**Department of Energy**
Washington, DC 20585

December 3, 2013

The Honorable Ed Whitfield
Chairman
Subcommittee on Energy and Power
Committee on Energy and Commerce
U. S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

On June 13, 2013, Secretary Ernest Moniz testified regarding "The Fiscal Year 2014 U.S. Department of Energy Budget."

Enclosed are the answers to 49 questions that were submitted by Representatives Upton; Barton; Shimkus; Latta; Olson; McKinley; Gardner; Griffith; Engel; and you to complete the hearing record.

If we can be of further assistance, please have your staff contact our Congressional Hearing Coordinator, Lillian Owen, at (202) 586-2031.

Sincerely,

Christopher E. Davis
Principal Deputy Assistant Secretary
for Congressional Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Bobby L. Rush, Ranking Member

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QUESTION FROM CHAIRMAN WHITFIELD

Q1. I understand that the administration has been encouraging agencies to advance their use of Energy Savings Performance Contracts to improve the energy efficiency of Federal buildings and to reduce energy consumption. However, I also understand that only 16 companies can compete for these contracts under the current Indefinite Delivery Indefinite Quality (IDIQ) that was established to provide a stream-lined bidding process for qualified companies. Further, of these 16 qualified companies, less than 8 actively pursue programs within federal space. There are other qualified Energy Service Companies (ESCO) who wish to participate, but they cannot because the IDIQ is closed.

What is DOE doing to ensure that all qualified ESCOs can participate on ESPC projects so that the federal government can utilize energy savings techniques to reduce taxpayer dollars on Federal energy costs?

A1. Qualified ESCOs can participate in performance contracts through a number of different outlets. They include:

1) DOE Qualified List – Agencies can enter into ESPCs outside of the IDIQ. These ESPCs are done through an open solicitation and are often referred to as "site specific ESPCs." In order to enter into an ESPC, a company must be included on the DOE Qualified Contractors List. Companies can submit their qualifications to DOE and, once qualified, are eligible to bid on site specific ESPCs. There are currently approximately 100 companies on this list that are eligible to compete for these projects. The list is available on the Federal Energy Management Program (FEMP) website at http://www1.eere.energy.gov/femp/financing/espcs_qualifiedescos.html.

2) General Services Administration (GSA) Schedule 84, SIN 246-53 – This GSA vehicle is currently open and accepting applications from ESCOs that are interested in implementing ESPC ENABLE projects that focus on smaller, targeted federal facilities. There are approximately 11 companies that have been awarded SIN 246-53 along with another 8 that have submitted applications.

3) Utility Energy Service Contract (UESC) Participating Utilities – The UESC program offers another opportunity where ESCOs can support projects by serving as sub-contractors to a local utility company.

4) DOE IDIQ and Huntsville IDIQ – Both DOE and the U.S. Army Corps of Engineers administer IDIQ contracts with a number of companies that implement performance contracts at both civilian and defense facilities. Although those contracts are currently closed, there are sub-contracting opportunities available for other firms interested in participating in these projects.

As part of a request for information (RFI) published in April in the Federal Register, DOE asked for comments on structuring an ESPC IDIQ contract so that new contractors may be added during the life of the contract. DOE will consider these comments regarding opportunities for improvement and ways to enhanced usability and flexibility at the next point at which the IDIQ contract is competed.

QUESTION FROM CHAIRMAN WHITFIELD

Q2: During the President's first term, thousands of pages of new regulations were issued by EPA affecting the production, supply, distribution or use of energy. These rules collectively cost tens of billions of dollars and effectively set national energy policy. Will you commit that under your watch DOE will independently review EPA's proposed rules to assess the impacts on the energy reliability or costs to consumers?

A2: The Department of Energy (DOE) recognizes the significance of regulations affecting the energy sector. In previous years, DOE has engaged in the interagency review process and, where appropriate, conducted analyses of the impacts of proposed rules affecting the energy sector. I intend to continue this practice.

QUESTION FROM CHAIRMAN WHITFIELD

Q3(a): What role do you see DOE taking to ensure federal regulatory policies do not lead to higher electricity prices for businesses and consumers?

A3(a): A regulatory impact analysis that includes an assessment of electricity price impacts is typically conducted for proposed federal regulations that significantly impact the electricity system. The Department of Energy reviews proposed rules through the interagency comment process led by the White House Office of Management and Budget. In addition, the Department of Energy is available to provide technical assistance, where appropriate, to ensure the best possible outcomes for potential rules that impact the energy system.

Q3(b): Would you say this is an urgent issue, given the state of the power sector today?

A3(b): The power sector is currently being affected by several factors, including the availability of inexpensive natural gas. DOE will continue to review potential regulations with respect to their impact on the energy sector, including on energy consumers, through the interagency comment process.

QUESTION FROM CHAIRMAN WHITFIELD

Q4. One of DOE's statutory duties under the DOE Organization Act is to "promote the interest of consumers through the provision of an adequate and reliable supply of energy at the lowest reasonable cost."

Q4(a): As Secretary of Energy, are you concerned about the impact of EPA rules on electricity rates and gas prices for consumers?

A4(a): DOE recognizes the importance of promoting the interests of consumers. DOE reviews proposed rules from other agencies through the interagency comment process. The regulatory impact analyses accompanying such proposals often include an analysis of costs and benefits.

Q4(b): If you have cost concerns, will you raise them with EPA?

A4(b): The Department is currently working with EPA and will continue working with EPA to address any issues that may arise in the implementation of its recent rules and in the promulgation of its future rules. Through this on-going coordination, we will raise such concerns with EPA when appropriate.

QUESTION FROM CHAIRMAN WHITFIELD

Q5(a): What is your understanding of the President' second term climate agenda as it relates to DOE?

A5(a): On June 25, the President gave a speech announcing a comprehensive plan to address climate change. This plan includes a number of federal commitments, some of which involve DOE. Examples of activities in which DOE is involved include spurring investment in advanced fossil energy via loan guarantee authority, instituting a federal Quadrennial Energy Review, developing and deploying advanced transportation technologies, and establishing a new goal for energy efficiency standards, among others. DOE may support other federal activities in relevant areas.

Q5(b): As Energy Secretary, have you been consulted about EPA's planned greenhouse gas regulations for power plants?

A5(b): Before the Secretary was confirmed, the Environmental Protection Agency began its greenhouse gas rulemaking process for new power plants, and the Department of Energy participated in the interagency review of the proposed rule issued in 2012. The Department of Energy was also engaged in the development of the President's Climate Action Plan, which was released in June of 2013 and called on EPA to develop regulations of greenhouse gases for existing power plants under the Clean Air Act.

Q5(b)(i): What is your understanding of the Administration's plans for regulating greenhouse gas emissions from new or existing power plants?

A5(b)(i): On June 25, the President gave a speech announcing a comprehensive plan to address climate change. Following this speech, the Administration released a Climate Action Plan and a Presidential Memorandum outlining a timeframe for EPA to issue flexible standards for greenhouse gas emissions from new and existing power plants under section 111 of the Clean Air Act. In addition, both potential rules are listed in the recent update to the Unified Agenda published by OMB.

Q5(b)(ii): Should DOE have a significant role in the development of any EPA rules affecting power plants given the impacts such rules would have on national energy policy?

A5(b)(ii): DOE will review proposed rules through the interagency comment process led by the White House Office of Management and Budget. DOE may also provide technical assistance in the development and implementation of such rules, where appropriate.

QUESTION FROM CHAIRMAN WHITFIELD

Q6. Do you believe renewable energy sources such as solar, wind, and geothermal can completely replace traditional sources of energy like coal, nuclear, and hydropower? If so, would such a transition come with an increase in energy prices?

A6. The Department of Energy (DOE) supports the President's all-of-the-above energy strategy. President Obama's goal is to generate 80 percent of our electricity from a diverse set of clean energy sources – including renewable energy sources like wind, solar, biomass, and hydropower; nuclear power; efficient natural gas; and clean coal - by 2035. The Office of Energy Efficiency and Renewable Energy has established goals for its technology development programs to make renewable electricity market competitive without subsidies.

QUESTION FROM CHAIRMAN WHITFIELD

Q7. Under your leadership, will DOE facilitate the continued use of coal as part of your national energy plan? If so, how?

A7. Today, coal accounts for about 20% of the total energy consumption in the United States, and fuels about 40% of our electricity generation. Although no new coal fired power plants are being proposed in the U.S., coal will continue to be an important part of our energy strategy.

The coal power industry has a history of responding to environmental challenges. Sulfur dioxide, particulate matter, and nitrogen oxide emissions from coal fired power plants have all declined over the past 30 years, while total coal consumption and electricity generation have increased. This trend was driven by strict environmental regulations and new emissions control technologies to reduce pollution.

The development of carbon capture and storage is continuing this trend, and will allow coal to generate electricity with a corresponding decrease in carbon dioxide emissions. We see coal as a key component of our energy strategy now and into the future.

QUESTION FROM CHAIRMAN WHITFIELD

Q8. In addition to CCS technologies, what is your position on advanced coal combustion technologies, such as ultra-supercritical coal combustion and advanced ultra-supercritical coal combustion technologies? Will DOE be supporting these types of highly efficient, low-emitting technologies in addition to CCS? If so, how?

A8. Advanced ultra-supercritical steam cycles are anticipated to be more efficient, exhibit improved environmental performance compared with today's conventional plants using less advanced steam conditions, and may reduce the cost of CCS due to their increased efficiency. The Office of Fossil Energy is supporting materials research and development for operation at steam pressures up to 5,500 pounds per square inch, and temperatures approaching 1,400 Fahrenheit, as well as support for steam turbine materials that can operate in this range of steam conditions. We are partnered with several U.S. technology suppliers in these activities.

