal will move private sector capital off the shelves and into the marketplace.

- Targeting investments for future economic growth.—To secure a competitive advantage in high-tech industries and maintain international leadership in scientific computing, we will invest in core research activities for energy technologies, the development of general biological design principles and new synthetic molecular toolkits to improve understanding of natural systems, and core research activities to advance the frontiers of high performance computing. Underlying these investments in research is the education and training of thousands of scientists and engineers who contribute to the skilled scientific workforce needed for a 21st century innovation economy.
- Doubling the number of Energy Innovation Hubs to solve key challenges.—Innovation breakthroughs occur when scientists collaborate on focused problems. The FY 2012 budget request proposes three new Energy Innovation Hubs that will bring top American scientists to work in teams on critical energy challenges in areas such as critical materials, batteries and energy storage, and Smart Grid technologies. These will join three existing Hubs that focus on fuel generation from sunlight, building efficiency, and nuclear reactor modeling and simulation.
- Integrating Research & Development.—The Department has identified areas where coordinated work by discovery-oriented science and applied energy technology programs hold the greatest promise for progress in achieving our energy goals. The Energy Systems Simulation to increase the efficiency of the Internal Combustion Engine (ICE) will produce a set of modern, validated computer codes that could be used by design engineers to optimize the next generation of cleaner, more efficient combustion engines. An initiative on extreme environments will close the gap between actual and ideal performance of materials in nuclear environments. And the Department's Exascale Computing initiative will allow the Department to take the lead in developing the next generation of scientific tools and to advance scientific discoveries in solving practical problems.
- Pursuing the passage of HOMESTAR.—Enactment of this program will create jobs by providing strong short-term incentives for energy efficiency improvements in residential buildings. The HOMESTAR program has the potential to accelerate our economic recovery by boosting demand for energy efficiency products and installation services. The program will provide rebates of \$1000 to \$3000 per household to encourage immediate investment in energyefficient appliances, building mechanical systems and insulation, and whole-home energy efficiency retrofits. This program will help middle-class families save hundreds of dollars a year in energy costs while improving the comfort and value of their most important investment—their homes. In addition, the program would help reduce our economy's dependence on fossil fuels and support the development of an energy efficiency services sector in our economy.
- Extending access to tax credit and tax grant programs.—Two provisions of the American Recovery and Reinvestment Act have been extraordinarily successful in spurring the deployment of renewable energy projects and building advanced manufacturing capabilities: Section 48C Advanced Energy Manufacturing Tax Credit program and the Section 1603 Energy Cash Assistance program. The Administration is pursuing an additional \$5 billion in support for the Section 48C program, which, by providing a 30% tax credit for energy manufacturing facilities, will continue to help build a robust high-technology, U.S. manufacturing capacity to supply clean energy projects with U.S. made parts and equipment. The Section 1603 tax grant program has created tens of thousands of jobs in industries such as wind and solar by providing up-front incentives to thousands of projects. The Administration is seeking a one-year extension of this program.
- Promoting efficient energy use in our everyday lives.—Currently, weatherization of more than 300,000 homes of low income families has been achieved, providing energy cost savings and financial relief to households. The FY 2012 request of \$320 million continues residential weatherization, while increasing the focus on new innovative approaches to residential home weatherization.

National Security: Securing Nuclear and Radiological Materials, Maintaining Nuclear Deterrence, and Advancing Responsible Legacy Cleanup

A pillar of President Obama's national security agenda for the United States is to eliminate the global threat posed by nuclear weapons and prevent weapons-usable nuclear material from falling into the hands of terrorists. As part of this agenda, the Administration and Congress worked tirelessly toward the December 2010 bipartisan ratification of the New Strategic Arms Reduction Treaty (New START) with Russia, which cuts the number of strategic nuclear weapons each country can

deploy to 1,550. After signing this agreement in April 2010, President Obama said, “In many ways, nuclear weapons represent both the darkest days of the Cold War, and the most troubling threats of our time. Today, we’ve taken another step forward . . . in leaving behind the legacy of the 20th century while building a more secure future for our children. We’ve turned words into action. We’ve made progress that is clear and concrete. And we’ve demonstrated the importance of American leadership—and American partnership—on behalf of our own security, and the world’s”.

The Department’s National Nuclear Security Administration (NNSA), through work with global partners and efforts to secure vulnerable nuclear materials, achieved significant milestones during FY 2010 and FY 2011 to reduce the risk of proliferation and leverage science to maintain our nation’s nuclear deterrence. Additionally, the Environmental Management program made progress advancing responsible nuclear cleanup from the Cold War. The Department’s FY 2012 request seeks to build upon these successes and advance the President’s nuclear security agenda.

Reduce the Risk of Proliferation

In 2009, President Obama committed the United States to an international effort to secure vulnerable nuclear material worldwide in four years. To solidify international support for this effort, and to address the threat of nuclear terrorism, the President convened leaders from 47 countries at the Washington Nuclear Security Summit in April 2010. The Summit resulted in a Communiqué which stated, “Nuclear terrorism is one of the most challenging threats to international security, and strong nuclear security measures are the most effective means to prevent terrorists, criminals, or other unauthorized actors from acquiring nuclear materials.”

The FY 2012 budget for the NNSA Defense Nuclear Nonproliferation program will help advance further work that is needed to meet the goals of President Obama and the Nuclear Security Summit, recognizing the urgency of the threat and making the full commitment to global cooperation on nonproliferation. The budget provides \$2.5 billion in FY 2012, and \$14.2 billion through FY 2016 to detect, secure, and dispose of dangerous nuclear and radiological material worldwide. This request is a decrease of 5 percent, or \$138 million, from the FY 2011 request, which reflects completion of accelerated efforts to secure vulnerable nuclear materials within the President’s stated timeframe. The decrease also reflects our decision to await agreement between the United States and Russia on detailed implementation milestones prior to requesting additional U.S. pledged funding to support Russian plutonium disposition. The FY 2012 budget request follows through on securing vulnerable materials and supports efforts to design new technologies in support of treaty monitoring and verification, which will contribute to implementation of New START. The budget also broadens cooperative nonproliferation initiatives with foreign governments and international organizations in support of the President’s objective of a world without nuclear weapons. The budget continues the provision of security upgrades at selected sites, both within the United States and in foreign countries, to address outsider and insider threats, and accelerates the pace of research reactor conversions from use of highly-enriched uranium fuel to lowenriched uranium fuel.

Leverage Science to Maintain Nuclear Deterrence

The FY 2012 budget request advances the Department’s commitment to the national security interests of the United States through stewardship of a safe, secure and effective nuclear weapons stockpile without the use of underground nuclear testing. The 2010 Nuclear Posture Review Report calls for the United States to reduce nuclear force levels. As the United States begins the reduction required by New START, the science, technology and engineering capabilities and intellectual capacity within the nuclear security enterprise become more critical to sustaining the U.S. nuclear deterrent. NNSA continues to emphasize these capabilities, including functioning as a national science, technology, and engineering resource to other agencies with national security responsibilities. Through the NNSA, the Department requests \$7.6 billion for the Weapons Activities appropriation, an 8.9 percent, or \$621 million, increase from the President’s FY 2011 request. It also is an 18.9 percent, or \$1.205 billion increase from the FY 2010 enacted appropriation. This increase reflects an investment strategy that provides a strong basis for transitioning to a smaller yet still safe, secure and effective nuclear stockpile without additional nuclear testing, strengthening the science, technology and engineering base, modernizing the physical infrastructure, and streamlining the enterprise’s physical and operational footprint. These investments will further enable the Nuclear Posture Review’s comprehensive nuclear defense strategy, based on current and projected global threats that rely less on nuclear weapons, while strengthening the nation’s nuclear deterrent through completing major stockpile system life extensions, stabi-

lizing the science, technology and engineering base, and modernizing the infrastructure.

The Naval Reactors program ensures the safe and reliable operation of reactor plants in nuclear-powered submarines and aircraft carriers, constituting 45 percent of the U.S. Navy's combatants. The FY 2012 request for Naval Reactors of \$1.2 billion, is an increase of \$83.2 million or 7.8 percent over the FY 2011 request and \$209 million or 18.1 percent above the FY 2010 enacted appropriation. Funding for this program is ramping up for reactor design and development efforts for the Ohio Class Replacement Submarine (\$121 million), refueling of the Land-Based Prototype (\$99.5 million), and recapitalization of the naval spent nuclear fuel infrastructure for the Spent Fuel Handling Recapitalization program (\$53.8 million) at the Naval Reactors Facility located at the Idaho National Laboratory.

Advance Responsible Environmental Cleanup

The FY 2012 budget includes \$6.13 billion for the Office of Environmental Management (EM), to protect public health and safety by cleaning up hazardous, radioactive legacy waste from the Manhattan Project and the Cold War. This funding will allow the program to continue to accelerate cleaning up and closing sites, focusing on activities with the greatest risk reduction. Acceleration of cleaning up sites where funding would have immediate impact was established as the overarching objective of the \$6 billion in Recovery Act funding. EM will use the remaining \$309 million of Recovery Act funding during FY 2012 as it completes footprint reduction and near-term completion cleanup activities.

As the Department continues to make progress in completing environmental cleanup, the FY 2012 budget request of \$170 million for the Office of Legacy Management supports the Department's long-term stewardship responsibilities and payment of pensions and benefits for former contractor workers after site closure.

DEPARTMENT OF ENERGY FY 2012 PROGRAM OFFICE HIGHLIGHTS

Office of Science: Invest in the Building Blocks of American Innovation

The Department of Energy's Office of Science (SC) delivers scientific discoveries and major scientific tools to transform our understanding of energy and matter and advance the energy, economic, and national security of the United States. SC is the largest Federal sponsor of basic research in the physical sciences, supporting programs in areas such as physics, chemistry, biology, environmental sciences, applied mathematics, and 15 computational sciences. In FY 2012, the Department requests \$5.4 billion, an increase of 9.1 percent over the FY 2010 current appropriation, to invest in basic research. The FY 2012 request supports the President's Strategy for American Innovation, and is consistent with the goal of doubling funding at key basic research agencies, including the Office of Science. The FY 2012 Office of Science budget request supports the following objectives from the Strategy, including:

- Unleash a clean energy revolution
- Strengthen and broaden American leadership in fundamental research
- Develop an advanced information technology ecosystem
- Educate the next generation with 21st century skills and create a world-class workforce

In FY 2012, SC continues to support fundamental research for scientific discovery, but today our country needs to move strongly to solve our energy problems. Therefore, the central theme of this year's budget in SC is research in new technologies for a clean energy future that address competing demands on our environment. These efforts, coordinated with the DOE applied technology programs and with input from the scientific community and industry, will emphasize research underpinning advances in non-carbon emitting energy sources, carbon capture and sequestration, transportation and fuel switching, transmission and energy storage, efficiency, and critical materials for energy applications.

In the area of advancing non-carbon energy sources, the FY 2012 budget request will provide for new investments in the science of interfaces and degradation relevant to solar photovoltaics, basic actinide chemistry research related to advanced nuclear fuel cycles, and research in materials under extreme environments relevant to extreme nuclear technology environments, and genomics-based research on biological design principles and synthetic biology tools to underpin bio-based energy solutions. Carbon capture and sequestration research will focus on novel molecular design for materials and multiscale dynamics of flow and plume migration, respectively. SC will initiate an energy systems simulation research effort focused on predictive modeling of combustion in an evolving fuel environment in support of the

Department's efforts in transportation and alternative fuels. Also underpinning transportation and fuel switching, as well as energy storage, the FY 2012 request will support an Energy Innovation Hub for Batteries and Energy Storage. The Fuels from Sunlight Hub, established in FY 2010, as well as the Energy Frontier Research Centers and DOE Bioenergy Research Centers also continue. Research in enabling materials sciences will support needs of future electricity transmission systems and novel building materials to improve building efficiencies.

The FY 2012 budget request also provides for foundational science in condensed matter and materials physics, chemistry, biology, climate and environmental sciences, applied mathematics, computational and computer science, high energy physics, nuclear physics, plasma physics, and fusion energy sciences; and provides for research facilities and capabilities that keep U.S. researchers at the forefront of science. The FY 2012 request supports targeted increases in areas such as computational materials and chemistry by 16 design, nanoelectronics, and advanced scientific applications and integrated application hardware-software co-design for exascale, which position the U.S. to secure a competitive advantage in high-tech industries and maintain international leadership in scientific computing. Underlying these investments is the education and training of thousands of scientists and engineers who contribute to the skilled scientific workforce needed for the 21st century innovation economy.

The Office of Science supports investigators at about 300 academic institutions and from all of the DOE laboratories. Over 26,000 researchers from universities, national laboratories, industry, and international partners are expected to use the Office of Science scientific user facilities in FY 2012.

Advanced Research Projects Agency—Energy: Transformational Research and Development

The FY 2012 budget request includes \$550 million for the Advanced Research Projects Agency—Energy (ARPA-E), plus an additional \$100 million for the program from the Wireless Innovation and Infrastructure Initiative for a total of \$650 million. ARPA-E was launched in FY 2009 to sponsor specific high-risk and high-payoff transformational research and development projects that overcome the long-term technological barriers in the development of energy technologies to meet the Nation's energy challenges, but that industry will not support at such an early stage. An essential component of ARPA-E's culture is an overarching focus on accelerating science to market. Beyond simply funding transformational research creating revolutionary technologies, ARPA-E is dedicated to the market adoption of those new technologies that will fuel the economy, create new jobs, reduce energy imports, improve energy efficiency, reduce energy-related emissions, and ensure that the U.S. maintains a technological lead in developing and deploying advanced energy technologies.

Office of Energy Efficiency and Renewable Energy: Investing in Breakthrough Technology and a Clean Energy Future

The Office of Energy Efficiency and Renewable Energy (EERE) supports research, development, demonstration, and deployment activities on technologies and practices essential for meeting national security goals by reducing dependence on oil, meeting environmental goals by minimizing the emissions associated with energy production and use, and stimulating economic growth and job creation by minimizing the cost of energy services. The EERE portfolio emphasizes work areas where the potential impact is largest, where Federal funds are most critical. It balances investments in high-risk research with partnerships with private firms that speed the translation of innovations into practical business opportunities. The diverse set of technologies supported helps ensure that the U.S. has many options for meeting its energy goals. Program management is designed to identify the best groups in the country to address these challenges and supports work in universities, companies, national laboratories, and consortia.

The FY 2012 budget request of \$3.2 billion, the increase of 44.4% over the FY 2010 current appropriation, is aimed at accelerating innovation and change in the Nation's 17 energy economy. The request includes programs associated with meeting the President's goals of investing in the next generation of clean energy technologies, vehicles and fuels, and energy efficiency measures that reduce energy use in Federal agencies and the industrial and building sectors.

Clean, Renewable Energy Generation

The FY 2012 budget request continues to work to transform the Nation's energy infrastructure by investing over \$1,164.9 million in a variety of renewable programs including solar (\$457.0 million), wind (\$126.9 million), water (\$38.5 million), hydrogen (\$100.5 million), biomass (\$340.5 million), and geothermal (\$101.5 million). Re-

search, development, and deployment of these technologies will reduce the production of greenhouse gas emissions and revitalize an economy built on the next generation of domestic production. The request includes the solar SunShot program which will invest in transformative research focusing on achieving radical cost reductions in photovoltaic modules, balance of systems, and power electronics.

Energy Efficiency

The Department implements a number of efforts to increase energy efficiency in homes, transportation, and industry. The FY 2012 budget requests \$1,805.3 million to accelerate deployment of clean, cost-effective, and rapidly deployable energy efficiency measures in order to reduce energy consumption in residential and commercial buildings, and the industrial and Federal sectors. The Department will invest \$470.7 million in the Building Technologies program and \$33.0 million for the Federal Energy Management Program. Federal assistance for state-level programs such as State Energy Program (\$63.8 million), Tribal (\$10.0 million) and Weatherization Assistance Program (\$320.0 million) will continue to help citizens implement energy efficiency measures, lower energy costs and greenhouse gas emissions, and build a technical workforce. (\$319.8 million) for Industry will provide a balanced portfolio of advanced R&D and pursuit of near-term low cost opportunities with the objectives of increasing U.S. competitiveness, enhancing clean energy manufacturing, and improving energy productivity. There will be a focus on next generation manufacturing processes and materials, activities for clean energy manufacturing, and re-focused efforts for Industrial Technical Assistance to achieve greater results with less funding through more effective leveraging of funding for deployment partnerships. A new Energy Innovation Hub on critical materials will be competed through the Industrial Technologies program. The FY 2012 request also includes \$588 million to accelerate research, development and deployment of advanced vehicle technologies, working in concert with biomass RD&D to reduce the use of petroleum and greenhouse gas emissions.

Better Buildings Initiative for Commercial Energy Savings.—The President's Better Buildings Initiative is focused on achieving a 20 percent improvement in commercial buildings' energy use by 2020. The initiative will include many new components to achieve this goal. The following are supported in the Department's FY 2012 request: launch of the Race to Green competitive grant program for states and municipal governments to encourage higher standards for commercial energy efficiency, which is funded within the Buildings Technologies Program; a new pilot loan guarantee program to support energy efficiency retrofits for buildings that serve as community assets; and increased R&D funding for building technologies. The Department intends to work with the business and academic communities to make their organizations leaders in saving energy.

Office of Electricity Delivery and Energy Reliability: Enabling a Clean Energy Economy

The Office of Electricity Delivery and Energy Reliability (OE) is responsible for leading national efforts to modernize the electric grid, enhance the security of energy infrastructure, and facilitate recovery from disruptions to the energy supply. The Department's FY 2012 budget request for OE of \$238 million, a 38% increase over the FY 2010 appropriation, represents a clear and determined effort to accelerate the transformation of one of the Nation's key enablers of a clean energy economy—the electricity delivery system.

The U.S. electricity delivery system was built on technology that was developed early in the 20th century and designed for the demands and challenges of that era. Today, this aging and often congested system is facing many new and complex challenges that require considerable improvements in the physical and technological components of the system. In order to alleviate the stress on the system from increasing demand for electricity and to enable greater use and integration of renewable and distributed resources, all while maintaining the reliability, security, and affordability of electric power, research and development breakthroughs and new energy management approaches are critical in the areas of transmission and distribution, energy storage, and cyber security.

OE's FY 2012 budget request provides \$193 million for research and development in these critical areas to bring the next generation of grid technologies closer to deployment and commercialization. The increased investment reflects the President's vision and OE's role in competing in a worldwide technological race. As such, with \$20 million in FY 2012, OE will establish a new Energy Innovation Hub, or in the words of President Obama, one of "the Apollo projects of our time." The Smart Grid Technology and Systems Hub will bring together a diverse, multi-disciplinary group to develop an integrated approach to enhancing smart grid technologies and sys-

tems. OE will also expand its advanced modeling capabilities to include other system layers in order to provide a more in-depth system understanding. The energy storage program will expand to aggressively support the deployment of grid-scale energy storage technologies with new demonstrations, and the cyber security program will continue to focus on the development and integration of secure control systems.

The budget request continues to support Permitting, Siting, and Analysis (PSA) with \$8 million to develop and improve policies, state laws, and programs that facilitate the development of electric infrastructure needed to bring new clean energy projects to 19 market, and to provide technical assistance to states and regions. It also supports Infrastructure Security and Energy Restoration (ISER) with \$6.2 million to enhance the reliability and resiliency of critical energy infrastructure and to facilitate recovery from energy supply disruptions.

Office of Environmental Management: Meeting Commitments and Making Progress

The mission of the Office of Environmental Management (EM) is to complete the safe cleanup of the environmental legacy brought about from over six decades of nuclear weapons development, production, and Government-sponsored nuclear energy research. This cleanup effort is the largest in the world, originally involving two million acres at 110 sites in 35 states, dealing with some of the most dangerous materials known to man.

EM continues to pursue its cleanup objectives within the overall framework of achieving the greatest comparative risk reduction benefit and overlaying regulatory compliance commitments and best business practices to maximize cleanup progress. To support this approach, EM has prioritized its cleanup activities:

- Activities to maintain a safe and secure posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal
- Spent nuclear fuel storage, receipt, and disposition
- Special nuclear material consolidation, processing, and disposition
- High priority groundwater remediation
- Transuranic and mixed/low-level waste disposition
- Soil and groundwater remediation
- Excess facilities deactivation and decommissioning

The FY 2012 budget request for \$6.13 billion will fund activities to maintain a safe and secure posture in the EM complex and make progress against program goals and compliance commitments by reducing the greatest risks to the environment and public health, using science and technology to reduce lifecycle costs, and reducing EM's geographic footprint by 90 percent by 2015. EM continues to move forward with the development of the capability for dispositioning tank waste, nuclear materials, and spent (used) nuclear fuel. The budget request includes the construction and operation of three unique and complex tank waste processing plants to treat approximately 88 million gallons of radioactive tank waste for ultimate disposal. It will also fund the solid waste disposal infrastructure needed to support disposal of transuranic and low-level wastes generated by high-risk activities and the footprint reduction activities.

EM carries out its cleanup activities with the interests of stakeholders in mind. Most importantly, EM will continue to fulfill its responsibilities by conducting cleanup within a "Safety First" culture that integrates environment, safety, and health requirements and controls into all work activities to ensure protection to the workers, public, and the environment, and adheres to sound project and contract management principles. EM is also strengthening its project and planning analyses to better assess existing priorities and identify opportunities to accelerate cleanup work. Working collaboratively with the sites, EM continues to seek aggressive but achievable strategies for accelerating cleanup of discrete sites or segments of work. In addition, functional and cross-site activities such as elimination of specific groundwater contaminants, waste or material processing campaigns, or achievement of interim or final end-states are being evaluated.

After the EM program completes cleanup and closure of sites that no longer have an ongoing DOE mission, post closure stewardship activities are transferred to the Office of Legacy Management (LM). LM also receives sites remediated by the U.S. Army Corps of Engineers (Formerly Utilized Sites Remedial Action Program) and private licensees (Uranium Mill Tailings Radiation Control Act, Title II sites). Post closure stewardship includes long-term surveillance and maintenance activities such as groundwater monitoring, disposal cell maintenance, records management, and management of natural resources at sites where active remediation has been completed. At some sites the program includes management and administration of pension and post-retirement benefits for contractor retirees.

Loan Programs Office: Helping Finance Clean Energy Deployment

Innovative Technology Loan Guarantee Program.—To encourage the early commercial deployment of new or significantly improved technologies in energy projects, the Department requests up to \$36 billion in loan guarantee authority for nuclear power facilities and \$200 million in appropriated credit subsidy to support an estimated \$1 to \$2 billion in loans for renewable energy system and efficient end-use energy technology projects under section 1703 of the Energy Policy Act of 2005. The additional loan guarantee authority for nuclear power projects will promote deployment of new plants and support an increasing role for private sector financing. The additional credit subsidy will allow for investment in the innovative renewable and efficiency technologies that are critical to meeting the Administration's goals for affordable, clean energy, technical leadership, and global competitiveness.

The FY 2012 budget also requests \$38 million to evaluate applications received under the eight solicitations released to date and to ensure efficient and effective management of the Loan Guarantee program. This request is expected to be offset by collections from borrowers authorized under Title XVII of the Energy Policy Act of 2005 (P.L. 109-8).

Advanced Technology Vehicle Manufacturing Program.—The Department requests \$6 million to support ongoing loan monitoring activities associated with the program mission of making loans to automobile and automobile part manufacturers for the cost of re-equipping, expanding, or establishing manufacturing facilities in the United States to produce advanced technology vehicles or qualified components, and for associated engineering integration costs.

Better Buildings Pilot Loan Guarantee Initiative for Universities, Schools, and Hospitals.—To spur investment in energy efficiency retrofits for buildings which serve as assets to our communities, the Department requests \$100 million for loan guarantee subsidy costs to support up to \$2 billion in loan authority for universities, schools, and hospitals. This pilot program is one component of the President's Better Buildings Initiative and would fund cost-effective technologies and measures to assist universities, schools, and hospitals save on energy usage and associated energy costs. The Department also requests \$5 million for administrative expenses to carry out the program. The request is subject to the enactment of legislation authorizing this program.

Office of Nuclear Energy: Investing in Energy Innovation and Technical Leadership

The Department is requesting \$852.5 million for the Office of Nuclear Energy (NE) in FY 2012—a decrease of 0.6 percent from the FY 2010 current appropriation. NE's funding supports the advancement of nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs by resolving technical, cost, safety, proliferation resistance, and security barriers through research, development, and demonstration as appropriate.

Currently, nuclear energy supplies approximately 20 percent of the Nation's electricity and over 70 percent of clean, non-carbon producing electricity. Over 100 nuclear power plants are offering reliable and affordable baseload electricity in the United States, and they are doing so without air pollution and greenhouse gas emissions. NE is working to develop innovative and transformative technologies to improve the competitiveness, safety and proliferation resistance of nuclear energy to support its continued use.

The FY 2012 budget supports a balanced set of research, development, and deployment (RD&D) activities. This program is built around exploring, through its R&D: technology and other solutions that can improve the reliability, sustain the safety, and extend the life of current reactors; improvements in the affordability of new reactors to enable nuclear energy to help meet the Administration's energy security and climate change goals; development of sustainable nuclear fuel cycles; and minimization of risks of nuclear proliferation and terrorism.

NE is requesting \$125 million for Reactor Concepts Research, Development and Demonstration. This program seeks to develop new and advanced reactor designs and technologies. NE is also requesting \$67 million for the Light Weight Reactor SMR Licensing Technical Support program, which will support cost-shared design certification and licensing activities for two light water reactor-based designs. Small modular reactors are a technology that the Department believes has the promise to help meet energy security goals. Work will continue on R&D for the Next Generation Nuclear Plant to support demonstration of gas-cooled reactor technology in the United States. The program also supports research on Generation IV and other advanced designs and efforts to extend the life of existing light water reactors.

The FY 2012 request includes \$155 million for Fuel Cycle Research and Development to perform long-term, results-oriented science-based R&D to improve fuel cycle and waste management technologies to enable a safe, secure, and economic fuel

cycle. The budget also requests \$97.4 million to support the Nuclear Energy Enabling Technologies program, focused on the development of cross-cutting and transformative technologies relevant to multiple reactor and fuel cycle concepts. The Crosscutting Technology Development activity will focus on a variety of areas such as reactor materials, creative approaches to further reduce proliferation risks, and establishing advanced modeling and simulation capabilities to complement physical experimentation. The Transformative Nuclear Concepts R&D activity supports, via an open, competitive solicitation process, investigator-initiated projects that relate to any aspect of nuclear energy generation ensuring that good ideas have sufficient outlet for exploration. Modeling and Simulation Energy Innovation Hub, supported within this program, will apply existing modeling and simulation capabilities to create a “virtual” reactor user environment to simulate an operating reactor and is a prime example of the type of crosscutting, transformative activity that will enhance many research areas within NE. NE will also continue its commitments to investing in university research, international cooperation, and the Nation’s nuclear research infrastructure—important foundations to support continued technical advancement.

Office of Fossil Energy: Sustaining American Energy Options through U.S. Ingenuity

The FY 2012 budget request of \$521 million for the Office of Fossil Energy (FE) will help ensure that the United States can continue to rely on clean, affordable energy from traditional domestic fuel resources. The United States has 25 percent of the world’s coal reserves, and fossil fuels currently supply over 80 percent of the Nation’s energy.

The Department is committed to developing technologies and providing technologybased options having public benefits including enhanced economic, environmental and energy security impacts. In FER&D, the emphasis, in keeping with Presidential priorities, is in supporting long-term, high risk initiatives targeted at carbon capture and storage as well as advanced energy systems and on cross-cutting research.

In addition, \$122 million of FE’s \$521 million request will be to provide for national energy security through the continued operations of the Strategic Petroleum Reserve. The budget proposes to sell \$500 million of SPR oil in order to provide operational flexibility in managing the Reserve.

The National Nuclear Security Administration: Leading Global Partners on Non-proliferation by Securing Vulnerable Nuclear Materials; Reaffirming Commitment to Stockpile Modernization

The National Nuclear Security Administration (NNSA) continues significant efforts to meet Administration and Secretarial priorities, leveraging science to promote U.S. national security objectives. The FY 2012 President’s budget request for NNSA is \$11.8 billion; an increase of 5.1 percent from the President’s FY 2011 Request. The five-year FY 2012-2016 President’s Request for the NNSA reflects the President’s global nuclear nonproliferation priorities and his commitment to modernize the U.S. nuclear weapons complex and sustain a strong nuclear deterrent, as described in the 2010 Nuclear Posture Review (NPR) Report, for the duration of the New START Treaty and beyond. The NNSA’s defense and homeland security-related objectives include:

- Ensure that the U.S. nuclear deterrent remains safe, secure and effective while implementing changes called for by the 2010 NPR and the New START Treaty
- Broaden and strengthen the NNSA’s science, technology and engineering mission to meet national security needs
- Transform the Nation’s Cold-War era weapons complex into a 21st century national security enterprise
- Work with global partners to secure all vulnerable nuclear materials around the world and implement the President’s nuclear security agenda expressed in the May 2010 National Security Strategy and the Nuclear Posture Review report
- Provide safe and effective nuclear propulsion for U.S. Navy warships

The FY 2012 budget request of \$7.6 billion for the Weapons Activities appropriation provides funding for a wide range of programs. Requested activities include providing direct support for the nuclear weapon stockpile, including stockpile surveillance, annual assessments, life extension programs, and warhead dismantlement. Science, Technology and Engineering programs are focused on long-term vitality in science and engineering, and on performing R&D to sustain current and future stockpile stewardship capabilities without the need for underground nuclear testing. These programs also provide a base capability to support scientific research needed by other elements of the Department, the federal government national security community, and the academic and industrial communities. Infrastructure programs sup-

port facilities and operations at the government-owned, contractor-operated sites, including activities to maintain and steward the health of these sites for the long term and construct new facilities that will allow the United States to maintain a credible nuclear deterrent. The unique nuclear security expertise and resources maintained by NNSA are made available through the National Laboratories to other Departmental offices, agencies and to the Nation for security and counterterrorism activities.

The Weapons Activities request is an increase of 8.9 percent over the President's FY 2011 Request. This level is sustained and increased in the later outyears. The multi-year increase is necessary to reflect the President's commitment to maintain the safety, security and effectiveness of the nuclear deterrent without underground nuclear testing, consistent with the principles of the Report on the Plan for the Nuclear Weapons Stockpile, Nuclear Weapons Complex, and Delivery Platforms (known as the "1251 Report") and the Stockpile Management Program as stipulated in Sections 1251 and 3113(a)(2) of the National Defense Authorization Act of Fiscal Year 2010. Increases are provided for direct support of the nuclear weapon stockpile, for scientific, technical and engineering activities related to maintenance assessment and certification capabilities, and for recapitalization of key nuclear facilities. The President's Request provides funding necessary to protect the national resource of human capital at the national laboratories through a stockpile stewardship program that exercises and retains these capabilities.

The FY 2012 request for Defense Nuclear Nonproliferation (DNN) is \$2.5 billion; a decrease of 5.1 percent from the President's FY 2011 Request. This decrease reflects completion of long-lead procurements for the Mixed Oxide Fuel Fabrication Facility (MOX) and Waste Solidification Building (WSB). It also reflects our decision to await an agreement between the U.S. and Russia on detailed implementation milestones prior to requesting additional U.S.-pledged funding to support Russian plutonium disposition. The Administration prioritizes U.S. leadership in global nonproliferation initiatives as directed through the National Security Strategy and has advanced this agenda through commitments from global partners during the 2010 Nuclear Security Summit. In addition to the programs funded solely by the NNSA, Defense Nuclear Nonproliferation programs support interagency and international efforts to protect national security by preventing the spread of nuclear weapons and nuclear materials to terrorist organizations and rogue states. These efforts are implemented in part through the International Atomic Energy Agency, the G8 Global Partnership against the Spread of Weapons and Materials of Mass Destruction, and the Global Initiative to Combat Nuclear Terrorism.

DNN supports the President's goal to secure vulnerable nuclear materials around the world within four years. The Global Threat Reduction Initiative's emphasis in FY 2012 is to convert domestic and international nuclear reactors from weapons-usable highly enriched uranium fuel to low-enriched uranium fuel (LEU); while preserving our capability to produce the critically needed Molybdenum 99 isotope. The FY 2012 President's request for International Nuclear Materials Protection and Cooperation reflects selective new security upgrades to buildings and sites in accordance with the President's goal to secure vulnerable nuclear materials around the world within four years, as well as enhancements and sustainability support for previous work. The Fissile Materials Disposition program continues domestic construction of the MOX Fuel Fabrication Facility scheduled to come online in 2016; and design for the pit disassembly and conversion capability to provide it with plutonium oxide feedstock.

The President's request of \$1.2 billion for Naval Reactors is an increase of 7.8 percent over the President's FY 2011 Request. The program supports the U.S. Navy's nuclear fleet, comprised of all of the Navy's 72 submarines and 11 aircraft carriers, which constitute 45 percent of the Navy's combatants. The U.S. relies on these ships every day, all over the world, to protect our national interests. The budget provides funding increases for the Ohio Class Replacement submarine to design and develop required submarine reactor plant technologies. R&D is underway now, and funding during this Future Years Nuclear Security Program is critical to support the long manufacturing spans for procurement of reactor plant components in 2017, and ship construction in 2019. Resources are also requested in FY 2012 to support design work for the recapitalization of the spent nuclear fuel handling infrastructure and refueling of the Land-based prototype.

The Office of the Administrator appropriation provides for federal program direction and support for NNSA's Headquarters and field installations. The FY 2012 request is \$450.1 million; a 0.4 percent increase over the President's FY 2011 Request. This provides for well-managed, inclusive, responsive, and accountable organization through the strategic 25 management of human capital, enhanced cost-effective utilization of information technology, and integration of budget and performance

through transparent financial management practices. The increase reflects additional federal oversight for construction of the Pit Disassembly and Conversion project, the Uranium Processing Facility, and the Chemistry and Metallurgy Research Replacement Facility.

The CHAIRMAN. Thank you very much.

We do have a quorum of 12 members or a few more than that, so let me go ahead with our business meeting, as I indicated we would, before we start asking you any questions, Mr. Secretary.

[Whereupon, at 9:48 a.m., the hearing was recessed and the committee proceeded to other business.]

[Reconvene at 9:53 a.m.]

The CHAIRMAN. Mr. Secretary, let me start with questions, and we'll go back to the regular hearing. You described in your opening statement there the innovation hubs in a general way. Could you be a little more—elaborate a little more on what these accomplish that ongoing research is not able to accomplish in your opinion?

Secretary CHU. Sure. Let me be specific. Let's start with the transmission and distribution hub. Typically when we make grants in the past we made specific grants to improve the smart grid, improve devices within the smart grid. But if you look at where the gains can be made, it would be in actually integrating the entire system.

The system we have to evolve to is a system where you need to manage two-way flows, you need to integrate the fossil fuel generation in a way that's automatic. Just in case wind dies down or if clouds go over the sky and there's a lull in transmission of renewable energy sources, you have to automatically ramp up as quickly as possible these fossil fuel sources. The integration of that has only just begun if you look at the wide range of technologies that have to be developed.

So a hub like this will be emphasizing looking across all the board to actually get an integrated system of transmission and distribution, which also has to integrate into the generation and the use of energy and the two-way flows. That's one example.

Batteries. We invest a lot in batteries. Again, it's the same thing. There's a specific idea of a battery, but the thing that really matters is—if I take a subset, automobile batteries for electric and plug-in hybrid vehicles, those batteries, it's not just the battery technology, the cell itself, but it's actually the integrated system, how it's packaged, if it's integrated into something that actually takes out the heat and manages the heat. This is the thing that really matters in a car.