QUESTION FROM CHAIRMAN WHITFIELD

Q9. During your confirmation hearing, you indicated support for additional research into beneficial uses for C02, rather than just sequestration. The President's budget requests approximately $276 million for carbon capture and storage research. If Congress provides this funding, how much do you intend to allocate for research into beneficial uses of C02?

A9. The FY2014 budget requests $500,000 for beneficial uses of $CO_2$, such as conversion to chemicals, plastics, building materials, and curing for cement. While these technologies show potential, they are in the early stages of development and must be proven in laboratory-scale tests before potentially transitioning to larger scales. While beneficial use of $CO_2$ presents options for commercialization of carbon capture technologies, the scale of emissions reductions necessary to address climate change necessitate that the focus of carbon storage research and development remain on large geologic reservoirs.

QUESTION FROM CHAIRMAN WHITFIELD

Q10. The budget for the Office of Energy Efficiency and Renewable Energy (EERE) is almost double the budgets for the Offices of Nuclear, Fossil Energy, and Electricity combined.

a) Wouldn't you agree that the Offices of Nuclear Energy, Fossil Energy, and Electricity have critical roles to play in shaping future U.S. energy policy?

The Department's Offices of Nuclear Energy, Fossil Energy, and Electricity Delivery and Energy Reliability have vital roles to play in shaping future U.S. energy policy. Funding for these offices is requested to support critical investments to advance technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels , the safety and reliability of new and existing nuclear reactors, and a secure and dependable electric grid to deliver an increasingly diverse energy mix.

b) The EERE budget request is a 55.9% increase from the FY 2013 EERE budget request. How does this reflect the President's "all-of-the-above" energy strategy?

The requested increase for the Office of Energy Efficiency and Renewable Energy (EERE) supports the President's aggressive goals of reducing the energy intensity of American industry, enhancing energy security and reliability by reducing net oil imports by half by 2020, and doubling electricity generation from renewable sources by 2020. EERE funding provides critical investments in sustainable transportation, renewable energy generation, and energy efficiency to innovate our way to a clean energy future and provide consumers with choices to reduce energy costs and save energy. Through this budget, EERE is positioned to achieve these goals by developing and accelerating the adoption of a new generation of energy technologies that are clean, safe, efficient, and cost effective. EERE supports high-impact applied research, development, demonstration, and deployment (RDD&D) in the fields of sustainable transportation, renewable electricity, and energy efficiency in homes, buildings, and factories. EERE funds RDD&D at some of America's most innovative businesses and research institutions

with the explicit goal of making clean energy technologies directly cost-competitive, without subsidies, with the energy technologies we use today.

c) Under your leadership, how do you plan to ensure that future budgets do a better job of allocating funds to the various offices more equitably, rather than concentrating the vast majority of taxpayer dollars within the Office of EERE?

The Department's applied energy budget request is formulated to provide the greatest impact in targeted areas of the energy sector. The fiscal year 2014 request supports an energy strategy that will enhance economic growth, create jobs through American innovation, save consumers money by cutting energy costs to families and business, enhance energy security by reducing the nation's dependence on oil, and promote health and safety by mitigating the impact of energy production on air quality and our climate. The request supports an all-of-the-above approach to develop every source of American energy in safe and responsible way.

QUESTION FROM CHAIRMAN WHITFIELD

Q11. Before an LNG export terminal is permitted to trade with a non-free trade country, DOE must certify that the exports are in the public interest. Section 3A of the Natural Gas Act creates a rebuttable presumption that a proposed export project is in the public interest. In other words, DOE must grant the application unless interveners show that the project is not consistent with the public interest.

a. Who within DOE will be making the final decision on the pending LNG export projects?

A11a. Section 3(a) of the Natural Gas Act states that "[N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of the [Secretary of Energy] authorizing it to do so." (15 U.S.C. § 717b). The Secretary's authority was established by the Department of Energy Organization Act, 42 U.S.C. § 7172, which transferred jurisdiction over import and export authorizations from the Federal Power Commission to the Secretary of Energy. This authority is delegated to the Assistant Secretary for Fossil Energy pursuant to Redelegation Order No. 00-002.04E (Apr. 29, 2011). The Secretary will ultimately make the final decision on the pending LNG export applications.

b. Acting Assistant Secretary of Fossil Energy, Christopher Smith, testified before Congress on the wide range of public interest criteria considered by DOE. Please share with the Committee the guidance document that DOE is currently using to conduct the public interest analysis. We are interested in the document describing DOE policy regarding "criteria weighting."

A11b. A wide range of criteria are considered as part of DOE's public interest review process. DOE identifies the criteria considered as part of DOE's public interest review process in each Federal Register Notice of Application. Each order includes a discussion of the public interest criteria considered by the Department. These criteria are not statutory but rather have been developed over several decades and supplemented and

refined by subsequent agency adjudication. It is important to emphasize, however, that these criteria are not exclusive. Other issues raised by commenters and/or interveners or DOE that are relevant to a proceeding may be considered as well. DOE does not have a document describing "criteria weighting".

c. Are there any plans to codify the guidance?

A11c. DOE identifies the criteria considered as part of DOE's public interest review process in the orders addressing applications to export LNG to non-free trade agreement countries. These criteria are not exclusive, since other issues raised by commenters and/or interveners or DOE that are relevant to a particular proceeding may be considered as well. There are no plans to codify the criteria employed in reviewing these applications.

d. How will one decision -- either a rejection or approval of a project -- impact the review process for subsequent applications?

A11d. DOE reviews each application to export LNG to non-free trade agreement countries on a case-by-case basis on its own merits. As part of that review, DOE/FE assesses the cumulative impacts <u>of each succeeding request</u> for export authorization on the public interest, with due regard to the effect on domestic natural gas supply and demand fundamentals. Therefore, the approval of any single export application is considered, collectively, in the review process for subsequent applications.

QUESTION FROM CHAIRMAN WHITFIELD

Q12. This budget raises questions about the Administration's energy priorities.

a) Please justify requesting 15 times more on batteries and electric cars ($575M) than on cybersecurity for the electric grid ($38M).

The transportation sector accounts for two-thirds of U.S. petroleum use, with on-road vehicles responsible for 80% of that amount. We continue to send nearly $1 billion a day overseas to satisfy our demand for oil. The requested funding for the Office of Energy Efficiency and Renewable Energy's Vehicle Technologies Program supports critical investments in advanced transportation technologies that reduce petroleum consumption and greenhouse gas emissions, while meeting or exceeding vehicle performance and cost expectations. These technologies include cost-effective batteries, higher performance electric drive systems, advanced combustion engines, superior fuels and lubricants, and lightweight materials. Research into these areas will improve the nation's energy security and strengthen our economic competitiveness in the global clean energy race.

The Office of Electricity Delivery and Energy Reliability's Cyber Security for Energy Delivery Systems program is also a critical to the United States' energy future. The request for fiscal year 2014 supports expanded efforts to improve cybersecurity technologies and capabilities for control systems used in critical energy infrastructure, improve situational awareness, and develop operational capabilities in the energy sector. Innovative solutions in these areas will maintain a reliable and resilient energy infrastructure, which is vital to our nation's economy, human health and safety, and national security.

b) Please justify requesting 9 times more on wind energy ($144M) than on energy infrastructure security and restoration ($16M).

Wind power has tremendous potential as a domestic U.S. energy resource that can contribute to a diverse, clean, inexhaustible U.S. energy portfolio. There are 90 quads of U.S. land-based wind

potential and 50 quads of U.S. offshore wind potential, which, when combined, represent the potential for more than 10 times the total current U.S. delivered electricity consumption. The Office of Energy Efficiency and Renewable Energy's Wind Energy Program supports investments that will tap into this potential and increase efficiency of the wind power sector. The program invests in high-risk, transformative technology innovations that industry does not address, provides a national testing platform, drives improvements in permitting, and generates methodologies and data to address market barriers and grid integration.

The Office of Electricity Delivery and Energy Reliability's Infrastructure Security and Energy Restoration Program is another critical piece of the overall energy strategy to ensure a clean and reliable energy future for the nation. The requested funding for fiscal year 2014 supports vital work in the areas of emergency preparedness and response; physical and cyber system assurance; and data analysis and situational awareness. In recognition of the demands on the nation's energy infrastructure precipitated by Hurricane Sandy and other disasters, the Department is also requesting funding for an Operational Energy and Resilience program to provide continuous monitoring of the status of the nationals critical energy infrastructure and a robust, state-of-the-art ability to asess, visualize and synthesize data to support a more focused, regionally-based rapid response to threats and hazards.

c) Please justify requesting 17 times more on building efficiency ($300M) than on developing new natural gas technologies ($17M).

In the United States, homes and commercial buildings consume 40% of the nation's total energy, with an annual bill of more than $400 billion. This translates into more than 70% of the electrical energy consumed in the U.S. These energy bills can be cost-effectively reduced by 20-50% or more through energy efficient technologies and techniques. The Office of Energy Efficiency and

Renewable Energy's Building Technologies Program supports technologies, systems, and practices that will foster economic prosperity, lower greenhouse gas emissions, and save American families and business money. The budget request for fiscal year 2014 supports the long-term goal of reducing building-related energy use by 50% by 2030.

The Office of Fossil Energy's Natural Gas Technologies program will focus research and development to understanding and minimize the potential environmental, health, and safety impacts of shale gas development. Through an interagency research effort with the Environmental Protection Agency and the Department of Interior's U.S. Geological Survey, the Department seeks to bring its technical expertise to ensure that hydraulic fracturing for natural gas development is conducted in a manner that is environmentally sound and protective of human health and safety. The program also intends to conduct laboratory and/or field-based research focused on increasing public understanding of methane hydrates in gas-hydrate-bearing areas.

d) The DOE budget priorities do not seem to be aligned with current and future U.S. energy needs and opportunities. Under your leadership, how do you plan to ensure that future budgets are better aligned with the nation's energy needs and priorities?

As stated earlier, the Department's applied energy budget request is formulated to provide the greatest impact in targeted areas of the energy sector. The request continues to support an all-of-the-above approach to develop every source of American energy in safe and responsible way.

QUESTION FROM REPRESENTATIVE UPTON

Q1. The increase in domestic gas production and unconventional oil promises to transform America's energy future from one of perceived scarcity to one of abundance. What do you see as DOE's role in ensuring this future comes to pass?

a. What role do you see for DOE in finding new and more efficient ways to produce fossil energy -oil, gas, coal -and to use it for the benefit of American prosperity over the next 50 years?

A1a. DOE will continue to focus its efforts and that of its National Laboratories on assessing and mitigating risk, and improving environmental sustainability and safety through the development of key technologies for oil and gas exploration and production activities.

Q1b. You testified about shifting America's cars and trucks off oil entirely. How do you reconcile this effort with ensuring the United States takes advantage of its abundant energy resources? Do you see the U.S. turning away from some of its resources?

A1b. DOE supports the President's all-of-the-above energy strategy, including his focus on continuing to expand responsible oil and gas development, increasing the fuel economy of the vehicles we drive which will save families money at the pump, supporting renewable energy sources, and investing in infrastructure and research and development, all of which play a central role in increasing our nation's energy security. As the renewable and alternative fuels and energy efficiency measures and technologies are deployed at costs comparable to current end uses of traditional fuels, especially in the transportation sector, the balance of energy consumption will shift away from oil. This shift will provide both economic and energy security benefits to the nation, and traditional domestic energy resources will continue to play an important role in both these outcomes.

Qlc. What future do you see for coal in this nation, and what do you believe DOE's role should be to enhance this abundant resource?

A1c. DOE's role in clean coal research and development is to advance technologies related to the reliable, efficient, affordable, and environmentally sound use of fossil fuels. To this end, our research and development is primarily focused on carbon capture and storage, a technology that can permanently reduce carbon dioxide emissions from utility and industrial processes which generate carbon dioxide, through the use of fossil fuels including coal.

QUESTION FROM REPRESENTATIVE UPTON

Q2. The U.S. is currently the world's largest producer of natural gas and has a chance to surpass Saudi Arabia as the world's largest oil producer by 2020. Under your leadership, how will DOE facilitate this energy transition and take full advantage of the nation's new energy abundance?

A2. The transition will be made more efficient through the efforts DOE is making to assess and mitigate risk, and develop technology for increased safety and environmental sustainability.

QUESTION FROM REPRESENTATIVE UPTON

Q3. You note in your testimony that you are reviewing DOE organization and management practices to develop options to improve how the Department performs its missions.

a. Would you briefly elaborate on potential changes that may improve how the Department tackles its most pressing management challenges, such as environmental cleanup?

b. Would you work with this Committee as you undergo this effort? And will you commit to DOE appearing before the Committee in the near future to outline in more detail your management changes?

A3a-3b. The reorganization consolidates the primary mission and operational support functions of the Department within the office of the Under Secretary for Management and Performance, and also includes the Office of Environmental Management and Office of Legacy Management as part of its structure and functions. The purpose of this consolidation is to elevate the Department's focus on and attention to these important functions. This office will have full-time oversight of the operational functions of the following offices:

Office of Management and Administration (MA)
Office of the Chief Human Capital Officer (HC)
Office of the Chief Information Officer (CIO)[1]
Office of Economic Impact and Diversity (ED)
Office of Hearings and Appeals (OHA)
Office of Environmental Management (EM)
Office of Legacy Management (LM)

Moving the Office of Environmental Management under the purview of the Under Secretary for Management and Performance brings the Department's strongest project management capabilities, resident within the Office of Acquisition and Project Management, directly to bear on one of the Department's most vexing yet

[1] The CHCO and CIO would continue to have direct access to the Secretary so that they can provide broad policy advice and other functions, as specified by statute or regulation.

vital challenges: cleaning up nuclear waste that is a legacy byproduct of the Cold War. These DOE sites include Hanford, WA, Savannah River, SC, and Paducah, KY.

This reorganization will enable the new Under Secretary for Management and Performance to utilize a more concentrated level of resources and to apply better managerial discipline to address project management issues in this critical area. Reforms initiated over the past several years have begun to bear fruit. The GAO has narrowed the scope of its high-risk designation for DOE's contract administration and project management to major capital asset projects — those costing more than $750 million. Efforts are now under way to address the serious challenges confronting several major construction projects. In addition, the Secretary has approved the formation of a new working group, representing offices across the Department, including NNSA, to continue on efforts to improve performance in this area.

In addition, transferring the Offices of Environmental Management and Legacy Management from the Undersecretary for Nuclear Security will allow this undersecretary to focus exclusively on NNSA's forward-looking missions — including stewardship of our nation's nuclear stockpile and advancing the President's nuclear security agenda — while entrusting the Environmental Management mission to an organization devoted to solving management challenges.

These organizational changes will enhance the Department's ability to carry out its responsibilities to the President and to the Congress, while improving our financial

stewardship at a time of tight fiscal constraints. Reducing the cost of doing business within the Department will enable us to allocate more resources toward our mission objectives in national security, science, clean energy, and environmental stewardship.

QUESTION FROM REPRESENTATIVE UPTON

Q4: How do you plan to improve integration of energy and science programs, as you reference in you testimony?

A4: I believe that it is important to integrate our energy and science programs in order to move quickly from basic science, to applied research, to technology demonstration. The Department has made important strides to foster communication and collaboration between its science and energy programs during the past few years—the Energy Innovation Hubs program, which pulls together senior managers from across the Department, is just one example. However, I believe that we can do more organizationally to advance this process, and I am considering ways to more closely integrate the management of science and energy programs to improve the dexterity and effectiveness of the innovation process.

QUESTION FROM REPRESENTATIVE UPTON

Q5. How do you plan to address safety and security challenges across the DOE complex?

A5. Safety and security are my top priorities and I have made this clear to our DOE Federal and contractor managers. It is imperative that the entire DOE community understand that safety and security are integral to the mission of DOE and that it is our responsibility to our people and to the communities that surround our facilities to maintain the highest standards of excellence in these areas. The Department will continue to seek ways to strengthen our safety and security performance and clarify lines of authority, particularly in managing our security responsibilities.

QUESTION FROM REPRESENTATIVE UPTON

Q6. You note that you will work with the Administration to produce a Quadrennial Energy Review. My understanding is this review is modeled on the Defense Department's legislatively-mandated Quadrennial Defense Review, which sets a long-term course for DOD as it assesses the threats and challenges the nation faces.

a. Why is this review critical to DOE's mission?

A6a. The mission of the Energy Department is to ensure America's security and prosperity by addressing its energy, environmental and nuclear challenges through transformative science and technology solutions. Innovation and new sources of domestic energy supply are transforming the nation's energy marketplace, creating economic opportunities at the same time they raise environmental challenges. To ensure that federal energy policy meets our economic, environmental, and security goals in this changing landscape, the Administration will conduct a Quadrennial Energy Review which will be led by the White House Domestic Policy Council and Office of Science and Technology Policy, supported by a Secretariat established at the Department of Energy, and involving the robust engagement of federal agencies and outside stakeholders. This first-ever review will focus on infrastructure challenges, and will identify the threats, risks, and opportunities for U.S. energy and climate security, enabling the federal government to translate policy goals into a set of analytically based, clearly articulated, sequenced and integrated actions, and proposed investments over a four-year planning horizon.

b. To the extent the defense review is guided by the fundamental policy of providing for the common defense of Americans, do you see the purpose of the energy review as providing for American prosperity and energy security?

A6b. American prosperity and energy and environmental security are at the core of the Department's missions and are a fundamental concern of the QER.

c. What is the time frame?

A6c. The Department should know more about the time frame in the coming months.

d. Will you work with this Committee to ensure this review is focuses appropriately?

A6d. The Committee is welcome to contribute comments on and during the review and will be briefed when appropriate.

QUESTION FROM REPRESENTATIVE UPTON

Q7. Part of DOE's core mission involves defense programs and national security, but those programs should be performed within the overall framework of civilian control and development of nuclear technology, under the Atomic Energy Act.

a. There has been pressure over the past few years to place DOE's NNSA programs within the Department of Defense, separate them as an independent agency, or otherwise silo them from DOE's core mission. How do you ensure that defense programs and other important security missions are performed within the framework of DOE's broad mission?

b. What can you do to increase the translation of important physics and other national weapons research to civilian benefit?

A7. The legislative history of the 1946 Atomic Energy Act reveals that a prominent theme of the organizational placement of the program was that the science was not segregable into solely military, naval, or civil pursuits. The multidisciplinary range reflected in the Department's suite of National Laboratories - - including the three weapons laboratories - - reflects this reality.