Again, if you look at the individual proposals we're doing, it all looks good. But if you look at what the competition is doing—for example, Toyota has recently announced that one advanced battery technology they want to develop—this is for a lithium-air battery or zinc-air; these are the kind of batteries used in your hearing aids. We're investing that similarly in university research groups and other groups and companies, but Toyota is putting 50 engineers in order to bring this to market, get them rechargeable, as a concerted effort, which includes the integration, the packaging into the car.

So an individual group doesn't have the wherewithal to do that. So we're saying, OK, so you look at the broad portfolio of things

and get a team to, say, deliver the goods that actually can be installed in a car. It's a very competitive world out there.

Finally, the materials hub. There are critical materials. We know that the world right now is mostly dependent on China for rare earth materials. So if you look at how we can get substitutes for rare earths, new technologies, or use the rare earths in a much smarter way so you use less of them.

There are other critical materials having to do with higher-temperature steels that would be useful in improving the efficiency of nuclear reactors and traditional gas and coal power plants. These things are—the plants of the future will be higher efficiency. These materials are again something looking broadly, how do you actually connect all the dots.

So this is exactly the vision we have, that also happened in World War II in the radar, where the scientists and engineers get together and they say, we have to deliver the full package, we've got to get it in the airfields, on ships, on airplanes. It's that concerted effort to actually do the basic research, but also to make sure it's deliverable in a very timely manner. It's a very competitive world out there and that is why we think we need these hubs.

The CHAIRMAN. Thank you.

Let me ask about a somewhat parochial issue here. At the beginning of this month we had very severe cold weather in my State of New Mexico and in Texas. There were rolling electricity blackouts. We had an interruption in natural gas service to about 30,000 New Mexico residents for several days.

We're going to have a field hearing next week in Albuquerque to look at this. The Federal Energy Regulatory Commission I think has initiated a staff inquiry into what went wrong and what could be done to prevent this in the future.

Does the Department of Energy have a role in responding to or investigating this kind of an energy emergency, and is there anything that you folks are doing or could do to be of help to us in understanding how to avoid this in the future?

Secretary CHU. The answer, the short answer, is yes, we do have a role. If there's interruptions in power, if there are things like you spoke about, also hurricanes, we are the agency that tries to coordinate. The energy delivery systems are private sector enterprises, but we have a responsibility to coordinate the restoration, to decide which areas to bring on as fast as possible, the most critical areas. So we have that responsibility and certainly we take that job very seriously.

The CHAIRMAN. Good. We might urge that you have—we're not calling anyone from the Department of Energy as such at this hearing next Monday, but we are calling representatives from FERC to testify. But you might see if someone from your Department might monitor what goes on there.

Secretary CHU. In terms of natural gas, I think that's more FERC's domain. We're mostly electricity, but we'll be happy to send—

The CHAIRMAN. We're looking at both because the natural gas producers say the problem was that they didn't get electricity and the electricity companies say the problem was they didn't get natural gas. So we're trying to figure out who's to blame.

Senator Murkowski.

Senator MURKOWSKI. It does sound like a government operation.

Mr. Secretary, I want to ask you about the Strategic Petroleum Reserve. The budget proposes a \$500 million non-emergency sale of SPRO oil. There's no explanation. I guess I'm a little curious about this, because we're sitting here more than 50 percent dependent on foreign sources of oil. We're not seeing any new permits being issued for domestic offshore production here. Given what is going on in North Africa, in the Middle East, from Tunisia to Egypt to Algeria to Iran and all that is happening, why is it appropriate at this particular juncture for the United States to reduce our stocks of emergency crude?

Secretary CHU. Yes, I'd be glad to respond to that. I think what we're asking for is a reduction. We have an issue with one of our reservoirs and there's one cavern that has some integrity issues, and we're draining that and backfilling other storage locations. But we're concerned of an overfill in those storage locations.

So what we want—we don't want to lose this crude. So we are trying to manage that. In addition, I think the scale is also very important. We're talking about—we're required by law, both the government resources and the private sector, to have a 90-day supply of oil. The government portion of that would be 75 days. So what we feel is going to be a temporary reduction will reduce the total supply, emergency supply, by 1 day as we work through the cavern issues.

Senator MURKOWSKI. But from what you said, we have some issues with integrity of the reservoir itself. So that could be a longer-term issue that we're dealing with or perhaps a more costly issue as we work to address the challenges?

Secretary CHU. Right. It's the reservoir, meaning the caverns, the underground caverns where we store those.

Senator MURKOWSKI. Right.

Secretary CHU. So there are some integrity issues with one of them. So we are working to do this.

Also, right now, because we're in this economic downturn, severe recession, for the moment the reserves—we're expecting a flat or even declining use of oil. Now, as that goes up we certainly have to adhere to the responsibilities and we would like that to be essentially full. So it's a temporary situation.

Senator MURKOWSKI. I'd like to learn a little bit more about what's going on within these caverns, and we can have a follow-up conversation on that.

Let me ask you about the comments that you made as it relates to a clean energy standard. Of course, the President discussed this in his State of the Union. But looking at the budget, it appears that some resources will be advantaged over others. If you just look at it from a budget perspective, wind is getting a 60 percent plus-up, solar almost 88 percent increase, biomass is at about a 57 percent plus-up, geothermal 135 percent, massive budget increases in terms of their categories.

But you look to some of others: hydropower, which is one that we pay particular attention to in Alaska, cut by 20 percent; nuclear power decreases slightly at .6 percent; nuclear waste is not addressed; all funding for natural gas technologies are zeroed out.

When we're talking about how the administration might look to design a CES, if that's the direction that we go, the question is will it be a technology-neutral standard. I'm hoping that the answer to that is yes, but when you look at these budget categories it seems to me that within the administration you are picking those areas through the budget process that you would like to see enhanced and also choosing to not promote in certain other areas.

Can you address that?

Secretary CHU. Sure. First, the clean energy standard is meant to be technology-neutral. Any technology that will advance the goal of producing energy in a clean, sustainable way is on the table. So there are certain regions that like solar, if they like wind, if they—hydro, with improved turbines to get more output from existing dams—those should all count in clean energy. Natural gas has partial credit. Clean coal, coal with carbon capture and sequestration, would also count.

So in that respect, that standard, which creates a marketplace, it creates certainty for industry and for the investment community, so they say, OK, if you build a clean coal power plant, if you build a nuclear plant, if you build solar or wind, that you have a market. So that's one part of it.

Now, if you look, the other part of the question is you're now referring to our technology investments. If you look at the history of the United States, there are mature technologies and then there are technologies that we need to have further developed. In the beginning, the late 1800s, the beginning of the first half of the 20th century, oil and gas got considerable help from the Federal Government to grow those things.

We consider those mature technologies today. But if you look at, for example, the solar industry, we feel that there could be dramatic improvements in photovoltaics and solar thermal. Quite frankly, it's a world race in order to get to those improvements. Whether it's going to be by the end of this decade or perhaps a few years further, there's a significant chance that solar energy will be competitive without any subsidy with fossil fuel. The country or the companies that develop that technology will have a worldwide market.

So we see these as putting investments in the new technologies that we think ultimately will be the technologies of the future. The other ones we will need and there's no doubt we will need oil, we will need gas, we will need coal going forward. There's no doubt about that. But we consider those more mature technologies.

Senator MURKOWSKI. Mr. Chairman, my time has expired. I know we're going to have an opportunity to discuss this further, but it does appear, just looking at the budget categories, that the administration is clearly picking those winners and designating those losers.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Coons.

Senator COONS. Thank you.

Secretary Chu, I just wanted to say I was very pleased with the broad direction this budget submission takes. I think the strategy for American innovation documents a fairly compelling vision, and

I'm interested to dig into some of the details of a number of the different programs here.

I support ARPA-E getting a significant increase and think it has shown, both in its strategy and its focus, a real innovative approach. I'm concerned about how, beyond investing in basic research and then in early applied work, commercialization gets ramped up. I was very pleased to see the 48

[c] program, the loan guarantee programs, be part of your request and Treasury's request.

Please help me understand how electric vehicle deployment and offshore wind deployment, which I think are neither early stage lab bench nor, obviously, fully commercialized technologies, how your proposals are going to help ramp them up quickly and what they're going to do to make sure that they're sustainably supported in the budget?

Secretary CHU. As I said before, the electric vehicles, I see this as a worldwide race. Right now we have electric vehicles. We anticipate by 2015 to have a real penetration. We think we can achieve a million vehicles. But we want to go much further than that. I think we need to develop electric vehicles that can go 3 to 500 miles on a single charge overnight, and at a price and a performance that would be competitive with internal combustion engines.

We think that this goal is within reach. There are a number of very innovative ideas that the Department of Energy is funding that can greatly reduce the cost, greatly increase the safety and, above all, the energy density by a factor of 3 to 5, 300, 500 percent improvement.

We know that industry will achieve 100 percent improvement to 50 percent improvement within a couple years. In fact, it was an idea that was funded by the Department of Energy, done by a national lab, Argonne National Lab, patented, the first patent application in the year 2000, there's a bevy of patents, now being licensed by General Motors for the next generation Volt battery. These are all very, very good stories.

But further—so another few years down the road, we see great things. So we're very focused on that, not only on batteries for vehicles, but batteries for energy transmission and storage, so we can use all our sources of energy much more effectively.

Senator COONS. How will the proposals here help offshore wind deployment, in particular the credit subsidy cost and the loan guarantee program?

Secretary CHU. So wind is a fairly mature technology, but offshore wind, as you indicated, is not. In order to be financially competitive and to get the investments it needs, offshore wind has to be much more reliable because of many things. The initial costs are more, but even more important in my mind, these things have to operate, the large turbines have to operate, perhaps 15, 20 years without major overhauls. That reliability is something we need to work for, work toward.

What we are investing in is what do we need in order to enhance the reliability of these very large turbines, because in choppy seas you cannot service these turbines. But the flip side of that is the wind resources offshore are better, they're steadier, they're higher

category wind sources, and they're closer to the population centers. So if you go 15 to 20 miles offshore in the Eastern seaboard and the Great Lakes, you have something that's not directly in anyone's back yard and you have a steady wind source.

So the advantages of offshore are tremendous. But we need technology development.

Senator COONS. Last, if I could, you've got a whole suite of energy efficiency initiatives here: the better buildings initiative, the race to green, Home Star, which is already being deployed in Delaware. Talk to me about how a different approach here is a model for how you're going to make significant advancements in efficiency and how that's going to help business competitiveness?

Secretary CHU. Sure, be glad to. The idea here is we believe very strongly that if you have—if you make modest capital investments—and in the end these are going to be hopefully capital investments where you borrow a long-term loan—that you can then make investments so that out-of-pocket expenses, including payment of loans, is actually saving you on a month to month, year to year basis, so that these investments paying back over a 20-year period, the length of time of these energy improvements, can actually save money.

So we're targeting in this new better buildings, it's a pilot program. You look at universities and schools and hospitals, that we can give them the necessary capital in order to make these investments. We want to also prove that these are real moneymakers and real energy savers. It's very important to demonstrate numerous times that making investments in energy efficiency, including the interest on the loan and even the discount for that, is something which is a net money maker. So we're also working with Sean Donovan in HUD to enable one to develop mechanisms of financing, long-term financing, that can enable people, both people in their homes and businesses, in order to get this energy savings and make our infrastructure run much more efficiently. That money saved goes directly back into the economy.

Senator COONS. Thank you, Mr. Secretary.

The CHAIRMAN. Senator Portman.

Senator PORTMAN. Thank you, Mr. Chairman.

Secretary Chu, thanks for being with us today. I would note that your budget increase since 2010, which is essentially where we are in the CR this year, is about a 12 percent increase. Being on the Budget Committee and talking to other agencies, that's not the case with all, as you know. Certainly in this budget environment we face, I am pleased to see you talking about streamlining operations and some of the tough decisions you've made on freezing salaries of certain employees or contractors, and I hope you will continue to focus on that.

I would share the chair's concern and the ranking member's concern on some of the priorities in the budget, particularly on the fossil fuel side, because, given not just our budget problems, but our economic problems, we need to be sure that we're able to continue to rely on relatively inexpensive fossil fuels to keep our economy moving forward and create jobs.

You talked about revving up the great American private sector to address energy needs in your testimony. I couldn't agree with

you more. You used the example of Toyota putting 50 engineers against a project and in essence saying the U.S. Government needs to counter that. We also need to be sure that the private sector is incentivized to do that, which goes to our regulatory environment and other issues.

So I, having talked to you privately, I know you have an interest in being sure that the picking and choosing by government doesn't displace that private sector ingenuity and innovation. I hope that continues to be the case.

On nuclear power, you did list it this morning on your list of clean energy sources. I was pleased to see that and encouraged that you seem to be interested in moving forward. I would hope we could expedite the regulatory regime there. That's not something that I see addressed adequately in this budget, and obviously the loan guarantee is critical to get out so that we can catch up, frankly, on the nuclear power production in this country.

I have a specific concern, as you know, on the source of fuel for nuclear power, which is the enriched uranium. You and I have talked about the Piketon plant and the American Centrifuge project, which is the only manufacturer of that enriched uranium in the U.S., U.S.-owned, for a nuclear Navy and also for nuclear power plants.

I would ask you a question about that if I could. There is, of course, a loan guarantee application pending and I'm very concerned that it's taken a few years to move that forward. As you know, we're at a very critical juncture there.

One of the issues is going to be what the credit subsidy is. I'm assuming that there will at some point be an understanding on the technology and on the financing side of this from the company's point of view. But still, we have a credit subsidy issue.

If you could talk to me just for a second about how you determine that credit subsidy and whether national security is one of the issues that's considered. As you know, this will be the only source in the United States for tritium, which is critical to our nuclear weapons arsenal, and whether that is considered in the credit subsidy calculation.

Secretary CHU. OK, there were a number of topics you covered, so let me go back to just—

Senator PORTMAN. You don't have to hit them all.

Secretary CHU. Let me try, at least the nuclear part. I mean, the specifics of the loan guarantee, of course, you know I can't comment on. But over globally, I share your view that the United States should have an in-country technology, and we are anxious to make sure that we have a technology that is intellectual property and it's done in the United States and it's intellectual property we own, it's not black box. So we share your view that that's very important to our national security.

In terms of the specifics of the credit subsidy, that is something—officially, that is in the bailiwick of the OMB. When we do our due diligence, we try to structure the deal to protect the taxpayer as much as we can, so that we make sure that the loan is a sound loan and that if something should go south the U.S. Government can get back a lot of the assets. But the exact credit sub-

sidy we can make recommendations only, but they have the final word.

Senator PORTMAN. Do you believe national security should be a consideration?

Secretary CHU. It should be, absolutely, in particular technologies like the enrichment of uranium, I agree. But I'm not sure how—but the credit subsidy part is something the OMB, they should be able to factor that in as well.

So with regard to fossil, we had to make some tough decisions, but part of the guidance on the fossil energy—I agree with you, the fossil energy will be part of our future, but if you look at the Recovery Act and our base budget, for example, clean coal technologies and in sequestration, the demonstration of sequestration, multiple sites in the United States. We already know over a decade or more of experience at certain sites around the world it's proved to be safe storage for long periods of time.

But we have to go further in demonstrating in U.S. geological sites that at scale it's also safe. That's something that private industry will not do and we're stepping up to the plate, and that's part of our program.

In terms of the demonstration—

Senator PORTMAN. But the budget reduces funding for carbon sequestration.

Secretary CHU. Right. That's right. The other part has to do with helping demonstrate technologies, especially technologies near commercial scale. So in the Recovery Act and our base budget we made about \$4 billion of commitments in the last 2 years, I would say matched by the private sector with \$11 billion. So that's very, very significant.

We felt because of that that the demonstration and deployment part of this has got a good start. So we're focusing on the next generation of technologies, which we believe can dramatically reduce the prices relative to the demonstrations that are being planned or are about to go into operation today. So we made that difficult choice.

Senator PORTMAN. My time is up. I look forward to following up with you on sequestration.

Thank you, Mr. Chairman.

The CHAIRMAN. Senator Franken.

Senator FRANKEN. Thank you, Mr. Chairman.

Mr. Secretary, thank you for being here today. It's good to see you again. I understand you were in Minnesota last week and I apologize I wasn't able to join you. But I'm glad you had a chance to sit and talk with Minnesota leaders in energy technology and innovation.

In looking through this budget proposal, I'm happy to see that the administration has prioritized innovation and renewable energy. Those are my priorities as well, and I'd like to ask you a few questions in some pretty specific areas.

At the risk of sounding parochial, but I think this has wider implications and it speaks to the loan guarantee programs, and I know that you may not be able to speak precisely to these particular instances. But one of the countries represented at the roundtable that you were at in Minnesota was Sage

Electrochromatics. Sage has developed these energy-efficient windows, as you know, which work on solar voltaic cells to—they darken during the summer to keep the heat out and they lighten up during the winter to bring the energy in. Actually, they lead the world in this technology, and they're looking to expand its facility in Farabow, Minnesota, which will create 150 high-tech manufacturing jobs.

Now, Sage got a \$72 million loan guarantee under the section 1703 program, but, as you know, this requires the company to pay a credit subsidy fee to offset the government's risk for issuing the loan guarantee. For Sage, this costs an estimated \$15 to \$25 million and is standing in the way of expanding the plant.

I'd like to get this credit subsidy fee waived for Sage so that the project can move forward. In this budget proposal, the administration is requesting \$200 million from Congress to cover credit subsidy fees for 1703 loan guarantees. I was wondering whether the Department would consider making this retroactive for companies like Sage which are ready to go for creating jobs?

Secretary CHU. I'm not sure about the authorities we might have for making it retroactive. I think this is mostly in Congress. But let me speak more broadly to the issue here. I'm very familiar with the Sage product and, quite frankly, it was tested and Lawrence Berkeley National Lab, the lab that I was a director of, was part of that, an integral part of that testing. We think it's a good thing.

But I don't want to talk specifically about Sage.

Senator FRANKEN. I understand.

Secretary CHU. The most important thing I want to say is, in the new budget proposal that was limited to renewable energy, but we are asking that it be broadened so it would also include energy efficiency.

Senator FRANKEN. Right.

Secretary CHU. Energy efficiency, you can either make clean energy or you can save energy, and we think they're equally valuable. In many instances, saving energy is a low-cost option to make our infrastructure run much more efficiently.

So the new request in our 1912 budget is actually to allow credit subsidies for energy efficiency, as well as renewable energy.

Senator FRANKEN. That's good. I like that.

I think I want to move on to the ARPA-E program, which is so critical for new technologies. ARPA-E reminds me of DARPA, the Defense Advanced Research Program Agency, which created the Internet. How did that work out? That was good, right?

Secretary CHU. I've been told the Internet has had a profound influence on the American economy.

Senator FRANKEN. OK. So what I worry about—I saw recently that a group funded by ARPA-E licensed its new battery technology to General Motors for use in the Chevy Volt. In the years ahead, technologies like this are vital to help us reduce carbon emissions and use less oil.

I was glad to see that the President requested \$550 million for ARPA-E. Unfortunately, some in the House have proposed funding only \$50 million for the rest of 2011. My question is, if we are to extrapolate and follow the House-proposed ARPA-E budget for fiscal year 2012, what would you anticipate the impacts to be on de-

velopment of new technologies and on the companies that would eventually sell them to the commercial market?

Secretary CHU. It would be a very significant setback. As you know, the ARPA-E is a new program that was started a year and a half ago. What already is mentioned—as I mentioned before, the investments in the first round companies that we have now a year, year and a quarter, year and a half of experience, has been remarkably good. We give \$3 or \$4 million, \$2 million, to a company, they go around and do the necessary research. With those new research results, they are able to raise money in the private sector. That's a significant 4 to 1 ratio.

This is exactly what we want to do. We want to leverage the precious Federal dollars to really stimulate industries to create these new things, so that we will remain a leader in innovation in the energy technologies.

At a budget of \$50 million, a lot of these spectacular people that we have been able to recruit over the last year—these are people who've come out of industry, people who've come out of academia, who are in the prime of their creativity, who are—and it's been noted—many of these people are truly outstanding scientists and engineers who are willing to sacrifice their own lives and families and income to come work for the Federal Government. Those people, some of them will just simply have to go home. It will deflate a lot of things, because if you don't give them money to manage this they'll say: What am I doing here? I'll go back to MIT, I'll go back to Intel, I'll go back to wherever.

So to use the technical word, it'll be a real downer, and the opportunities to the United States in order to get what industry widely regards and venture capital widely regards as a very exciting program—

Senator FRANKEN. I'm in total agreement and it would be a bummer. If we are going to out-innovate the rest of the world, ARPA-E is so important. I just would ask people to think about what would have happened if we hadn't had DARPA and DARPA had never created the architecture for the Internet, what the loss of that would have been. So thank you very much for your testimony.

Secretary CHU. Thank you.

The CHAIRMAN. Senator Lee.

Senator LEE. Thank you so much for joining us today, Mr. Secretary.

I want to start with the President's ambitious goal of achieving 80 percent clean energy resources by the year 2035. Can you talk to me for a minute about what you anticipate will be the distribution among clean energy resources at that point, meaning as we examine that universe that will comprise the 80 percent of our total power needs what percentage of it is likely to be from nuclear, from wind, solar, hydroelectric, geothermal, and so forth?

Secretary CHU. OK. First let me start with where we are today. We're roughly 40 percent, 20 percent nuclear. Hydro is 6.5, 7 percent. Wind is 3 or 4, let's say 4 percent now contribution. Solar is smaller. Geothermal is half a percent, a third of a percent. Remember, we're giving partial credit to natural gas. So if you look at strictly carbon-free sources, we're at 30. But then you get to 40 with partial credit.

So the goal is ambitious, but it's actually quite reasonable if you think of it, especially in the time scale, because the time scale to 2035 is very important because we have to work very hard to drive down the costs of clean coal. It's not only clean coal, but the carbon capture and sequestration will be needed in all fossil fuel generation—gas, also stationary sources of carbon. So it is very important that we develop those technologies.

To get large-scale deployment and get the investment, a 10 to 15 year time scale is just too short. So that's why it was 2035.

Nuclear, a similar sort of thing. If you want to say, I want to build a nuclear power plant, and you begin now to think about it, 10 years is too short. 15 years in my opinion is too short. But by the time you're at 20 years or 25 years, that gives you a lot of headroom.

I think we're anticipating that nuclear at 20 percent, we'd like to grow that. The clean energy standard, by the way, gives the marketplace the certainty that clean energy production will be needed. So what nuclear faces today is it needs to establish a track record, you can build the reactors in a timely manner on budget, on time, and that over the long haul, because when you invest in a nuclear power plant that's a 70-year investment, perhaps over longer, that over that period of time you will have a market.

So we see that as a great stimulus, but it won't automatically shift there. We see it increasing a little bit. We see natural gas increasing. We also, quite frankly, see renewables, solar and wind increasing. Geothermal will be increasing where it's appropriate. But we see all of them increasing.

Senator LEE. But do you have an anticipated breakdown of where the 80 percent will come from? I mean, will half of that be from nuclear?

Secretary CHU. I think less than half will be from nuclear. Again, it really depends going forward on what happens, especially in the solar technology field, because we anticipate the price—most industry—people in the industry believe that the price of solar energy will drop by 50 percent within this decade, and where again we have an initiative to see that it drops by 75 percent.

If it drops by 75 percent, solar can be a huge factor.

Senator LEE. How are you dealing with the fact that, as great as the developments in these areas, the areas of wind and solar may be and have already been, how do you deal with the fact that they can't really provide what we call baseload power?

Secretary CHU. In fact, that's what one of our hubs is doing. Again, you need a diverse supply of energy. You need energy on demand. If you look, for example, at what northern Europe is doing, in certain countries, let's say Ireland, they're already 20 percent wind, 80 percent fossil. In order to get to 20 percent wind, you need to have a generating capacity of 40 percent. What they have done is they have looked up a system so they integrate very intimately the fossil fuel plants with the wind and very short-term predictions—hour, half hour—and automatic controls enable them—and they claim that it does not decrease the efficiency of the fossil fuel plant.

So we have to integrate all those things.

Senator LEE. With regard to nuclear, would you agree that it's a good thing to have available domestic sources of uranium?

Secretary CHU. Yes.

Senator LEE. Were you consulted by your counterpart at Interior, Secretary Salazar, in his efforts to effectively halt the mining operations? Some of the Nation's very best uranium mining operations can be found in southern Utah and northern Arizona. Yet those have been largely halted by Secretary Salazar. Did they consult you prior to doing that?

Secretary CHU. No, he didn't. But I'd be glad to work with Secretary Salazar. I'm sure he has very good reasons and we would be glad to work with him on that.

Senator LEE. Thank you.

The CHAIRMAN. Senator Udall.

Senator UDALL. Thank you, Mr. Chairman.

Good morning, Secretary Chu. Always a pleasure to see you, and thanks for your leadership. It's been consistent, it's been clear, on this whole area of opportunities, which is clean energy. I was encouraged by the pledge the President made in the State of the Union last month. I'm also very pleased to hear that you and Secretary Salazar are working together to make sure that we can deploy renewable energy on our public lands in an appropriate way.

I also understand that you're working even more closely with the Department of Defense to help them transition their energy systems to cleaner, more efficient, and safer technologies. That has a certain harmony since the DOE is an offshoot or a sibling, maybe a child, of the DOD, for those who know the history there.

We're going to have to have a really concerted effort, as you well know, to reach these clean energy goals and a lot of important pieces have to be put together to help us arrive at that place. One example of such a project—and you won't be surprised, I'm going to be a little Colorado-centric here in my question—is the Energy Systems Integration Facility, which is at the National Renewable Energy Laboratory in Colorado. My opinion is it's needed because it's the only R and D facility that can model, develop, and validate the complex integrated systems that are required to move clean energy technology onto the grid, as you just shared in that regard your thoughts with Senator Lee. Also, there will be applications into the DOD needs when it comes to their installations and their forward operating bases. As I understand it, ESIF will also ensure that we keep our current high standards of grid efficiency and reliability.

Can you tell me what's being done to expedite the ESIF project, and how soon do you think we can get ground broken?

Secretary CHU. Yes. As you know, we can't start a project until we accrue all the funds necessary. What has happened because of the cost, we've been sort of piggybacking 2-year budgets. The last budget, 2011, should enable us to ground-break. But right now, as you well know, the 2011 budget is a continuing resolution and so we hope that somehow Congress can see the wisdom in allowing that project to go forward.

But that's the hangup at the moment, is the last installment before we actually can start the project.

Senator UDALL. I don't want to be a contrarian, but I did want to throw out this point, that I think ESIF's an ongoing project, which means it isn't subject to the CR and therefore would not need the final appropriation to start construction.

Secretary CHU. I can go back and look at—I'd be willing to go back and look at it. But I've been informed by my people that the last—again, it is an ongoing thing, but there was an allocation in the 2011 budget for that.

Senator UDALL. I'll keep pushing. We'll work with all of your experts and the appropriators and everybody else who's involved. There's enormous opportunity here.

Let me also comment that I think this budget has done what we've got to do across the entire Federal budget, which is set some priorities, reduce here, increase there. In particular, the focus on innovation, R and D, in the new emerging technologies versus the more mature technologies really makes sense to me from where I sit.

I don't know if you've talked more about the SunShot program, but in my remaining time I wanted to point out that it looks like there's a \$7 million cut in the proposed budget. It's almost a 10 percent reduction. I just was curious how we can simultaneously give a vital new role and responsibilities to the NREL solar team while at the same time propose that we give them fewer resources to accomplish a pretty ambitious goal?

Secretary CHU. My recollection—I don't know. I can get back to you on that. Certainly the SunShot goal is something we have spent a lot of time thinking about. It's something that we really believe will help propel the innovation in the United States so that we can become not only competitive, that we can be a dominant force in the technologies for solar power.

So we have pulled a lot of things into the budget. It's a very coordinated attempt as well that cuts across the energy technologies area, energy efficiency, renewable energy. It also cuts across ARPA-E and the Office of Science. We brought in an outstanding engineer who happened to be just elected to the National Academy of Engineering this year, a person in his 40s. Again, that's the caliber of people that we are now being able to attract to this. He's leading the charge on how to coordinate all these things to drive the cost down and to do the research, including research in manufacturing technologies. We're talking about fully installed costs. We're not just talking about modular costs.

So it's something we're very excited about and it really will—it will be one of the landmarks, if successful, in the President's pledge to out-innovate, out-compete. This is going to be important.

We actually have gathered money up and said we're funneling it into this for that Sunshot. So I think it's going the other way. We're actually increasing the budget for that program.

Senator UDALL. Thank you, Secretary Chu.

The CHAIRMAN. Senator Hoeven.

Senator HOEVEN. Thank you, Mr. Chairman.

Dr. Chu, good to see you again. Thank you for your trips out to our State, multiple trips. We appreciate that very much. As you know, we're doing exciting things in energy development, and we work very hard to support energy development across the board.

You know that. You've seen it, both in terms of what we're doing through our universities, what we're doing through our State programs, like our oil and gas research fund, our lignite energy research fund, our renewable energy programs, biofuels, wind.

All of those—and I know you've had a chance to observe them and learn a little bit about them. But the concept that we've employed is let's develop all of our energy resources, both traditional and renewable; let's try to do it in a way where we create partnerships and synergies between them; let's do it in a way where we incentivize new technologies to not only produce more energy, more dependably, more cost-effectively, with better environmental stewardship; and let's build a legal, tax, and regulatory environment where we create as much certainty as possible, so that we encourage private investment because companies, investors, know the rules of the road.

That's the approach we've taken, and we're seeing growth both in traditional sources, oil and gas, coal, clean coal technologies, and the renewables as well, the biofuels, the wind, solar, biomass, and so forth.

So when I look at your budget—and this follows some of the comments made by Senator Murkowski and probably Senator Portman as well—you really seem to be stepping into this situation where you're picking winners and losers. But if we're going to create—and every source of energy has its strengths and every one, each one, has its weaknesses as well. You really seem to be choosing, rather than this concept of let's bring them all up together, create more jobs, grow this economy, and work toward a clean energy environment where the new technologies drive better environmental stewardship in all of the different subsectors of the energy category, oil and gas, coal, traditional sources, as well as renewables.

So why are you going that direction, rather than really trying to bring all of them up together, based on what you see going on in our State and other places, where it's been very successful?

Secretary CHU. Sure. It's very much along the lines that Senator Murkowski was talking about. It's actually for the same reason why we're decreasing the investments of onshore wind and saying, what do we need to do to promote offshore wind, because we feel that onshore wind is becoming a mature technology. So in those areas where you have very mature technologies that are proven, they're profitable, some very profitable, we feel that they don't need that assistance.

The clean energy standard doesn't actually pick any winner, so that's different. We again want to differentiate between investments in technology development R and D that could help improve things.

Now, in our investments in R and D, for example this materials hub, we are very keen on developing new alloys of metal or metal-ceramic alloys that can go to higher temperatures. That will be extremely useful in things like new generations of efficient cogen plants for gas, as well as nuclear. But it's a research and then finally research and development opportunity.

So we want to invest in things which will give the United States the competitive edge, primarily in areas where we do not see the private sector, just as we do not see the private sector picking up

in sequestration experiments that we think is a vital part of what we need. So we say, OK, in that case there's a real government role.

But the clean energy standard proposal itself doesn't actually pick a winner or a loser. If it looks like natural gas can be competitive, natural gas gets to play in the field. Each region—the energy issues are regional. Some areas like renewables and wind and have great solar resources. Other areas think that nuclear power would be a good proposal. So it doesn't—the clean energy standard specifically doesn't pick the winners. You're talking about our investments.

But our investments are R and D investments in technology.

Senator HOEVEN. Right, but I would submit to you that to develop a lot of the energy sources that you want to develop in these areas you're going to have to create these partnerships and synergies, and you can't just invest in certain subsectors. You're going to have to work with all of them.

Sequestration is a great example. You're going to need oil and gas research in the nontraditional methods to truly develop sequestration if you want to put CO₂ down a hole and bring up tertiary oil recovery. That's one example.

Secretary CHU. I think the oil and gas industry could be extremely helpful in helping us in sequestration, not only—enhanced oil recovery is not really sequestration. It's using the carbon dioxide to squeegee more oil out.

Senator HOEVEN. But it makes it economically viable, and that's vital, right?

Secretary CHU. They recover the carbon dioxide and use it for more EOR.

But I think the technology—but I agree with you that the technology that the oil and gas industry has would be vitally useful, and I'd love to work with them in putting up monitoring of where the carbon dioxide goes, because there is a real opportunity there. So I would ask that you encourage the oil companies to partner with us in that.

But again, it's something—these are technologies—we're investing in the things that are going to make us competitive in the next year and the following year and the years to come. We see a worldwide market out there and a worldwide competition.

Remarkably, I might add that there are 2 partnerships in carbon capture and sequestration with an American company, AEP and Duke Energy, with 2 companies in China, Hunang Group and ENN. The sequestration experiments are actually being done in China—the capture experiments, rather. So China also sees an economic opportunity here.

So I think we want to invest in that research that will actually—we want to see it made in America. Let me be blunt about all this stuff, because again that's something very important to the future prosperity of this country.

Senator HOEVEN. I know I'm out of time. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator HOEVEN. I look forward to more discussion on that subject.

The CHAIRMAN. Senator Sanders.

Senator SANDERS. Thank you very much, Mr. Chairman.

Secretary Chu, let me just thank you very much. Your job is a difficult one. You're dealing with contentious issues. You're taking on very powerful special interests. I think in the last 2 years you have done an extraordinary job, and I thank you very much for what you've done.

One of my concerns is that we are in the midst of a horrendous recession. Unemployment is extremely high. As chairman of the Green Jobs Subcommittee, we had a hearing yesterday just dealing with sustainable energy. What we discussed is the fact that China now manufactures roughly half of the world's wind and solar energy products, while at the same time the United States, we've lost 42,000 factories in the last 10 years.

So our manufacturing capabilities are crumbling. China is exploding. There is a great fear out there that a lot of these technologies—solar, wind—that were developed in the United States are slowly but steadily moving to China.

Now, how do we rebuild those technologies here in the United States? How do we have factories producing the wind turbines, the solar panels that we need? How does your budget reflect those goals?

Secretary CHU. Thank you for that question. First, I will agree with you there is a race out there. The country and companies that develop the clean energy technologies that will be needed in the future or the energy transmission and distribution technologies, the highest voltage transmission lines, the most efficient plants, the most efficient infrastructure, that country can not only have great advantage at home because they run more efficiently, they don't waste as much money, but they have a world market out there.

This is why the President, in these very tough budget times, has chosen to not decrease the Department of Energy's budget, but to actually increase it in very, very hard budget times. There was a difficult choice made. I agree with you wholeheartedly. Especially in the last 10 years, U.S. manufacturing has nosedived.

So it's not only that we invest the things here with our great research universities and national labs, but we also do the innovation here. We don't want it invented in the United States and manufactured in China.

Senator SANDERS. You know that there was a very sad story in Massachusetts. There was a major—

Secretary CHU. Oh, yes.

Senator SANDERS. You saw that. They shut down and they moved to China, for a variety of reasons. But I think you are cognizant of that, and we're going to work together to rebuild our manufacturing base and we're going to focus on sustainable energy.