The Department's capabilities formed in order to meet atomic energy defense missions have aided many civil pursuits. Beginning in the mid-1980s, the Department's extensive supercomputing capacity, developed for the weapons program, prompted Congress to fund the Department as the early lead in the Human Genome Project which ultimately led to the mapping of the complex human genome sequence. Commercial civil developments prompted or aided by the capacities and expertise of the weapons laboratories include chip-scale atomic clocks (to enhance GPS performance), radiation detection from fast-moving vehicles, simple hand-held biohazard detectors, and small and disposable forensic explosive detectors.

In addition, one of the weapons laboratories has developed, with EPA, open-source software for prompt detection of drinking water contamination that is used by several large utilities, and has developed with the University of New Mexico a promising enhanced-efficiency membrane for use in reverse-osmosis water desalinization.

The Department employs several tools to apply the results of scientific research devoted initially to "weapons research" to society at large. These include direct appropriations where the capabilities of the weapons research laboratories are directed to civil projects. The statutory recognition of technology transfer as a Departmental mission under the National Competitiveness Technology Transfer Act of 1989 (granting National Laboratory directors significant authority to retain and license intellectual property), complemented by DOE IP policies, are tools designed to provide necessary incentives and partnership opportunities that encourage commercial application of the fruits of the scientific and technical research of the DOE National Laboratories, including the weapons laboratories.

QUESTION FROM REPRESENTATIVE UPTON

Q8. How do you, as Energy Secretary, most effectively manage the diverse missions of the Department in a way that protects taxpayer funds and ensures safety and security across the complex?

A8. To manage effectively we must set clear mission goals; establish unambiguous requirements and expectations for cost controls and safety/security performance; closely monitor performance; and hold our managers and contractors accountable for delivering mission outcomes in a safe and secure manner across the complex. While the missions of the Department are diverse, the principles of effective management can and should be applied to all.

QUESTION FROM REPRESENTATIVE UPTON

Q9. Over the past year, there have been serious security shortcomings identified at the National Nuclear Security Administration (NNSA) and DOE, underscored by the breakdown at the Y-12 site in Tennessee.

a. Would you elaborate on what you think is necessary to restore accountability and strong oversight of the nation's nuclear weapons facilities?
b. What is necessary to ensure the national weapons labs operate with a consistent safety and security culture?

A9. The several reviews conducted by or for the Department in the aftermath of the Y-12 incident (Inspector General review, the General Finan review, the report by the Department's Independent Oversight office, and the assessments of the "Three Wise Men") collectively provide a thorough analysis of the security and management deficiencies of the Department and the beginnings of a roadmap for actions by DOE. While the Department continues to consider aspects of its approach to strengthening security, our approach unquestionably includes clarifying and simplifying lines of authority and accountability. It also includes strengthening and improving our line management oversight and contractor assurance processes for nuclear security, and ensuring rigorous and comprehensive Departmental Independent Oversight of nuclear security and other high consequence activities, such as nuclear safety.

The Department places a high priority on the strength of the safety culture and security culture at all DOE sites, and within our federal workforce. We formally emphasize the importance of culture in the Department's nuclear safety and integrated safety management policies. We have undertaken a systematic approach to assess our organizational culture, with primary emphasis on nuclear safety culture, across the Department, utilizing a framework endorsed by the Nuclear Regulatory Commission.

We have taken steps to further increase knowledge and awareness of this topic throughout the workforce, including providing tailored training to federal and contractor managers. This initiative will require sustained effort over a long period of time, and our goal is to fully realize a safety and security culture such that the organizational values and behaviors modeled by our leaders, and internalized by our workforce, serve to make safe and secure performance of work the overriding priority. Further, we seek to consistently demonstrate an environment in which employees are encouraged and are willing to raise safety and security concerns to their own management and to DOE without fear of retaliation.

QUESTION FROM REPRESENTATIVE BARTON

By passing Section 999 of the Energy Policy Act of 2005 (EPAct), Congress directed the U.S. Department of Energy (DOE) to support a program to improve domestic energy production, protect the environment and increase U.S. jobs. The program has established a successful track record of public, private and academic cooperation-with oversight from the National Energy Technology Laboratory (NETL) and a Federal Advisory Committee. Since 2006, the EPAct Section 999 program has been managed by the Research Partnership to Secure Energy for America (RPSEA) -- a consortium of over 160 organizations of leading researchers and experts in industry and academia.

Q1. Please describe how the Section 999 program has worked as intended to improve technology and environmental safeguards related to energy production.

A1. The program has facilitated public-private research partnership that has developed technologies and best practices for oil spill prevention offshore and environmental protection onshore.

QUESTION FROM REPRESENTATIVE BARTON

Q2. Which areas of program administration do you believe need improvement?

A2. The President's Budget has consistently proposed repeal of Section 999 of the Energy policy Act of 2005 since FY2007. The FY2014 Annual Plan will detail remaining program activities prior to the statutory sunset of program authorities.

QUESTION FROM REPRESENTATIVE BARTON

Q3. Program participants have expressed concerns that DOE has failed to award Section 999 program funding in a timely manner. I understand these delays have resulted in lost opportunities for much needed field testing and R&D projects.

a. Please describe the role DOE Office of Fossil Energy will play in implementing Sec. 999.

A3a. The Secretary of Energy has ultimate responsibility for, and oversight of, all aspects of the program. DOE is responsible for planning the annual solicitations, managing the Program Consortium, RPSEA, and two Federal Advisory Committees and all their meetings, approval of all solicitations and selections, and evaluating the quality of technology transfer efforts. Currently, all DOE actions are up to date, and no actions are pending. The President's Budget has consistently proposed repeal of Section 999 of the Energy policy Act of 2005 since FY2007. The FY2014 Annual Plan will detail remaining program activities prior to the statutory sunset of program authorities.

b. What administrative changes will you make to improve implementation of Sec. 999 and ensure timely decision-making?

A3b. An important administrative change is having NETL provide more hands on support for RPSEA in their execution of the government procurement regulations and contract negotiation. This change has already been implemented. On three occasions during 2012, NETL sent a team to Houston to assist RPSEA with their backlog of awards. The President's Budget has consistently proposed repeal of Section 999 of the Energy policy Act of 2005 since FY2007. The FY2014 Annual Plan will detail remaining program activities prior to the statutory sunset of program authorities.

QUESTION FROM REPRESENTATIVE SHIMKUS

1. A New York Times article earlier this year relating to power shortages in New England noted the importance to the region of being able to import power from the Indian Point nuclear facility, quoting one individual as saying: "Without Indian Point, New England would have been toast.

Q1(a): This situation in New England was due to an overdependence on gas. Would you agree this reflects why it is important to have fuel diversity?

A1(a): The New England situation illustrates the importance of developing and implementing regional-scale plans to ensure the adequacy, diversity and flexibility of the region's generation supplies.

Q1(b): In your view, do nuclear facilities play a critical role in ensuring the reliability of the grid?

A1(b): In general, yes. Local conditions will be important, however, with the result that some nuclear facilities are likely to be more important for regional reliability than others. In fact, the siting and operation of all types of generation is important for reliability at both the local and regional levels.

Q1(c): Do you agree that if our country wants to continue to have affordable, reliable electricity, federal policies should support fuel diversity?

A1(c): Fuel Diversity is important to address several issues, including reliability and affordability. However, regulators have to find an appropriate balance between these objectives and costs to consumers.

QUESTION FROM REPRESENTATIVE SHIMKUS

Q2. In your testimony, you refer to doubling the use of renewable electricity generation by 2020. Do you have any goals for the growth of nuclear energy?

A2. I am committed to maintaining nuclear energy as part of the President's "all-of-the-above" strategy. Nuclear power currently provides 20 percent of our electricity generation and over 60 percent of our carbon emission free electricity. I believe work in areas such as small modular reactors, modeling and simulation, accident tolerant fuels, nuclear loan guarantees, and potential solutions to the back-end of the fuel cycle will help ensure nuclear power continues to be part of the nation's energy mix.

QUESTION FROM REPRESENTATIVE SHIMKUS

Q3. DOE's core mission derives from the Atomic Energy Act of 1954, in which Congress established the policy of promoting the civilian development and control of nuclear energy towards "promot[ing] world peace, improv[ing] human welfare, increas[ing] the standard of living, and strengthen[ing] free competition in private enterprise, and promoting world peace."

a. Do you see this as an important element of DOE's current mission?
b. If so, what will you do to invigorate this mission at the agency?

A3. Yes, I do see the work on civil nuclear energy as an important part of DOE's mission. The President's FY 2014 Budget requests $735.46 M for the Office of Nuclear Energy. As mentioned above, I believe efforts in areas such as SMRs, fuel cycle R&D, and modeling and simulation all contribute to that important mission.

QUESTION FROM REPRESENTATIVE SHIMKUS

Q4. Federally sponsored research at Argonne labs tells us that vehicle components on Flex Fuel Vehicles (FFVs) and Gasoline vehicles are mostly identical. So based on DOE funded scientific reports, most every vehicle on the road today can already use or could be converted to E85 with the advancement of EPA certified technologies.

However, DOE's Clean Cities sponsors a program that discourages converting existing vehicles even with EPA certified technology claiming that ethanol is bad for vehicles, fuel is too expensive, and conversion cannot be done economically. DOE claims most every fuel line and engine component must be modified while EPA has concluded these changes are not needed.

a. We have been working on legislation for blender pumps and making higher concentrations of ethanol available e.g., E15, E20, E30 in support of the Energy Independence Act. What does your own research show regarding ethanol compatibility with vehicles on the road today? What is the material compatibility issue you have found with modern vehicles?

A4a. DOE promotes the development and use of alternative fuels, including ethanol, which can reduce U.S. dependence on petroleum in the transportation sector. Recent DOE research on ethanol blends focused on determining the effects of E15 and E20 (15% and 20% ethanol, respectively) on vehicle systems.[2] This research included some materials compatibility testing but was not intended to be a comprehensive evaluation of all ethanol blends with all vehicles in all driving conditions. The results did not identify significant issues with E15, and ultimately were instrumental in forming the basis for the EPA decision that allows the sale of E15 for vehicles model year 2001 and newer.

[2] Oak Ridge National Laboratory, "Compatibility Study for Plastic, Elastometric, and Metallic Fueling Infrastructure Materials Exposed to Aggressive Formulations of Ethanol-blended Gasoline," (May 2012), http://info.ornl.gov/sites/publications/files/Pub35074.pdf.

However, the results did indicate a range of sensitivity to increased levels of ethanol. Though fuel lines are generally alcohol-tolerant in modern vehicles, there are other components that require upgrading for use with E85 in flexible fuel vehicles (FFVs). These components include injectors and fuel pumps, valves and valve seats, and, sometimes, piston rings.[3]

[3] The Department commissioned an engineering analysis (from ASG Renaissance) in 2008 to estimate the incremental cost of making FFVs (relative to conventional vehicles). A large part of the incremental cost is due to the use of special materials. http://www.transportation.anl.gov/pdfs/AF/914.PDF

QUESTION FROM REPRESENTATIVE SHIMKUS

Q5. I'm troubled with the widely held misconception that our nation's vehicles would be damaged by the use of any ethanol because of the belief that fuel lines and gaskets on FFVs are somehow special and different from gasoline vehicles. I'm not aware of any example where ethanol has created corrosion problems in modern vehicles since the introduction of E10 and E85.

a. What material compatibility issues has DOE found on vehicles produced since the introduction of E10 and OBDII?

A5a. Automobile manufacturers adapted their vehicle production to be compatible with E10 when it was introduced in the late 1970s. As such, virtually all vehicles on the road today are compatible with ethanol blends up to E10. OBDII was introduced with the adoption of the Tier II emissions standards for light-duty vehicles in the 2004 model year. All vehicles equipped with OBDII are compatible with E10.

It is important to note, however, that there are sensitivities to higher ethanol levels. An extensive DOE study examining the sensitivity of legacy vehicles to mid-level ethanol blends did not identify significant issues with E15, and ultimately was instrumental in forming the basis for the EPA decision that allows the sale of E15 for vehicles in model year 2001 and newer. For higher-level blends, although fuel lines are generally alcohol-tolerant in modern vehicles, there are other components that may require upgrading, depending on the blend level. These components include injectors and fuel pumps, valves and valve seats, and, sometimes, piston rings.[4]

[4] The Department commissioned an engineering analysis (from ASG Renaissance) in 2008 to estimate the incremental cost of making FFVs (relative to conventional vehicles). A large part of the incremental cost is due to the use of special materials. http://www.transportation.anl.gov/pdfs/AF/914.PDF

b. Have you identified any specific parts on popular vehicles or any vehicles produced on the last 15 years that are not compatible with gasoline blended with ethanol. If so, how many of these vehicles are on the road today?

A5b. The materials that manufacturers use for specific parts vary widely by manufacturer and frequently change. Automobile manufacturers adapted their vehicle production to be compatible with E10 when it was introduced in the late 1970s. As a result, virtually all vehicles on the road today are compatible with ethanol blends up to E10. Higher blends, such as E85, do require some modifications. Flexible fuel vehicles (FFVs)—those built specifically to use blends of up to E85—have upgraded metal and gasket materials to avoid corrosion and other issues associated with higher ethanol levels.[5] Though fuel lines are generally alcohol-tolerant in modern vehicles, there are other components that require upgrading for use in FFVs. These components include injectors and fuel pumps, valves and valve seats, and, sometimes, piston rings.

According to the Energy Information Administration, there are more than 8 million FFVs on the road today.[6]

[5] The Department commissioned an engineering analysis (from ASG Renaissance) in 2008 to estimate the incremental cost of making FFVs (relative to conventional vehicles). A large part of the incremental cost is due to the use of special materials. http://www.transportation.anl.gov/pdfs/AF/914.PDF

[6] http://www.eia.gov/tools/faqs/faq.cfm?id=93&t=4

QUESTION FROM REPRESENTATIVE SHIMKUS

Q6. Is DOE aware of any car manufacturers using fuel line materials that are compatible with E10 but not compatible with higher concentrations of ethanol? If so, has there been any scientific research done to confirm your findings?

A6. DOE is not aware of vehicle manufacturers using fuel line materials that are compatible with E10 but incompatible with higher concentrations of ethanol. Fuel lines in modern vehicles are essentially all alcohol-tolerant. There are other components, however, that must be upgraded for use in flexible fuel vehicles (FFVs) that use higher concentrations of ethanol (E85). These components include injectors and fuel pumps, valves and valve seats, and, sometimes, piston rings. Manufacturers consider specific material formulations proprietary, and as such, the Department does not have specific information about the materials that individual manufacturers use, although it is known that these materials vary widely and frequently change.

QUESTION FROM REPRESENTATIVE SHIMKUS

Q7. DOE publishes guidance and tools for consumer and fleet managers on E85 fuel economy and other fuels. The guidance would lead consumers to believe that using E85 will only result in more cost to them as the guidance unfairly punishes ethanol. For example, a "28% loss in fuel economy". Does DOE have any support for this guidance with consumer fuels?

A7. To accelerate deployment of alternative fuel vehicles (AFVs), the Department provides technical and scientific information related to all alternative fuels recognized by the Energy Policy Act of 1992, including E85. The Department provides this information to fleets, businesses, and the general public through its on-line Alternative Fuels Data Center (AFDC)[7] and Transportation Energy Data Book, as well as FuelEconomy.gov (a joint effort with EPA).[8]

The energy content of E85 is 81,600 Btu/gallon, compared to 115,400 Btu/gallon for conventional gasoline (approximately 29% less than gasoline).[9] This difference in energy content results in a similar reduction in fuel economy when comparing flexible fuel vehicles using E85 and conventional vehicles using gasoline.

[7] Alternative Fuels Data Center fuels page: http://www.afdc.energy.gov/fuels/
[8] FuelEconomy.gov find-and-compare feature for E85 vehicles: http://www.fueleconomy.gov/feg/PowerSearch.do?action=alts&path=3&year=2013&vtype=E85&srchtyp=yearAfv&rowLimit=10&pageno=1
[9] Transportation Energy Data Book: http://cta.ornl.gov/data/download31.shtml

QUESTION FROM REPRESENTATIVE SHIMKUS

Q8. EPA has certified Compressed Natural Gas (CNG) and E85 conversion technologies yet DOE consumer awareness programs only support and promote CNG conversion technology.

a. What is the basis for this policy?

A8a. To accelerate deployment of alternative fuel vehicles (AFVs), DOE provides technical information related to all alternative fuels recognized by the Energy Policy Act of 1992. This includes information related to converting vehicles to operate on natural gas, propane, electricity and ethanol. DOE provides this information to fleets, businesses, and the general public through its on-line Alternative Fuels Data Center (AFDC).[10]

In addition, DOE collaborates with EPA to exchange information related to vehicle conversion technologies and systems that have been tested and certified as compliant with EPA emissions regulations. With regard to FFV conversions, it is important to note the following:

- According to the U.S. Energy Information Administration, there are more than 8 million flexible fuel vehicles (FFVs) on U.S. roads today.[11] In addition, many FFV models are available directly from original equipment manufacturers at no additional cost over gasoline vehicles. As such, consumer interest in and demand for FFV conversions has been very limited.

[10] AFDC conversion information: http://www.afdc.energy.gov/vehicles/conversions.html; FFV conversion page: http://www.afdc.energy.gov/vehicles/flexible_fuel_conversions.html
[11] http://www.eia.gov/tools/faqs/faq.cfm?id=93&t=4

- Conventional gasoline vehicles can be converted to FFVs; however, this conversion process requires modifications throughout the fuel system and electronic engine-control system.
- To date, EPA has certified only two vehicle platforms for FFV conversion, compared to more than six hundred for CNG conversion.[12]

b. What is DOE's experience in cost, performance, emissions, and available infrastructure with these two alternative fuel options?

A8b. Emissions and performance data for alternative fuel vehicles is highly dependent on the type of vehicle (size, weight, engine/transmission configurations, etc.) as well as the duty cycle and driver's habits. In its commitment to provide technical information related to all alternative fuels recognized by the Energy Policy Act of 1992, the Department has developed and maintains a number of tools, including cost calculators, for determining the total cost of ownership as well as annual fuel cost for conventional as well as alternative fuel vehicles including CNG and E85. These tools and related data are available online through the Department's Alternative Fuels Data Center and Transportation Energy Data Book, as well as FuelEconomy.gov (a joint activity with EPA).

The table below shows current cost and infrastructure information for CNG and E85, as well as general emissions trends for vehicles using these fuels. Performance and tailpipe emissions information for specific vehicle makes and models is available on FuelEconomy.gov.