Secretary CHU. Right, absolutely. Now, I go back to the clean energy standard. This creates a market, a market certainty, to drive investment. Quite frankly, if you look, talk to any manufacturer around the world, whether it's wind turbines or solar energy, there is a key—any company, whether it's in Spain or Germany or Denmark or China, they would prefer to set up local supply chains for wind turbines in the country that they're going to be used. The way

to develop local supply chains, which means local manufacturing, is that you have to create a market.

So it's very important. So that is—the clean energy standard creates that market. You develop the local supply chains. You bring back the manufacturing capability in the United States. “Made in America” is something that we have been very proud of for over a century, and we have to get back the quality manufacturing back in the United States. The clean energy standard creates a market draw for that.

Senator SANDERS. I couldn't agree with you more.

Let me just ask you another question or 2. As you're aware, I strongly support solar energy. We've authored a bill called the 10 Million Solar Rooftops. I believe that this bill complements your SunShot initiative, which aims to make solar cost-competitive with fossil fuels. We're making significant progress as the cost of solar panels goes down.

I look forward to working with the Department to incorporate some elements of your initiative into a new version of 10 Million Solar Rooftops, in particular focusing the competitive grants in my bill on helping to cut the cost of solar energy by making local permitting more efficient.

Can you talk a little bit about how standardization of permitting could help reduce costs of solar energy installations?

Secretary CHU. Yes, absolutely. I think you have to break down the barriers in the local communities, the cities and municipalities. Right now in many places around the country, I should say most places around the country, the local towns or cities or districts would say, oh, you want to put a solar thing on your rooftop? It requires a structural inspection of your roof to make sure it doesn't fall down. It requires licensing agreements, things of that nature.

So we're doing 2 things. First, as part of our SunShot initiative we want to develop those technologies that greatly reduce the load, the weight load, going from very thin glass backings to plastic backings, so you don't have to puncture the roof.

But the other thing we want to do is to work with the local communities so that, for example, you don't—there are not long delays. I've heard some stories where if you want to put a solar panel on your roof you have to go and stand in line and personally—it's a department of motor vehicle experience, I am told, that you're sitting on line for several hours to get a permit. We don't require this for a water heater.

So what we'd like to do is to help the local—this is the local community jurisdiction, this is State jurisdiction. But we would like to help them streamline those things.

Senator SANDERS. I think that that is terribly important.

The last point that I want to make, Mr. Chairman, is to tell you Vermont has been a leader in the Nation, as you know, in terms of energy efficiency. We are getting out the weatherization money that came from the Department I think very rapidly and effectively. I can tell you many wonderful stories where older people are now living in homes which are much more energy efficient, saving a lot of money on their fuel bills and saving energy consumption in general.

We are also beginning to make some significant progress in moving toward sustainable energy. I know the stimulus bill is much maligned, but as a result of the money coming into the State of Vermont you drive around the State now, you see a lot more solar panels, significant solar installations. Some businesses are getting almost all of their electricity from solar. We're going to move forward on wind.

So I think we're making some progress. We look forward to working with you. Thank you for what you're doing.

The CHAIRMAN. Senator Barrasso.

Senator BARRASSO. Thank you very much, Mr. Chairman.

Secretary Chu, welcome back to the committee. As you know and others have mentioned, the President's budget calls for a significant increase over 2010 spending levels. I know you still have unspent stimulus money and Senator Murkowski made reference to that. I remember us having a discussion in the committee with the stimulus money earlier about how can you spend all of that money. Your own inspector general has identified major problems with how the money has been spent—bills paid to contractors for labor charges when no labor had been done; materials that had not been installed, and on and on and on and on.

I still have a lot of concerns about that stimulus money, how it's been spent and the justification for additional budget at this time.

In your response to Senator Murkowski, you justified massive increases in funding for renewables because you said they were not mature technologies yet. The budget cuts 26 percent from clean coal investments. Clean coal is something that the President even referenced in the State of the Union. So my question then is, is clean coal a mature technology in your perspective?

Secretary CHU. No, clean coal is not a mature technology. As I tried to explain, the investments in the Recovery Act, inappropriately maligned, is tremendous investments in clean coal technologies during that period. The clean air base budget, \$4 billion have been obligated to those. That's a lot of money to obligate to those technologies. So we believe clean coal—in fact, the capture of carbon from all the stationary sources is part of the technologies the world will need in the coming years, and we want the United States to have a leadership position in this, because coal will be around. It's not only the United States, but China and India and Russia have tremendous coal reserves that they will use, and there will be a market for that internationally.

So we think that it is a vital part of that. With regard to the Recovery Act, we've obligated 100 percent of the funds. I've read that inspector general's report and, look, on balance it is actually not a bad report at all. It talked about some lagging in funding, but it noted that the Department of Energy itself—many of these had to do with other programs, but the Department of Energy itself was doing everything it could in its power in order to do that. We had a spend-rate plan and, as you know—for example, many of the programs, you would have to have a request for proposals, you assign that money, it's awarded to particular companies or States or whatever, and then what happens is those orders go down, and what really starts the ball rolling is then all of a sudden you've got a contract out there. They're starting the work. You have to go

through a selection process. The jobs get going and people get hired, and what you're talking about is the eventual billing of that. But the construction jobs start, they get paid, and then the last thing you do is bill.

We are not that far from our initial 2009 claim. If you look at what we were thinking we were going to be at a spend rate, we're pretty close to that. So I think there are a few hiccups, but overall it's been actually a good performance.

Senator BARRASSO. It does show how difficult it is with the amount of money that needed to be spent to really be careful with the taxpayer dollars, because there are clearly abuses with this program.

I do want to follow up on Senator Lee's question about that 80 percent clean energy by 2035. The budget included massive increases for renewables. How has the Department calculated the amount of—or have you calculated the amount of new transmission lines that are going to be needed, as well as the amount of land needed, to meet this goal with renewables like wind and solar, and how are you going to be dealing with that?

Secretary CHU. This is a coordinated effort. The Department of Energy has a central role in this, but there are other players—FERC, Interior, Agriculture. We are very interested in developing these transmission lines. We think that the transmission lines and the coordination, because the coordination is the real issue. There are regional transmission sectors, there are vertically integrated utility companies, there are transmission line companies.

Each company and each State tries to solve the problem within the control of what their jurisdictions are, the best they can. Also, when you build a new source of energy you try to solve that problem as best you can. But what is really needed is an overall coordination. So we are working very hard, and we've recently had a series of meetings going forward to try to get the private sector to get coordinated. We view ourselves as part of the grease, if you will, to say, OK, if you coordinate you can stop what one Western Governor referred to as the spaghetti of transmission lines, rather than a right-sized transmission line which is rational, if you could step back and say in certain Western States it makes much more sense to right-size it, to allow you to put up a tower, maybe string one or 2 lines, but it has the capacity for 4 lines.

So this is something we think there is a plan in the Western States and the Eastern States, and so we think that this is very important. With transmission lines, we see an incredible opportunity to bring the overall cost of energy down because you can tap the right sources.

Senator BARRASSO. Thank you. Thank you, Mr. Secretary.

Mr. Chairman, 2 additional questions I'd like to submit in writing if I could, because my time is up. One is on the Rocky Mountain Oilfield Testing Center and the other is about the Department's loan guarantee program.

Thank you, Mr. Secretary. Thank you, Mr. Chairman.

The CHAIRMAN. Thank you.

Senator Manchin.

Senator MANCHIN. Thank you very much, Mr. Chairman.

Mr. Chu, Dr. Chu, thank you for being here. The State of West Virginia, as you know, is an energy State. We're a net exporter of power. What you might not know is that we use a little bit of everything. We have an energy portfolio bill that's realistically looking at what we can do in our State to be independent and also be a net exporter. We have one of the largest wind farms east of the Mississippi.

So we have basically diversified ourselves and done as much as possible. But we find it very difficult to continue on because of the EPA's intervention and their very onerous position that they've taken on permitting and being able to supply the energy the Nation needs.

I think the question I would ask first of all, from the administration's point of view and maybe from your point of view also the highest priority, how would you rate that? Would it be the independence, for us to be independent from foreign oil, or to develop renewable energy policy?

Secretary CHU. The highest priority is, as the President said, is neither of those. It's really to make sure that we put in place an infrastructure that will ensure the prosperity of all Americans going forward this year, next year, and in the decades to come. The energy charge and our responsibility is to be an essential role in ensuring that prosperity.

So within that, I think it may be a false choice to say it's either this or that. We want—part of that prosperity is we want to be independent from importing foreign oil. It's roughly \$400 billion a year, and that's why we said we have to improve the mileage standards, the efficiency of our automobiles. We have to continue to develop biofuels and electrification of vehicles, especially for personal transportation.

So all of those things we think can deal significantly with that issue.

Senator MANCHIN. I mean, we could be using the existing, like from coal to liquids, which we get very little help, very little direction, from the administration to do that, to make us less dependent on foreign oil.

We're fighting a war, the longest war in history, because of our dependency and the unstableness of the Middle East because of our dependency. It continues to go on and on and on. Yet, basically through the budget process all of the advantages have been given to the renewables, which is fine. I mean, we're fine with that.

But I think if I can ask you this question. If you looked at the cost of energy in China right now, who has cleaned our clock on manufacturing, has theirs increases as much as ours has in this Nation as far as the baseload power?

Secretary CHU. Yes, their energy costs are going up. Let me first mention something about coal to liquids. There are new technologies that we're really interested in doing. Coal to liquids, including carbon capture and sequestration, with the addition of biomass, has a real advantage here. A recent study of the National Academy of Sciences and National Research Council entitled "America's Energy Future" had an entire section on coal to liquids with carbon capture and sequestration and biofuels. Right now the

technology with carbon sequestration of the excess carbon dioxide has better life cycle costs than the life cycle carbon emission of oil.

But if you begin to blend in biomass at 30 percent, 40 percent, it actually becomes a net decrease in the carbon dioxide in the atmosphere, including the tailpipe emission. So the Academy report actually says: Wait a minute; this is—you normally think coal to liquids, the old process—

Senator MANCHIN. Has the EPA read that report?

Secretary CHU. I'm sure it has.

Senator MANCHIN. They sure haven't acted on it.

Secretary CHU. But this is coal to liquids with carbon capture and sequestration. It also makes very clean fuels. Then once you start blending in biofuels, it becomes a real plus. It becomes carbon-neutral, including tailpipe emissions.

So for that reason, the Department of Energy is very eager to promote that type of research.

Senator MANCHIN. The only last thing I would say is that you described onshore wind as being mature than offshore wind. How is onshore wind more mature than solar when they both basically have been in the same timeframes?

Secretary CHU. That's a good question. If you look at the development of and what I would call the technological headroom of wind versus solar, what wind has been doing—and it's made spectacular improvements over the last decade, 2 decades, going to very large turbines, much more efficient construction, things of that nature—and you project forward where they're going to really be improving, they're going to be improving by going to taller turbines and increasing the reliability of those turbines.

There's a few niche markets where there are new designs. But we think that the headroom in wind is less than the technological headroom of what we see coming down and the ideas being generated in solar.

But now, having said that, there could be—we're rooting for wind as well. We think that if you can get carbon composite materials done inexpensively that have the longevity, the new gearbox is direct drive, there's a lot of things. So I see a future of continuing improvement.

But the most improvement again is going back to the reliability. So we're focused on what can—we have precious dollars in our budget. What can we do to improve the reliability? In offshore, where there's less experience, salt water does a lot—salt water, salt air, does a lot of corrosive things, and so there are materials issues there.

So again, we have to make difficult choices. We don't have an infinite budget. We have much less than that. So we have to make tough choices.

Senator MANCHIN. Thank you. I have other ones, but maybe hopefully a second round, or I'll submit.

The CHAIRMAN. Senator Risch.

Senator RISCH. Thank you, Mr. Chairman.

Mr. Secretary, welcome, good to see you again. Thank you for coming today.

First of all, the good news. I want to thank you again for the approval of the guarantee for the enrichment facility that actually is

up and moving, the Eagle Rock facility in Idaho Falls, Idaho. As you know, as has been discussed here, it's really critical to national security and to us as Americans to have that there. So thank you for that.

However, moving on from that, put me in the same category as the vice chairman and Senator Portman, and I think to some degree Senator Manchin was critical of the priorities. I'm one that really believes that we really need to pay more attention to those that brought us to the dance. That's in the immediate future the fossil fuel is something that is very important to the American people, and second the nuclear industry is so important to us. With all due respect, I don't think your budget reflects the importance of those priorities. Certainly the vision that you have for the future on solar and battery-operated cars and things like that is all well and good, but we've got immediate problems in this country.

So let me take this down to a real pragmatic basis. Today we're sitting here in February 2011 and my constituents are asking me, how come gas is over \$3 a gallon and diesel's over 3.50 a gallon? What's going to happen a year from now, February 2012, when your phone rings and you pick up the phone and he says, this is the President and I've got a little election coming up here in a few months and, gosh, the White House switchboard is getting a lot of calls about \$4 gasoline and 4.75 diesel? You're the Secretary of Energy. What are you doing about this and can you turn the spigot up for me so I can get reelected again? What are you going to tell him?

Secretary CHU. The Secretary of Energy has some authorities, but we do not—we cannot control the price of a world commodity. What we can do is to decrease our use of oil. The United States uses about 25 percent of the oil of the world, and if we use it in the most efficient way possible and if we develop a diverse supply of alternates like biofuels and electrification, which allows us to generate electricity any number of ways, including nuclear, that they can offload our use of oil, because we're such a significant user of oil, if we drop our use from 25 to 20 percent of the world market this will actually have a very positive effect on the prices. It will drive the prices down.

So what we try to do is say, how can we decrease our use of oil, go to higher efficiency, get alternatives that diversify our energy supply, so that we will not be subjected to those—or at least minimize those price spikes that can occur.

Now, on the long term, if you just look at what is on the horizon, I don't know what will happen a year from now or 2 years from now, but 5 and 10, 20 years from now, I think you and I both will see the handwriting on the wall. You see developing countries rising in prosperity, generating auto industries—the largest carbon manufacturer in the world is now China—for the home market. So India is going to be coming along. You see the multinational oil companies, the Shells and Exxon Mobils and Chevrans and BPs and companies of that ilk, where they feel that their future accessibility will be increasingly in deep offshore and Arctic. So you see a rising demand. You see going to more expensive sources. So in the long term—

Senator RISC. Mr. Secretary, I appreciate that, but I think you're going to need to polish that answer a little bit if you get that call, because he's going to be looking for something a lot more immediate than the long-term, 20-year picture that you're talking about.

My constituents are concerned. I mean, they go out and fill their car with gas once a week or what have you and they are really concerned. You're the Secretary of Energy and I understand your answer that you're not responsible for a world commodity, but as the Secretary of Energy you're going to have to answer some questions about this, because I understand you say you don't know what's going to happen a year from now, but certainly you're reading the trade publications and everyone else that talk about China's thirst, India's thirst, the fact that our production goes down day by day by day.

I mean, this is not getting any better, and a year from now it isn't going to be any better, and the President is going to be looking to you for some immediate answers.

Secretary CHU. I agree, it's not getting any better. The production in the United States has been declining since the middle 1970s. Even though we're getting better at finding oil and we're getting better at extracting the amount of oil in the ground, the fraction of oil in those reserves, the long-term position is we have to do something about that and we have to do it. That's why we're so keen on controlling the expansion of the use of oil in the United States.

So we are doing everything we can, as I outlined before. This is not 10-year, 15-year plans. This is today we're doing these things.

Senator RISC. Thank you, Mr. Chairman. I hope you'll polish the answer a little better. Thank you.

The CHAIRMAN. Thank you very much.

Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman.

Thank you, Secretary Chu, for being here this morning and for being one of those scientists who is willing to sacrifice to commit to serving the country in your role as Secretary. So very much appreciate that.

I apologize for having to leave for part of your testimony, but it was an appropriate leave because I went over to the Alliance to Save Energy's great Energy Efficiency Day. Their slogan for this year is "Energy Efficiency, the First Fuel of the 112th Congress." So I was very pleased to see the focus in the budget on energy efficiency. As we all know, it's the fastest, cheapest way to achieve our energy needs.

One of the things that I wondered about, however, was the President's proposed clean energy standard, because it wasn't clear to me that what he is proposing includes energy efficiency as a qualifying resource. Even 2 years ago when this committee did our energy standard we included energy efficiency as one of the potential savings. So can you talk about, first, what your understanding is of what's being proposed for that clean energy standard and what the role of energy efficiency ought to be in a clean energy standard?

Secretary CHU. Sure. The outline of the clean energy standard, which we the administration will need to work out the details with

Congress if there is enthusiasm, which I hope there will be, does not include energy efficiency. It really has to do with energy generation. Having said that, I agree with you 100 percent that energy efficiency is the cheapest, best way to save money as well as reducing our dependency on foreign oil versus all the other things that we hold near and dear to our heart.

Energy efficiency is a very big deal, and there should be similar incentives and encouragement to encourage families and businesses, you name it, to save energy. The most important thing is to demonstrate that saving energy really means saving money and to really get that out in the thinking.

Most people think if you're going to invest in energy savings, well, that's a good virtue, but it's going to cost. We think it's not going to cost. If done right, it will actually save money, and that money gets reinvested into the business, reinvested in the United States.

So we think just because it was not included in CES, the clean energy standard, does not mean that—it is part of this effort to actually make the United States prosperous, and it's very much part of the plan, but it's just been separated out from the clean energy standard.

Senator SHAHEEN. So should we have an energy efficiency standard?

Secretary CHU. A lot of the jurisdictions on energy efficiency standards are local, State and local jurisdictions. So I don't think we can—we can make recommendations on how much insulation should be in a home. We can make recommendations like that. We can facilitate the information, where money could be best invested to save the maximum amount of money and energy.

We also have appliance standards, which are actually remarkable in the sense that those appliance standards—normally, if you don't have a standard what industry wants to do is, it's a competitive world out there, they want to drive down costs.

Senator SHAHEEN. Right.

Secretary CHU. But they do not necessarily want to drive down what we call life cycle costs. You buy a refrigerator and you own it for 15 or 20 years; what will happen? What we have found is, we looked at before standards were put in place and after standards were put in place, and if it's a reasonable standard that nudges industry and their engineers to do the right thing, we found a remarkable event. For example, in refrigerators those standards have actually made industry design refrigerators that saved America many billions of dollars over the last—starting with California, but since middle 1975, in a trajectory that they would not have done on its own.

So those things are actually an enormous asset to Americans, because these refrigerators of today—the refrigerators of today are large in size, they're 22 cubic feet, they're frost-free, and if you look at the inflation-adjusted price of that and compare it to when I was a kid of an 8 or 10 cubic foot refrigerator where there's a freezer inside and every month or so I had to chip away the ice, they're more efficient and on an inflation-adjusted price they're cheaper, and they're bigger.

Senator SHAHEEN. I totally agree with you, Mr. Secretary. You don't have to convince me. I'm trying to figure out how we convince everybody else.

Secretary CHU. I think that's part of my job, is to actually show America that you can actually save lots of money with no loss of life style or any of those things. I think this is a great opportunity. With those highly efficient products you have a world market as well.

Senator SHAHEEN. Thank you. My time is up.

The CHAIRMAN. Senator Coats.

Senator COATS. Thank you, Mr. Chairman.

Mr. Secretary, thank you. I'm sorry I couldn't be here. We all have to balance more than one committee. But I have looked at your statement and looked at some of the information that's been provided.

Given where we currently are from a fiscal standpoint here in the United States, I think the handwriting's on the wall that there are a lot of things we would like to do, but we're not able to afford to do them. So I was surprised when the number came out under the President's budget request that there's a significant, in fact \$3.12 billion, increase over this fiscal year's budget.

Obviously, this is true for a lot of the agencies. My question is, I think the handwriting's on the wall here that these numbers are not going to be available to you. I see the projections here about the significant increases in a whole number of programs.

From 2010—I don't have the 2008 comparisons for what's been increased over the last 2 years—but just on energy efficiency, 45.6 percent plus-up there. As you go through the various categories, I know there are some offsets, but overall we're looking at a budget which is probably not going to be realized.

So my question to you is, does the Department, and you and the Department, have a plan B, a plan B which is going to have to deal with a much lower number? How are you going to prioritize where to spend that money? What kind of management decisions are you going to have to make in terms of personnel, in terms of commitment of resources?

I'm very skeptical about government's ability to successfully pick winners and avoid the losers. The market always gets in the way of those decisions.

So we're at a very difficult time, and that's going to put a lot of responsibility on your and every agency, every Cabinet department, in terms of finding, coming in at that lower number. So have you analyzed that in terms of where would we go if what appears to be the reality of the funds that are going to be available for this next fiscal year don't come in anywhere near where it's projected?

Secretary CHU. Sure. First, I think in the budget presented by the President there were some tough decisions made and, as the President pointed out, this is—

Senator COATS. Yes, but the overall is a very significant increase.

Secretary CHU. That's right. There are 2 agencies that got increases, Education and Energy, because it was felt—and every other agency had decreases or held the same. The overall budget was flat and he was calling for a 5-year—just stopping the increases for 5 years.

So now, so that's something that was—since the Eisenhower Administration, that was the first time a President has proposed a budget like that, and for the outgoing years. So difficult choices were made.

We think that, the administration thinks, the President thinks, that the reason why Education and Energy were receiving increases during these very tough budget times—and I agree with you, I recognize that in the coming 4, 5, 6 years that there will be huge demands to show fiscal restraint and to try to get back to a balanced budget. I absolutely agree with that and it's important.

But the reason we're making those investments is this is about the future, next year and the following year and the years that follow, that to put America in the best competitive position this is what we need to do.

I'm reminded of a friend of mine, Norm Augustine. He was the chair and CEO, former chair and CEO of Lockheed Martin.

Senator COATS. A friend of mine also, and a wise man.

Secretary CHU. Yes, great. So I served on that committee, "Rise Above the Growing Storm," with him, and since that time he has become a friend. He became the chair of my advisory board at Lawrence Berkeley National Lab. He's on the Secretary of Energy's advisory board. A very wise man.

He said: In times of fiscal austerity—and we are in those times today—from his experience at Lockheed Martin, the last thing you want to do is to decrease your research and development budget. It's like you were designing an airplane, the plane is overweight and what do you do? You don't take off an engine to reduce the weight problem. So it's difficult choices.

Now, if in the wisdom of Congress it turns out that we won't get our full budget, I would be glad to work with Congress, and we do have a priority of things. But again, this really is about winning the future, and that's why those tough decisions were made and the other agencies got significant cuts.

Senator COATS. I understand that about winning the future and I think that is where investment ought to go, particularly at the basic research level, not necessarily the applied research level, because again I have great skepticism over the political process's ability to make the right selection.

I had the opportunity to live and serve in Germany for 4 years and they made political decisions about how much mandatory wind and sun had to be produced by a certain fixed date, and a lot of places found that the sun didn't shine as much as they thought or the wind blow as hard as they thought. Then the political process always raises its ugly fist, because it turned out that most of the politicians representing various geographic areas of the country had to get their share, even though the statistics showed that from a wind standpoint it blew a lot harder in somebody else's district than it did down south and the sun is showing more down south than it is up north. But everybody had to get their panels and their money for solar and wind. It seems to me that the political process often intercedes in a way that distorts the correct application of the funds.

So I'm not here to tell you how to fix that or deal with that. I just think the 2 points I want to make is, it's likely that you'll be

called on to do less—to do more with less, and if so hopefully there is a plan in place and a set of priorities that you can share with us in terms of where you think that is best applied.

Second, to the extent that we can get the decision process out of the political process—and I'm not just saying out of your Department; I'm also pointing the finger at us—and get the needed dollars of research that will be investments for the future settled in a non-political, more market-directed way, which as you know capital follows—it will follow subsidies. We can make decisions even though the market, even those putting up private money, think that's the wrong decision or have reservations; it'll follow the subsidy, and then dries up, potentially dries up capital where it could have been applied more efficiently.

In any event, I look forward to working with you on this committee and everyone on this committee, the chairman and others, and helping work through that process. Thank you.

The CHAIRMAN. We've all had a chance to ask 5 minutes of questions. Let me go back around for those who are still here and see if they have additional questions.

Senator Coons.

Senator COONS. Thank you, Mr. Chairman.

First, I just was interested in a previous exchange about the promise of coal mixed with biomass and wondered what role you think advances in catalysis and catalytic science might be able to make in achieving that sort of intermediate stage deployment of a blend of sort of coal to liquid fuels and biofuel, and how the AFRCs or the innovation hubs might plan a role in connecting national labs to research universities to that work? It's something the University of Delaware is particularly strong in and I'm interested in seeing deployed if possible.

Secretary CHU. Catalysis is a major part, if not one of the crucial aspects, of the ability to convert biomass and the ability to decrease the energy penalties in converting one form of energy into a cleaner form of energy, separating out the carbon dioxide and sequestering it. That's again talking about the technological possibilities.

We see catalysis as a real technological possibility so that we can do some of these gasification, liquification to transportation fuels that works toward our energy independence, diversify our supply, and where we can then create wealth using American resources. So that's why we're so keen on it, because if you do this in conjunction with the carbon sequestration of the excess carbon dioxide it's a winner all around—environmentally, it's a winner in terms of our energy independence, and it's a winner in terms of wealth creation in the U.S.

But it's science, it's research, and that's why we're so focused on doing that research that can see if it has a shot. Now, once the research is done, I would agree with the remarks of the last Senator that the private sector then would be in a position to make those investments.

Again, the clean energy standard is very important because it goes toward promoting—you have a market for these products and the business community has some certainty.

Senator COONS. How valuable do you see the proposal for a new offshore transmission line that would cover basically the whole

mid-Atlantic to the rapid deployment of offshore wind, and how do some of these proposals help advance that?

Secretary CHU. That's a good concept. I'm supportive of it. What I like about it especially is that if you begin to connect the mid-Atlantic States from, let's say, North Carolina to on up north to New Jersey, and even the New England States—well, you've got to go around Long Island, so the first part is just from New Jersey on south—that creates a way of distributing the power so that the wind energy can be distributed much more effectively, more of it can be utilized, and so you can start to port energy into places where it is needed, where in many of these areas there's a spot market for energy, and all of sudden if you're paying not 5 cents for a wholesale price of electricity or 6 cents per kilowatt hour, if you're paying 50 or 500 cents per kilowatt hour, you can port it up there.

So it will make the energy infrastructure much more efficient and it will overall lower the price of electricity. So I'm very keen on it. We'll see. There are a number of private companies looking at this very hard.

Senator COONS. I think that's critical, as you discussed before, to creating the kind of draw that will sustain manufacturing here.

My last question. I was interested in the advanced manufacturing technology consortia which your Office of Science is participating in. Many of us are concerned about how do we advance not just the basic science for deployment, but manufacturing related to energy in the United States. Given the previous question, given the budget realities, if there was one particular investment or program you wanted to highlight today that you think has the best chance short-term of helping advance manufacturing, what would you draw our attention to in today's budget submission?

Secretary CHU. It's a mixture of advanced manufacturing of batteries and photovoltaics. I think again I see a lot of space where the research—and this again is research. If you can develop a new method of taking molten silicon, creating very thin wafers, and taking it off that substrate and then directly making it into solar cells, you've radically changed the manufacturing process in a very fundamental way.

I liken it to the radical change in making glass. If you look at a building of 200 years ago, it's this wrinkly sort of glass and very expensive. Then all of a sudden someone figured out how to float glass on another surface, another liquid surface, and gravity just makes it flat and cheap, and that had a profound influence on the manufacturing of glass and drove down costs.

So we are looking very hard. It's not just research in materials, but research in manufacturing, that can transform the way we make things. Again, in this competitive world that is part of what we need to do in order to bring back this high-quality manufacturing, which has been a very strong leg in the American enterprise and the American economy.

So a lot of our research is actually research in new ways of manufacturing which could transform the world.

Senator COONS. I want to close by just echoing the comments of some other Senators. I'm grateful for your service and appreciate the direction you're taking the Department. Thank you.

The CHAIRMAN. Senator Lee, did you have additional questions?

Senator LEE. Mr. Secretary, I assume you're aware of the current debate surrounding FERC's proposed rule on transmission cost allocation. Has the administration taken a close look at this, including on whether and to what extent FERC has authority to issue this and what the effect might be on customers?

Secretary CHU. Yes, we're looking at that and I'm aware of the controversy. I think it is—people have different opinions on how to do this. Typically in the past the transmission—if you generated a new fossil fuel plant, a solar farm, a wind farm, you name it, the transmission costs for the hook-over were generally borne by the people who were producing the source of energy. That was effective in the days when energy was produced, generated locally and distributed locally, because it made a lot of sense. If you have a power plant, you're not reaching out 500 miles, 1,000 miles somewhere. You are actually making that power plant to satisfy local needs.

Now, having said that, if you look toward the future and what's going to be happening, to take full advantage of the wind resources, take full advantage of nuclear sources, which are mostly the capital expense—the fuel is a few percent of the cost; it's the capital expense of the power plant. Once you make these huge capital investments—wind, solar, nuclear, are capex-intensive—you want to keep them running as long as possible and you want to port that energy.

So then all of a sudden overall you can actually drive down the cost to consumers and to businesses by being able to say, can this energy go across the jurisdictions, across the regional areas, across the utility companies? Again, if you look at the auctioning that's going on now in the market, especially in the eastern section of the United States, if you have a very small area you can get price spikes, incredibly price spikes in demand. All of a sudden, demand goes up and the cost can increase dramatically, from 10, 15 cents, 5 cents a kilowatt hour to, as I said, 50, 100, 500 cents.

Having a transmission system that allows you to make interchanges will mean that the energy assets of the United States could be used to distribute it and so you don't have these huge little spikes in prices. So I think this is something—if you have a closed market and you're a merchant supplier, you might like to see that. So what we're driving at is the best possible way to satisfy all the stakeholders in this, but ultimately it's the businesses and the people of the United States and how do you drive down the cost. We're using transmission as a tool.

Senator LEE. Are you satisfied that FERC's current statutory authority is sufficient to enable it to do that?

Secretary CHU. I don't think it's sufficient in the sense that it doesn't have the teeth that we have in gas lines. But in terms of the costing, this is something that I think—these are mostly, almost exclusively private enterprise, and so the government's role is, one, we need to help all the stakeholders come together and say what is in the best interests of the United States and the best interests of its industries and its consumers.

Senator LEE. So perhaps acting as a facilitator rather than regulator?

Secretary CHU. Right now, especially in the Department of Energy, we see ourselves as facilitators, to try to get the best possible plan going forward over not only the short-term, but transmission and distribution is really a long-term issue.

Senator LEE. OK. Shifting gears really quickly, recognizing I'm almost out of time, I wonder why you appear to be moving in a direction in which you're devoting less attention rather than more to hydropower, notwithstanding the fact that hydropower currently supplies, if I'm not mistaken, about two-thirds of our renewable energy resources and about 7 percent of our total electricity production in this country, and it's also an area in which many of the resources for hydropower are under the jurisdiction, the control one way or another, of the Federal Government.

Does that strike you as something you might want to reconsider?

Secretary CHU. I think hydropower—I agree with you, hydropower is a very good energy resource. In fact, it is the fastest way to turn on electricity instantly in generation. I think without building new reservoirs and new dams, just putting in more efficient turbines, which are friendlier to fish that migrate, but more efficiency, or putting in turbines in water control projects that are built for flood control, but we don't—to generate that—I think there is still a lot of potential for hydropower, not in the traditional sense of a new dam, but in the sense of using what we have and the reservoirs that we have already.

Senator LEE. Or marine generation, tidal power.

Secretary CHU. Yes.

Senator LEE. Are you looking at that also?

Secretary CHU. We are looking at marine, underwater currents, tidal power. All those things are things that we are looking at.

Senator LEE. Thank you.

The CHAIRMAN. Senator Shaheen.

Senator SHAHEEN. Thank you, Mr. Chairman.

I have a parochial question, notwithstanding some of the earlier discussions. New Hampshire is at the end of the pipeline for oil, and yet we are very heavily dependent on oil. So that means cost to heat our homes for using oil is more expensive in New Hampshire and Maine than in much of the rest of the country.

One of the things that we do have is a lot of forests, so a lot of biomass. New Hampshire is the second most heavily forested State in the country. I was pleased to see that DOE's budget proposal increased funding for biomass and biorefinery systems, but I noticed that most of the money is going into liquid biofuels.

There's been a fair amount of interest in New Hampshire and I think also in some of the other New England States in combined heat and power to fund—to support district heating systems. In fact, in 2007 I think Congress authorized a program within DOE to help communities with setting up those kinds of district heating systems with combined heat and power.

So do you see doing anything in that area in this new budget, and how can we help incentivize some of those communities who are interested in building these kinds of systems and just need a little bit of incentive to get that going?

Secretary CHU. OK, sure. There are 2 issues. One is that when you use biomass in New England, Vermont, New Hampshire,

Maine, those areas where heating costs and fuel costs, especially fuel oil, is very high, we see that it can play a very important role, and that if you manage the forest in a sustainable way, so that as you use trees you plant trees and in the long term that's a sustainable use of the forest, I think that should be part of a clean energy standard, quite frankly.

Senator SHAHEEN. Me too.

Secretary CHU. Get 100 percent credit, if you will, for taking in a managed way, so you sustain. When you chop down, you replant. Europe does this in spades and we too can do this. So that's one thing. We support that. We are looking at ways in our biofuels programs, inexpensive ways of concentrating the material so that you can transport it, pelletizing, other things. Ideally, for the transportation field you would want to convert it into a liquid form. But that's one area where we are doing research.

There are very inexpensive ways of taking lumber residues, residues from paper mills, you take that and you port it; also old dead trees, trees where you can transport it in a much more economic way. But I think the biggest incentive was let it count as clean energy, part of the portfolio.

Senator SHAHEEN. I certainly agree with that, and hopefully, if we adopt a clean energy standard, it will include biomass as part of that. But again, as you're looking at your budget and focusing on those liquid biofuels, do you see any opportunities in the biomass for combined heat and power?

Secretary CHU. Yes. I think—just recalling, there's a little bit of work being done on the issue. As you blend in traditional fossil fuel sources with biomass, as you go to higher and higher fractions, there are issues having to do with the conventional boilers. There are residues—

Senator SHAHEEN. Right.

Secretary CHU. So to that extent, yes. Again, on the more research and development side of things, how do you enable or design it to use that biomass in a way that doesn't sort of gunk it up, so to speak. So that's one of the issues, so that you can go, not from 10 percent, but to 20 to 30 percent and higher.

Senator SHAHEEN. There are some boilers already on the market in Europe, Denmark in particular—

Secretary CHU. Right.

Senator SHAHEEN [continuing]. That can take care of that problem.

Secretary CHU. We're following what Denmark is doing very closely because they are the leader in that, the higher and higher fractions of blending biomass with conventional fossil fuel.

Senator SHAHEEN. Thank you.

The CHAIRMAN. Mr. Secretary, thank you very much. We appreciate your testimony, and please keep us informed as to what we need to be doing. Thank you.

Secretary CHU. Thank you.

[Whereupon, at 11:42 a.m., the hearing was adjourned.]

APPENDIX
RESPONSES TO ADDITIONAL QUESTIONS

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR BINGAMAN
RE-ENRICHMENT OF URANIUM TAILS

Question 1. Mr. Secretary, do you support a competitive procurement process in re-enriching any high assay tails in possession by the DOE?

Answer. Any determination by the Department to re-enrich its higher assay tails would include careful consideration of several factors, among them an appropriate contracting approach, the economic benefits to the taxpayer and the potential market impacts of processing and selling the higher assay tails. Other significant factors for consideration include the condition of the material, the costs associated with enrichment at the time of disposition, and the suitability of the containers in which the tails are stored for transportation.

ADDITIONAL BLEND DOWN OF HEU

Question 2. Has DOE been involved in discussions with the Russian Government, or is it aware of any such discussions, relating to the additional U.S. purchase of down-blended Russian highly enriched uranium following completion of the current program in 2013? What is the status of such discussions and what time span and SWU volumes are envisioned?

Answer. Senior DOE officials have informed Russian officials on several occasions over the past calendar year of our desire to pursue further HEU elimination after the current HEU Purchase Agreement expires in 2013. Although Russia has indicated firm opposition to extending the HEU Purchase Agreement beyond 2013, NNSA plans to include discussions of additional Russian HEU downblending options as part of our broader dialogue on U.S.-Russian nuclear nonproliferation and commercial partnerships. These discussions would examine the potential time span and SWU volume of a follow-on agreement.

SMALL MODULAR REACTORS

Question 3. For Fiscal Year 2012, the Department is proposing a program to work with industry to help license small light water modular reactors. How long a program does the Department envision before being able to successfully license these designs before the NRC?

Answer. The FY 2012 request envisions a five-year program costing \$452 million to support certification and licensing activities by vendors and utility partners for SMR deployment projects. The Department expects that SMR vendors will have sufficiently learned from interaction with the Nuclear Regulatory Commission (NRC) and that continued support by DOE will not be necessary after the five-year program.

Question 4. The budget proposes a 100 percent increase for the Equipment Standards and Analysis activity to expand and accelerate the analysis, establishment and enforcement of product energy efficiency standards.

Congress will be considering legislation similar to the bill considered last year, S. 3925. The bill would enact consensus agreements negotiated between product manufacturers and energy efficiency advocates and establish new or increased standards for: furnaces, heat pumps, central air conditioners, room air-conditioners, refrigerators, freezers, clothes washers, clothes dryers, dishwashers, drinking water dispensers, hot food holding cabinets, electric spas, pool heaters, and service-over-the-counter refrigerators.

Generally, what would be the impact on the schedule and budget of the Equipment Standards and Analysis activity, and what schedule and budget adjustments would be made, if legislation along these lines were to be enacted?

Answer. If legislation to adopt the negotiated consensus agreements between manufacturers and energy efficiency advocates is enacted, many of the Department's appliance and equipment standards schedules would be accelerated. Moving forward the Department would revisit its prioritization of these newly covered products for FY 2012 and beyond. With these potential rulemakings, DOE does not foresee any essential changes to the budget.

The majority of equipment standards that stakeholders proposed in the consensus standard levels are included in S. 398, Implementation of National Consensus Appliance Agreement Act of 2011 (INCAA), and are scheduled for completion by June 30, 2011. This includes the rulemakings for furnaces, central air conditioners, central air conditioning heat pumps, room air conditioners, and clothes dryers which all have court ordered deadlines. DOE is striving to meet this schedule regardless of the outcome of proposed legislation. If legislation is enacted to adopt negotiated consensus agreements as statutory standards for these covered products, the impacts would be minimal because these rulemakings are scheduled to be completed in FY 2011.

The rulemakings for dishwashers and residential clothes washers are scheduled to continue into FY 2012. If legislation is enacted to adopt negotiated consensus agreements as statutory standards for these covered products, then DOE could have additional resources in FY 2012 to pursue other rulemakings.

Potential standards for drinking water dispensers, hot food holding cabinets, electric spas, heat pump pool heaters, and service over the counter refrigerators have not gone through DOE rulemaking processes in the past. If legislation is enacted that prescribes standards for these products, DOE would revisit its prioritization of newly covered products for FY 2012 and beyond.

Question 5. As with last year's appliance standards bill, the legislation expected to be considered this year directs the Department to conduct four studies, on: video game consoles, motor market assessment, efficiency standards compliance, and direct current electricity supply in buildings.

Very approximately, what do you estimate each of these studies would cost to conduct, and would the cost be covered from existing program funds?

Answer. As described below, the Department expects the four studies to cost approximately \$8 million to complete. To cover these costs, DOE would need to re-prioritize its list of products that it is considering for coverage based on these new initiatives and the funding implications caused by these new actions.

The proposed legislation directs DOE to conduct a video game console energy efficiency study. Such a study would address manufacturer characteristics and market shares, existing regulatory and nonregulatory efficiency improvement initiatives, trends in product markets and characteristics, and identification of energy saving technologies. DOE estimates a study of this magnitude would cost approximately \$500,000 to complete and the cost would be covered from existing appliance and equipment standards program funds.

The proposed legislation also directs DOE to conduct a study of compliance with energy standards for appliances, which would include running a testing verification program for covered products and equipment. DOE estimates this study, including the purchasing and laboratory testing needed to support any recommendations, would cost approximately \$5,000,000 to complete and the cost would be covered from existing appliance and equipment standards program funds.

Furthermore, the proposed legislation directs DOE to conduct a motor market assessment and commercial awareness program. While DOE's appliance standards program is currently working on a motor market assessment for certain types of motors currently subject to rulemakings under DOE's regulatory programs, the proposed legislation would significantly expand the scope of the current study. Additionally, it would require DOE to establish a national program to increase awareness of the energy and cost-savings opportunities of using more efficient motors. DOE estimates this study and administration of such a program would cost approximately \$2,000,000. The Department would consider whether to request funds for the administration of such a program in future budget requests.

Lastly, the proposed legislation directs DOE to conduct a study of using direct current (DC) electricity supply in buildings. DOE would need to investigate the various end uses of the electricity used in buildings and the details of the wiring in various types of buildings. DOE estimates this study would cost approximately \$500,000 to complete and the cost would be covered from existing EERE's solar technologies program funds.

Question 6. Please briefly describe the steps that have been taken by this Administration to enhance enforcement of equipment energy efficiency standards.

Answer. The Department of Energy has established a new program to systematically enforce-for the first time-federal energy conservation standards that have been

in place for decades. The Department has also ramped up testing of ENERGY STAR appliances to verify products' energy efficiency claims. The Department created a new Office of Enforcement within the Office of the General Counsel that, with the support of the Building Technologies Program, has been proactive-issuing enforcement guidance, revising DOE's regulations to improve the effectiveness of its enforcement efforts, and bringing numerous enforcement actions against entities who fail to comply with DOE's rules and efficiency standards. Since we began our efforts, manufacturers have newly certified more than 600,000 products as meeting our energy efficiency standards. To date, the Department has collected nearly \$550,000 in civil penalties and removed 70 products from the market that did not meet DOE's energy conservation requirements. More details can be found at http://www.gc.energy.gov/enforcement_news.htm. The Department's goal is to establish a practical, systematic, and fair enforcement program that will allow DOE to enforce the federal standards effectively and ensure a level playing field in the marketplace, without unduly burdening regulated entities. Effective enforcement of the Department's energy standards will save energy and costs for American consumers and create incentives to reward those businesses that incur the risks and the costs needed to create more efficient products.

Question 7. Has DOE been involved in discussions with the Russian Government, or is it aware of any such discussions, relating to the additional U.S. purchase of down-blended Russian highly enriched uranium following completion of the current program in 2013? What is the status of such discussions and what time span and SWU volumes are envisioned?

Answer. Senior DOE officials have informed Russian officials on several occasions over the past calendar year of our desire to pursue further HEU elimination after the current HEU Purchase Agreement expires in 2013. Although Russia has indicated firm opposition to extending the HEU Purchase Agreement beyond 2013, NNSA plans to include discussions of additional Russian HEU downblending options as part of our broader dialogue on U.S.-Russian nuclear nonproliferation and commercial partnerships. These discussions would examine the potential time span and SWU volume of a follow-on agreement.

Question 8. I see that you plan to sell about 6 million barrels of oil from the SPR, generating about \$500 million.

Could you explain any operational benefits to SPR management from such a sale?

Answer. A sale of approximately six million barrels would relieve the over filling issues that existed at several SPR caverns. For example, the caverns need spare capacity and operational flexibility to allow site personnel to perform casing inspections on all caverns in order to comply with a recent Texas Railroad Commission requirement. The sale would create the space needed to do the mandatory cavern inspections and workovers.

Question 9. If this sale is intended to improve operations of the SPR, could you explain why the revenue from the sale is directed to the federal treasury, rather than the SPR petroleum account? (I note that this gives the appearance that the sale is intended as a revenue raiser to the federal treasury.)

Answer. Past emergency and test sales proceeds were used to repurchase crude oil for the SPR to replace the oil sold. However, the SPR is currently at capacity and no repurchase of crude oil is planned. The purpose of the six million barrel sale is to provide operational flexibility in managing the Reserve including alleviating unplanned overcapacity at some SPR caverns. The sale provides an opportunity to free up space in overfilled caverns in order to perform mandatory cavern inspections and workovers. Reducing the volume of inventory in the overfilled caverns also alleviates concerns associated with cavern maintenance and on-site crude oil movements.

Question 10. Could you talk about why the Department recommends repealing the Department's authority to use Royalty-in-Kind oil to fill the SPR? This strikes me as a legislative issue that is firmly within the jurisdiction of this Committee, and I'm not sure that it's appropriate for such a policy measure to be included in a budget and appropriations discussion.

Answer. The Secretary of the Interior cancelled the royalty-in-kind program in 2009 and it is no longer an option for DOE.

Question 11. I recognize that HHS, not DOE, manages the Low Income Home Energy Program. But since you are here—can you explain why the Administration has proposed a 50% cut for FY2012 (from \$5.1 billion to \$2.57 billion). State programs will have to reduce the number of households served by about 3 million. EIA reports that the average cost of home heating is expected to decline from \$1033 during the winter of 2008-2009 to \$990 for this winter heating season. However, that is a 4.1% decline in costs for home heating and is clearly disproportionate to a 50% cut in funding.

Answer. The Department of Energy does not implement the Low Income Home Energy Program and defers to HHS for response.

Question 12. I am very pleased with the emphasis on efficiency and clean energy in your budget—particularly the “Better Buildings Initiative”. We look forward to working with you on this initiative. How do you envision the program working? How will you select the universities, schools, and hospitals for energy retrofits? How will you measure the energy savings?

Answer. The Better Buildings Initiative is a Presidential priority. It will leverage the lessons learned from other federal and state programs, as well as years of research and experience in energy efficiency. As envisioned, the Program has five important components including a new tax incentive for commercial building upgrades, financing programs, competitive grants to state and local governments who implement innovative approaches to building codes, regulations and performance standards, and a challenge to the private sector and universities to make facilities more energy efficient. Those meeting the challenge would have their organizations recognized and supported with technical assistance.

Universities, schools, hospitals and other commercial buildings are currently encouraged to participate in existing programs such as DOE’s Commercial Building Energy Alliances as well as the Energy Star Program which promotes consumer recognition of highly efficient products and provide public recognition of highly efficient buildings.

DOE envisions that savings data will be gathered from the Initiative partners and allies who will report their energy savings accomplishments and financial results as part of the reporting and recognition requirements of the program.

Question 13. There has been an increasing awareness of the connection between energy and water and we are beginning to understand the water availability may be a constraint on both conventional renewable energy development in the future.

Can you please give us an overview of how the connection between energy and water is being addressed within the Department’s programs?

Answer. The nexus of water conservation and energy use continues to be an area of interest across the Department, and one we are addressing through research activities and standards. In particular, energy efficiency technologies and practices often contribute to reductions in both energy and water use. As such, both our Buildings Technologies Program and Industrial Technologies Program have activities impacting water conservation. Within the Building Technologies Program, water conservation activities are included under the Appliance Standards Program. In accordance with the Energy Policy and Conservation Act of 1975, as amended, DOE administers a program of energy conservation standards for consumer products and certain commercial equipment and water conservation standards program for residential dishwashers, residential and commercial clothes washers, and products and plumbing equipment. The standards for residential dishwashers and residential and commercial clothes washers include both water and energy conservation requirements. The standards for plumbing products and equipment set water consumption requirements only.

In addition, certain water use assessments and conservation measures can be implemented in parallel with the types of energy use assessments and efficiency measures performed and promoted by the Department through the Industrial Technologies Program’s Save-Energy-Now initiative, and could immediately benefit those industrial partners already benefiting from the existing DOE energy programs. These onsite energy saving assessments for industrial facilities include a boiler assessment, which considers water chemistry and water use in steam boilers. Other portions of assessment cover steam transport systems and pumps, both of which can directly affect water consumption and use in the plant. Improvements in any of these systems generally will result in water efficiency improvements as well.

ARPA-E is also currently addressing the issue of water use in energy production and incorporates water issues into the development and management of its programs whenever practicable. One example of how ARPA-E is actively addressing the energy-water connection in its current programs is in the Electrofuels program. ARPA-E is engaging with one of its performers to model its Electrofuels system in order to understand the water demand per gallon of fuel produced. In ARPA-E’s FY2012 budget request, water plays a prominent role. ARPA-E plans to include water use as a performance metric in any embedded efficiency programs it might run. ARPA-E is also interested in the possibility of using water to produce energy in new ways. One possibility ARPA-E is considering is the electrical generation potential from osmotic power at the locations where freshwater rivers meet saltwater oceans.

In addition, DOE’s Office of Electricity Delivery and Energy Reliability is coordinating an energy-water initiative in support of interconnection-wide transmission

planning. Funded with \$4 million in the American Recovery and Reinvestment Act funds, this work focuses on the western interconnection and Electric Reliability Council of Texas (ERCOT). In the West especially, water resources play a critical role in generation availability. This is the first time that water resources are being comprehensively considered in an interconnection-wide electric transmission planning process.

Further methods of reducing water needs for energy production are explored in the Office of Fossil Energy. The program is completing research to improve management of produced waters from oil and gas operations, currently the largest byproduct of fossil energy production. Another area of research relates to the water increase when applying carbon capture and storage (CCS) technologies to new and existing plants. Current research shows that the application of CCS could effectively double the water usage at some plants. Research is directed towards new methods and processes such as the use of membranes to separate CO₂, and higher-efficiency integrated gasification combined cycle (IGCC) systems that use less water compared to conventional pulverized coal power plants.

Question 14. There has been an increasing awareness of the connection between energy and water and we are beginning to understand the water availability may be a constraint on both conventional renewable energy development in the future.

How can we be assured that the Department will continue to address these issues as it moves forward with its various priorities?

Answer. Clearly energy efficiency is a top priority for the the Department and through efficiency measures we will continue to support both energy and water conservation efforts. As you know, improving our standards is a priority of mine, and provides assurance that water and energy consumption will be addressed in the future.

Question 15. There was language included in the 2011 Defense Authorization law supporting the development of the Energy Parks Initiative within DOE. What progress has been made to date?

Answer. On February 17, 2011, DOE announced the establishment of a task force on asset revitalization to facilitate a discussion among the DOE, communities around DOE sites, nonprofits, tribal governments, the private sector and other stakeholders to identify reuse approaches as environmental cleanup efforts at DOE sites reach completion. The task force will explore opportunities to reuse DOE site assets for beneficial purposes, which may include clean energy development, environmental sustainability projects, open space or other uses.

Question 16. What are the Department's plans to reuse assets and excess property at sites across the defense complex?

Answer. On February 17, 2011, DOE announced the establishment of a task force on asset revitalization to facilitate a discussion among the DOE, communities around DOE sites, nonprofits, tribal governments, the private sector and other stakeholders to identify reuse approaches as environmental cleanup efforts at DOE sites reach completion. The task force will explore opportunities to reuse DOE site assets for beneficial purposes, which may include clean energy development, environmental sustainability projects, open space or other uses.

SUPERCONDUCTIVITY

Question 17. Japan and Korea continue to make heavy investments in superconductivity, yet the Department has deleted support for superconductivity deployment and demonstration for fiscal year 2012. Will there be any support within the Department or government—wide for such activity to ensure we remain competitive in this technology?

Answer. The Department's Office of Electricity Delivery and Energy Reliability (OE) is winding down its involvement in high temperature superconductivity (HTS) wire research because, after investing over \$600 million over the past 20 years, the Department believes that the HTS wire research has reached a point that provides meaningful technical value and that second generation HTS wire technology can be successfully transitioned to the U.S. manufacturing base. While this program is phasing out, there are other activities within DOE related to superconductivity. OE is continuing to support the several ongoing demonstrations of prototype high temperature superconducting (HTS) equipment, which was funded through the American Recovery and Reinvestment Act. These innovative systems include a grid-scale HTS fault current limiter, HTS power cable and HTS fault current limiting transformer.

In addition, DOE's Advanced Research Projects Agency-Energy (ARPA-E) is funding a project for the development of an advanced HTS magnetic energy storage system that could store significantly more energy than current superconducting mag-

netic energy storage (SMES) systems at a fraction of the cost. If successfully developed in this project, HTS-based SMES will allow this technology to become cost competitive for delivering megawatt hours of stored electricity to address the renewables ramping challenge. In the area of advanced materials technology research and development, DOE's Office of Science Energy Frontier Research Center for Emergent Superconductivity is performing basic research to discover new superconductors. The Office of Science also supports basic research on synthesis, advanced characterization, and theory to understand fundamental phenomena related to superconductivity. In addition, the FY 2012 request for OE has proposed a Smart Grid Technology and Systems Hub, which can leverage crosscutting technologies and capabilities developed under the superconductivity program to impact this and other energy applications.

I am also aware of superconductivity work going on at other agencies. For example, the Department of Homeland Security is examining the feasibility of a HTS fault current limiting power cable. And at the Department of Defense, the Navy is developing innovative applications for military usage, and the Air Force is supporting basic research on superconductivity and also has some investments in superconducting devices through the Small Business Innovation Research program.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR MURKOWSKI

TAXES VS. SUBSIDIES

Question 1. Do you draw any distinction between the amount of taxes that a company pays to the government, and the amount of taxpayer dollars that the government directs to companies or individuals in the form of subsidies? In the Department's view, are tax decreases and government subsidies functionally equivalent to one another?

Answer (a). The Administration's approach to tax reductions and subsidies was stated in the State of the Union Address, "the only way to tackle our deficit is to cut excessive spending wherever we find it—in domestic spending, defense spending, healthcare spending, and spending through tax breaks and loopholes."

Answer (b). The Administration does, however, make a distinction between broad-based tax decreases like the ones contained in the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010, which the President signed into law following a historical bipartisan compromise, and tax breaks for special interests, such as the Fossil Fuel Preferences that the President's Budget proposes to eliminate.

STIMULUS

It has been two years since the President signed the 2009 stimulus bill into law. The Department of Energy received more than \$35 billion through that Act, but has consistently lagged behind nearly every other federal agency in actually having those funds spent. According to the Department's website, just 34 percent of its stimulus have actually been outlaid.

Question 2. Can you explain why some programs that still have significant stimulus balances would receive additional funding under the budget request? An example: weatherization's budget would increase by 46 percent, when DOE's own website shows that it has more than \$2.6 billion in ARRA funds obligated but unspent.

Answer. Under the American Reinvestment and Recovery Act 2009, the Weatherization Assistance Program (WAP) received \$5 billion to provide weatherization services to over 600,000 to low-income families. According to a 2010 report from Oak Ridge National Laboratory, families save an average of \$400 a year on their energy bills as a result of WAP. To date, the weatherization program has paid out over \$2.7 billion (54%) and helped more than 400,000 low-income families nationwide improve the energy efficiency of their homes and help them save money on their energy bills. Moreover, in the first quarter of 2011, WAP funding supported thousands of jobs.

All recipients of Recovery Act funds plan to spend their funds by Spring 2012. However, many states such as Wisconsin, Idaho and Ohio, among others, have already spent the majority of their funds and will need base budget funding by FY12 to retain their state program and high-trained weatherization workers.

Question 3. What are the top 3 impediments that have slowed down the Department's progress in outlaying ARRA funds?

Answer. From the first day after the Recovery Act was signed into law, DOE has been focused on moving the money out the door quickly to create jobs and spur economic recovery. Under the Recovery Act, the Department of Energy received \$35.2 billion in direct appropriations, \$32.7 billion in grant and contract authority and

\$2.5 billion in loan guarantee credit subsidy. This represents nearly a 5-fold increase in normal energy base budget operations.

In just 18 months, DOE used competitive process to select projects, signed under contract and now manage over 5,000 clean energy recipients across the nation. The Recovery Act allowed DOE to break down silos across the complex and pride ourselves along the way with the highest standard of transparency and accountability. Most importantly, we are partnering with the private sector to make a meaningful down payment on the nation's clean energy future.

Additional Resources Required to Stand Up Operations

As noted above, the Recovery Act represented a nearly five-fold increase over the Department's base energy budget. The funding levels for many programs represented a dramatic year-on-year increase, creating major scale-up challenges. Additionally, DOE had to not only expand existing programs (in some cases nearly 20 fold), but also build new programs (e.g. Advanced Research Projects Agency—Energy (ARPA-E), Energy Efficiency Community Block Grants (EECBG), Loan Guarantee Program Section 1705, Smart Grid Investment Grant Program, Smart Grid Demonstration Program). Beyond this challenge, DOE had to carry out the Recovery Act with unprecedented transparency and accountability. In order to scale up operations while at the same time avoiding waste, fraud and abuse, DOE, as well as State and local governments had to bring on additional human resources to stand up operations.

Within DOE, the Recovery Act staff had to establish clear milestones and schedule for nearly 144 programs. The Recovery team built out a master plan defining key deadlines: for issuing notices of funding opportunities, for applications to be due, for the completion of review processes, for announcements to be made, for environmental clearances to be in place, for contracts to be completed, and for projects to start. The master plan defined a timeline and a tempo necessary to deliver against the goals of delivering on time. The master plan also specified the resources required to get through each stage for each project and, in March 2009, highlighted the need for unprecedented collaboration across offices within the Department. All told, more than 4,600 reviewers spent almost 80 person-years reviewing Recovery Act applications. These extra resources created the capacity to deliver at scale. As a result, some grant and loan processes that had taken 2 years were shortened to six months, with no loss of rigor.

Compliance Requirements

The Recovery Act imposed new compliance requirements for DOE programs. Applying Davis-Bacon Act (DBA) provisions required a complex wage-setting process and imposed new compliance reporting. Working through environmental reviews required DOE to develop a new approach to categorical exclusions (CX) to speed processing. Jobs reporting imposed new challenges on funds recipients. We had to develop streamlined approaches to make it easier for recipients to comply with FederalReport.gov reporting, National Environmental Preservation Act (NEPA), DBA, Buy American, and National Historic Preservation Act requirements.

In order to complete all of the compliance requirements stated above, DOE established:

- **Recovery Act Call Center:** DOE expanded clearinghouse call center operations during the Recovery Act to field calls 10 hours a day. To date, the Recovery Act call center has handled over 50,000 calls on topics ranging from funding opportunity announcements, applications, reporting requirements and compliance practices, among others.
- **Templates:** DOE has shared lessons learned with recipients through sample NEPA, Historical Preservation and Buy American document packages and templates to help expedite the review process.
- **Guidance:** The Department issued program guidance as early as possible to explain new Recovery Act compliance requirements and outlining applicability on their projects.
- **Categorical Exclusions:** In cases where it was appropriate and environmentally responsible to do so, the Council on Environmental Quality encouraged the use of CXs. CXs are the least time consuming form of NEPA review. DOE has made these CX determinations publicly available on its NEPA website.
- **Regular Interagency Collaboration:** DOE worked closely with other federal agencies to ensure proper application of federal requirements. For example, DOE worked closely with Department of Labor on DBA determinations and the Advisory Council on Historic Preservation (ACHP) and the National Conference of State on Historic Preservation Issues.

Invoicing

Many of DOE's Recovery Act recipients are first-time recipients of government funding and were unfamiliar with the government's invoicing and payment process. To expedite payments, DOE has run invoicing "webinars" for recipients not familiar with the government process; communicated and closely tracked each of our recipient's monthly financial and performance targets; and offered technical assistance to States and other recipients who are not spending funds on pace to meet outlay targets.

Question 4. How many employees has the Department hired to implement ARRA? How many of those individuals remain employed by the Department today? How long will those individuals continue to work for the Department? Has the hiring of any employees to work on stimulus-related accounts prevented the Department from hiring, even temporarily, any full-time employees for any other offices or programs within DOE?

Answer. The Recovery Act represented a nearly five-fold increase over the Department's base energy budget. Most of DOE's Recovery funded programs were new initiatives designed to reinvest in America's future and provide for long-term benefits to the American economy. We ran competitive review and selection process for over 10,000 applications.

In total, we stood up two new program office and signed agreements with over 5,000 direct recipients. We are now overseeing over 15,000 clean energy projects across the nation that our direct recipients are developing. In order to scale up operations while at the same time avoiding waste, fraud and abuse, the Department brought on over 500 Recovery Act hired employees across DOE headquarters, site offices and service centers. Many of these Recovery Act hires were temporary in nature (typically 2 years) to overcome the burden of standing up Recovery Act implementation. However, now that Recovery Act programs have moved to more routine operations, nearly 50% of these specific Recovery Act hires have gone on to other jobs. Moreover, many have accepted positions in the private sector, with clean energy firms that are now able to hire as a result of the economic activity spurred by the Recovery Act.

These Recovery Act hires have not prevented the Department from hiring full-time employees for other offices as Recovery Act funds can only be used to pay salaries for work on Recovery Act issues.

ALASKA

Question 5. Alaska boasts some of the most exciting possibilities in the nation for renewable energy from hydropower both conventional and hydrokinetic—to geothermal and wind. Despite this potential, last year the Department terminated the Arctic Energy Office. This was a huge disappointment for Alaska and DOE is missing a real opportunity to perfect new technology in cold climate conditions. Does the Department have any plans to devote additional resources to test or develop renewable energy projects in Alaska in the coming year?

Answer. The Department is committed to continuing its support for renewable energy and energy efficiency technologies in Alaska. The Department's devotion of resources includes funding an on-site renewable energy expert from the National Renewable Energy Laboratory's (NREL), direct funding through the American Recovery and Reinvestment Act, and work with the U.S. Coast Guard to convert some of its facility heating from diesel fuel to biomass.

NREL has been funded by the Department to help develop Alaska's renewable energy and energy efficiency potential by joining forces with developers, state government, Native corporations, and tribal and community leaders to assist them in making smart decisions about deploying sustainable energy technologies and preparing for a cleanenergy driven economic transition. NREL's technical training, energy planning assistance, education, and outreach activities, led by Project Manager Brian Hirsch from the satellite Arctic Energy office in Anchorage, are providing the catalyst for transforming the way Alaska uses energy.

NREL's Clean Energy in Alaska initiative currently includes the following activities:

1. Supporting the Cold Climate Housing Research Center's Sustainable Northern Shelter near net zero residential building program, the Alaska Center for Energy and Power's monitoring program for wind-solar-diesel hybrid power systems and stranded renewables analysis, and the Chaninik Wind Group's high penetration winddiesel project;
2. Providing technical assistance to the state, numerous village utilities, private industry tidal and in-stream hydrokinetic developers, Native corporations, and others;

3. Technical assistance on the Fire Island Wind Project;
4. Publishing a report on “Renewable Energy and Energy Efficiency Opportunities and Challenges in Alaska;”
5. Chairing the Alaska Emerging Energy Technologies Fund Advisory Committee;
6. Participating on the Denali Commission’s Energy Advisory Committee, and bringing private industry to Alaska for renewable energy investment and local job creation;
7. Working closely with the state of Alaska on woody biomass heating for diesel displacement throughout rural Alaska.

In addition to providing technical training, energy planning assistance, education, and outreach activities through NREL and its onsite Project Manager, the Department has supported the state of Alaska with direct funding under the American Recovery and Reinvestment Act. Funding has been provided to the State Energy Program (\$28 million), Weatherization Assistance (\$18.5 million), and Energy Efficiency and Conservation Block Grants (\$12 million to tribes and \$16.5 million to the state of Alaska). Through these formula and competitive grants, SEP, WAP and EECBG facilitate the adoption of renewable energy and energy efficiency technologies to address energy challenges in local communities nation-wide and reap the economic benefits of energy savings. These programs represent a federal investment in the ideas and innovations of state and local governments, empowering communities to design programs that meet their energy needs while working towards national goals of energy independence and a transition to clean energy economy. In the FY12 budget proposal, the programmatic formula would provide Alaska with \$1,648,134 for WAP and \$222,000 for SEP.

In addition to funding from the aforementioned state and local programs, DOE has been active in supporting renewable energy deployment projects in Alaska in numerous ways, including the following:

1. Fort Yukon/Council of Athabascan Tribal Governments, biomass development—\$1.2 million
2. Haida Corporation, Reynolds Creek Hydroelectric—\$1.1 million
3. Kootznooow Inc, Thayer Lake Hydroelectric—\$1.1 million
4. Chaninik Wind Group, Village energy smart grid and wind-diesel hybrid systems—\$750,000
5. Chickaloon Village, Energy Efficiency and Renewable Energy feasibility study—\$244,000
6. Native Village of Eyak, Wind energy resource assessment—\$248,000
7. Cook Inlet Tribal Council, Weatherization apprenticeships and Building feasibility-\$253,000
8. Central Council of Tlingit and Haida Indians, Weatherization—\$200,000
9. University of Alaska Fairbanks-Alaska Center for Energy and Power, Geothermal for Pilgrim Hot Springs—\$4.6 million
10. University of Alaska Fairbanks-Alaska Center for Energy and Power, EPSCoR Wind-Diesel Applications Center—\$3 million
11. Naknek Electric, Geothermal—\$12.4 million

Another DOE-led initiative that is being implemented by both NREL and the National Energy Technology Laboratory is conversion of US Coast Guard facility heating from diesel fuel to biomass where available. The current focus within Alaska has been the USCG Kodiak base, the largest in the country, as well as bases in Sitka, Juneau, Ketchikan, and Cordova. This effort, when fully implemented, may provide enough demand to establish wood pellet markets in southeast and south-central Alaska from local supply for local consumption. NREL is working with USDA, the US Forest Service, the Alaska Energy Authority, and private industry on establishing this wood pellet manufacturing industry in Alaska.

METHANE HYDRATES

Question 6. In the 2005 Energy Policy Act, Congress demonstrated its support for research and development into methane hydrates. In S. 1462, the energy bill approved by this Committee last year, we reiterated that support with additional funding authorizations. The President’s FY 2012 budget request, however, calls for just \$10 million in methane hydrate research funding. Why isn’t the Administration more supportive of this type of research, especially given the favorable results of an Alaska North Slope drilling project in 2009 which demonstrated that hydrates can flow into production? What does DOE hope to accomplish with the requested level of funding?

Answer. The \$10 million request in the Office of Science's Basic Energy Sciences (BES) program is commensurate with the Administration's fiscally responsible FY 2012 budget request and supports basic research associated with methane hydrates. BES funding will support basic experimental research and advanced simulation on how hydrates are formed, including the subtle, intermolecular forces that govern the structure and properties of hydrates; the multi-phase behavior of hydrate-sediment systems; and the stability of hydrates in the natural environment.

GASLINE

Question 7. Do you feel that the federal government has done and is doing everything it can to encourage a successful open season which will lead to construction of an Alaska Gas Pipeline project as rapidly as possible?

Answer. The Federal government is doing all it can to encourage a successful Open Season. The Federal Coordinator, an independent agency, has the lead authority for coordination of Federal actions regarding the development of the Alaska Natural Gas Pipeline and is therefore the appropriate agency to provide updates on the status of the project. The Federal Energy Regulatory Commission (FERC) has the lead responsibility for setting the regulations for the Open Season process. The Department of Energy has been authorized by Congress to provide a loan guarantee when a commercial project has been identified, but holds no direct role in the Open Season process.

STRATEGIC PETROLEUM RESERVE

The Department's budget request assumes a \$500 million, non-emergency sale of SPR oil. To follow up on questions asked during Tuesday's hearing:

Question 8. Does DOE have any alternative options outside of selling the oil in Bayou Choctaw Cavern 20?

Answer. The proposed sale would afford operational flexibility in managing the reserve. No decision has been made about which caverns will be used to comprise the six million barrels of crude oil to be sold or the quantity of crude oil to be taken from each cavern. The Bayou Choctaw Cavern 20 situation is just one example of the need for operational flexibility in managing the reserve. The 7.5 million barrel capacity Cavern 20 currently holds 3.2 million barrels-4.3 million barrels has already been removed and distributed to other SPR caverns as a precaution. Consequently, many SPR caverns have been overfilled and may be better candidates from which to comprise the six million barrels to be sold. There are no other currently available options for adjusting the volume of oil in the Reserve.

Question 9. Does DOE plan to repurchase an equivalent volume of oil? If so, when?

Answer. DOE has no plans for repurchase. The purpose of the sale is to "free up" a small amount of space to provide operational flexibility in managing the reserve. The receipts from the sale will not be used for the SPR. The receipts from the sale will be deposited into a general fund receipt account of the Treasury and therefore will not be available for expenditure by DOE.

Question 10. Does DOE intend to devote the revenues from the sale of oil to any specific purpose or program, or will those revenues be returned to the Treasury?

Answer. The 2012 Budget (SPR Petroleum Account appropriation language) proposes that the funds generated in the sale be deposited in a general fund receipt account of the Treasury and therefore will not be available for expenditure by

Question 11. How often is DOE authorized to conduct non-emergency sales of SPR oil?

Answer. In the absence of Congressional direction, there is no legal authority under the Energy Policy and Conservation Act (EPCA) (P.L. 94-163, as amended) for DOE to conduct non-emergency sales of SPR oil, except through the conduct of a test sale. Test sales or exchanges of no more than 5 million barrels per test are authorized by section 161(g) of EPCA (42 USC 6241(g)), but there is no statutory restriction on how often they may be conducted.

In the 1990s, Congress directed non-emergency sales from the SPR for reasons of budget savings. The President's FY 2012 budget proposes a non-emergency sale from the SPR for operational reasons related to the overfilling of several SPR caverns. Implementation of the President's FY 2012 Budget proposal, requires new statutory authority as proposed in the SPR legislative language included in the 2012 Budget.

Question 12. Is there a minimum amount of oil in the SPR that must be maintained in order for DOE to conduct non-emergency sales of oil?

Answer. In the absence of Congressional direction, there is no legal authority under the Energy Policy and Conservation Act (EPCA) (P.L. 94-163, as amended)

for DOE to conduct non-emergency sales of SPR oil, except through the conduct of a test sale. Test sales or exchanges of no more than 5 million barrels per test are authorized by section 161(g) of EPCA (42 USC 6241(g)), but there is no statutory restriction on how often they may be conducted. There is no statutory limitation regarding a minimum amount of oil that must be maintained in the Reserve to conduct a non-emergency sale.

SPR + ROYALTY-IN-KIND AUTHORITY

Question 13. Has the abolishment of the Royalty-in-Kind program within the Interior Department had any effect, direct or indirect, on the statutory mandate for DOE to expand the SPR to one billion barrels?

Answer. No. Prior to the Department of the Interior cancelling the royalty-in-kind program, the SPR had completed fill to its capacity of 727 million barrels. The President's FY 2011 budget requested cancellation of \$71 million of prior year funds for expansion to one billion barrels and Congress enacted the request.

Question 14. When does DOE forecast its compliance with the mandate to expand SPR to one billion barrels?

Answer. The Energy Policy Act of 2005 directed the DOE to expand the SPR to its authorized level of one billion barrels, as expeditiously as practical, without incurring excessive cost or appreciably affecting the price of petroleum products to consumers. The Administration will review its policy related to 1 billion barrel expansion.