[12] EPA listing of compliant conversion systems: www.epa.gov/oms/consumer/fuels/altfuels/documents/certified-conversions.xls

| | E85 | CNG |
|---|---|---|
| **COST** (April 2013) | $3.30 gallon | $2.10 gasoline gallon equivalent |
| **INFRASTRUCTURE** (June 25, 2013) | 2610 refueling stations | 1226 refueling stations |
| **GENERAL PERFORMANCE EXPERIENCE** | No noticeable difference in vehicle performance when E85 is used. Lower energy content than gasoline, resulting in fewer miles per gallon. Meets current emissions regulations. | Natural gas vehicles are similar to gasoline or diesel vehicles with regard to power, acceleration, and cruising speed. Vehicle range is generally reduced. Meets current emissions regulations. |

References:

- Alternative Fuel Pricing Report: http://www.afdc.energy.gov/fuels/prices.html
- AFDC Fueling Station Locator: http://www.afdc.energy.gov/locator/stations/
- Vehicle-specific Performance and Emissions Information:
    - Vehicle-specific search:

      http://www.fueleconomy.gov/feg/alternatives.shtml
    - Ethanol references: http://www.fueleconomy.gov/feg/ethanol.shtml
    - Natural Gas references:

      http://www.fueleconomy.gov/feg/bifueltech.shtml

c. What is the experience in the Federal fleet?

A8c. The Federal fleet has not experienced a need for converting existing vehicles to run on E85. The fleet has acquired flex-fuel models that can use petroleum or E85 offered by

the major vehicle manufacturers. Over time, the manufacturers have increased the number of flex-fuel models available in many of the vehicle classes prevalent in the Federal fleet. Between FY 2005 and FY 2012, the number of flex-fuel vehicles in the Federal fleet has increased by 111 percent. (Source: http://federalfleets.energy.gov/performance_data.)

QUESTION FROM REPRESENTATIVE SHIMKUS

Q9. GSA reports to Congress show only 3% of the fuel purchases by the Federal Government is E85 while almost 1/3 of the fleet are flex fuel capable; *no one is using the fuel in the Federal fleet*. What has DOE done to work with agencies such as USDA, DOJ, Armed Forces, and Post Office to ensure they are utilizing fuel for these flex fuel capable vehicles? What progress has been made?

A9. The Federal fleet has increased its E85 use to 12.2 million gasoline gallon equivalents (GGE) in FY 2012 from 3.1 million GGE in FY 2005, an increase of 298 percent. The increase in E85 use has outpaced the growth in Federal flex-fuel vehicles, which increased by 111 percent over the same time period. (Source: http://federalfleets.energy.gov/performance_ data.)

At the start of FY 2012, the Department of Energy's Federal Energy Management Program (FEMP) began providing Federal agencies with a Web-based dashboard that utilizes fuel transaction data for GSA-leased vehicles to provide monthly tracking of fuel consumption by each component fleet within an agency. The dashboard also tracks each fleet's missed opportunities to use E85 instead of gasoline when E85 was available nearby. Fourteen agencies are currently using the dashboard to increase their E85 use and reduce gasoline consumption.

QUESTION FROM REPRESENTATIVE SHIMKUS

Q10. Those same GSA reports show us that when the Federal Government does purchase ethanol fuels they pay too much wasting tax payer dollars. Fleets spent over $4.00/gallon on E85 while national market prices were below $3.00.

a. What is DOE doing to assist other agencies in purchasing fuel for their fleets?

A10a. The units for fuel consumption in GSA's Federal Fleet Report, though not specified, are gasoline gallon equivalents (GGE). A GGE is a unit of measurement used for alternative fuels so that they can be compared with gasoline on an energy-equivalency basis. A gallon of E85 has approximately 29 percent less energy content than a gallon of gasoline; converting gallons of E85 into GGE of E85 takes into account this difference in energy content. The data in GSA's FY 2011 Federal Fleet Report show that the cost of E85 to the Federal fleet was over $4 per GGE of E85 and less than $3 per gallon of E85.

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GSA's FY 2011 Federal Fleet Report can be found at

http://www.gsa.gov/portal/content/242645

b. What do you believe is contributing to the higher than average price being paid by federal fleets for E85 costing the taxpayers a premium over market costs?

A10b. The units for fuel consumption in GSA's Federal Fleet Report, though not specified, are gasoline gallon equivalents (GGE). A GGE is a unit of measurement used for alternative fuels so that they can be compared with gasoline on an energy-equivalency basis. A gallon of E85 has approximately 29 percent less energy content than a gallon of gasoline; converting gallons of E85 into GGE of E85 takes into account this difference in energy content. The data in GSA's FY 2011 Federal Fleet Report show that the cost of E85 to the Federal fleet was over $4 per GGE of E85 and less than $3 per gallon of E85.

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QUESTION FROM REPRESENTATIVE LATTA

Q1. Advances in innovative technologies have played a major role in unlocking the vast oil and gas energy resources that have contributed to our new energy renaissance.

a. In your role as Secretary of Energy, how will you facilitate the private sector's ability to maximize our resource abundance through advanced technologies?

A1a. America's abundant unconventional oil and natural gas resources are critical components of our Nation's energy portfolio. Their development enhances America's energy security and economy. The Department's work in this area has focused on developing technologies and best practices to address safety and environmental issues associated with hydraulic fracturing. Currently, FE's work includes unconventional resource characterization, developing technologies for mitigating impacts associated with unconventional gas development, and the treatment and handling of produced water. In addition, DOE is pursuing a range of research activities to support an integrated environmental risk assessment associated with unconventional resource development. This assessment integrates evaluations of risks to water and air quality, as well as issues related to induced seismicity.

The program is also evaluating methane hydrates. The program intends to conduct laboratory and/or field-based research focused on increasing public understanding of methane hydrates in gas-hydrate-bearing areas. These public sector-led efforts will be designed to evaluate the occurrence, nature, and behavior of naturally-occurring gas hydrates and the resulting resource, hazard, and environmental implications.

b. Under your leadership, will DOE support the use of traditional energy resources -such as fossil fuels and nuclear energy - in advanced and innovative ways? How so?

A1b. The DOE works to achieve the President's goals to develop America's innovative competitive edge through strategic investments in our Nation's clean energy research development and demonstrations (RD&D). We are investing in only the key enabling technologies that are on critical paths and that show the highest potential impacts on achieving the program goals and benefits in the timeframe needed for deployment.

The development of innovative oil and gas technologies is being focused on ensuring that the Federal Government's understanding of the risks associated with oil and gas development keeps pace with advancements in production technology and developing technologies to mitigate these risks. Our current research focus is on safe and environmentally sustainable development of unconventional natural gas.

In the traditional energy source of nuclear energy, DOE is conducting research on advanced fuels that would be more tolerant of extreme conditions. In partnership with industry and universities, we are currently looking at a range of concepts in innovative coatings, claddings, and fuel designs that improve safety, as well as emission free energy production. DOE will also conduct research to address questions related to advanced nuclear energy technologies, , such as fuels and materials for high temperature gas reactors . DOE also conducts R&D for reactor technologies that can be used in remote locations with only infrequent refueling.

Today, coal accounts for about 20% of the total energy consumption in the United States, and fuels about 40% of our electricity generation. Although no new coal fired power plants are being proposed in the U.S., coal will continue to be an important part of our energy strategy.

The coal power industry has a history of responding to environmental challenges. Sulfur dioxide, particulate matter, and nitrogen oxide emissions from coal fired power plants have all declined over the past 30 years, while total coal consumption and electricity generation have increased. This trend was driven by strict environmental regulations and new emissions control technologies to reduce pollution.

The development of carbon capture and storage is continuing this trend, and will allow coal to generate electricity with a corresponding decrease in carbon dioxide emissions. We see coal as a key component of our energy strategy now and into the future. In addition we anticipate the application of carbon, capture and storage technology to natural gas fired electricity generation at a future time in order to meet the long term environmental goals for the country.

QUESTION FROM REPRESENTATIVE LATTA

Q2. Does DOE's all of the above approach to energy include coal? Will this require the use of carbon, capture and storage (CCS) technology? When do you expect CCS technology to be commercially available and economically viable? Is it fair to the coal industry to advocate an energy policy approach that requires technology not yet economically feasible to use?

A2. DOE supports the President's all-of-the-above energy strategy, including his focus on continuing to expand responsible oil and gas development, increasing the fuel economy of the vehicles we drive which will save families money at the pump, supporting renewable energy sources, and investing in infrastructure and research and development, all of which play a central role in increasing our nation's energy security. Research and development of advanced fossil energy technologies, including carbon capture and storage, are part of this strategy. While there are no insurmountable technological, legal, institutional, regulatory or other barriers that prevent carbon capture and storage (CCS) from playing a role in reducing greenhouse gas emissions, early CCS projects face economic challenges related to climate policy uncertainty, first-of-a-kind technology risks and the current high cost of CCS relative to other technologies.

CCS continues to be a critically important component in a portfolio of low-carbon energy technologies that will be needed to address global climate change mitigation. DOE is actively investing in the research, development, and demonstration of advanced CCS technologies to enable CCS deployment as rapidly as possible.

QUESTION FROM REPRESENTATIVE OLSON

1: Our Committee had a hearing earlier this year in which we heard from a broad range of electricity providers. They all testified that fuel diversity in the nation's electricity sector is important for ensuring low cost, reliable electricity.

Q1(a): Do you agree that fuel diversity is important to keeping electricity prices low?

A1(a): Fuel diversity is important for a number of reasons. Diversity enhances reliability, and it also gives grid operators a broader range of options for dealing with unanticipated conditions. However, diversity itself comes at a cost, and in some situations achieving diversity goals could put upward pressures on retail electricity rates.

Q1(b): Do you agree that fuel diversity is important for reliable electric service?