ULTRA-DEEPWATER PROGRAM

Question 15. What is the status of approval of the 2011 Annual Plan for the Ultra-Deepwater and Unconventional Natural Gas program authorized in Section 999 of EPCA '05?

Answer. The Unconventional Resources Technology Advisory Committee, one of two Federal advisory committees required by the Energy Policy Act of 2005 (EPCA 2005) to review the draft annual plan, provided its written comments in October 2010. The members of the other Federal advisory committee, the Ultra-Deepwater Advisory Committee (UDAC) were appointed in February 2011. The UDAC held its first meeting to begin its review of the Draft 2011 Annual Plan on February 23, 2011. Written comments, as required by EPCA 2005, are expected by the end of April 2011. Upon receipt of all written comments, the 2011 Annual Plan will be made final, transmitted to Congress, and published in the Federal Register.

The research program established pursuant to EPCA 2005 Section 999A has been refocused to emphasize greater focus on quantification of risk and environmental sustainability, especially as related to ultra-deepwater and unconventional natural gas (shale gas).

Question 16. How many projects are currently being managed under the Section 999 program for ultra-deepwater and unconventional natural gas research and development?

Answer. There are currently 79 active projects being managed under the Section 999 program for ultra-deepwater and unconventional natural gas research and development. An additional 8 are anticipated to be awarded in 2011. To date, 12 projects have been completed for a total of 99 projects for Fiscal Years 2007-2009.

Question 17. In the wake of the Deepwater Horizon incident, what is your view of the role of the Section 999 program, as it exists under current authorities and funding levels, in terms of increasing safety and well integrity through ultra-deepwater research and development?

Answer. Following the explosion of the Macondo well in the Gulf of Mexico on April 20, 2011, the Program Consortium was instructed to refocus the Section 999A Ultra-Deepwater research so that at least 50% of the funds are invested in quantification of risk and environmental sustainability. This change will be manifested in the 2010 research portfolio and the 2011 Annual Plan.

This shift in research emphasis is based on the recognition that technological improvements in the efficiency and cost-effectiveness of producing oil and gas from deepwater fields and unconventional reservoirs, while important, must only be applied when potential negative environmental impacts are well defined and the appropriate plans and technologies are in place to either prevent or mitigate these impacts. While previous Annual Plans have focused primarily (although not entirely) on technologies focused on efficiency and cost, the ultra-deepwater projects in 2010 and the annual plan going forward in 2011 will focus on quantifying potential environmental risks and developing technologies to address them.

Question 18. Has the Sec. 999 program focused on or required inclusion of safety, well integrity, and environmental sustainability elements in its work?

Answer. Although all projects included in the program satisfy certain aspects of safety and environmental sustainability a greater emphasis on quantification of risk and environmental sustainability has been placed on projects to be selected as part of the 2010 research program and solicitations subject to the 2011 Annual Plan. The Program Consortium was instructed to refocus the Section 999A Ultra-Deepwater research so that at least 50% of the funds are invested in quantification of risk and environmental sustainability. This change will be manifested in the 2010 research portfolio and the 2011 Annual Plan.

This shift in research emphasis is based on the recognition that technological improvements in the efficiency and cost-effectiveness of producing oil and gas from deepwater fields and unconventional reservoirs, while important, must only be applied when potential negative environmental impacts are well defined and the appropriate plans and technologies are in place to either prevent or mitigate these impacts. While previous Annual Plans have focused primarily (although not entirely) on technologies focused on efficiency and cost, the ultra-deepwater projects in 2010 and the annual plan going forward in 2011 will focus on quantifying potential environmental risks and developing technologies to address them.

Question 19. In the last 4 years the federal government has invested just over \$92 million in the ultradeepwater and unconventional gas program. How much have public and private partners brought forward in matching funds during that time?

Answer. For the projects selected in years 2007–2009, a total of \$45.6 million of matching funds have been provided for the \$92.8 million of government funds provided for those projects, \$11.7 million for Ultra-Deepwater research, \$26.5 million for Unconventional research, and \$7.4 million for Small Producers research.

Question 20. Of the 99 projects the Sec. 999 program has funded, how many involve universities and how many universities have received program awards?

Answer. A total of 65 projects involve universities as lead or partners in 22 states. Of this, a total of 48 awards have been made directly to universities as the lead. This represents a total of \$53.9 million for projects involving universities of which \$33.5 million was awarded directly to universities.

ENERGY EFFICIENCY

Question 21. The President's FY 2012 budget request calls for funding his new Better Buildings Initiative to achieve a 20 percent improvement in commercial buildings' energy use by 2020. The budget materials describe this new initiative as "including many new components to achieve this goal." One such component appears to be for a \$100 million loan guarantee program for universities, schools, and hospitals, plus an additional \$5 million for administrative costs.

The Administration appears to be seeking \$100 million in appropriations to cover the subsidy cost amount, like the Section 1705 loan guarantee program created in the Stimulus bill for renewable technologies. Q21. The Administration appears to be struggling to administer the existing Section 1703 (under which the project developer pays the subsidy costs) and the Section 1705 loan guarantee programs, as well as the loan guarantee program for Advanced Technology Vehicle Manufacturing (ATVM). In fact, last Congress, the Department's implementation was so slow that \$3.5 billion of the Section 1705 funds was taken away from the DOE loan program to pay for "Cash for Clunkers" and State assistance. The ATVM program has issued just one small conditional loan in the past 10 months and nearly two-thirds of the program's loan authority remains unused. How can DOE reasonably be expected to administer yet another loan guarantee program? How much additional personnel would be needed to handle this new program?

Answer. The Title XVII Loan Program Guarantee was authorized in 2005 and funded in 2007, yet had not issued a single loan until this Administration. Since the spring of 2009, the Loan Programs has supported over \$40 billion in total government supported financing, including capitalized interest, in loans and loan guarantees to 42 clean energy projects with total project costs of over \$63 billion. Cumulatively, project sponsors expect these projects to produce nearly 38 million megawatt hours yearly—enough to power over two million households—and to fund almost 68,000 jobs¹ across 38 states. LPO estimates that the existing conditional commitments for projects may utilize all of our remaining credit subsidy appropriations under the Section 1705 program.

DOE anticipates that the \$100 million in credit subsidy for a new "Better Buildings Pilot Loan Guarantee Initiative for Universities, Schools, and Hospitals" could

¹ Breakdown by program is as follows (based on Sponsor estimates): 1703: 5,210 construction, 1,340 permanent; 1705: 16,783 construction, 3,995 permanent; ATVM: 8,200 created, 38,960 saved.

support up to \$2 billion in loan guarantees to support energy efficient retrofits, depending on the exact parameters of the authorizing legislation and governing rules. The Department looks forward to working with Congress to develop the elements of a successful program.

Question 22. The President's FY 2012 budget request calls for funding his new Better Buildings Initiative to achieve a 20 percent improvement in commercial buildings' energy use by 2020. The budget materials describe this new initiative as "including many new components to achieve this goal." One such component appears to be for a \$100 million loan guarantee program for universities, schools, and hospitals, plus an additional \$5 million for administrative costs. The Administration appears to be seeking \$100 million in appropriations to cover the subsidy cost amount, like the Section 1705 loan guarantee program created in the Stimulus bill for renewable technologies.

In addition to this new \$100 million loan program, the President is calling for an "aggressive reform of existing tax and other incentives for commercial building retrofits and proposing a new competitive grant program." How will these be paid for, beyond the \$100 million that the President is asking Congress to appropriate? Please break down the costs and the funding.

Answer. The Better Buildings Initiative is a Presidential priority. It will leverage the lessons learned from other federal and state programs, as well as years of research and experience in energy efficiency. This program is part of the Department of Energy's proposed budget request and program plans for FY2012 which has just been transmitted to Congress. Specific activities included in the Better Buildings Initiative including a new tax incentive for commercial building upgrades, financing programs, competitive grants to state and local governments who implement innovative approaches to energy efficiency building codes, regulations and performance standards, and a challenge to the private sector and universities to make facilities more energy efficient. Those meeting the challenge would have their organizations recognized and supported with technical assistance.

Question 23. The President is requesting an almost 50% increase in funding from FY10 levels for the Weatherization Assistance Program (WAP). As you know, this program received \$5 billion in the American Recovery and Reinvestment Act (ARRA or Stimulus). I understand there have been several instances of waste, fraud and abuse. In fact, DOE's Inspector General has initiated several investigations into the use of WAP funds under ARRA. It is troublesome, then, that Congress is being asked to increase funding to this program that clearly has suffered from lack of oversight.

Has all of the \$5 billion in stimulus money for this program been spent? If not, how much is left? DOE's website shows that the agency has more than \$2.6 billion obligated but still unspent from the 2009 stimulus bill for this program.

Answer. Under the Recovery Act, the Weatherization Program received \$5 billion to provide weatherization services to over 600,000 to low-income families. These weatherization services include the repair of heating and cooling systems, electrical systems, and electrical appliances, while at the same time ensuring health and safety. According to a 2010 report from Oakridge National Laboratory, families save an average of \$400 a year on their energy bills as a result of the weatherization program. This is significant given that the total heating and cooling costs average 10 percent or more of a low-income family's income per year, compared with just 3 percent for the average American home.

To date, the weatherization program has paid out over \$2.7 billion (54%), and helped more than 400,000 low-income families nationwide improve the energy efficiency of their homes and help them save money on their energy bills. Moreover, in the first quarter of 2011, WAP funding supported thousands of jobs. Many of these workers are former construction workers or contractors that were hit hard by the downturn in the housing market. The weatherization program expects to weatherize over 600,000 homes by Spring 2012.

Question 24. Please describe actions that DOE will be taking with regard to the IG's recommendations stemming from these reports.

Answer. The Department of Energy works closely with the Inspector General on the audit and inspections it carries out. Their work has been an integral part of the Department's monitoring and oversight efforts, and we are committed to continuing to work with the Inspector General (IG) to address any substantive issues that they identify. Moreover, DOE will continue to work in real-time with the Inspector General to implement recommendations as the IG report is being written.

Guidance

Based on IG findings and recommendations, Weatherization Assistance Program (WAP) has reviewed and updated a variety of guidance documents, including but not

limited to monitoring and oversight, grant guidance, reporting, eligibility provisions, and health and safety measures. Moreover, WAP also developed new guidance documents based on IG findings, including but not limited to Davis Bacon, Historic Preservation, privacy of recipients' services, and policy procedures, such as call-backs.

Monitoring

In addition to issuing additional guidance on monitoring (amending Weatherization Program Notice 01-6), we've also worked hard to identify and resolve risks associated with individual recipients. We used risk scores for individual Recovery Act recipients to prioritize our oversight and monitoring efforts. We further established a Recipient Risk Management System that considers 48 distinct risk indicators to inform management, procurement, and oversight staff of potential risks associated with individual Recovery Act recipients and sub-recipients. As part of this effort, we are also receiving real-time alerts on potentially problematic developments related to our recipients, which we share with the Inspector General, as appropriate.

In addition to weekly and monthly desktop reviews with recipients, Weatherization project officer also conduct frequent site visits corresponding to the value of the award and risk level. In general, frequency is as follows:

- Grants over \$90 Million (Quarterly)
- Grants between \$90 Million—\$40 Million (Three visits)
- Grants under \$40 Million (Semi-Annual)

Note: More visits may be done depending on specific situation or need of recipients.

Staff Focused on Targeted Areas

To ensure sufficient level of oversight and outreach with recipients, Weatherization has hired additional, targeted staff such as:

- Training and Technical Assistance Team
- Expanded WAP policy and guidance team
- A Buy American specialist
- Davis Bacon specialists

Question 25. The budget request notes that this proposed increase is for “key activities of weatherization formula grants and innovations in weatherization within the Weatherization Assistance Program.” Given that the WAP has been around for 33 years, what are these innovations?

Answer. The FY2010 Appropriations Bill's Conference Report* provided \$30 million from within available funds for the development of a pilot project that would increase the leverage of Federal funding through the formation of partnerships between the Department and traditional and/or nontraditional weatherization providers. *(Official title: “Conference Report to Accompany H.R. 3183, Report 111-278,” at page 105 under Weatherization Assistance).

In order to address this Congressional directive, DOE introduced a competitive funding opportunity, a new Weatherization Innovative Pilot Program (WIPP), to select the applications that met these goals of increased leverage and the formation of new innovative partnerships. The first round of WIPP grantees included organizations that have not historically been a part of the Department's Weatherization Assistance Program, including private companies, non-profit organizations, universities, city governments, and national partners like Habitat for Humanity and YouthBuild USA. WIPP projects will help build the local capacity of new weatherization providers and will allow DOE to rigorously test the cost-effectiveness of a range of new weatherization approaches that have the potential to accelerate efforts to build an efficient and sustainable weatherization and retrofit market. Projects include:

- New technologies, such as solar, efficient hot water systems, and in-home energy devices, that hold the promise of increased energy savings and cost-effectiveness
- Innovative financing, loans, and revolving funds to increase leveraging of federal funds
- Healthy homes approaches that streamline health interventions with weatherization and produce better energy and health outcomes
- Volunteer-based national organizations that have legacies of strong corporate funders and in-kind donations, which both increase the level of non-federal funds into the program and decrease direct labor expenses

Additional funding for the WIPP program will help DOE to achieve the program's goals of leveraging federal grant dollars 3-to-1 with non-federal funds, attracting

new partnerships with both traditional and non-traditional weatherization providers, and increasing effectiveness through more efficient delivery of services and higher energy and dollar savings for clients. http://apps1.eere.energy.gov/news/progress_alerts.cfm/pa_id=384

See the full list of selected awardees: http://www.eere.energy.gov/wip/pdfs/grantees_selected_wipp_awards.pdf

Description of 16 funded WIPP Projects, which is generally indicative of the type of things we would like to fund in 2012: http://www1.eere.energy.gov/wip/wipp_projects.html

NUCLEAR

Question 26. The budget request calls for \$550 million for ARPA-E plus an additional \$100 million for wireless technologies, yet the COMPETES Reauthorization Act only authorizes ARPA-E at \$306 million for FY2012. I understand all \$400 million provided to ARPA-E by the Recovery Act two years ago has now been obligated and awarded, but since these programs are forward funded we won't see the results for several years. Given that it took ARPA-E two years to obligate and award \$400 million, and that was in part due to the timeline required under the Recovery Act, can ARPA-E really obligate and award \$650 million in programs in the next fiscal year?

Answer. ARPA-E is confident in its ability to obligate and award all of the funds in its budget request in the next fiscal year. ARPA-E implemented a process for the development and creation of programs that features extensive technical community engagement, topical workshops, a three-stage peer review process that allows for rebuttals to reviewer comments, and rapid contract negotiation, as shown in the figure below.*

Despite its depth of engagement and multi-stage evaluation, this model affords a timeline from conception to execution that is greatly accelerated—typically six to eight months. This allows ARPA-E to respond rapidly to newly emerging technological discoveries in its creation of new programs.

ARPA-E's embedded dedicated legal and procurement teams allow it to achieve a rapid pace of transferring awards from announcement to signing cooperative agreements—usually about two to three months—a pace that is uncommon in the public sector. ARPAAE successfully responded to the challenge of awarding Recovery Act funds in just 17 months—with only a fraction of current staffing levels and having to start a brand new agency from scratch—through the creation of an innovative process, careful resource allocation, and the efforts of a bright, determined team.

ARPA-E can now do in one year what previously took seventeen months because we have fully ramped up and can “hit the ground running” with new funds. The current, expanded ARPA-E team—with its previous experience of creating and managing the seven existing programs, awarding and obligating the Recovery Act funds, and establishing policies and practices—has the capacity to obligate and award the entire FY2012 appropriated amount on schedule.

Question 27. Section 302 of the Nuclear Waste Policy Act of 1982, as amended, authorizes the Secretary of Energy to establish a Nuclear Waste Fund through the collection of fees from the nuclear industry for the construction of a geologic repository for high-level radioactive waste and spent nuclear fuel storage. The Act expressly identifies the Yucca Mountain site as the sole permanent repository to be considered. The Act also directs the Secretary to propose an adjustment of the fee if the amount collected is insufficient or in excess of the amount needed to meet the cost of the construction of the repository. With the attempted withdrawal of the Yucca Mountain license application and the proposed termination of the only expressly identified permanent repository, do you believe that the fees collected and deposited in the Nuclear Waste Fund are in excess of the amount needed to meet the repository's costs? Do you believe an adjustment of the fee is in order?

Answer. The Nuclear Waste Policy Act establishes a fee of one tenth of a cent per kilowatt-hour of electricity generated and sold that must be paid by nuclear utilities and deposited in the Nuclear Waste Fund. The Act also requires that the Secretary of Energy annually review the adequacy of this fee. If the Secretary determines that either insufficient or excess funds are being collected, the Secretary must transmit a proposed fee adjustment to Congress.

The Department completed its most recent annual review of the adequacy of the Nuclear Waste Fund fee in November 2010. The review concluded that there is no reasonable basis to conclude that the current fee is generating either insufficient or excess funds to cover the costs of the Department's obligation to dispose of the Na-

* Figure has been retained in committee files.

tion's high-level nuclear waste and spent nuclear fuel. A copy is available on the U.S. Department of Energy website at: http://www.gc.energy.gov/documents/Secretarial_Determination_WasteFee.pdf

Although the Department has determined that a geologic repository at Yucca Mountain is not a workable option and should be terminated, the Department has repeatedly affirmed the Government's commitment to meeting its obligation to dispose of high level waste and spent nuclear fuel.

The Department is committed to reviewing the fee annually and to making its review publicly available. If the Department concludes in the future that either insufficient or excess revenues are being collected to meet this obligation, the Department will promptly propose an appropriate adjustment of the fee to Congress.

Question 28. The new Light Water Reactor—Small Modular Reactor Licensing Technical Support program anticipates a cost of \$452 million over five years. Do you expect this program to run longer than five years or do you believe two SMR designs will have made it through the licensing process in that time frame?

Answer. The Department does not expect the program to run longer than five years. The program is designed to help improve the timeline for the commercialization and deployment of these relatively mature technologies and the Department expects that adequate progress will have been made on the most critical steps of the licensing process in that time frame. The Department expects that SMR vendors will have sufficiently learned from interaction with the Nuclear Regulatory Commission (NRC) and that continued support by DOE will not be necessary after the five year program.

Question 29. Please provide more detail on the types of technologies you expect the new Nuclear Energy Enabling Technologies program to develop and support. Why is it necessary to have a new, separate program from the Reactor Concepts and Fuel Cycle programs to achieve these goals?

Answer. The mission of the Nuclear Energy Enabling Technologies (NEET) program is to conduct research and development to deliver crosscutting technologies that directly support and enable the Office of Nuclear Energy's (NE) broad research and development portfolio and to encourage the development of transformative, "outside-the-box" innovations in nuclear energy science and engineering.

The Transformative component of NEET is open to the full range of nuclear energy technology and is not specific to any on-going mission activities. It is designed to provide a mechanism for identification and development of creative, new, emerging technologies via an open, competitive solicitation process. The effort will support transformative projects that have the potential for making significant leaps forward in advanced nuclear technology development in all aspects of the civilian nuclear energy program.

The NEET program will also conduct crosscutting research and technology development relevant to the various reactor and fuel cycle concepts within the scope of NE research and development (R&D) programs that offer substantially improved economic and safety performance. NEET will be able to coordinate efforts on common issues and avoid duplication of efforts in technology development in separate programs. The NEET program is intended to carry out research that is beyond the scope of individual NE R&D programs, lead and coordinate research that is needed by several NE R&D programs, and identify and deliver enabling technologies to achieve critical steps in technology deployment. The activities undertaken in this program complement those within the Reactor Concepts Research Development & Demonstration and the Fuel Cycle R&D programs by providing a mechanism for pursuing broadly applicable R&D in areas that may ultimately benefit specific reactor and/or nuclear fuel concepts. Reactor and fuel cycle designs are currently limited by technologies at the subsystem and component level, and NEET research is aimed at providing new options to the system level designs.

Through coordinated R&D, this program will ensure that resulting technologies and solutions are scalable to individual reactor and fuel cycle applications (e.g., development of high-temperature resistant materials and radiation-hardened electronics, proliferation risk assessment of different nuclear fuel cycle options, etc.). This R&D will ultimately result in lower costs for needed capabilities across NE R&D programs, better use and coordination of expertise and leveraged facilities across the enterprise, and assurance that the best technologies are available for nuclear energy deployments when needed.

Examples of the types of technologies expected in NEET crosscutting areas include the following:

- New, innovative reactor materials concepts for fuel cladding and structural materials well beyond those currently considered by most industrial interests will be explored to provide alloys with improved performance over traditional mate-

rials. Improved performance may include a 5- to 10-fold increase in strength, or increased maximum operating temperature by over 200° Celsius (°C), with a service period of at least 80 years.

- Advanced manufacturing technologies that could provide simplified, standardized, and labor-saving outcomes for manufacturing and civil works processes (both technologies and methods) for new nuclear component manufacturing and plant fabrication will be investigated. For example, concrete installation is one of the most costly (up to \$1 million per day) and time-consuming aspects of building a new nuclear power plant. Potentially, the use of high-strength concrete or steel-concrete composite wall construction could significantly reduce construction cost and schedules.
- Advanced instrumentation and sensors that could: (1) operate in the temperature regimes and harsh environment (e.g., 1000°C gas environment, liquid metals) that preclude the cross-compatibility of existing instrumentation, (2) directly measure primary process parameters that would otherwise be inferred or measured from a distance with a corresponding loss in precision and increase in uncertainty, (3) minimize measurement drift that can support longer intervals between maintenance and service outages, as envisioned for advanced reactors, and (4) include electronics that are, or can be made to be, radiation tolerant due to their proximity to the nuclear reactor core and back end of nuclear fuel cycle process.
- Advanced modeling and simulation tools are being developed that will provide a greater understanding of the long-term performance of fuels both in the reactor during operations and once discharged (useful to regulators, designers, and operators). For example, the Advanced Multi-Physics (AMP) code being developed at the Oak Ridge National Laboratory models fuel at the “pin” level in three dimensions with very high temporal and spatial resolution. The AMP code is presently being considered for use in the virtual reactor model being developed by the Energy Innovation Hub for Modeling & Simulation of Nuclear Reactors.

Question 30. The Office of Electricity proposes a significant increase to \$238.22 million in FY 2012 (+41%). With this proposed increase in funding, will the Department also examine the potential impact of regulations, such as those contemplated by EPA, on the nation’s grid reliability? According to news reports you recently told a renewable energy conference that there will be “massive” closures of coal plants in the United States within the next 5 to 8 years. Do you believe those closures will have any impact on the reliability of the electrical grid, or the cost of energy paid by consumers? What role do you believe EPA regulations will play in provoking those closures?

Answer. The Office of Electricity Delivery and Energy Reliability is working collaboratively with other Federal agencies, including EPA, as well as States, and the electric generation industry to evaluate the potential impact of EPA’s proposed regulations. These regulations are just one of many factors that are expected to lead to an increase in the number of retirements of existing generation facilities over the next 3-8 years.

The business decision surrounding if, or when, an electric generation facility is retired is not easily predicted. There are a range of factors that are expected to result in coincidental retirements including age of existing facilities, build out of new generation, load forecasts, and cost of compliance with environmental requirements. In addition, this decision making process will be unique for each utility. For example, the factors considered by a rate-based vertically integrated utility are quite different than those considered by merchant facilities. Determining which facilities will retire, and when, is not possible at this time. Similarly, any impact on the cost to consumers may only be evaluated when more specific information becomes available. Any increase in cost would at least partially be offset by State and Federal energy efficiency programs.

As site-specific retirement information becomes available, reliability analyses will become possible. These analyses are often conducted as part of the supporting information when a facility is proposed for retirement. If reliability issues are identified, a variety of alternatives are considered. When potential conflicts arise between achieving timely environmental protection contemplated in EPA’s proposed regulations and maintaining electric reliability, DOE will work with EPA, States and the appropriate utilities to ensure electric reliability is maintained.

Question 31. The Office of Electricity proposes a significant increase to \$238.22 million in FY 2012 (+41%). A full \$60.8 million is to be directed to clean energy transmission and reliability. DOE’s budget materials further explain that the Department proposes to examine system requirements to integrate renewables into the

grid. As you know, FERC recently release a long-awaited study on grid reliability that was conducted by the Lawrence Berkley Laboratory. How does DOE's proposed effort differ from what has already been completed by the Lab?

Answer. On January 20, 2011, FERC issued for public comment a study, conducted by Lawrence Berkeley National Laboratory (LBNL), which examined what is known as the frequency response of the bulk power system. Frequency response measures how the electric system performs in responding to a sudden loss of generation that could cause reliability problems such as blackouts.

This report presents a systematic approach to identifying metrics that are useful for operating a reliable system with increased amounts of variable renewable generation, building on existing industry practices for frequency control after unexpected loss of a large amount of generation. It introduces a set of metrics (or "tools") for measuring the adequacy of frequency response within an interconnection. These metrics take advantage of new information gathering and processing capabilities for wide-area situational awareness that DOE is working with system operators to develop.

The Transmission Reliability and Renewables Integration activities within the Clean Energy Transmission and Reliability program includes research that is focused on developing advanced technologies and applications that enhance real-time operational decision-making by enabling wide-area measurement and situational awareness. This includes the information technologies, software programs, and reliability/analysis platforms (or "technology tools") needed by system operators and reliability coordinators to monitor, track, predict, and respond to maintain grid reliability. These technologies, for example, could allow operators to monitor the parameters (or metrics) identified in the LBNL frequency response report.

RELIABILITY

Question 32. Section 202(c) of the Federal Power Act grants the Department of Energy the authority to order an electric generation facility to operate in an emergency to preserve the reliability of electricity service and serve the public interest. Is an electric generation facility required to operate under this authority if the operation of the facility violates an environmental law (including but not limited to, the Clean Air Act, Federal Water Pollution Control Act, Solid Waste Disposal Act, the Safe Drinking Water Act, Endangered Species Act, and Comprehensive Environmental Response, Compensation and Liability Act or analogous laws or regulations promulgated by any federal state or local authority)?

Answer. The Department is aware of only one instance where there was a possible conflict between an emergency order issued under FPA section 202(c) and environmental statutes. That involved Mirant Corporation and its wholly owned subsidiary, Mirant Potomac River, LLC. In that instance, DOE worked closely with United States Environmental Protection Agency (EPA) and state authorities to achieve both electricity reliability and protection of the environment. Under such circumstances it is the responsibility of the executive branch to administer all statutes in a manner that promotes their underlying policy goals and carefully balances any potential conflicts.

On August 21, 2005, Mirant ceased operation of the Potomac River Generating Station (Plant) in response to a letter from the Virginia Department of Environmental Quality (DEQ) requesting that Mirant undertake such action necessary to ensure protection of human health and the environment in the area surrounding the Potomac River Generating Station. In response to Mirant's decision, the District of Columbia Public Service Commission filed an Emergency Petition and Complaint requesting the Secretary of Energy to find that an emergency exists under subsection 202(c) of the FPA and to issue an order directing Mirant to continue operation of the Plant. The basis for the petition was that the shutdown of the Plant "...will have a drastic and potentially immediate effect on the electric reliability in the greater Washington, D.C., area and could expose hundreds of thousands of consumers, agencies of the Federal Government and critical federal infrastructure to curtailments of electric service, load shedding and, potentially, blackouts." The structure of the electricity transmission system at that time placed the Plant in a uniquely important position with regard to maintenance of electric reliability for downtown Washington.

After extensive investigation and analysis of the electric supply situation in the Central D.C. area, and in consultation with EPA and the DEQ, on December 20, 2005, the Secretary of Energy issued DOE Order No. 202-05-3, pursuant to FPA section 202(c), ordering the limited operation of the Plant. The order found "that an emergency exists because of the reasonable possibility an outage will occur that would cause a blackout, the number and importance of facilities and operations in

our Nation's Capital that would be potentially affected by such a blackout, the extended number of hours of any blackout that might in fact occur, and the fact that the current situation violates applicable reliability standards."

In issuing the order, the Secretary was cognizant of the concerns that were expressed concerning the potential adverse environmental consequences of operating the Plant, and of the national interest in attainment of the NAAQS that have been established under the Clean Air Act. To address those concerns, the order sought to harmonize environmental protection interests to the extent reasonable and feasible by ordering Mirant to operate in a manner that provided reasonable electric reliability, but that also minimized any adverse environmental consequences from the operation of the Plant.

On June 1, 2006, EPA entered into an Administrative Compliance Order by Consent (ACO) with Mirant pursuant to the Clean Air Act. The ACO provided specific operating parameters and procedures for Mirant to follow in "Non-Line Outage Situations" and "Line Outage Situations." In a June 2, 2006, letter order to Mirant, DOE directed Mirant to operate the Plant in accordance with the ACO in Non-Line Outage situations.

On January 31, 2007, the Secretary of Energy issued DOE Order No. 202-07-2, extending the emergency order. The Secretary made two noteworthy additions to the Ordering Paragraphs contained in the original December 20, 2005 order. These additions were:

A. During any period in which one or both of the 230 kV lines serving the Central D.C. area is out of service, whether planned or unplanned, Mirant will operate the Potomac River Generating Plant to produce the amount of power (up to its full capacity) needed to meet demand in the Central D.C. area as specified by PJM for the duration of the outage.

1. In the event of a planned outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand.

2. In the event of an unplanned 230 kV line outage, Potomac River units will generate that amount of electricity specified by PJM to meet demand as soon as possible.

When producing electricity pursuant to this paragraph, Mirant shall utilize pollution control equipment and measures to the maximum extent possible to minimize the magnitude and duration of any exceedance of the NAAQS. Compliance with the ACO shall constitute compliance with this requirement.

B. During periods when the two 230 kV lines serving the Central D.C. area are not out of service, Mirant shall keep as many units in operation, and shall take all other measures to reduce the start-up time of units not in operation, for the purpose of providing electricity reliability, but without causing or significantly contributing to any exceedance of the NAAQS or causing serious risk of danger to the Plant or unreasonable risk to Plant personnel. Pursuant to DOE's June 2, 2006 letter to Mirant, Mirant will operate the Plant in accordance with paragraph B of Part IV of the ACO, and any other applicable terms of the ACO.

Thus, the Department in recognizing the ACO and tailoring its order to avoid to the maximum extent possible any adverse environmental effects, and EPA in recognizing the vital importance of reliable electricity service to the Central D.C. area (and the adverse environmental effects of a blackout) when fashioning the ACO, demonstrated how the executive reconciled potentially conflicting statutory goals. The Department's order expired when upgrades to the regional transmission system made it no longer necessary.

Question 33. If DOE retains such authority, and a generation facility is required to operate by DOE in conflict with any environment laws, would the facility operator be subject to civil or criminal liability?

Answer. As the Department's experience in the Mirant matter described above demonstrates, the Department believes the appropriate course to pursue in such a case is to harmonize the working of applicable federal regulatory regimes when invoking the Department's authority under section 202(c) of the Federal Power Act. Given the absence of any provision of section 202(c) of the Federal Power Act explicitly describing the relationship of its requirements to those imposed by the other federal statutes referred to in the question, administering whatever federal regulatory statutes may be applicable to a given facility in a way that harmonizes potentially differing effects seems the only sensible way to carry out these laws.

Question 34. As you know, this Committee addressed cyber security issues last Congress in S.1462, the American Clean Energy Leadership Act, in which we pro-

vided additional authorities to both DOE and FERC. Other Senate Committees have also been working on the cyber issue but would prefer to give overarching authority to the Homeland Security Department. I understand that the Administration prefers a comprehensive approach to cyber security as opposed to the sector specific plan we approved in the Energy Committee. Does the Department's proposed decrease in cyber security funding reflect a preference by the Administration that cyber security efforts be concentrated in another Department?

Answer. No. In fact, the Department cannot achieve its mission to modernize the electric grid without the development and integration of cyber security solutions to meet the stringent performance requirements of the mission-critical systems that manage, monitor, and control the reliable delivery of energy to the nation. The decrease in funding compared to FY 2010 reflects a one-time allocation for a Congressionally-directed activity, as well as the successful completion of several industry-led projects. The FY 2012 request supports the Department's activities, which are specifically designed to address the unique cyber security challenges of the energy sector as detailed in the 2011 "Roadmap to Secure Energy Delivery Systems". The 2011 Roadmap is an updated version of the 2006 "Roadmap to Secure Control Systems in the Energy Sector" which has led to the development and deployment of several critical cyber security solutions, including more secure supervisory control and data acquisition (SCADA) systems, a secure SCADA communications protocol to secure data communications between remote substations and utility control centers, and software tools to help utilities ensure that SCADA systems and applications are properly configured against cyber attacks. These tools also help utilities ensure compliance with the North American Electric Reliability Corporation cyber security requirements.

While there are a number of public and private sector entities working on cyber security solutions for traditional IT business and network systems, these solutions are not appropriate or adequate to meet the cyber security needs for energy delivery systems for a number of reasons. Energy delivery systems must be designed to control real-time physical processes that deliver continuous and reliable power to support national and economic security. As such, they require security solutions that meet unique performance requirements and operational needs. For example, electric control systems must operate 24/7/365 with extremely high availability; data communications in substations require time-critical responses of less than 4 milliseconds for protective relaying; and technologies to provide wide-area situational awareness for transmission lines require data communications links with time delays of less than a second. Further, when vulnerabilities are found, patching the system is difficult and sometimes not possible. Because system upgrades could cause power outages if not implemented properly, they are planned weeks or months in advance through pilot implementations on backup systems before deployment on production systems. Pre-deployment testing of any security solution or update is essential to validate system performance. Also, power system sensing and control devices are widely dispersed across large geographic regions, and often located in populated areas where they are vulnerable to physical tampering. Finally, cyber security solutions for the energy sector must ensure the timely and proper operation of cyber-physical devices (e.g., opening a digital relay or changing settings on transformers). Thus, cyber attacks on energy delivery systems can cause power outages, as well as physical damage to expensive electric grid components like generators that can take many months to replace. The Stuxnet worm-designed to attack a specific control system-was discovered last summer. Stuxnet underscores the seriousness of targeted cyber attacks on energy control systems, and emphasizes the need for research that provides cyber security protections tailored to the unique requirements of the energy sector.

Question 35. In the budget request, the Office of Electricity is slated for a significant increase of 41.4 percent for \$238.22 million in FY 2012. Within this office, the Research and Development arm is slated to receive the lion's share at \$192.8 million to support research into smart grid (+\$13.5 million), clean energy transmission (+23.4 million), energy storage (+43.4 million), and cyber security (-8.9 million). Just this month, the Department announced it was launching a new Cyber Security Initiative, calling cyber security "vital to the development of a modern electric grid." Why are you supporting a decrease of funding in this critical area, particularly in light of DOE's new initiative and given the fact that both Smart Grid (\$4.4 billion) and clean energy transmission (\$6 billion loan guarantee program before the \$3.5 billion rescission and \$20 million for transmission planning) received substantial Stimulus funding?

Answer. The decrease in funding from FY 2010 reflects a one-time allocation of funds in 2010 to support the creation of the congressionally-directed National Electric Sector Cybersecurity Organization, or NESCO, as well as the successful comple-

tion of several industry-led projects. The FY 2012 request will continue to sustain the Department's work with the energy sector, academia, and national laboratories to address the unique cyber security challenges of the energy sector. As new advanced digital computing and communications devices are developed and deployed (i.e., Smart Grid) and the threat continues to evolve, adapt, and become more persistent, it is critical that industry and government continue to work together to develop and deploy resilient systems that can survive an intentional cyber event without loss of critical functions as set forth in the 2011 "Roadmap to Secure Energy Delivery Systems."

Question 36. According to the Administration, the nation already receives 40 percent of its electricity from clean energy resources by 2035. The White House explained to my staff that to get to this 40 percent figure they're counting nuclear (20%), half of our natural gas (so 10%), hydropower (7%) and the remaining renewable resources (3%). With that calculation then, we're really talking about a 40 percent standard by 2035, correct?

Answer. The Administration believes that the simplest way to define the clean energy share is to divide total clean generation by total electricity sales. This leads to the 40% initial share, and it puts the 2035 goal in the context of our current energy system. With this definition, the President has proposed an 80% share by 2035—40 additional percentage points above the current share.

Question 37. Which agency is best suited to run this new program—DOE or FERC?

Answer. The administration of a CES program, if enacted by Congress would require strong support from DOE and FERC as well as other relevant agencies such as the EPA. The designation of a lead agency is a policy decision, and one that the Administration looks forward to working with Congress on.

Question 38. How do you propose figuring out the baseline calculations for this new mandate? How do you propose treating existing sources of clean energy?

Answer. Baselines should be calculated using EIA data. The treatment of existing sources of clean energy is a policy decision, and one that the Administration looks forward to working with Congress on.

Question 39. How do you envision this new Clean Energy Standard interacting with the renewable energy mandates already in existence in 29 states plus the District of Columbia?

Answer. A federal CES would be an independent program. As the Administration envisions the Clean Energy Standard working, there is no implied interaction or interference with state RPS programs, and states could continue to operate these programs as appropriate.

SMART GRID

Question 40. Last Congress, the Stimulus bill provided \$4.4 billion in smart grid funding. The President's budget request calls for even more money in the smart grid arena (\$45 million) plus a new Smart Grid Innovation Hub. Has all the Smart Grid stimulus funding been dispersed to date? How much additional funding is needed for the new Innovation Hub? As you know, FERC has yet to approve interoperability standards for smart grid. How is the lack of such standards hindering development?

Answer. All Smart Grid-related stimulus funds were obligated by September 30, 2010. While it took time as 342 awards were put in place, the projects, aimed at improving grid reliability and efficiency, are now in full swing. 97 percent of the funds were competitively awarded, and resulted in significant private sector investment. Recipients contributed a cost share of almost \$5.6 billion, more than matching the Federal investment. In contrast to the research and development work funded by annual appropriations, the Recovery Act-funded primarily focused on deployment of Smart Grid technologies.

In addition to the Smart Grid R&D activities, the FY 2012 request includes \$20 million for the Smart Grid Technology and Systems Hub for the first year, with a goal to continue funding research activities for an additional four years. The Hub will invest in research and development to address high-level challenges to the modernization of the grid.

Although the Federal Energy Regulatory Commission (FERC) was charged in the Energy Independence and Security Act of 2007 with adopting standards as they deem necessary to advance the Smart Grid, their exact role in discharging that duty is still evolving. The lack of such standards directly from FERC, however, has not been a hindrance to the Smart Grid interoperability and standards work going on in the Smart Grid Interoperability Panel led by the National Institute of Standards and Technology. Significant development has taken place on addressing important gaps, an overarching framework for standards development, and cyber security, as

well as interoperable standards that are providing guidance and direction for utilities, industry, and State and local regulators.

RENEWABLES

Question 41. The President has proposed an 80 percent standard to increase deployment of clean energy resources by 2035. Hydropower currently makes up approximately 7 percent of total electricity generation and two-thirds of renewable electricity generation. Clearly, in order to meet the President's goal, increased deployment of hydropower resources—including conventional, marine and hydrokinetic and pumped hydro storage—will play a critical role. Yet, DOE's FY 2012 budget proposes a cut to its waterpower program of over 20 percent from FY 2010 levels to \$38.5 million. At the same time, all the other renewable programs—wind (+60.6%), solar (+87.8%), geothermal (+ 135.5%) and biomass (+57.5%)—are slated for substantial increases. What is the reason for this clear disparity? In light of the President's ambitious goal, how can you support funding cuts for the country's leading renewable resource?

Answer. The FY 2012 budget request does not represent lowered expectations for water power technologies. In fact, the Department of Energy is optimistic about the opportunities to further develop emerging marine and hydrokinetic energy technologies and to increase generation from our nation's hydropower resources. The FY2012 request builds upon the significant investment the Recovery Act made in conventional hydropower activities and will advance work to support the development of cost-competitive water power technologies. The \$38.5 million requested for water power research in FY2012 is sufficient to perform this work and accelerate the market adoption of these technologies.

The Water Program is completing a comprehensive set of resource assessments, and undertaking detailed techno-economic assessments of emerging technologies, which will help us to effectively determine the opportunities and costs associated with these technologies. These important analyses will help the Department determine what funding levels are necessary and appropriate to realize water power's potential and are a responsible use of taxpayer dollars.

For conventional hydropower, the Department's current goals are to facilitate the deployment of new sustainable hydropower generating capacity, including timely and low-cost upgrades at existing hydroelectric facilities, the powering of non-powered dams and constructed waterways, and assessing the potential for new small hydropower deployment. The Department also works with other federal agencies, such as the Army Corps of Engineers and the Department of the Interior's Bureau of Reclamation, to support the development of environmentally sustainable hydropower by increasing energy generation at federally-owned facilities and exploring opportunities for new development of low-impact hydropower.

Question 42. If the country is to move toward greater clean and renewable energy generation, particularly with increased variable renewable energy generation, then energy storage will be needed. As you know, pumped hydro storage is a proven, existing, grid-scale energy storage technology with almost 22,000 MW of installed capacity in the U.S. and with over 30,000 MW of new projects under consideration. Pumped hydro storage already provides significant grid reliability benefits and assists with integration issues throughout the system. The President's budget contains items for energy storage research and project deployment. Can you discuss whether and how pumped hydro storage projects can benefit from these programs? The Department's budget materials note that DOE will start on new methods for identifying promising locations for pumped hydro—something I have called for in my Hydropower Improvement Act. What other initiatives will the Department pursuing to increase deployment of pumped storage resources? Will you be examining the FERC licensing process at all?

Answer. The Department's energy storage research efforts support a diversified storage portfolio with large (compressed air energy storage and pumped storage hydropower (PSH)) and medium-to-small (batteries, flywheels, etc.) grid-scale technologies, which operate on various time-scales and power levels, that will be needed to make the power system more robust and efficient.

The Department recognizes the value of pumped storage hydropower and has taken several steps to spur deployment of new PSH in the U.S. DOE convened a pumped storage technology summit meeting in September 2010, to address issues and barriers related to PSH development. National and international industry experts, manufacturers, developers, and other stakeholders from diversified fields relevant to pumped hydropower were present. This meeting identified several key issues and outlined prospective actions to advance PSH development through competitive solicitations to be released in FY2011. Going forward, the Department will

also demonstrate the full value of pumped storage through improved modeling, which will include the beneficial effect of PSH on further renewable energy system deployment and effective integration into the power system. DOE is also evaluating the complimentary role of PSH with other storage technologies. For example, DOE, in collaboration with the Bonneville Power Administration, is engaged in a study to explore the synergies between PSH, battery storage, and wind forecasting for better integration of wind power on the grid. DOE also hopes to release a Funding Opportunity Announcement in FY11 to capture opportunities to cost-effectively increase the capacity and generation of renewable electricity from conventional hydropower resources in the United States. Potential areas of support include investments in sustainable small hydropower, PSH, and environmental mitigation technologies.

SOLAR

Question 43. The FY 2012 budget request supports an ambitious program, deemed the SunShot Initiative, to reduce the cost of an installed solar photovoltaic system to price parity to fossil-based electricity. The goal is to achieve a dollar-a-watt installed price for Solar PV electricity before the end of the decade. What is the current average national installed price for Solar PV? How does that compare to the average installed price for wind, hydropower, biomass, geothermal, coal, nuclear, and natural gas? How much does the Administration estimate this new initiative will cost?

Answer. The goal of the SunShot Initiative is to reduce the total costs of solar energy systems by about 75 percent so that they are cost competitive with other forms of energy without subsidies before the end of the decade. This would equate to an installed cost of approximately \$.05-.06 per kilowatt-hour. At this price, DOE believes that solar energy has the potential to supply 15-18% of U.S. electricity by 2030, without energy storage. This will increase American economic competitiveness and help the U.S. regain leadership in the global market for solar energy.

To compare different technologies, one must look at the levelized cost of energy (LCOE) as this number reflects all cost factors including capital, financing, taxes, fuel and operating costs. According to analysis by DOE's Office of Energy Efficiency and Renewable Energy (EERE), current LCOE for residential photovoltaics (PV) is estimated to be at \$0.33; the LCOE of commercial PV is estimated at \$0.28; and the LCOE of utility-scale PV is estimated at \$0.14.

According to analysis by EERE, the LCOE for land-based wind is estimated at \$0.09; small hydropower is estimated at \$0.09; and geothermal (hydrothermal) is estimated at \$0.10. Energy Information Agency data is used for pricing on other technologies.

Meeting the SunShot goal will require investments in research, development, and demonstration that are closely linked with the efforts of ARPA-E and the Office of Science (SC). The current FY12 budget request of \$457 million covers the costs of this ambitious program for EERE, and addresses the competitiveness gap that now exists. The EERE efforts are supported by an SC request of \$8 million in FY 2012 to support new scientific research focused on understanding the fundamental mechanisms of the degradation of photovoltaic materials during use and ARPA-E projects that focus on "out-of-the-box" transformational energy research that industry by itself cannot or will not support due to its high risk. The SunShot Initiative goals will be reached within the decade.

Question 44. Last Congress, Senator Sanders introduced S. 3460, the Ten Million Solar Roofs Act, to allow states to use federal loans to provide rebates, loans and other incentives to consumers to purchase solar energy systems. How would the Administration's SunShot Initiative interplay with the Ten Million Solar Roofs Act if that legislation were enacted?

Answer. The goal of the SunShot program is to reduce the cost of solar technologies to be competitive with conventional generation without subsidies by the end of the decade. This would equate to a 75% reduction in installed cost or approximately \$1/WattDC for utility scale systems. Meeting this goal will require addressing costs due to permitting, interconnection, and inspection delays; so-called "soft" balance-of-system costs that are predominantly due to local and state regulation. These costs are a significant and rising part of total system costs, and addressing them is central to SunShot objectives. S. 3460 provides for a competitive grant program to fund activities that support the purchase and installation of solar technologies at today's prices which are not yet competitive with commercial power. Preference for these grants would be provided to States, Indian tribes, and local governments that have established and maintained, or agreed to commit to establish

and maintain, standards and policies conducive to distributed generation, including interconnection and net metering.

REVERSE AUCTION FOR CELLULOSIC BIOFUELS

Question 45. Through the Biomass and Biorefinery R&D program, the administration requests \$150 million for a reverse auction for cellulosic biofuels. Many within the industry have called for this funding, but some observers believe it will have minimal effect on cellulosic production—that it's more effective at increasing production from existing plants, rather than helping ensure that plants are built in the first place. Can you explain how the reverse auction would work? Where do you project cellulosic biofuel production will be this year, before the auction, and where do you project it would be after the auction has been completed? Is this a one-time request, or does the Department intend to make additional requests in future years?

Answer. The Cellulosic Ethanol Reverse Auction will add a market-based outlet for cellulosic ethanol demonstration plants. Specifically, a reverse auction will solicit bids from potential producers of cellulosic biofuels with a 750% decrease in greenhouse gas emissions. Those producers submitting the lowest bids would be awarded the production incentives. This is motivated by our detailed analysis, which demonstrates that we need to create a strong market signal for cellulosic ethanol and other advanced biofuels to solidify investment towards commercialization and meet the RFS targets. The auction will not increase any biofuels production from current biofuels facilities producing starch-based ethanol or biodiesel.

The auction will incent the production of cellulosic biofuels, which are “new” products requiring new production facilities. DOE anticipates it will support additional auctions if the cost benefit analysis validates the value of continued funding requests.

GEOHERMAL

Question 46. The Department proposes to increase funding for geothermal activities by 135.5 percent to \$101.53 million. I've been a long-supporter of geothermal research and authored Section 635 of the 2007 Energy Independence and Security Act (EISA) that authorized the U.S. Department of Energy (DOE) to provide grants for the installation of geothermal projects in high-cost areas nationwide. There are numerous opportunities for geothermal projects in my home state, as well as throughout the West. With additional geothermal funds, will the Department commit to finally funding Section 635 of EISA?

Answer. Following up with Senator Murkowski's staff, DOE confirmed that the Senator was referring to EISA Section 625, High Cost Region Geothermal Energy Grant Program.

The DOE Geothermal Technologies Program (GTP) is implementing EISA Section 625 by including in its Funding Opportunity Announcements (FOAs) a program policy factor for projects in high electricity cost regions as an additional consideration in the selection process for applications that have met merit review standards. High cost regions have been, and will continue to be, important areas for geothermal development. This is especially true where the geothermal resource can offset expensive diesel generators and other high-cost fuels.

The Program currently supports four projects in the State of Alaska as authorized under Section 625 and other sections of EISA, using funding appropriated under the Recovery Act. These projects include:

Awardee	Title	DOE Funding
Hattensburg, Dilley, and Linnell, LLC	Identifying Fractures with Geochemical Techniques	\$313,858
University of Alaska	Pilgrim Hot Springs (Innovative Exploration Technologies)	\$4,274,792
Naknek Electric Association	Implementation of a Demonstration EGS Project at Naknek, Alaska	\$12,376,568
The Trabits Group	Development of an Improved Cement for Geothermal Wells	\$2,154,238

In FY 2012, the Program will continue to focus on expanding access to geothermal energy nationwide and include the policy factor for high electricity cost regions in its FOAs.

CRITICAL MINERALS REPORT AND PERMITTING

Question 47. In December of last year, DOE issued an excellent report on minerals critical to clean energy. That report lays out a great deal of work that must be done to re-establish recycling and production capabilities here in the United States. Some of that work, however, falls outside the jurisdiction of DOE.

Focused on the length of time it takes to permit new, domestic mines. The DOE report notes that the U.S. ranks dead last in this category worldwide, and that it can take up to a decade to obtain approval in the United States but only 1-2 years in Australia, for example. We absolutely must protect the environment, but I believe that goal is best met through competent implementation of the laws we have on the books—not by delaying projects, stranding private capital, and hoping domestic mineral development efforts are abandoned. Those tactics are short-sighted, counter-productive, and ultimately result in similar mines operating in areas of the world with far less stringent environmental protections.

The DOE is scheduled to release an update of this report by the end of 2011. Is it possible to have that version jointly written by DOE and the Interior Department, with specific steps laid out that DOI not only can take, but will take, to address these permitting deficiencies?

Answer. DOE's 2010 Critical Materials Strategy highlighted three pillars to address the challenges associated with critical materials in the clean energy economy. We anticipate that the updated 2011 report will expand on the discussion of these three pillars.

First, substitutes must be developed. Research leading to material and technology substitutes improves flexibility to meet the material demands of the clean energy economy. Second, recycling, reuse and more efficient use can significantly lower world demand for newly extracted materials. Research into recycling processes coupled with well-designed policies will help make recycling economically viable over time. Finally, diversified global supply chains are essential. To manage supply risk, multiple sources of material are required. This means encouraging other nations to expedite alternativesupplies and exploring other potential sources of material (such as existing mine tailings or coal ash) in addition to facilitating environmentally sound extraction and processing here in the United States.

Within this larger context, we do intend to discuss domestic production of rare earths in our 2011 report. Production within the United States is important for at least two reasons. First, the United States' considerable reserves of some critical materials could add significantly to total global production and to greater diversity in the global supply of these materials. Second, U.S. technology and best practices developed during mine operations can help promote safe and responsible mining in other countries, further contributing to supply diversity and the sustainable development of resources. With regard to mining in the United States, it is important to point out that permits are not the only requirements that can extend the time required to open a mine. The substantial capital investment required for rare earth mine development can also lead to delay.

DOE will work with interagency colleagues (including DOI, USDA, EPA) whereappropriate in the development of the updated 2011 report and will recognize the significant role that DOI plays in domestic natural resource management.

LOAN GUARANTEES

Question 48. When the money under Section 1705 of the Loan Guarantee Program runs out, do you view Section 1703 as conducive to helping smaller renewable energy technologies?

Answer. We are currently focused on ensuring that the Section 1705 program draws to a successful close. Once that program ends, we look forward to using existing authorities including Section 1703, to promote commercial deployment of innovative renewable energy technologies.

HYDROGEN/FUEL CELLS

Question 49. Generally, please describe the advances that have been made in hydrogen and fuel cell technologies over the past 15 years. Please include a description of how costs have come down, how efficiency has increased, and any role the federal government has had in those developments.

Answer. Hydrogen and fuel cell technologies have made significant advances over the last 10 to 15 years (in cost, durability, efficiency, platinum loading, etc.), due in large part to funding provided by the federal government. For example, DOE-funded research and development (R&D) has, in separate projects:

- Reduced the cost of automotive fuel cells by more than 80% since 2002, from \$275/kW to \$51/kW (projected for high volume manufacturing)²
- Contributed to a more than order of magnitude reduction in platinum loading (from 4 mg/cm² to less than 0.2 mg/cm²), which corresponds to reducing the amount of platinum in a typical fuel cell electric vehicle from more than 300 grams to less than 20 grams^{1,3}
- Enabled significant reductions in the cost of high temperature stationary fuel cells; for example from roughly \$20,000/kW in 1996 to about \$4,000/kW in 2010^{4,5}
- Increased fuel cell efficiencies by more than 30% at both higher current densities and lower platinum loadings, from roughly 42% in 1999⁶ to 55% in 2010⁷
- Reduced the cost of electrolyzer stacks by more than 80% over the last decade, from more than \$2,500/kW to roughly \$460/kW when projected at high volumes⁸
- Demonstrated 152 fuel cell electric vehicles and 24 hydrogen stations, achieving 2.8 million miles, up to 59% efficiency (more than twice the efficiency of conventional gasoline engines), and a driving range of more than 250 miles;⁹ and independently validated an additional vehicle to be capable of 430 miles on a single fill of hydrogen¹⁰
- More than doubled the durability of fuel cells, demonstrating the ability to achieve 2,500 hours (75,000 miles) of durability in vehicles on the road with less than 10% degradation⁸
- Reduced the cost of producing hydrogen from a number of pathways, such as reducing the cost of hydrogen production from distributed natural gas from \$5.00 per gallon gasoline equivalent (gge) in 2002 to \$3.00/gge in 2005.¹¹

The R&D efforts of the Department's Fuel Cell Technologies Program have resulted in nearly 200 patents, 30 products becoming commercially available, and industry currently pursuing development of more than 50 emerging technologies.¹² These R&D gains have directly enabled companies such as Proton OnSite to sell more than 1,400 electrolyzers, Quantum Technologies to sell more than 2,000 hydrogen storage tanks, and 3M manufacture more than 800,000 fuel cell membrane electrode assemblies to date.

Question 50. Has the hydrogen and fuel cell program at DOE generally met the targets established for it?

Answer. DOE's hydrogen and fuel cells programs have generally met their targets and milestones. Past accomplishments include:

²U.S. DOE Hydrogen Program Record 10004, http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf; costs are based on projections to high-volume manufacturing (500,000 units/year)

³See for example, Ian Raistrick, U.S. Patent 4876115 (1989), "Electrode assembly for use in a solid polymer electrolyte fuel cell" (www.freepatentsonline.com/4876115.html)

⁴International Status of Molten Carbonate Fuel Cell (MCFC) Technology, R. Bove, A. Moreno, S. McPhail, JRC Scientific and Technical Reports (2008)

⁵US DOE MCFC and PAFC R&D Workshop Summary Report (2010); "Molten Carbonate and Phosphoric Acid Stationary Fuel Cells: Overview and Gap Analysis", Technical Report NREL/TP-560-49072 (2010)

⁶Mahlon S. Wilson et al., "PEMFC Stacks for Power Generation," in: Proceedings of the 1999 U.S. DOE Hydrogen Program Review, <http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/26938aa.pdf>

⁷M. K. Debe et al., "Advanced Cathode Catalysts and Supports for PEM Fuel Cells," Mark K. Debe et al., "Advanced Cathode Catalysts and Supports for PEM Fuel Cells," in: FY 2010 Progress Report for the DOE Hydrogen Program, U.S. Department of Energy, Washington, DC, 2010, pp. 790. http://www.hydrogen.energy.gov/pdfs/progress10/v_e_1_debe.pdf

⁸M. Hamdan, "Low cost, high pressure hydrogen generator," DOE Annual Merit Review presentation, 2008, http://www.hydrogen.energy.gov/pdfs/review08/pd_10_hamden.pdf

⁹K. Wipke, et al., "Controlled Hydrogen Fleet and Infrastructure Analysis," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/tv001_wipke_2010_o_web.pdf.

¹⁰K. Wipke, et al., "Evaluation of Range Estimates for Toyota FCHV-adv Under Open Road Driving Conditions," Sandia National Laboratories and the National Renewable Energy Laboratory, August 2010, http://www.nrel.gov/hydrogen/pdfs/toyota_fchv-adv_range_verification.pdf

¹¹Distributed Hydrogen Production from Natural Gas, Independent Review, October, 2006, <http://hydrogen.energy.gov/pdfs/40382.pdf>; and Hydrogen Program Record # 5035, "Cost Analysis of Hydrogen Production from Natural Gas, 2003–2005," http://hydrogen.energy.gov/pdfs/5035_cost_analysis_production.pdf.

¹²Pathways to Commercial Success: Technologies and Products Supported by the Fuel Cell Technologies Program, 2010, <http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/pathways.pdf>

¹³DOE Hydrogen Program Record 10004, http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

- Reduced the cost of automotive fuel cells, projected at high volumes, by 30% since 2008 and 80% since 2002 (from \$275/kW in 2002 to \$51/kW in 2010)¹³
- Demonstrated improved durability of fuel cell systems in vehicles operating under real-world conditions from 950 hours in 2006 to 2,500 hours (approximately 75,000 miles), which exceeds the 2009 target of 2,000 hours¹⁴
- Developed a non-platinum group metal catalyst with mass-transport corrected activity exceeding the DOE 2010 target of 130 A/cm² at 0.8 volts¹⁵
- Developed a 5- to 10-kW solid oxide fuel cell system for combined heat and power applications, with a 24% increase in system power density, which enabled a 33% reduction in stack volume and a 15% reduction in stack weight;¹⁶ this system's high volume cost has been projected to be \$729/kW, which surpasses the 2011 target of \$750/kW
- Reduced the modeled cost of hydrogen production from natural gas at high volume, meeting the 2005 target of a gasoline-competitive price of \$3.00/gallon of gasoline equivalent¹⁷
- Reduced the cost of producing hydrogen through several production pathways, including distributed electrolysis (\$4.90—\$5.70/gge) and centralized electrolysis from wind (\$2.70—\$3.50/gge)¹⁸
- Improved hydrogen-from-coal technologies-hydrogen flux rates of greater than 400 scfh/ft² have been observed for best alloy membranes, and baseline alloy membranes show stable performance for 200 scfh/ft² during lifetime reactor testing, meeting the Program's 2010 technical targets for flux¹⁹
- Operated integrated laboratory-scale, hydrogen from nuclear power, high-temperature electrolysis unit for 45 days achieving 5,650 liters per hour peak output at 12 kWe input²⁰
- Reduced the projected cost of hydrogen delivery by achieving a 30% reduction in projected tube trailer costs, 20% reduction in projected pipeline costs, and a 15% reduction in projected liquid hydrogen costs²¹
- Identified several promising new materials for high-capacity, low-pressure, on-board hydrogen storage systems, which have provided more than 50 percent improvement in storage capacity since 2004, with some materials achieving nearly 10 percent material-based capacity by weight; R&D conducted to modify the performance characteristics of these materials has demonstrated potential for room temperature storage in sorbent materials (which would normally require cryogenic temperatures) and has increased the rates at which hydrogen is released from materials (including increasing the release rate from one material by a factor of 60 For the amount of this material that stores roughly 5 kg of hydrogen, the rate increase was from 0.02 grams of hydrogen per second to approximately 1.4 grams of hydrogen per second, close to the 2015 and Ultimate Full Fleet system target rate of 1.6 grams of hydrogen per second for an 80 kilowatt automotive fuel cell system.^{22, 23, 24}
- Developed and demonstrated a novel "cryo-compressed" tank concept, achieving system gravimetric capacity of 5.4 percent by weight (wt %), which exceeds the

¹³DOE Program Record 10004, http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

¹⁴K. Wipke, et al., "Controlled Hydrogen Fleet and Infrastructure Analysis," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/tv001_wipke_2010_o_web.pdf.

¹⁵P. Zelenay, "Advanced Cathode Catalysts," 2010 Annual Merit Review Proceedings, 2010, http://www.hydrogen.energy.gov/pdfs/review10/fc005_zelenay_2010_o_web.pdf.

¹⁶"Development of a Low Cost 3-10 kW Tubular SOFC Power System," 2010 DOE Hydrogen Program Annual Progress Report, http://hydrogen.energy.gov/pdfs/progress10/v_g_2_bessette.pdf.

¹⁷Distributed Hydrogen Production from Natural Gas, Independent Review, October, 2006, <http://hydrogen.energy.gov/pdfs/40382.pdf>; All production costs are based on projections to high-volume production; centralized production costs do not include delivery and station costs.

¹⁸Current (2009) State-of-the-Art Hydrogen Production Cost Estimate Using Water Electrolysis, NREL, September 2009, <http://hydrogen.energy.gov/pdfs/46676.pdf>.

¹⁹S. Dillich, "Hydrogen Production," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/pd00a_dillich_2010_o_web.pdf

²⁰S. Herring, "FY 2009 Laboratory-Scale High Temperature Electrolysis System," 2009 Annual Progress Report, http://hydrogen.energy.gov/pdfs/review09/pd_14_herring.pdf.

²¹R. Farmer, "Fuel Cell Technologies Program Overview," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/pln005_farmer_2010_o_web.pdf.

²²L. Simpson, "Overview of the DOE Hydrogen Sorption Center of Excellence" 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/st014_simpson_2010_o_web.pdf.

²³http://www.hydrogen.energy.gov/pdfs/5037_h2_storage.pdf

²⁴http://www.hydrogen.energy.gov/pdfs/9014_hydrogen_storage_materials.pdf

Program's 2010 system target of 4.5 wt %, and a volumetric system capacity of approximately 31 g/L²⁵

- Reduced the cost of gas diffusion layers in one project by more than 60% through improved materials and manufacturing processes²⁶
- Deployed 152 fuel cell vehicles and 24 hydrogen fueling stations to validate R&D advances under real world conditions-these vehicles have traveled over 2.8 million miles and the fueling stations have produced or dispensed over 150,000 kg of hydrogen. The Program validated the status of these technologies, including:
 - Vehicular fuel cell efficiency of up to 59 percent
 - Vehicular fuel cell system durability of 2,500 hours (nearly 75,000 miles), with less than 10% degradation
 - Vehicle range of more than 250 miles between refueling²⁷ (another vehicle, which is not part of the Program's demonstration activities, was independently validated to be capable of 430 miles on a single fill of hydrogen)²⁸
- Developed online resources to disseminate hydrogen safety information and facilitate the process of permitting hydrogen installations, including: The Hydrogen Safety Best Practices Manual, the Technical Reference on Hydrogen Compatibility of Materials Manual, the Regulators' Guide to Permitting Hydrogen Technologies, the Hydrogen Safety Bibliographic Database, the Hydrogen Incidents and Lessons Learned Database, and the Permitting Hydrogen Facilities Compendium
- Launched the "Increase Your H2IQ Public Information Program"²⁹ which includes radio spots, podcasts, and print materials; and disseminated hydrogen and fuel cell course materials to over 8,000 middle school and high school teachers,³⁰ and developed 25 university courses and curriculum modules.

More work needs to be done to advance the development and use of these technologies in the marketplace. The President's FY2012 Budget request for Hydrogen and Fuel Cell Technologies will support activities that address a variety of near-, mid- and longer-term applications and technologies. For example, in FY 2012, fuel cell R&D will focus on achieving a catalyst specific power of 5.7 kW per gram of platinum group metal in 2012 compared to 2.8 kW per gram in 2008.

Question 51. Has the hydrogen and fuel cell program at DOE been successful in attracting private investment in these areas?

Answer. The Department's Fuel Cell Technologies program has been successful in attracting private investments for R&D and demonstration activities. Awards made by the program require at least 20% cost share from non-federal sources for applied research and development projects and at least 50% cost share for demonstration activities. The overall cost share for the program in Fiscal Year 2010 was 25%, resulting in \$46 million of leveraged funds. In addition, the program provided \$43 million for the deployment of up to 1,000 fuel cells under the Recovery Act of 2009, which was matched by an additional \$54 million by industry. In fact, one company receiving Recovery Act Funding ordered 100 additional fuel cell forklift trucks funded 100% privately.

In one major demonstration project with energy companies and automobile companies, the Department spent \$135 million since 2005, which was matched with an average of more than 50% cost share by industry, bringing the total direct private investment to \$152 million.

In addition to direct private investment as cost share for DOE funded projects, the research and development efforts of DOE's Fuel Cell Technologies Program have resulted in significant industry investment through nearly 200 patents developed,

²⁵"Hydrogen Storage Sub-Program Overview," 2007 Annual Progress Report, DOE Hydrogen Program, 2007, p. 337, www.hydrogen.energy.gov/pdfs/progress07/iv_0_introduction.pdf.

²⁶J. Morgan, "Reduction in Fabrication Costs of Gas Diffusion Layers," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/mn002_morgan_2010_o_web.pdf.

²⁷K. Wipke, et al., "Controlled Hydrogen Fleet and Infrastructure Analysis," 2010 Annual Merit Review Proceedings, 2010, www.hydrogen.energy.gov/pdfs/review10/tv001_wipke_2010_o_web.pdf.

²⁸K. Wipke, et al., "Evaluation of Range Estimates for Toyota FCHV-adv Under Open Road Driving Conditions," Sandia National Laboratories and the National Renewable Energy Laboratory, August 2010, http://www.nrel.gov/hydrogen/pdfs/toyota_fchv-adv_range_verification.pdf

²⁹"Increase Your H2IQ," www1.eere.energy.gov/hydrogenandfuelcells/education/h2iq.html.

³⁰M. Spruill, "H2 Educate! Hydrogen Education for Middle Schools," 2010 Annual Merit Review Proceedings, June 2010, http://hydrogen.energy.gov/pdfs/review10/ed017_spruill_2010_p_web.pdf.

30 products brought to commercial availability, and current industry development of more than 50 emerging technologies.³¹

Question 52. Where does the United States rank globally—especially compared to Europe and Asia—in the development of fuel cell and hydrogen technologies?

Answer. The United States continues to lead in the development of fuel cell and hydrogen technologies. Department of Energy funding has already enabled fuel cell cost reductions of more than 80% since 2002 and 30% since 2008;³² and continues to focus on research and development to further improve technology and enable domestic leadership. The Department has invested more than \$2 billion over the last decade in fuel cell and hydrogen technologies.^{2, 3} Europe and Asia are planning similar levels of investment through 2016, focused on deployment and demonstration of fuel cells and related infrastructure.⁴

One external estimate indicates that there are more than 630 active companies and laboratories in 47 states involved in fuel cell and related fuels industry, investing an estimated \$1B a year.⁵ According to a 2010 report global investments in fuel cell companies (in venture capital and private equity) grew from \$155 million in 2007 to \$242 million in 2009.⁶ Out of the top ten venture capital and private equity investors in hydrogen and fuel cell technologies worldwide, the highest cumulative investment over the last decade (\$825 million) was from the United States.⁶

Question 53. Under the Department's FY 2012 request, how much funding would be applied to hydrogen and fuel cell technologies, and how much funding would be applied to electrification-related technologies?

Answer. Under the FY12 Budget request, the Hydrogen and Fuel Cell Technologies Program would receive a total of \$100,450,000. The budget request also includes \$433.5 million for electrification related technologies through the Vehicle Technologies Program.

Question 54. Secretary Chu stated that funding for hydrogen and fuel cell technologies is being slashed because the Department intends to “focus on technologies deployable at large scale in the near term.” At least four major manufacturers—Honda, Toyota, GM, and Daimler—are currently working on fuel cell vehicles, however, and many expect their cars to be commercially available by 2015. Could cutting funding for this program—and putting more money into electric vehicles instead—send the wrong signal and have a chilling effect on future investments into hydrogen and fuel cell technologies?

Answer. The Department's strategy is to sustain a balanced research and development (R&D) portfolio, with emphasis on nearer-term priorities, such as batteries, advanced vehicle technologies, and technologies for renewable power and energy efficiency. Fuel cell electric vehicles (FCEVs) are still part of the portfolio of options under development. DOE's funding for battery R&D will also be beneficial for fuel cell electric vehicles (FCEVs) which rely on batteries in addition to fuel cells.

The Department will continue its critical efforts in hydrogen and fuel cell R&D, which have already reduced the cost of fuel cells by more than 30% since 2008 and 80% since 2002.³³ DOE's hydrogen and fuel cell program has also resulted in approximately 200 patents, 30 products becoming commercially available, and industry currently pursuing development of more than 50 emerging technologies.³⁴ The FY12 budget sustains DOE's core R&D efforts which will continue to advance the technologies and improve the likelihood of a successful rollout by automobile manufacturers in the coming years.

PRESIDENT'S GOAL FOR ELECTRIC VEHICLES

Question 55. What percentage of the overall vehicle fleet would 1 million electric vehicles represent in 2015?

Answer. According to projections in the Energy Information Administration's Annual Energy Outlook 2011, one million plug-in vehicles would represent 0.42% of the U.S. light-duty vehicle fleet in 2015. However, it is important to note that the one million vehicles initiative is considered a milestone for growth of the advanced tech-

³¹ <http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/pathways.pdf>

³² http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

² DOE Hydrogen Program Budget, <http://hydrogen.energy.gov/budget.html>

³ Dr. Shailesh D. Vora, “Office of Fossil Energy Fuel Cell Program-Solid State Energy Conversion Alliance (SECA): Clean, Economic Energy for a Carbon Constrained World,” National Energy Technology Laboratory, July 2010, www.netl.doe.gov/publications/proceedings/10/seca/Presentations/Vora%20Presentation.pdf.

⁴ http://iphe.net/docs/Resources/IPHE_FINAL_SON_press_quality.pdf

⁵ <http://www.fuelcells.org/StateoftheStates.pdf>

⁶ <http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/49492.pdf>

³³ http://www.hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

³⁴ <http://www1.eere.energy.gov/hydrogenandfuelcells/pdfs/pathways.pdf>

nology vehicle market, rather than an end point. Significant additional market penetration is required to fully address petroleum consumption and greenhouse gas reductions across the nation's vehicle fleet.

Question 56. How much oil consumption would 1 million electric vehicles displace per year?

Answer. The Department of Energy's Vehicle Technologies Program estimates that one million electric-drive vehicles would save 11.5 million barrels in 2015. This estimate compares the fuel consumption of one million electric-drive vehicles to one million conventional vehicles in 2015 and assumes the electric-drive vehicles are a 50-50 mix of batteryelectric vehicles and plug-in hybrid electric vehicles³⁵. Additionally, it is important to note that one million electric-drive vehicles is only a small percentage of the nation's vehicle fleet (currently over 240 million vehicles) and represents a milestone for growth of the advanced technology vehicle market, rather than an end point. Significant additional electric-drive vehicle market penetration in the coming decades would result in significant additional oil savings.