A1(b): Yes. However, fuel diversity is only one contributing factor in maintaining reliable service. Several other factors are also significant contributors to reliability, e.g., vegetation management, grid operation, and system resource scheduling and planning (generation, transmission, distribution, and demand-side).

Q1(c): Do you agree that fuel diversity is important for keeping the lights on and restoring electricity quickly during major weather events or natural disasters?

A1(c): Yes, but bear in mind that a region with diverse fuel options can still be impacted by weather or other natural disasters. Regardless of the source of electricity, a generator must still be connected to the consumer through the grid (both

transmission and distribution); and the grid is often the focal point of restoration efforts following such an outage.

QUESTION FROM REPRESENTATIVE OLSON

2: California has been pursuing its own climate policies, including a cap-and-trade program and renewable energy mandates. Concerns have been raised about electricity reliability because the state's growing reliance on wind and solar and a shrinking number of conventional plants. These concerns have increased due to the unexpected announced closure of the San Onofre nuclear power plant.

Q2(a): While California regulators have said they don't anticipate blackouts this summer, do you have concerns about electricity reliability in that state?

A1(a): California's regulators and utilities have pursued a multi-option strategy for dealing with the challenges raised by the absence of San Onofre's capacity. While major events could still cause reliability problems in California, situational awareness of grid conditions and careful planning to prepare for and respond to potential reliability events help reduce the likelihood of such events.

Q2(b): Do you have any concerns about potential cost increases for Californians as they are mandated to use more and more renewable power?

Q2(b): We have entered a period which is extremely challenging for utility regulators. They have to find an appropriate balance among several fundamental electricity-related goals, including the adoption of clean energy. Other goals include reliability, supply diversity, physical and cyber security, two-way flows of energy and information, and, of course, the cost of electricity to consumers.

QUESTION FROM REPRESENTATIVE OLSON

Q3. Especially in competitive markets, several planned new full-scale nuclear plants around the country have run into some economic trouble and have been cancelled or put on hold. However, there are a number of companies working on novel new Small Modular Nuclear Reactors that could be more economically viable. One of the companies working on SMRs – NuScale – is actually partnered with Fluor, a firm headquartered in my district. I know that DOE has an ongoing grant program for SMR, but I would just like to hear your thoughts on this technology and really, how your budget reflects the future of nuclear power.

A3. The Department is embracing the concept of Small Modular Reactors (SMRs) as an opportunity to provide the country with an alternative source of clean, safe, and affordable nuclear power. The Department views SMRs as a potential replacement that can provide clean nuclear power for certain aging fossil plants to help meet the Nation's greenhouse gas reduction goals. There are many other features and advantages expected of SMRs:

- Passive safety designs that would allow the reactors to withstand and respond to severe accidents with little or no operator action;
- Modular construction techniques that could improve cost and schedules;
- Flexibility to add units to increase output in response to incremental demand growth;
- Flexibility in siting at locations with remote grids and lower power requirements; and,
- Potentially lower cooling water requirements with less environmental impact.

The Department's SMR Licensing Technical Support program was initiated to assist in accelerating the commercialization and deployment of the safest and most mature SMR designs by supporting certification and licensing of these units.

The program will support cost-shared design and engineering work for at least two SMR technologies within the program's total budget of $452 M over six years. This funding will support the development of SMR designs that would eventually compete for the nuclear market share.

QUESTION FROM REPRESENTATIVE MCKINLEY

Q1. Last year EPA proposed greenhouse gas standards for new power plants that would effectively ban new coal plants in the U.S. by requiring that they install carbon capture and storage (CCS) technology that is not commercially available.

a. Do you agree that coal has for decades played a critical role in providing affordable, reliable electricity in the U.S.?

A1a. Coal has provided a low cost, domestic source of energy to provide between 40% and 50% of our electricity production. We anticipate that coal will continue to provide low-cost base load electricity while meeting all environmental standards.

Q1b. Do you support EPA's proposal to ban construction of any new coal plants in the U.S. for the foreseeable future?

A1b. The draft proposal for regulation of certain new fossil fuel fired power plants under section 111(b) of the Clean Air Act does not ban construction of new coal plants.

QUESTION FROM REPRESENTATIVE MCKINLEY

2. Over 41,000 megawatts of coal-fired generation have been scheduled to shut down due to EPA rules.

Q2a. Did DOE anticipate that so much capacity would be retiring the very near term?

A2a. A number of coal fired power plants have recently announced plans to retire due to a combination of factors, including low natural gas prices and low demand growth. Both the 2012 and 2013 versions of the Energy Information Administration's Annual Energy Outlook Reference Case, which account for such factors, project that roughly 49 GW of coal-fired power plants would retire by 2020.

Q2b. Are you concerned about the potential impacts on grid reliability?

A2b. It is the Department of Energy's (DOE) responsibility to be concerned about grid reliability regardless of the source of any impacts. That said, DOE, FERC and EPA have been engaging with industry which is working hard to minimize any potential reliability impacts from EPA's energy sector rules. Through this coordinated effort, the agencies have been jointly working with the transmission operators and planners to ensure that any potential issues are raised and addressed as early and efficiently as possible. At the same time, one must remember that although the odds on reliability events can be reduced, preventing such events altogether is not feasible.

Q2c. Are you coordinating with FERC and EPA to ensure that no outages occur?

A2c. The Department is coordinating with EPA and FERC to monitor and address any potential reliability impacts. For example, the agencies have been holding joint discussions with the nation's regional transmission operators/independent system operators (RTOs/ISOs) for updates on their respective monitoring and assessment activities as well as any updates from generators in their region as they implement the recently finalized EPA rules (e.g., Mercury and Air Toxics (MATS) rule). Through these dialogues, the agencies are also seeking early insights the RTOs/ISOs have on potential reliability problems in their respective footprints and any mitigation efforts planned. We are also, through publicly available information, monitoring the announcement of power plant retirements and the status of power plants expecting to retrofit. The Department is committed to identifying and resolving any anticipated reliability impacts associated with EPA's energy sector rules.

QUESTION FROM REPRESENTATIVE GARDNER

Q1. As Secretary of Energy, will you encourage the Administration to open up new areas to domestic production as a part of national energy plan to capitalize on our nation's newly discovered oil and gas abundance?

A1. DOE supports the President's "all-of-the-above" energy strategy where we pursue more domestic energy production while still protecting the environment and addressing climate risks. This strategy calls for continuing to expand responsible oil and gas development, increasing the fuel economy of the vehicles we drive which will save families money at the pump, supporting renewable energy sources, and investing in infrastructure and research and development, all of which play a central role in increasing our nation's energy security. As part of this plan the Administration will consider opening up new areas for development if those areas can be developed safely while protecting the environment.

QUESTION FROM REPRESENTATIVE GRIFFITH

Q1. The DOE FY 2014 Budget provides $276 million for coal R&D programs, a 23% reduction from FY 2012.

a. Based on DOE's current projections, what is a realistic date by which CCS could be developed and deployed on a commercial scale?

A1a. DOE is actively investing in the research, development, and demonstration of advanced carbon capture and storage (CCS) technologies to enable CCS deployment as rapidly as possible. The first suite of full scale CCS demonstration projects, using the best currently available carbon capture technologies, will start operation over the next five years. While there are no insurmountable technological, legal, institutional, regulatory or other barriers that prevent CCS from playing a role in reducing greenhouse gas emissions, early commercial CCS projects face economic challenges related to climate policy uncertainty, first-of-a-kind technology risks, and the current high cost of CCS relative to other technologies.

CCS continues to be a critically important component in a portfolio of low-carbon energy technologies that will be needed to address global climate change mitigation. Many global climate models suggest that CCS will need to be widely deployed by 2050 to meet current climate mitigation targets.

b. In your view, is CCS currently a workable option on a large commercial scale?

i. If yes, what facilities demonstrate that?

Albi. Although several carbon capture and storage (CCS) technologies already exist in different industries and applications, they have not yet been demonstrated successfully on a medium/large electric power plant. The expected first power plant to do so is Southern Company's 582 MWe (net) Plant Ratcliffe in Kemper County, Mississippi. The plant is scheduled to commence commercial operations in 2014 with over 65% of its $CO_2$ (3 million tons of $CO_2$ per year) captured, compressed and transported by pipeline to mature oilfields for long-term storage via Enhanced Oil Recovery ( EOR.)

Other types of industrial facilities provide some indications of the commercial workability of CCS. In December 2012, Air Products began CCS operations at an oil refinery in Port Arthur, Texas. Air Products' CCS facility is capturing approximately 925,000 tons of $CO_2$ per year, for EOR. There are several more CCS examples within the oil & natural gas processing industry, both domestically and internationally. These include Statoil's Sleipner CCS project in Norway (approximately 1 million tons of $CO_2$ annually, since 1996); Exxon's natural gas facility in Labarge, Wyoming (4 million tons annually since 2008; 6 million tons annually since 2010); BP's natural gas field at In Salah in Algeria (3.8 million tons of $CO_2$ injected between 2004 and 2011); etc.

Also, Archer Daniels Midland (ADM) has been capturing 300,000 tons/year of $CO_2$ since 2011 at a biofuels plant in Decatur, Illinois, and successfully storing that $CO_2$ in the Mt. Simon sandstone formation. Expansion activities are under way at

Decatur, and ADM expects to increase its CCS activities to 900,000 tons annually later this year.