Question 57. What is the total amount of federal subsidy and outlay—including all spending at DOE, the proposed communities deployment program, the per-vehicle tax credits, loan programs, and other federal assistance—that those 1 million electric vehicles are projected to receive?

Answer. Aside from the \$7,500 tax credit, the first one million electric vehicles sold will not receive Federal funds. Department of Energy funds are not specifically targeted to subsidize the first million vehicles. However, the Department's vehicle-related programs, such as activities funded through the American Recovery and Reinvestment Act, the Vehicle Technologies Program, and the Advanced Technology Vehicle Manufacturing Loan Program, support advanced vehicle technology development, demonstration, and commercial deployment. These efforts focus on a broad range of technologies including not only batteries and power electronics needed for electric-drive vehicles but also advanced combustion, materials technologies, and fuels technologies that support the transformation of the nation's entire 240 million vehicle fleet. Electric drive R&D funds are not solely focused on reaching the 1 million vehicle goal; instead R&D is focused on removing technical barriers to broad market acceptance.

VEHICLE TECHNOLOGIES PROGRAM

Question 58. In recent years, light duty vehicles have received far more funding from this program than have medium-and heavy-duty trucks. Please provide a breakdown of funding for the Fiscal Year 2012 request. How much funding would light-duty vehicles receive? How much funding would heavy-duty vehicles receive?

Answer. With the President's fiscal year (FY) 2012 budget request of \$588 million, the Department of Energy's Vehicle Technologies Program plans to continue its support of a broad range of advanced vehicle technologies including electric drive, advanced combustion, fuels, and materials technologies that are applicable to light-, medium-, and heavy-duty vehicles. Of the total request amount, \$200 million would support a new competitive grant program to help communities accelerate the deployment of electric vehicles and electric charging infrastructure. The remaining \$388 million would support work specifically related to light, medium, and heavy-duty vehicles, as well as work that crosscuts vehicle classes, including enabling technologies and outreach, deployment, and analysis activities.

The precise division of FY 2012 funds for work supporting different vehicle classes will depend on the selection of projects under a recently closed FY 2011 solicitation and new solicitations planned for FY 2012. It is important to note that the program's support of light-duty vehicle technologies generally reflects their significant contribution to highway transportation energy use, compared to other vehicle classes: light-duty vehicles account for 76% and heavy trucks account for 19% of U.S. highway transportation energy use (buses and medium trucks account for the remaining 5%).

Question 59. Will natural gas vehicle technologies receive any funding through this year's Vehicle Technology Program request, or any other program within the Department?

Answer. The Vehicle Technologies Program (VTP) has no plans to fund additional work projects on natural gas engines in fiscal year (FY) 2012 or FY 2011. In FY 2010, VTP awarded \$5 million in new projects for work on natural gas engine and vehicle platform integration and this work will continue during the next several years. These funds are being partly matched by the California Energy Commission

³⁵ 2015 stock vehicle listed as 22 miles per gallon in the 2011 Energy Information Agency Annual Energy Outlook (table 59), plug-in hybrid assumed to have a 40 mile all-electric range.

and the California South Coast Air Quality Management District for a total of more than \$12 million, in addition to recipient cost share.

EV COMMUNITY DEPLOYMENT PROGRAM

Question 60. The utility NRG Energy has announced it will deploy electric vehicle charging stations in Dallas and Houston using its own money, and is considering expanding to other markets in the near future. A lot of companies—from the Best Buys of the world to Walgreens—seem to be realizing that they have an economic incentive to install chargers to help draw in customers.

Given that most consumers are expected to charge their vehicles at home or at work, how necessary is it for the federal government to provide significant additional funding—beyond the existing tax credit—for public charging infrastructure?

Answer. Although it is anticipated that consumers will most often charge their plug-in electric vehicles at home or at work, it is critical that adequate public charging infrastructure exist in order to promote consumer acceptance of grid-connected vehicles. The presence of this infrastructure will alleviate concerns over range-anxiety, positively impacting the number of consumers who consider purchasing electric-drive vehicles. Additionally, public charging infrastructure will expand the practical operating area of electric vehicles, allowing the benefits to be realized more broadly than with residential and workplace charging alone. Adequate public charging infrastructure is a key enabler for the adoption of grid-connected vehicles, and federal funding to support deployment will greatly accelerate the transition of our nation's vehicle fleet away from its reliance on petroleum. While commercial entities may establish some charging infrastructure, government should work to leverage those activities.

Question 61. How would communities be selected to receive grants under the Department's proposed program?

Answer. Communities would be selected through an open and competitive process and selection criteria would be included in the Funding Opportunity Announcement, which will be publicly available. While the specific selection criteria have not been finalized, we envision the following factors as being key to a successful application:

- Does the community have credible plans to overcome permitting barriers?
- Has the community engaged the right partners and key stakeholders to be successful?
- Has the community proposed innovative incentives to promote adoption?
- How is the community using local and private funds to highly leverage the available Federal funds?
- Does the total number of charging points proposed represent a very high value for the funding?

Question 62. How will you prevent this program from crowding out investment, and replacing private dollars with federal funding?

Answer. This program would not crowd out investment and replace private dollars with Federal funding; rather, it would highly leverage non-Federal funds and encourage stakeholder involvement and investment at the local level. Among the considerations for selecting communities for award would be the way in which they use local and private funds to highly leverage the available Federal funding.

ATVM (ADVANCED TECHNOLOGY VEHICLE MANUFACTURING) LOAN PROGRAM

Despite initial reports that it was greatly oversubscribed, just one small conditional loan has been offered in the past 10 months, and nearly two-thirds of the ATVM loan program's authority remains unused.

Question 63. Will you explain what exactly is happening with the Advanced Technology Vehicle Manufacturing, or ATVM, Program?

Answer. On July 13, the Department announced the conditional commitment of a loan to Severstal for \$730 million. To date, the Advanced Technology Vehicle Manufacturing Loan program has made six loans or conditional commitments to vehicle manufacturers or parts suppliers so far totaling over \$9 billion. Approximately \$4 billion of the credit subsidy remains for future loans awarded under the Advanced Technology Vehicle Manufacturing Loan Program. We anticipate offering a number of additional conditional commitments under the program in the near future.

Question 64. Why did the past year feature so few new loans?

Answer. There are several reasons why the ATVM program had fewer loans in 2010. First, the statute requires a nexus between a component maker's products and an advanced technology vehicle. Traditional business practices do not ordinarily entail long term contracts for such components well in advance of production, nor the earmarking of components for specific car models. Even some major traditional sup-

pliers could not meet this requirement. Second, the past year (2010) represented a recovery in the automobile market over the disastrous economy of 2009. Suppliers are generally financed by Original Equipment Manufacturers (OEMs) who were cutting production and experiencing cash flow problems in 2009, but increased production in 2010, thus providing the financing which suppliers rely on. Third, several major OEMs struggling through bankruptcy needed time to meet all the necessary eligibility requirements for the program. Finally, as major OEMs announced new advanced technology product offerings, the competitive environment became much more difficult for OEM start-ups and many failed to qualify for or pursue ATVM loans.

Question 65. Please provide a breakdown of how the ATVM program's \$20 million administrative budget was spent in Fiscal Year 2010, and is being spent during Fiscal Year 2011.

Answer. In FY 2010, the ATVM Loan Program obligated \$1.4 million for federal salaries and expenses and \$17.4 million for contractor and other expenses including legal advisors, financial advisors, market advisors, and technical reviews provided by DOE labs. In FY 2011, the ATVM Loan Program is projected to obligate \$2 million for federal salaries and expenses and \$10 million for contractor and other expenses.

Question 66. In the President's budget request, this program's administrative costs are trimmed to \$6 million to "support ongoing loan monitoring activities." Do you anticipate originating and/or closing any new loans this year? When do you believe the ATVM program will have exhausted its statutory \$25 billion in loan authority?

Answer. The FY 2012 budget request anticipated the ATVM program to have awarded the bulk of the authority by the end of FY 2011. Therefore, by FY 2012, the program expected to be in the role of primarily monitoring the loans completed through FY 2011. Since that time, GM has generated sources of capital that permit it to finance its own technical work and others have been affected by the factors articulated in Q64 above. We are working to process all pending applications as fast as possible.

CHINA

Question 67. In November, you likened clean energy to a "race" and suggested we were on the verge of falling behind other countries including China. While China is working on a range of clean energy technologies, it would be helpful to understand their broader energy policies. How does China approach oil, natural gas, coal and mineral development, both within its borders and abroad? How does China approach hydropower? Is China building new coal plants without carbon capture and sequestration technology, and if so, at what rate?

Answer. China is investing heavily in its energy sector. Increasingly, Chinese energy investments are characterized not just by their size, but by the high quality of the technologies deployed. The Chinese government is focused on promoting energy innovation as a core part of its economic development strategy. Furthermore, China is seeking to develop its energy industry by investing both domestically and abroad.

Oil

According to the Energy Information Administration (EIA), China is the second largest oil consumer behind the United States, with oil accounting for 19 percent of its total energy mix. China used to be a net exporter of oil in the 1990s, but by 2009, was the world's second largest net importer of oil, again behind the United States. Currently, China is reliant on imports for just over half of its oil consumed domestically, a share that has been trending upwards due to the peaking of production of its largest domestic onshore oil fields in the northeast. China has set up a strategic petroleum reserve (SPR), starting construction in 2004. On the demand-side, China has begun to introduce price reforms to manage demand. It launched a fuel tax on the retail sale of gasoline in 2008 and has also liberalized the pricing system of gasoline to better reflect crude oil prices in the international market. In 2010, the government announced it would levy a new 5 percent ad valorem resource tax on upstream hydrocarbons in 13 provinces.

Natural Gas

Natural gas accounts for approximately 4 percent of China's energy consumption, but demand for it and its share in the consumption mix is increasing. Demand for natural gas is projected by EIA to more than triple by 2035. In an effort to move away from heavy coal use and reduce fossil fuel emissions, China is seeking to double the share of natural gas to 8.3 percent of the total energy mix by 2015 under

its new five-year plan. In order to meet increased demand, China's National Energy Administration estimates China will import 90 billion cubic meters of gas a year by 2015, in addition to producing 170 billion cubic meters domestically. China is also thought to have rich reserves of "unconventional" gas, which is buried in shale or coal rock formations. Unconventional natural gas has yet to be produced commercially on a large scale in China. In an effort to gain the technical expertise to develop its own unconventional gas resources and acquire additional natural resources overseas, Chinese national oil companies (NOCs) have purchased shares of unconventional gas deposits in other countries, including the United States.

Coal

According to EIA, coal comprises 71 percent of China's total energy consumption and 80 percent of its electricity production. It is both the largest producer and consumer of coal. China's coal reserves are third largest in the world behind the United States and Russia. Despite vast coal resources, China became a net importer of coal for the first time in 2007. Over the past two years, it has steadily increased its imports of coal from countries like Russia, Indonesia and Australia. China is seeking to boost the productivity and efficiency of both its coal mine operations and coal-fired power plants. Coal mining is a highly fragmented industry in China, with tens of thousands of small, inefficient coal mines operating with unsafe worker conditions. Over the past few years, China has undertaken the process of closing down thousands of small, mostly illegal, coal mines. Small, inefficient coal-fired power plants have also been the target of closures as part of China's broader goal to reduce economy-wide energy intensity. Although these plant closures are offset by new coal-fired capacity coming online, the new power plants tend to be larger in scale and boast some of the highest thermal efficiencies in the world. China is starting to export the technologies from such efficient coal power plants to other countries, most notably India. China is investing heavily in Carbon Capture and Storage (CCS) R&D, and there are pilot CCS plants up and running in Beijing, Tianjin and Shanghai. Data collected by DOE's National Energy Technology Lab (NETL) shows that China added about 458 GW of new coal plant capacity from 2005—2010, with a planned addition of 209 GW over the 2013-2016 period. U.S. 2009 coal capacity was 314 GW, with NETL projecting virtually no new U.S coal after 2018 until the end of its reference case in 2035 following the completion of several planned CCS demonstration plants.

Minerals

China currently has the largest share of discovered rare earth reserves in the world at 36 percent and produces over 95 percent of global rare earth raw materials in the form of rare earth oxides. Rare earth deposits and mines are distributed widely in China, but three mines—in Baotou, Sichuan, and Jiangxi—together make up nearly all of China's total deposits. China has had ongoing R&D efforts on rare earths since the 1950s, including two key national research programs and four state laboratories that form part of the country's desire to accelerate high-tech development. Industry consolidation is beginning to accelerate with the goal of creating three to five "national champions" in addition to curbing illegal trade. The Chinese government has acknowledged and approved a pilot project for the country's rare earth reserve mechanism which may be launched next year. Chinese state-owned enterprises also show an interest in acquiring foreign mining companies with significant rare earths operations in North America and Australia.

Hydropower

China has a significant number of hydropower projects under construction or in development that will not only help meet growing energy demand, but also help China meet its target of achieving 15 percent of its primary energy mix through non-fossil sources by 2020. China has relatively extensive experience in this sector, it has a well developed domestic industry, and it has extensive hydro resources. According to media reports, the Chinese government aims to have 380 GW of installed hydroelectric capacity in 2020, compared to 210 GW installed currently. China's most famous hydropower project is the Three Gorges Dam located in Hubei Province on the Yangtze River. China's hydropower companies are expanding overseas to build dams in Latin American, Southeast Asia and Africa.

WHITE HOUSE OFFICE OF ENERGY AND CLIMATE

Question 68. Carol Browner recently had her last day at the White House, and it's still unclear if a new czar will be named to take her place. The White House Office of Energy and Climate is not listed in this year's budget, but it wasn't listed in previous years, either. Do you anticipate that office will continue to exist? If so,

what do you estimate its budget will be for Fiscal Year 2012? Do you believe it has a useful, constructive influence on U.S. energy policy?

Answer. This question should be directed to the White House.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR STABENOW

ELECTRIC VEHICLES

Question 1. Michigan and the rest of the United States need to out-innovate, out-educate, and outbuild the rest of the world. Already, Michigan is leading the nation in manufacturing plug-in electric vehicles, advanced batteries, and their component parts. To leverage that success, I introduced the Charging America Forward Act, which will make plug-in electric vehicles more affordable for consumers and businesses and encourage American innovation and manufacturing of advanced vehicles. I'm pleased that the Budget includes my proposal to change the existing \$7,500 tax credit for electric vehicles into a rebate that will be available to all consumers immediately at the point of sale.

How will this proposal help meet the President's goal of putting one million advanced technology vehicles on the road by 2015?

Answer. Changing the existing \$7,500 tax credit to a point of sale benefit is expected to significantly encourage electric drive vehicle adoption. By providing the benefit at the point-of-sale, the cost reduction is applied immediately and consumers will not have to wait until filing their tax return to receive the benefit. This initial-cost reduction is likely to positively affect consumers' purchase decisions.

VEHICLE TECHNOLOGIES PROGRAM

Question 2. I applaud the President's budget request for the Vehicle Technologies Program. Last year, this committee passed a bill that I introduced known as the Advanced Vehicle Technology Act, which helped to ensure that the Vehicle Technologies Program is working with companies of all sizes and not just focused on one type of vehicle technology.

Could you please explain how this funding increase will be used and on which technologies the program will be focusing on? Will this include medium and heavy-duty hybrid and electric vehicles as well?

Answer. The Vehicle Technologies Program (VTP) will continue to work across a broad range of technologies, including electric-drive advanced combustion, fuels technology, and materials technologies, that benefit all vehicle classes (light-, medium-, and heavy-duty). Specifically, the funding increases included in the fiscal year 2012 budget request would support the following:

- Within the VTP Outreach, Deployment, and Analysis activity:
 - Implement a new competitive grant program to assist community-based partnerships accelerate electric vehicle deployment; up to 30 awards would support highly-leveraged local efforts to streamline permitting processes, invest in electric charging infrastructure, develop and implement local incentive programs to encourage electric vehicle adoption, and develop and implement workforce training related to electric vehicle deployment.
 - A new effort to explore ways to reduce fuel consumption and greenhouse gas emissions of the nation's existing vehicle fleet by reducing the miles traveled and developing/deploying cost-effective, fuel-efficient aftermarket tires.
- Within the VTP Batteries and Electric Drive activity:
 - A new Battery Readiness Initiative intended to (1) move mature battery technology closer to market entry through design and development of preproduction prototypes; (2) support the market entry of materials through scale-up, pilot production, and commercial sampling; and (3) accelerate the development of computer-aided engineering tools. This new focus will provide a systematic, coordinated development of electric drive system technology to meet performance targets and realize drastic cost reductions.
 - Significantly expanded activities in the research and development of advanced power electronics and electric machines to meet performance targets and realize drastic cost reductions, as well as reduce the use of rare earth materials in electric motors and support long-term research to develop novel, low-cost magnetic materials with no rare earth content.
- Within the VTP Vehicles and Systems Simulation and Testing activity, expand codes and standards work to address identified areas of concern such as vehicle charging, smart chargers, and vehicle-to-grid interfaces; expand research and development to improve efficiencies of vehicle HVAC systems and reduce ther-

mal loads, improving on-road electric vehicle efficiency by as much as 20%; and develop, evaluate, and demonstrate advanced wireless electric vehicle charging that can address consumer convenience, safety, and grid management issues.

SECTION 136 AND THE 1705 DOE LOAN GUARANTEE PROGRAMS

Question 3. Mr. Secretary, as you know the Advanced Technology Vehicle Manufacturing Loan Program, and the Department of Energy Loan Guarantee Program have both been a big priority for me. To date, the Advanced Technology Vehicle Manufacturing Program has approved several loans and has created approximately 35,000 jobs nationwide, including thousands of jobs for my home state of Michigan.

While I appreciate this great work, I have also been hearing from companies that are currently working with the department that say the process takes too long, and that the hurdles for receiving a loan are even higher than if they had gone through the private sector. Clearly, this is not what we intended when these programs were designed.

Can you provide us with an update on when we can expect more loans to be finalized? Can you provide suggestions for ways to improve these programs?

Answer. On July 13, the Department announced the conditional commitment of a loan to Severstal for \$730 million. There are a number of applications under review in the Section 136 program. DOE is reviewing these applications as quickly as possible.

DOE reviews each loan guarantee application against a common set of criteria outlined in each solicitation and the programmatic statutory and regulatory requirements. All projects must meet the basic eligibility criteria, at a minimum, including the statutory requirement of a "reasonable prospect of repayment." In order to ensure that taxpayer monies are properly safeguarded, the Department uses best practices, similar to those private sector lenders would use in reviewing such deals. It is important to keep in mind that these transactions are large and complex and that no two deals are alike. In the private sector, the due diligence associated with such transactions is measured in months, not weeks. We are committed to processing applications as quickly as possible, while ensuring that taxpayer funds are properly safeguarded.

INDUSTRIAL TECHNOLOGIES PROGRAM

Question 4. I see that the Industrial Technologies Program received a significant increase and will be refocusing on innovation in industry.

Can you please describe in greater detail what the program will now be doing and in what ways it will be working with industry to improve energy efficiency?

Answer. As noted in the preface to this question, the Industrial Technologies Program (ITP) will seek to continue elevating and advancing innovation in industry. To that end, ITP will prioritize research development, demonstration and deployment (RDD&D) of a strategically selected set of new manufacturing technologies and materials needed to ensure that U.S. producers lead the world in modern production technologies. These technologies can reduce manufacturing costs, energy use, and pollution while simultaneously improving product quality and business competitiveness. This will ensure that U.S. companies can be fully competitive in the production of clean energy technologies, such as advanced photovoltaics, lighting devices, sensors and controls, batteries, wind system components and other devices essential for meeting US energy and efficiency goals. The overarching goal of ITP is to develop a suite of advanced manufacturing technologies and practices that provide pathways for doubling the energy productivity of U.S. industry and enable the associated carbon reductions by 2020.

Investments in these advanced manufacturing technologies both revitalize existing industries and support the development of new products in emerging industries such as clean energy.

New directions proposed for FY 2012 include an expanded emphasis on advanced manufacturing techniques that lead to dramatic increases in energy productivity such as use of ionic liquids, membrane separations, and continuous monitoring and optimization of processing. ITP intends to provide support for a new critical materials energy innovation hub.

ITP will seek to also build and strengthen its highly successful program for helping business learn about and adopt strategies that can lead to striking gains in the energy productivity of existing facilities. At its core, that program seeks to foster a new corporate culture of energy efficiency and carbon management through a combination of workforce development, technical assistance and energy management standards setting efforts.

Moving forward, ITP intends to promote continuous energy improvement for manufacturers throughout the supply chain. This push will include the provision of software tools, training and technical resources to companies both directly and through partners like state energy offices and utilities. ITP will also support this effort through its Superior Energy Performance program—a market-based, American National Standards Institute (ANSI)-accredited energy management certification program. Collectively, ITP's activities are designed to build: 1) demand for energy efficiency savings, 2) supply of energy efficiency services, and 3) a supportive market environment.

ENERGY INNOVATION HUB-BATTERIES

Question 5. One of the things that I was very happy to see proposed was a new innovation hub for batteries and energy storage. As you know, advanced battery manufacturing has created hundreds of permanent jobs in my home state through companies like LG Chem, Dow Kokam, Johnson Controls, and A123 Systems. Each company was able to receive support through the Recovery Act's Advanced Battery and Component Manufacturing Program. This program has helped the U.S. to go from producing only 2% of the world's advanced batteries to 40% of the world's advanced batteries.

Given all the work that we have been doing in this area, can you describe how this new innovation hub will work?

Answer. The Battery and Energy Storage Hub will help retain and grow U.S. leadership in advanced batteries. Today's electrical energy storage devices can benefit from further improvements in performance, from energy and power capacities, rates of charge and discharge, calendar and cycle life, to abuse tolerance. Many of the fundamental performance limitations are rooted in the constituent materials making up the storage system and in the fundamental physics and chemistry that govern the transport and storage of energy in the material. The research challenges are inherently multidisciplinary.

The Batteries and Energy Storage Hub will support the research and development needed to fill the gaps in scientific understanding that prevent technological breakthroughs in both grid and mobile applications. The Hub will expand our scientific base for synthesis of novel nanoscale materials with architectures tailored for specific electrochemical performance, develop new methodologies to characterize materials and dynamic chemical processes at the atomic and molecular level, and expand our competencies in simulation and prediction of structural and functional relationships using leading computational tools.

The Hub's ultimate technological goals are development of radically new concepts for producing storage devices from materials that are abundant and have low manufacturing cost, high energy densities, long cycle lifetimes, and high safety and abuse tolerance for a broad range of energy storage applications. The breadth and depth of the scientific challenges associated with these goals will require that the Hub integrate premier scientific talent from the disciplines of chemistry, physics, materials sciences, biology, and engineering. The Hub is likely to develop strong collaborations with industry to overcome engineering and manufacturing challenges. The Hub will facilitate expansion of domestic manufacturing of high-tech energy storage technology for both grid-level and transportation applications.

CR RESCISSION OF ARRA FUNDING

Question 6. Many businesses and non-profits across my state and the country are extremely concerned about the Continuing Resolution currently being debated in the House. Many of these organizations are worried about the provision to rescind the unobligated balances from the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). In fact, many grantees working on clean energy projects are concerned that the rescission would unintentionally take away funds that have been committed by contract, but not yet spent or disbursed by the agency, potentially interrupting projects that are currently in underway with local businesses.

Is it safe to presume that an executed assistance agreement counts as "obligated" funds?

Answer. An assistance agreement that has been signed by both the Department of Energy (DOE) and the recipient constitutes an obligation. There would be significant legal consequences if DOE attempted to rescind obligated dollars—indeed it is possible that attempting to rescind obligated dollars would cost the government more than simply complying with the obligations. With rare exceptions, Congress has rescinded funds that were obligated to DOE instruments, and thus this would be uncharted territory.

For financial assistance agreements, DOE does not include a provision allowing DOE to deobligate funds, nor do our financial assistance regulations permit us to do so without cause. As a matter of law, the Government can only terminate a financial assistance agreement, in order to deobligate funds, on one of the following grounds:

1. A finding that the recipient “materially fail[ed] to comply with the terms and conditions of an award”.
2. A mutual agreement by DOE and the recipient; or
3. A written notification from the recipient announcing its intention to terminate the award.³⁶

Thus were there an attempt simply to “rescind” the obligated funds, it would not alter the legal obligation to make payment. We believe refusing to make payment of obligated financial assistance funds would lead to litigation. Moreover, many of our financial assistance has associated private cost share and the recipient would be entitled to submit a settlement for costs incurred as a result of the termination (e.g. purchase orders, legal fees, etc).

RESPONSE OF HON. STEVEN CHU TO QUESTION FROM SENATOR BARRASSO

Question 1. Your budget zeroes out the base funding stream for the Rocky Mountain Oilfield Testing Center (RMOTC) in Wyoming. This is similar to last year’s proposal. Last year’s budget justified the cuts as phasing out subsidies for fossil fuels. RMOTC provides small businesses and inventors great facilities to test and develop new technology. Casper College uses the facility for renewable energy classes for technician training and education programs. There is also geothermal testing and demonstration at RMOTC. I am concerned that the Department of Energy is pulling the rug out from under this program, without a transition plan. Last year the Administration required the facility to operate as a user facility without providing the roadmap or tools to implement that requirement. This year’s budget says “RMOTC will identify and analyze options for becoming a self-sustaining user facility.”

In January 2011, RMOTC laid off 27 contract employees. It is turning away potential testing partners. RMOTC is a valuable asset. Whatever the long-term plan—100 percent remediation, selling it to a private entity, or transitioning to a user facility—the Department needs a plan so the taxpayer gets maximum value for the asset.

- a. Does the Department have an approved plan for RMOTC to operate as a user facility or for long-term remediation?

Answer. The Department prepared a Report to Congress in 2007 entitled Environmental Liabilities Study of the Rocky Mountain Oilfield Testing Center, November 2007. That study places the environmental liabilities at RMOTC in excess of \$100 million. A small portion of remediation has been completed to date. The FY 2012 budget request proposes that the Department develop a plan for the sale or disposition of NPR-3. In this plan, disposition options and strategies will be analyzed and further engineering design will be conducted to more precisely determine environmental remediation costs and schedules.

Funding for testing at RMOTC will be supplied by the entity conducting the testing; no appropriation is requested. Funding of geothermal and other renewable energy technology testing is expected to follow a similar path.

- b. How will the Department provide the necessary flexibility to support projects that are 100% fully reimbursable?

Answer. The Department intends to develop a disposition plan by the end of FY 2012 that will include a determination of the final use of the property. Maximizing the value of this asset will be a major factor in the determination of the final disposition of this property.

In the interim, the Department is investigating creative methods to provide RMOTC with the proper business support systems and agreements with partners to maximize the use of non-appropriated funds in a manner that will allow RMOTC to operate as a viable and successful testing center. The Department, recognizing that RMOTC’s resources allows it to test energy technologies broader than oil and

³⁶The specific rules that apply to termination of financial assistance differ slightly depending on the nature of the recipient, but the categories described above apply to all three. See 10 C.F.R. Section 600.161 (nonprofits); section 600.243 and 600.244 (state and local governments); and section 600.351 (for-profits).

gas, is also investigating collaborative funding with renewable energy programs where applicable.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR JOHNSON

Question 1. The President and the Department of Energy have made an important commitment to a forward-looking energy policy that invests in clean energy research, development and deployment. I am especially interested in the continuing role of biofuels in meeting our clean energy goals. How does the Administration's budget request support increasing the amount of biofuels in the overall mix of transportation fuels.

Answer. The Administration's budget request for Office of Biomass Programs in FY 2012 is \$340M. Within this request DOE will continue work on biorefinery deployment projects. The portfolio includes a diversity of feedstocks, conversion technologies, products, refinery scales, and project maturity. These projects will contribute to the 2014 Biomass Program goal of 100 million gallons per year of biofuel production. Research and development will continue to reduce costs in processing steps associated with advanced biofuels, with an emphasis on hydrocarbon biofuels such as diesel and green gasoline, and including algae as a feedstock. In addition, research conducted in collaboration with the Office of Science will be initiated to enhance the biomanufacturing sector, including fuels and products that enable economics of the biorefinery. Lastly, the Administration has requested, \$150M to support a reverse auction incentive program, authorized under Section 942 of the EPAct 2005, Pub. L. 109-58 (August 8, 2005). The purpose of the program is to:

- (1) accelerate deployment and commercialization of biofuels;
- (2) deliver the first one billion gallons of annual cellulosic biofuel production by 2015;
- (3) ensure biofuels produced after 2015 are cost competitive with gasoline and diesel; and
- (4) ensure that small feedstock producers and rural small businesses are full participants in the development of the cellulosic biofuels industry.

Question 2. I am pleased to see the continued emphasis on increasing renewable energy in our electricity generation. South Dakota has great wind potential and is home to many successful wind projects. To meet the true potential for wind in the Great Plains, we also need to address our interstate transmission system. Will you elaborate on programs in the budget and other efforts aimed at helping us further develop and deploy this important domestic energy source?

Answer. Department of Energy efforts to further develop and deploy wind energy are coordinated between the Office of Electricity Delivery and Energy Reliability and the Office of Energy Efficiency and Renewable Energy's Wind and Water Power Program. These offices are coordinating two efforts to better understand the impact of high levels of wind deployment—the second phase of the Eastern Wind Integration and Transmission Study and the Western Wind and Solar Integration Study.

In addition, within the Office of Electricity Delivery and Energy Reliability, the Office of Electricity is funding collaborative approaches for long-term transmission planning at the interconnection level. These projects will determine the transmission requirements associated with a broad range of electricity supply futures, including intensive development of renewable resources. With respect to developing deployable technology solutions, the Office of Electricity is funding efforts to expand wide-area situational awareness (through widespread deployment of phasor measurement units and smart grid devices) to address operational variability associated with renewables and to develop energy storage technologies to meet the challenge of wind integration on the grid. In Iowa, for example, a compressed air energy storage plant will be able to absorb nighttime wind power from the Great Plains and deliver day time peak power.

The Wind and Water Power Program is working to better understand reliability impacts of wind deployment through analysis of wind turbines providing frequency response, support from experts at national labs to various utilities on wind integration studies, analysis of coordinated dispatch and operations between utilities to aid in wind deployment, the development and validation of non-proprietary wind generator models for use by system planners, efforts to improve wind forecasting and increase its use by operators, and efforts to establish methodologies for determining the impacts on reserves needed in systems with high levels of wind.

Question 3. I appreciate Department of Energy's support to date for the Deep Underground Science and Engineering Laboratory at Homestake.

Considering the envisioned changes to the model for stewardship of the DUSEL between the National Science Foundation and DOE, do you feel that there is suffi-

cient support from the Obama Administration and NSF leadership to facilitate an expanded DOE role and successful completion of DUSEL in the future?

Answer. The Administration does not plan to build DUSEL but remains committed to achieving the science goals of the Office of Science High Energy Physics and Nuclear Physics programs. We are assessing options for the Long Baseline Neutrino Experiment far detector, as well as future dark matter and neutrinoless double beta decay experiments. We have asked an independent panel of experts for assistance in making this assessment, which will include an alternatives analysis for the location of individual experiments.

Question 4a. How have DOE and NSF been working together to plan for a smooth transition into a revised stewardship agreement on DUSEL?

Answer. Since the decision by the National Science Board to decline further funding for construction of the DUSEL facility, DOE and NSF have continued to communicate about DOE plans for the Long Baseline Neutrino Experiment far detector, as well as future dark matter and neutrinoless double beta decay experiments. NSF is providing \$4,000,000 to bridge an approximately four month funding gap between June to September 2011 to keep the Homestake Mine dry through FY 2011. The Office of Science has requested \$15,000,000 in FY 2012 for continued de-watering and minimal sustaining operations to maintain the viability of the Homestake Mine while the DOE assessment is carried out. DOE and NSF are continuing to communicate on DOE's plans to carry out its assessment.

Question 4b. Does the FY 2012 budget request reflect inter-agency discussions and agreements?

Answer. The Office of Science and NSF have discussed DOE's \$15,000,000 FY 2012 request to continue dewatering activities and minimal sustaining operations at the Sanford Laboratory while DOE assesses cost effective options to carry out experiments planned by the High Energy Physics and Nuclear Physics programs.

Question 5. With regard to DUSEL, do you feel that the \$15 million you are proposing in FY 2012, despite the NSF's proposal to provide no additional funding, is sufficient to maintain progress on this important national facility, leveraging the more than \$250 million invested to date in private, state, and federal funds?

Answer. The Office of Science requested \$15,000,000 in FY 2012 to continue dewatering activities and minimal sustaining operations at the Homestake Mine in Lead, South Dakota. Before making further investments, DOE must assess its plans for the Long Baseline Neutrino Experiment far detector, as well as future dark matter and neutrinoless double beta decay experiments.

Question 6. Is DOE prepared to provide any additional funding needed in FY 2011 to ensure that no jobs are lost in the near term while DOE evaluates its long-term options and plans in high energy physics?

Answer. DOE is not currently planning to provide any additional funds toward DUSEL in FY 2011. Before making further investments, DOE must assess its plans for the Long Baseline Neutrino Experiment far detector, as well as future dark matter and neutrinoless double beta decay experiments. That assessment will continue through FY 2011.

Question 7. Has the National Science Foundation been a strong collaborator to date on DUSEL and do you foresee future collaborations with them on other high priority nationally reviewed science facilities given the difficulties encountered to date?

Answer. The National Science Foundation and the DOE have a strong partnership in high energy physics and nuclear physics. The National Science Board declined funding to bridge the NSF supported DUSEL Project team between the submission of the DUSEL Preliminary Design Report and approval to begin the DUSEL Final Design Report. Since that time, NSF has not communicated its intentions to DOE concerning further partnering on DUSEL. DOE welcomes continued partnership with the NSF on high priority nationally reviewed science projects.

Question 8. How is DOE prepared to work with the university community to ensure that the research needs will still be met with any proposed changes to the existing plans for DUSEL?

Answer. As part of DOE's assessment of the options for the Long Baseline Neutrino Experiment far detector and future dark matter and neutrinoless double beta decay experiments, reports will be given by DOE stakeholders, including the research community, on the science impacts of different budget and site location scenarios. Based on the findings of this assessment, the Office of Science will seek to develop a cost effective plan, which maximizes scientific opportunity for the research community.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR WYDEN

Question 1. President's Export Initiative Q1. When you were here last year to testify on the 2011 budget, the President had just announced the creation of National Export Initiative, or the NEI, to double exports over the next five years. The Administration has put forward a plan to boost clean energy exports as put forward in the "Renewable Energy and Energy Efficiency Export Initiative," which is part of the NEI. The key components of the plan appear to be to use the resources of the Export Import Bank to help provide financing to exporters, to negotiate trade deals to lower tariffs on these products, and to help connect U.S. businesses with foreign buyers. Has the Energy Department developed specific goals and benchmarks related to this plan and to boosting exports of clean energy products to recapture market share? Will this plan be sufficient to help our manufacturers compete against China in our market and in those overseas? What more should DOE and the Administration do?

Answer (a). DOE co-led the development of the Renewable Energy and Energy Efficiency Export Initiative (RE4I) with the Department of Commerce's International Trade Administration. The RE4I involves 23 commitments for new programs, actions, or deliverables from across the U.S. Government organized around four pillars: 1) more tailored financing options for RE&EE exporters; 2) enhanced market access for U.S. RE&EE products and services; 3) increased trade promotion to better link buyers and sellers of U.S. RE&EE technologies; and 4) the more efficient delivery of U.S. export promotion services to RE&EE companies.

The Renewable Energy and Energy Efficiency Export Initiative (RE4I) is a product of coordinated effort among a dozen agencies participating in the Trade Promotion Coordinating Committee Working Group on Renewable Energy and Energy Efficiency. DOE provides technical assistance, data, and analysis to all the inter-agency partners working together to achieve the goals and benchmarks set forth in the RE4I Export Initiative. DOE has not developed specific RE4I goals and benchmarks that apply only to the Department.

Answer (b). The RE4I will enhance the federal government's capacity to promote exports of clean energy technologies made in America. It will not enhance domestic demand for those technologies nor stimulate more investment in domestic manufacturing, both of which are key to competing successfully with suppliers from other countries including China. The RE4I is not a substitute for the strong, consistent domestic energy policy this country needs to motivate domestic investors to innovate and deploy clean energy technologies.

Answer (c). As co-chair of the TPCC Working Group on Renewable Energy and Energy Efficiency, DOE will continue to support the Department of Commerce's efforts to lead the implementation of the RE4I. DOE's efforts will include active support for trade missions, commercial advocacy, and outreach to American companies. Through the Clean Energy Ministerial and other international activities, DOE will also continue working with counterparts in other countries to create market conditions that encourage rapid growth in markets for clean energy technologies. In addition, we will continue working with our interagency partners to improve the information-sharing U.S. RE&EE exporters need to compete effectively in global markets.

DOE and the Administration will continue to pursue the kind of strong, consistent energy policy America needs to compete successfully in markets for clean energy technologies. Effective energy policies that stimulate domestic demand for clean energy technologies provide Americans the stable, domestically-produced clean energy our country needs while also developing a manufacturing capacity that can support exports to meet demand around the world.

BUY-AMERICAN

Question 2. As far as DOE is concerned, it's OK to count a solar panel assembled in the U.S. from 100% foreign parts as made in America, but it's not OK to import a solar panel with 50% American parts and count that as American. I don't see how it helps convince companies to invest in supply chain manufacturing facilities in the U.S. when DOE has a policy that they can't get credit for what they make here. DOE has the statutory authority to define what's made in America based on the public interest. Why is it not in the public interest for companies that manufacture or purchase value-added components in the United States to get credit for those components? Would you agree to reexamine the Department's policy on U.S. content in the solar Buy America waiver?

Answer. The Solar Public Interest Waiver issued by DOE dated 9/30/2010 was made to be consistent with prior iterations of Buy American regulations which used "substantial transformation" as the applicable standard—specifically those within Title 19 CFR (trade, tariffs and Customs duties). It allows for either cells or modules

to be manufactured in the U.S. to qualify for Buy American. In constructing this waiver, DOE specifically considered precedents from other industries such as the semiconductor industry. In this case, wafers and ingots produced in the United States, but assembled into microprocessors abroad, have been considered a sub-component of the final product and therefore such microprocessors did not qualify as American-made. Applying this precedent to the PV industry would mean that only modules manufactured in the U.S. would qualify as American made. In the U.S. PV industry, only three companies would currently qualify under this determination which could result in reduced market competition. For that reason, DOE agreed to expand the definition temporarily to include both U.S.-made cells or U.S.-made modules. In granting this waiver it was understood that even foreign made cells would likely contain significant U.S. content since the U.S. currently supplies approximately 40% of the world's supply of polysilicon as well as other supply chain components used in conventional PV cells. Further expanding the definition, however, to explicitly consider these supply chain components would go well beyond established precedent for the definition of "substantial transformation" and make the policy virtually impossible to administer since once the cell is manufactured, there is no systematic way to verify the origin of the components. Any attempt to use manufacturer reported information would be made more difficult since most manufacturers use multiple supply sources, not all of which may be located in the U.S.

Further, DOE believes that decisions to invest in U.S. manufacturing are based on a number of factors including IP protection, access to a skilled workforce, and proximity to the U.S. market. In 2010, the U.S. PV market grew approximately 100% most of which we believe did not include Government installations which are subject to Buy American. We believe that this level of growth will continue and will accelerate, and will draw both supply chain as well as cell and module companies to the U.S. DOE is also directly supportive of the U.S. domestic PV supply chain. As part of the Recovery Act, DOE awarded over \$1 billion to solar companies under the 48C Manufacturing Tax Credit program, many of which were for the manufacturing of PV supply chain components.

DOE recognizes that the U.S. PV industry is highly dynamic and that the current policy may need to be revised. As stated in the waiver, the Assistant Secretary reserves the right to revisit and amend this determination based on new information or new developments. This waiver expires in August 2011.

BUDGET CUTS AND IMPACT ON EXPORTS AND COMPETITION

Question 3. I am also concerned that no one really thought about exports and foreign competition when your budget was put together. For example, your new budget cuts funding for fuel cells and wave energy technology. Fuel cells are technology where the U.S. still has some real technology leadership and genuine export potential. Last year, for example, one of our fuel cell companies in Oregon signed a \$40 million distribution agreement with Korea to sell 800 of their fuel cells there, but there's no evidence that DOE thought about exports like these, or foreign competition, when it cut the fuel cell program. Wave energy is a technology where our competitors are investing hundreds of millions dollars in technology development and demonstration and yet your budget cuts the program back to less than \$18 million.

If the theme of the President's budget is to "out-innovate, out-educate, and out build the rest of the world," how is that going to happen when your budget slashes funding in some of the very areas, like fuel cells and wave energy, where the U.S. has a real opportunity to compete in the international market?

Answer. As the President has stated, "A decade of deficits, compounded by the effects of the recession and the steps we had to take to break it, as well as the chronic failure to confront difficult decisions, has put us on an unsustainable course." The objective of the President's budget is to pare down these debts, while investing in the areas that position the United States to compete in the global economy.

Meeting these spending cuts requires tough choices and sacrifices. The President's budget set as priorities those programs that are poised to make an impact sooner and at a larger scale. For example, the President's budget provides resources to put one million advanced technology vehicles on the road by 2015. The President's budget also makes important investments in fuel cells and wave energy technology.

For hydrogen and fuel cells, DOE's Fiscal Year 2012 budget request sustains critical research and development including \$45.5 million for Fuel Cell Systems R&D and \$35 million for Hydrogen Fuel R&D, which we believe to be the key to continued U.S. competitiveness and widespread commercialization hydrogen and fuel cell technologies. With the progress that has been made in fuel cell technology such as reducing the projected high-volume cost of automotive fuel cells by 30% since 2008

and 80% since 2002 (from \$275/kW in 2002 to \$51/kW in 2010)³⁷; doubling the durability of fuel cell systems operating in real-world conditions to 2,500 hours (with less than 10% degradation; equivalent to 75,000 miles of driving); and reducing the high volume cost of hydrogen production from natural gas to a gasoline-competitive price of \$3.00/gallon of gasoline equivalent³⁸, the Department has already enabled progress to allow leadership of U.S. industry.

DOE is optimistic about the opportunities to further develop emerging marine and hydrokinetic (MHK) energy technologies, including wave and tidal energy technologies. For example, DOE has previously funded both the Ocean Renewable Power Company (ORPC) and Verdant Power, who may potentially develop tidal current arrays in Canada and China respectively. Verdant has signed an MOU with China's Energy Conservation Environment Protection Group to develop tidal power in the country, the first MOU of this sort between China and a U.S. MHK company.

We believe that the \$38.5 million requested for water power research in FY2012 is sufficient to continue the program's ongoing efforts to advance industry development and export capability of MHK technologies. We are currently completing a comprehensive set of resource assessments and undertaking detailed techno-economic assessments of emerging technologies, which will help us to effectively determine the opportunities and costs associated with these technologies. These important analyses will help the Department determine what funding levels are necessary and appropriate to realize water power's potential.

INVESTING IN JOBS

Question 4. Secretary Chu, your Department is one of the few agencies that would get increased funding under the President's Budget. If Congress approves this additional proposed funding, what will you do to ensure that the additional investment will focus "in areas that show the most promise for job creation" as the President's Budget calls for? [Investing in American Innovation p. 34]

Answer. As we know, the Recovery Act helped create tens of thousands of jobs and, combined with the FY 2012 request, will help the Department accelerate the transition of our nation to a clean energy economy. These investments are designed to accelerate investment in clean energy projects and pull private investment off the sidelines. They are jumpstarting a major transformation of our energy system including unprecedented growth in the generation of renewable sources of energy, enhanced manufacturing capacity for clean energy technology, advanced vehicle and fuel technologies, and a bigger, better, smarter electric grid.

The President's FY 2012 Budget supports the plan to rebuild our economy through clean energy research and development. Some specific areas of focus include:

- Expanding programs that spur innovation.—The President's request proposes for the Advanced Research Projects Agency—Energy (ARPA-E) program a FY 2012 request of \$550 million. ARPA-E performs transformational and cutting-edge energy research with real-world applications across areas ranging from grid technology and power electronics to batteries and energy storage. The budget also supports programs with significant promise to provide reliable, sustainable energy across the country, such as SunShot, an initiative aimed at making solar energy cost competitive. With focused investment in manufacturing innovation and industrial technical efficiencies, the President's proposal will move private sector capital off the shelves and into the marketplace.
- Doubling the number of Energy Innovation Hubs to solve key challenges.—Innovation breakthroughs occur when scientists collaborate on specific problems. The FY 2012 budget request proposes three new Energy Innovation Hubs that will bring top American scientists to work in teams to research critical energy challenges in areas such as critical materials, batteries and energy storage, and electricity grid technologies.
- Promoting efficient energy.—Currently, over 50 percent of the goal to weatherize 600,000 homes of low -income families has been achieved, providing energy cost savings and financial relief to households. The FY 2012 request of \$320 million continues residential weatherization, with more than one-third of the funding devoted to new innovative approaches to residential home weatherization.

³⁷ http://hydrogen.energy.gov/pdfs/10004_fuel_cell_cost.pdf

³⁸ <http://www1.eere.energy.gov/hydrogenandfuelcells/accomplishments.html>

OIL LIABILITY FOR CONTRACTORS

Question 5. The President's Budget states "the Administration is committed to holding the oil and gas industry accountable for the risks associated with oil and gas production by removing the existing liability cap for damages associated with offshore drilling activity." [p.37] Does this commitment to holding the industry accountable extend to holding drilling contractors accountable or are you only proposing to hold the primary leaseholders accountable?

Answer. While the basic thrust of the proposal is clearly stated in the budget material, the Department understands that the exact wording of the legislative text has yet to be refined for submission to Congress. The question you have posed involves the scope and reach of the proposal, which will turn on the wording of the text, and we look forward to working with the Congress to address such issues.

ENERGY STORAGE STRATEGIC PLAN

Question 1. Last year, the Department provided a report to the Committee outlining the Department's research and development activities related to energy storage technologies. In light of the many applications for energy storage—from electric vehicles to integration of intermittent renewables—and the many offices within the Department with a direct interest in energy storage, I believe that it is imperative that the Department develop an integrated strategic plan for research, development and deployment of energy storage technologies. Can I have your commitment to produce such a plan?

Answer. As you know, the Grid Storage Report provided by the Department to the Committee in July 2010 outlined a strategy for grid-level storage projects through a discussion of applications, DOE collaborative activities, and focused efforts of specific offices within the Department. It has served as a valuable tool in our efforts to further improve our internal coordination, and better integrate work by the various parts of the Department on this issue.

As we approach the one-year anniversary of that report, the Department plans to revisit the strategy it outlined, and incorporate lessons we have learned in the intervening time from the applied technology programs, the Office of Science, ARPA-E, and the new Energy Innovation Hub on Batteries and Energy Storage. Coordinating this strategic planning effort will require direct involvement from senior leadership as well as program-level staff, and an ongoing willingness to work across organizational silos. The Department is committed to this effort, because the opportunity for improved system reliability, reduced energy consumption, and increased economic benefits are very large, but will only be realized through coordinated action across the Department's multiple programs. We will continue to keep the Committee fully informed of our progress.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR CANTWELL

CHALLENGES OF COMMERCIALIZATION ACTIVITIES AT DOE

Question 1. Can you please comment on commercialization efforts within DOE generally and on these examples specifically?

Answer. In order to achieve its mission of addressing America's energy challenges through transformative science and technology solutions, DOE must be focused on moving its technologies in the labs out into the marketplace in order to ensure broad deployment and strengthening US competitiveness. It is important to note that the commercialization needs of awardees vary both by technology readiness level and type of organization (i.e. university, small business, large corporation, etc). As such, DOE is facilitating commercialization and deployment of clean energy technologies in a number of ways through EERE, ARPA-E and SC programs. These efforts include facilitating connections to translate technology concepts to a market need, developing mentorship opportunities, and engaging with industry experts to receive feedback, as well as, provide a venue for industry collaboration and partnerships.

In response to your specific questions:

DOE Loan Guarantee Program

DOE reviews each loan guarantee application on its own merits against a common set of criteria outlined in the program's statute, regulations, and each solicitation. All projects must, at a minimum, meet the basic eligibility criteria, including the statutory requirement that they demonstrate a "reasonable prospect of repayment." This requirement, established by Congress, is important to ensuring that taxpayer funds are safeguarded, and DOE takes it very seriously. The Department uses best practices, similar to those private sector lenders would use in reviewing such deals.

It is important to keep in mind that these transactions are large and complex and that no two deals are alike. In the private sector, the due diligence associated with such transactions is measured in months, not weeks.

Fuel Cell Market Transformation

The Department agrees with the importance of continued investment in clean energy technologies, including fuel cells, and recognizes the benefit of market transformation activities. In fact, although not reflected in the FY 2012 budget request, the Department invested \$43 million under the Recovery Act to enable the deployment of up to 1,000 fuel cells for early market applications such as forklifts and backup power. This additional funding will allow the Department to collect data on the performance and cost of fuel cells for early market applications, deferring market transformation funds until this data becomes available. In the mean time, funding is invested in critical research and development to ensure that domestic companies continue to develop their technologies. Other mechanisms such as the investment tax credit and grants in lieu of tax credit (section 1603) allow companies to take advantage of incentives available for commercial deployments.

48C Advanced Manufacturing Tax Credit

I understand the importance of ensuring that small companies be able to monetize the 48C credit in order to take advantage of it. As you know small, innovative companies are critical for the U.S. clean energy manufacturing sector and we want to make sure we do everything in our power to support the growth of this industry. We believe that tax policies, can provide highly effective mechanisms to increase the amount of investment in the US and increase job growth in these crucial markets.

Fortunately, companies of varying size have been able to take advantage of the 48C tax credit. It is important to ensure that small companies which may not have large, nearterm tax liabilities are able to take advantage of the credit. Our experience with the 48(c) program has suggested that those companies were able to successfully monetize the credit and bring their plants on line.

I have to defer questions related to Section 6103 of the Tax Code, which limits requests to taxpayers for any new information that was not originally provided in the application, to the IRS.

CHALLENGES OF COMMERCIALIZATION ACTIVITIES AT DOE

Question 2. How can their effectiveness be improved? Why is it so difficult to get commercialization efforts firing on all cylinders?

Answer. There are a number of ways that DOE is improving the effectiveness of its technology transfer program and commercialization efforts. We have re-established the Secretary of Energy's Advisory Board (SEAB), which has a strong focus on technology transition and deployment. The first full-time Technology Transfer Coordinator (TTC) has been appointed to address known concerns. She is also exploring additional initiatives to improve the impact and outcomes of the technology transfer program. We recognize that a strategic and coordinated effort is needed to facilitate and encourage the successful commercialization of our scientific discoveries to the private sector. We published a Request for Information to provide stakeholders an opportunity to voice their concerns, and we are already tackling several of the commonly raised issues that affect collaborations and transfer of technologies.

SMART GRID INNOVATION HUB

Question 3. I was pleased to see the DOE's intent to establish a new Innovation Hub for Smart Grid Technology and Systems. As you know, the Pacific Northwest is investing in substantial grid transformation activities with important support from Recovery Act grants ranging from the Northwest Regional Smart Grid Demo (the nation's largest), the Western Interconnection Synchrophasor Project, multiple smart grid workforce training grants, and several smart grid investment grants.

On top of all this, the Pacific Northwest is a leader in renewable wind integration. In fact the Bonneville Power Administration's system is now home to 3.6 Gigawatts of wind, within BPA's 9 Gigawatt balancing area.

I think a Smart Grid hub, as contemplated in the budget, gives us the opportunity to build on this work, in a way that should deliver both innovations that improve current grid operations and, more importantly, point to new paradigms for the way in which we operate the grid.

A smart, digital power system can deliver more value and greater resilience with more efficiency and fewer emissions.

Can you share how you envision this innovation hub providing leadership in shaping our national pursuit of a transformed power system for the 21st century?

Answer. The Smart Grid Technology and Systems Hub would establish a U.S. center of excellence where top performers from various disciplines will come together to focus on the holistic transformation and modernization of the electricity infrastructure that ties the electric grid together. Research, development, and demonstration of novel technologies and concepts devised from a systems-level approach will generate innovations and analyses that lower the risk to the private sector and supplement the on-going transformations in the electric industry. The flexibilities introduced by these new technologies will facilitate the adoption and use of wind, solar, electric vehicles, storage, smart meters, and other advanced components. In addition, the Hub also represents an investment in human capital that will help build the capabilities, expertise and skills to foster the leaders for the power systems of tomorrow.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR SHAHEEN

Question 1. I would like to get your thoughts on the President's proposed Clean Energy Standard (CES). From what I have seen, the proposal doesn't list energy efficiency qualifying as a "resource", as it does for wind, nuclear and natural gas. I think this is a mistake, since the cheapest unit of power is the one we don't have to produce.

Answer. The Administration is committed to unlocking the full potential of energy efficiency and intends to use efficiency as an important means to achieve the President's clean energy goals, through programs such as the Better Buildings Initiative and HOMESTAR as well as existing programs to promote energy efficiency in the industrial sector. As a starting point in the design process, we believe that a CES can be more effective in driving the deployment of clean energy technologies if it is focused on the generation side, while a suite of complementary energy efficiency measures work to reduce electricity demand. We also note that even without crediting energy efficiency as a resource, a CES inherently creates a strong economic incentive for reducing load through demand-side energy efficiency. However, the Administration is committed to working with all interested parties on CES legislation and is eager to discuss alternative approaches to achieving the twin goals of clean energy deployment and energy efficiency.

Question 2. Several states include efficiency as a resource in their own Renewable Electricity Standards (RES). Even more states have their own separate Energy Efficiency Resource Standards (EERS). If these states recognize the value of efficiency as a "resource" shouldn't it also be recognized in Clean Energy Standard or a separate federal Energy Efficiency Resource Standard?

Answer. A separate energy efficiency resource standard (EERS) is one example of a complementary energy efficiency policy. The Administration is open to working with all members of Congress to design policies such as these and others that could help realize the full potential of energy efficiency.

Question 3. What role do you see for highly efficient combined heat and power (CHP) and waste heat recovery systems in a Clean Energy Standard? Aren't these systems just as efficient and "clean" as natural gas, which is included in the President's CES proposal?

Answer. Combined Heat and Power (CHP) and waste heat recovery systems are both highly efficient on-site energy systems and, as such, could be readily integrated into a Clean Energy Standard. The Administration is eager to work with interested members of Congress to explore the best ways to give clean energy credits in a CES for measurable clean electricity generation from such technologies, taking into account the increased efficiency of cogeneration systems as well as the consumption of electricity onsite.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR LANDRIEU

Question 1. In the President's State of the Union speech, he announced a goal of putting one million electric vehicles on the road by 2015. In reviewing the budget documents, I understand that the DOE is planning to invest \$588 million in electric vehicle research to help achieve this goal. I generally think moving to electric vehicles is a laudable goal, but I think we must be realistic about how quickly we can get there.

I recently read a great article in the Washington Post from January 28, entitled, "Cold truths on electric avenues." The author highlights, that even if we reach the President's goal, it would represent just 0.4 percent of the U.S. automotive fleet, yielding no substantial reduction in carbon emissions or U.S. dependence on foreign oil. Given that the President's budget includes \$588 million to help us achieve that goal, one would hope we could get more bang for our buck. The article recommends that an alternative policy would do more to accomplish the Administration's goal

faster and at a lower cost—this alternative policy is to use a more efficient internal combustion engine.

As you know, Mr. Secretary, there is a company called Next Autoworks that has developed a more efficient combustion engine. Next Autoworks is currently working its way through the DOE Advanced Technology Vehicle Manufacturing (ATVM) loan program authorized by the Energy Independence and Security Act of 2007. I am told DOE has been reviewing their application for 18 months now.

Do you agree that using a more efficient internal combustion engine, in the short term, can help us reduce our dependence on oil and lessen our carbon emissions faster than waiting for electric vehicle technology to become accessible to the average consumer?

Answer. It is true that significant advances in internal combustion engines (ICEs) are possible, and it is also true that these technologies can be transferred to the market quickly through existing manufacturing facilities and capability. In the very short term, increasing vehicle efficiency using advanced ICE technology is an important pathway to address reducing petroleum consumption and greenhouse gas emissions. However, to completely address these issues and break our dependence on oil, we must transition to a combination of technologies using biofuels and electric vehicles. Advanced ICEs can play a role in this transition, as using advanced ICEs in hybrid electric vehicles and plug-in hybrid electric vehicles will enable even greater fuel savings benefits.

Question 2. If you agree, it seems DOE has the perfect opportunity to help enable the production of a more efficient internal combustion engine. As such, why has DOE taken so long to review Next Autoworks' application and is there any way this process can be accelerated? Do you expect DOE to finalize this application soon?

Answer. It is Department policy not to comment on specific applications. However, we are committed to processing applications under our programs as efficiently as possible, while ensuring that taxpayer funds are properly protected and that all program requirements are met.

Question 3. In the President's State of the Union speech, he announced a goal of putting one million electric vehicles on the road by 2015. In reviewing the budget documents, I understand that the DOE is planning to invest \$588 million in electric vehicle research to help achieve this goal. I generally think moving to electric vehicles is a laudable goal, but I think we must be realistic about how quickly we can get there.

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I understand that about \$7.5 billion was provided in the Stimulus Act to provide loan guarantees to ATVM awardees. How much of that \$7.5 billion remains and do you expect to award the remaining funds within the year?

Answer. ATVM did not receive any appropriated credit subsidy under the Recovery Act. The program was established by Section 136 of the Energy Independence and Security Act of 2007, and the FY 2009 Continuing Resolution (CR), enacted on September 30, 2008, appropriated \$7.5 billion to support a maximum of \$25 billion in loans under the ATVM Loan Program. However, the ATVM program did receive \$10 million in funds under the Recovery Act to cover administrative costs.

On July 13, the Department announced the conditional commitment of a loan to Severstal for \$730 million. The ATVM Loan Program has issued loans or conditional commitments totaling over \$9 billion to six advanced technology vehicle manufacturers or parts suppliers. The program has approximately \$4 billion in credit subsidy remaining. DOE is continuing to review a number of applications under the program.

Question 4. Mr. Secretary, I note that one of the largest cuts on a percentage basis is a 45% cut to the Office of Fossil Energy. I am concerned about the large cut and the impact it will have on the timely review of permits and applications.

For instance, I want to ask you about a project that would have a positive impact on Louisiana jobs and U.S. exports. On September 7, 2010 Sabine Pass Liquefaction filed an application with the Department of Energy's Office of Fossil Energy for authorization to export liquefied natural gas (LNG) from its Cameron Parish facility. The Department opened a period for public comment on the application through December 13, 2010 that was extended through January 11, 2011. I joined the bipartisan Louisiana delegation in writing to you on July 26 of last year, describing the importance of the proposed project to creating jobs on site and supporting expanded natural gas production in northern Louisiana. As you know, timely regulatory reviews are critical to the planning and construction of such a large, capital-intensive project.

Do you expect this large cut to affect the timely review of permits and applications? When can we expect the Department to make a final decision on the Sabine Pass application?

Answer. The Administration's FY 2012 budget request provides funding for Department of Energy staff positions that perform regulatory review functions and issue authorizations in response to applications submitted by the private sector requesting authority to import and export natural gas and liquefied natural gas from and to the U.S.

There are no statutory or regulatory timelines for the Department to issue a decision on the type of application submitted by Sabine Pass Liquefaction. This application is the first application that has been submitted by a company that is proposing to export domestically produced, lower-48 natural gas as LNG. As such, it is a precedent-setting application, with potential ramifications on any similar future applications, and the Department must perform a careful review and evaluation in order to determine whether or not the application is consistent with the public interest. The Department is currently reviewing the application, as well as all comments and interventions associated with this application, and we expect to issue a decision concerning the public interest determination sometime in the first half of CY 2011.

Question 5. Mr. Secretary, I understand that the Department is now in the process of working with industry to form a public-private partnership to implement the NGNP project. Can you please describe to me the Department's planned process and time frame for accomplishing this?

Answer. The Department of Energy has completed a market research survey that asked respondents for feedback on a number of aspects of the terms and conditions of various potential federal contracting mechanisms. The results of this survey are being factored into a draft solicitation for forming a cost-shared public-private partnership for the design, licensing and construction of the Next Generation Nuclear Plant Demonstration Project. As stated in the Budget, a Secretarial decision on the future of the NGNP project is planned for the fourth quarter of FY 2011 and will consider technical, financial performance, and other issues in determining the appropriate next steps, including whether to proceed further on the project. Future funding needs will be determined through standard planning and budget development processes and will be outlined in future Budget requests.

Question 6. Mr. Secretary, your Department has made reduction of carbon emissions a major priority. The Idaho National Laboratory and the NGNP Industry Alliance have estimated that if we applied nuclear energy as a substitute for just 25% of the current fossil fuel input to the petrochemical, refinery and fertilizer industries in the U.S., there is a market for over 300 high temperature gas cooled reactor modules—resulting in a very substantial reduction in greenhouse gasses. I'm told that for these industries, there's really no other foreseeable alternative to fossil fuels than high temperature gas cooled reactors. Given these facts, I'm a bit disappointed that attention the NGNP project receives in the budget is so very modest. Assuming the Department is successful in forming a partnership with industry on the NGNP project, is it your plan to substantially grow the NGNP budget in future years? If not, why not?

Answer. The Department's budget request reflects the belief that light water reactors, both large and small, offer the quickest path to deploying new reactors and achieving clean energy goals. A Secretarial decision on the future of the NGNP project is planned for the fourth quarter of FY 2011 and will consider technical, financial performance, and other issues in determining the appropriate next steps, including whether to proceed further on the project. The FY 2012 request for NGNP maintains essential research and development activities. Future funding needs will be determined through standard planning and budget development processes and will be outlined in future Budget requests.

Question 7. I know that DOD, particular the Air Force, has a major initiative in terms of developing alternative sources of liquid fuels—in fact, as I understand it, our military is one of, if not the largest consumer of liquid fuels in the world. I know

that the Department of Energy has met with the Department of Defense to encourage their support for Small Modular Reactors for electric power production. Has your Department had a similar meeting or meetings with Defense about the potential of high temperature gas cooled reactors in terms of synfuel manufacture and coal liquifaction? Has the Department encouraged DOD to become involved in the NGNP project? If not, why not?

Answer. The Department of Energy (DOE) is currently engaged with the Department of Defense (DOD) on the deployment of light water small modular reactors for electricity at various defense installations. Previous conversations with DOD included discussions on the marrying of high-temperature gas-cooled reactors (HTGRs) to the production of syn-fuels from bio-feedstocks or coal and its potential impact on energy and national security. DOE and DOD will continue to assess the feasibility of liquid fuel production using nuclear energy as the heat source, but no specific project is currently envisioned.

Question 8. Can you please tell me about the current status of the Department's work with the NRC on a licensing regime for high temperature gas cooled reactors? How much money is the FY12 budget for this activity?

Answer. Since the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) submitted the joint Next Generation Nuclear Plant Licensing Strategy—A Report to Congress in 2008, significant progress has been made. Current efforts are focused on R&D collaborations particularly in the area of thermal hydraulic modeling, and the resolution of key policy and technical issues affecting high temperature gas-cooled reactors (HTGRs). DOE has submitted 8 of 13 planned white papers to the NRC which address priority licensing topics. DOE is also engaged in performing a detailed regulatory gap analysis to review existing NRC rules and regulations and identify their applicability to HTGRs. The results of the gap analysis and NRC disposition of white papers will serve as the basis for a license application content guide for HTGRs. The gap analysis is projected to be completed 2011. The Department plans to spend \$2.2 million on licensing efforts in FY2012, which includes providing \$1.5 million directly to the NRC.

Question 9. As we all know, the budget for Yucca Mountain was eliminated two budget cycles ago, but we are still dealing with the ramifications of the decision to pull this the plug on the project. As such, DOE's current liability for failing to begin accepting spent fuel now stands at \$16 billion and that is approximately a \$2 billion increase over the previous year's estimate. Previously, the liability was estimated to be growing at \$500 million per year; and now since termination of the program, it has doubled the growth of the liability to \$1 billion per year. As such, what is DOE doing to rectify this situation? Have you evaluated the long-term implications of your Yucca Mountain termination decision on DOE's liability? What is DOE's forecasted liability in 20 years or 60 years if the DOE fails to begin accepting spent fuel?

Answer. For the purpose of appropriately recognizing the Government's potential financial liability in the Department's financial statements, the Department annually performs an assessment of the Government's future potential liability due to the Department's delay in beginning the acceptance of spent nuclear fuel in accordance with the provisions of the Standard Contracts with the nuclear utilities. The most recent estimate of the outstanding liability as of the end of fiscal year 2010 was \$15.4 billion. The Department based this estimate of the future potential liability upon, among other things, the costs that utilities have submitted for compensation and that the Department has approved for recovery, pursuant to the existing settlement agreements with nuclear power plant operators. This estimate assumed that the Department would begin acceptance of spent nuclear fuel in 2020, as was assumed in the previous year's estimate. While the Department believes that the methodology utilized in performing this assessment is appropriate for quantifying the Government's total potential liability resulting from the delay in performance under these contracts with utilities, the Department has no way to determine when utilities will actually incur these costs and submit claims for reimbursement, or when a Court's judgment may become final and unappealable. As a result, the Department is unable to provide an annual projection of the potential liability, and the estimates may vary substantially from year to year, based upon the prior year's actual cumulative experience of payments of claims under settlements or judgments.

The Department's prior statements that each year of additional delay in the beginning the acceptance of spent nuclear fuel would increase the government's liability by up to \$500 million were predicated upon a further delay in completing the Yucca Mountain repository. The Department has determined that a geologic repository at Yucca Mountain is not a workable option. The Secretary has established the Blue Ribbon Commission on America's Nuclear Future, and has charged the Commission with identifying alternatives for managing the Nation's nuclear waste. The

Administration will evaluate the information from the Commission as it develops a new strategy for nuclear waste management and disposal. Forecasts will reflect strategies and alternatives as appropriate.

RESPONSES OF HON. STEVEN CHU TO QUESTIONS FROM SENATOR COONS

Question 1. I was disappointed to see the House GOP propose sweeping cuts to the ARPA-E program, which would leave it with only \$50 million for the remainder of FY 2011. I think the program is absolutely critical to continue to drive innovation and keep America competitive. Over the next 5-6 years, how much more do you think we need to invest in cutting edge technologies to be competitive in the global clean energy market and what would be necessary to be the world's leader?

Answer. I thank you for your support of ARPA-E. ARPA-E is devoted exclusively to funding specific high-risk, high payoff, research and development projects to meet the nation's long-term energy challenges. ARPA-E fulfills a critical need for transformational energy technologies. Given the recent surge in energy investments overseas and unparalleled growth in the global demand for energy resources, the next few decades must be the most innovative period of U.S. history in order to remain competitive in the energy economy of the future. ARPA-E will play a key role in fostering that innovation. The magnitude of this challenge is enormous, as is the opportunity. Encouraging American innovation and maintaining our leadership in research and technology is a high priority for the Administration.

I support the President's request for ARPA-E's budget, and look forward to continuing to work with the authorization and appropriations committees in Congress.

Question 2. The proposed DOE budget includes a decrease for the ATVM program of 70% for the program in FY 2012, due to the fact that credit subsidy scores have come back higher than expected, leading to higher than anticipated costs. Do you think this is a critical program that should be moved forward? How can we best ensure that it does?

Answer. The Advanced Technology Vehicles Manufacturing Loan Program (ATVM) is a critical program that provides loans to automobile and automobile part manufacturers for the cost of re-equipping, expanding, or establishing manufacturing facilities in the United States to produce advanced technology vehicles or qualified components, and for associated engineering integration costs.

The ATVM Loan Program budget requests from FY 2010-2012 were for administrative operations only because the \$7.5B credit subsidy appropriated in 2009 provided sufficient budget authority. The ATVM Loan Program requested \$6M for administrative operations in FY12 compared to \$10M requested in FY11 and \$20M appropriated in FY10. The decrease in FY12 over the FY11/10 levels is due to the fact that the ATVM loan program anticipates transitioning from loan origination to portfolio management activities.

The Department is committed to utilizing the funds currently appropriated to the ATVM Loan Program to fund solid projects to achieve our statutory objectives. On July 13, the Department announced the conditional commitment of a loan to Severstal for \$730 million. To date, over \$9 billion in direct loans and conditional commitments have been made to six manufacturers, three of which have been exclusively focused on plug-in electric and hybrid electric vehicles. In addition, we are currently engaged in due diligence on numerous other projects.

Question 3. I am pleased to see \$5 billion for the Advanced Energy Manufacturing Tax Credit (Section 48c) in the Department of Treasury's budget. I participated in an effort during the lame duck session to try and extend the program, and was disappointed that it did not pass. Do you know the number and scale of clean energy manufacturing opportunities we are missing out on because of this lapse?

Answer. Department of Energy (DOE) has supported Internal Revenue Service (IRS) to award of \$2.3 billion in tax credits for 183 clean energy manufacturing projects in 43 states under the 48(c) program. The manufacturing capacity supported by these grants will produce solar panels, wind turbines, geothermal equipment, nuclear plant components, and energy efficient building products, putting the US on track to significantly increase our capacity to manufacture these high technology, clean energy components. These facilities represent some of the premier companies in renewable manufacturing.

The interest was extraordinary and the program was oversubscribed by a ratio of more than 3 to 1. The Administration has called on Congress to provide an additional \$5 billion to expand the program.

Since, this program was a onetime snapshot of multiple industries taking advantage of a program; the data was not comprehensive enough to draw a specific conclusion. However, market research suggests that the US wind industry is a \$16 billion industry, solar is \$3-4 billion, and building controls and energy efficiency is

roughly a \$4 billion industry. New technologies and advancements are being made every day thanks to these 48c investments. Many of these technologies are new, innovative, and game changing technology.

Question 4. The University of Delaware is currently working on a proposal to establish a demonstration project for offshore wind off the southern coast of Delaware. This project would provide critical information for future offshore wind projects, including turbine performance and impacts of storms, which will help reduce costs and uncertainty, and draw more offshore wind projects to the U.S. Is there any funding in DOE's FY 2012 budget for demonstration projects? If not, do you expect to eventually offer such a program and when?

Answer. The Department of Energy's FY 2012 budget request includes \$63.7 million for offshore wind energy research, development, and demonstration. The budget request specifically identifies \$12 million for partnerships with commercial developers, research consortia, power producers, and electric utilities in the development and demonstration of first-of-its-kind offshore wind power projects. DOE anticipates selecting demonstration project partners through competitive solicitations. The initial scope of DOE's anticipated funding awards to these demonstration projects will focus on addressing project deployment needs and will support basic technical data reporting requirements.

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