In addition, Dakota Gasification has been capturing approximately 3 million tons of $CO_2$ annually since 2000, from its Great Plains lignite gasification facility near Beulah, North Dakota, and sending the $CO_2$ 205 miles north to the Weyburn and Midale EOR fields in Saskatchewan. Although the Great Plains facility is not an electric power plant, it provides a good representation of commercial scale CCS at a large coal gasification facility.

In the electric sector, specifically for existing coal-fired power plants, Southern Company is currently demonstrating post-combustion CCS at a 25 MWe scale on Alabama Power's Plant Barry near Mobile, Alabama. That is presently the largest post-combustion CCS facility operating at a coal-fired power plant.

b. In your view, is CCS currently a workable option on a large commercial scale?

ii. Of those facilities, which is the most promising in your view?

A1bii. The eight major CCS demonstrations that DOE's Office of Fossil Energy is co-funding with industry certainly rank among the most promising CCS facilities, both nation-wide and world-wide.

- Demonstration of a Coal-Based Transport Gasifier; Southern Company Services; Kemper County, Mississippi; ~$3B est. total plant cost, $270M DOE share (9%);

Integrated Gasification Combined-Cycle (IGCC); 3,000,000 tons of$CO_2$/year to EOR.

- Texas Clean Energy Project; Summit Texas Clean Energy LLC ; Penwell, Ector County, Texas; $1.73B total est. cost, $450M DOE share (26%); IGCC/polygeneration (baseloaded); 2,200,000 tons of CO2/year to EOR.
- Hydrogen Energy California (HECA) Project; Hydrogen Energy California LLC (a project company owned by SCS Energy); Bakersfield, Kern County, California; $5B total est. cost, DOE share $408M (8%); IGCC/polygeneration (load following); 2,570,000 tons of $CO_2$/year to EOR.
- W.A. Parish Post-Combustion $CO_2$ Capture & Sequestration Project; NRG Energy; Thompsons, Texas; $775M total est. cost, DOE share $167M (22%); post-combustion capture at an existing coal-fired power plant; 1,400,000 tons of $CO_2$/year to EOR.
- FutureGen 2.0; FutureGen Alliance, Meredosia, Morgan County, Illinois; $1.77B total est. cost, DOE share $1.05B (66%); oxy-combustion repowering; 1,000,000 tons of $CO_2$/year to saline storage.
- Demonstration of $CO_2$ Capture and Sequestration of Steam Methane Reforming Process Gas Used for Large-Scale Hydrogen Production; Air Products & Chemicals; Port Arthur, Texas; $431M total est. cost, DOE share $284M (66% $CO_2$ from steam methane reforming for hydrogen manufacture at an oil refinery; 925,000 tons of $CO_2$/year to EOR.
- $CO_2$ Capture from Biofuels Production and Storage into the Mt. Simon Sandstone; Archer Daniels Midland; Decatur, Illinois; $208M total est. cost, DOE

share $141M (68%); $CO_2$ capture from an ethanol plant; 900,000 tons of $CO_2$/year to saline storage.

- Lake Charles Carbon Capture & Sequestration Project; Leucadia Energy LLC; Lake Charles, Louisiana; $436M total est. cost, DOE share $261M (60%); $CO_2$ capture from a petroleum coke-to-methanol gasification facility; 4,500,000 tons of $CO_2$/year.

The Air Products project at Port Arthur is already in operation. Two more, the Southern Company and ADM projects, are both under construction and slated to begin operations within the next 10 months. Taken together, these eight projects comprise the world's leading demonstration program for 1st-generation CCS technologies, with a diverse portfolio of IGCC, oxy-combustion, post-combustion, and industrial CCS processes. At DOE's Office of Fossil Energy, we are researching and developing 2nd- and 3rd-generation technologies that have a lot of potential for bringing down CCS costs in the medium- and long-terms.

QUESTION FROM REPRESENTATIVE GRIFFITH

Q2. Given the strict new regulations coming out of EPA that effectively prevent the construction of any new coal plants, what is DOE doing (outside of CCS research) to ensure that coal will remain a part of the US energy portfolio?

A2. Outside of research and development, and as part of President Obama's Climate Action Plan, the U.S. Department of Energy announced a draft loan guarantee solicitation for innovative and advanced fossil energy projects and facilities that substantially reduce greenhouse gas and other air pollution. The draft solicitation will be open for comments from industry, stakeholders, and the public.

The solicitation will support new or significantly improved advanced fossil energy projects and facilities – such as advanced resource development, carbon capture, low-carbon power systems, and efficiency improvements – that reduce emissions of carbon dioxide, methane, and other greenhouse gas pollution. The Energy Department will make available up to $8 billion in loan guarantee authority through this solicitation.

QUESTION FROM REPRESENTATIVE GRIFFITH

Q3. If the upcoming tests on Coal-Direct Chemical Looping at the National Carbon Capture Center in Wilsonville, Alabama are successful, what plans does DOE have to support additional testing on a larger scale and/or what plans does DOE have to help facilitate applying this technology on a commercial scale at a power plant?

A3. In FY2012, a solicitation was issued by the National Energy Technology Laboratory Advanced Combustion Program seeking proposals for research and development on both pressurized oxycombustion and chemical looping systems. Three chemical looping projects have completed a 1-year detailed systems and technology gap analysis on their specific technologies (including the coal direct chemical looping technology tested at the National Carbon Capture Center). The results of these analyses are being used to select the most promising technologies for further development and scale up to large-pilot scale. These projects will develop and test novel process components to prepare them for potential application into a fully integrated commercial scale system.

QUESTION FROM REPRESENTATIVE ENGEL

Q1. Mr. Moniz, in your testimony you mentioned electric vehicles. Can you expand on what other types of alternative fuels you foresee being developed and funded through the Energy Security Trust?

A1. The President's FY2014 budget request proposes to invest $2 billion of Federal oil and gas development revenue over ten years in a new Energy Security Trust. This Trust would provide a reliable stream of mandatory funding for research and development to lower the cost and improve the performance of transportation alternatives that reduce our dependence on oil—specifically, technologies that will allow us to power our cars and trucks using electricity, homegrown biofuels, renewable hydrogen, and domestically-produced natural gas.

QUESTION FROM REPRESENTATIVE ENGEL

You also spoke of the recent release of eGallon, which as you mentioned would give the "fuel cost" equivalent for operating an electric vehicle. I think this a positive development. Educating people regarding alternative fuels and their relative costs helps bring people and our country towards large scale usage of alternative fuels.

Q2. Is the department going to release similar cost comparisons for other types of fuels, such as methanol or ethanol?

A2. The Department has developed and maintains a number of tools, including cost calculators, to help fleets and consumers understand the relative benefits of different alternative fuels and choose the fuel that best meets their needs. In addition to eGallon, tools include the Department's Alternative Fuels Data Center vehicle cost calculator, which calculates the total cost of ownership as well as emissions for different makes and models of conventional, advanced technology, and alternative fuel vehicles such as those that use ethanol.[13] In addition, the Department, together with EPA, provides the fueleconomy.gov web site, which allows users to find and compare conventional and alternative fuel vehicles and calculate annual fuel cost.[14]

[13] AFDC Vehicle Cost Calculator: http://www.afdc.energy.gov/calc/
[14] http://www.fueleconomy.gov/feg/alternatives.shtml

QUESTION FROM REPRESENTATIVE ENGEL

In your testimony you spoke about the decreases in carbon emissions due to the large increase in natural gas production, specifically from hydraulic fracturing. While the drop in carbon emissions is a positive sign, fracking brings with it other concerns.

Q3. Can you address what, if any, steps the Department of Energy is taking to deal with environmental concerns that are a result of fracking, such as methane leaks and groundwater contamination?

A3. In response to the Secretary of Energy Advisory Board (SEAB), the onshore portion of the Section 999 research program was refocused to address the risks associated with shale gas production including protection of air quality and groundwater. The DOE then led an effort to implement a specific recommendation from the SEAB which was to coordinate the efforts of relevant Federal agencies. A tri-agency research plan is still under development. The work to date to develop the plan has been very helpful in both coordinating the research efforts of the three agencies and developing the President's FY 2014 Budget Request. The Department's work in this area has focused on developing technologies and best practices to address safety and environmental issues associated with hydraulic fracturing.

QUESTION FROM REPRESENTATIVE ENGEL

Q4. Can you comment on what steps the Department is taking to make nuclear power as safe as possible?

A4. The Department's Office of Nuclear Energy is developing and executing programs that are focused on improving the safety, security, efficiency and overall economics of a broad spectrum of nuclear power systems through a variety of activities. In the wake of the Fukushima accidents in Japan, the Department recognizes the value of reactor designs that can continue to provide safety functions under extreme conditions. One of the Department's priorities in nuclear power development is our support of small modular reactors (SMR). A key driver for the Department's interest in SMRs is the potential for safety improvements in nuclear power operations afforded by these technologies over the existing fleet of large reactors. Currently proposed light water-based SMR designs include passive reactor safety and protection features that not only could help to avoid severe accident conditions, but also could help mitigate the consequences of an accident without requirement for operator involvement for extended periods. These features are expected to include, but are not limited to:

- Deep underground siting to provide protection from natural and man-made threats.
- Compact, integral pressure boundary to avoid the possibility for large loss of coolant accidents.
- Large gravity-fed tanks to provide post-accident cooling capability that can function without offsite power.

- Containments that mitigate the release of fission products in the case of severe accidents.
- Large passive ultimate heat sinks that can dissipate reactor decay heat for days after an accident.

From a longer-term perspective, the Department is also conducting research projects aimed at more advanced small modular reactor concepts that are projected to have high potential for improving the safety, security and efficiency of nuclear power.