Department of Energy
Washington, DC 20585

July 21, 2017

The Honorable Lisa Murkowski
Chairman
Committee on Energy and Natural Resources
United States Senate
Washington, DC 20510

Dear Madam Chairman:

On June 22, 2017, Secretary Rick Perry testified regarding, the Department of Energy's budget request for Fiscal Year 2018. To complete the hearing record, please find enclosed answers to the questions submitted by Ranking Member Maria Cantwell, Senators Ron Wyden, Debbie Stabenow, Al Franken, Joe Manchin III, Martin Heinrich, Mazie Hirono, Bill Cassidy, and you regarding this hearing.

If you need any additional information or further assistance, please contact me or Lillian Owen, Office of Congressional and Intergovernmental Affairs at (202) 586-5450.

Sincerely,

Jennifer A. Loraine
Deputy Assistant Secretary for Senate Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Maria Cantwell
Ranking Member

QUESTIONS FROM CHAIRMAN LISA MURKOWSKI

Q1. For the past several years, the Department has been preparing for a major effort to test the economic feasibility and practical benefits of Enhanced Geothermal Systems to make geothermal power more widely available. The project, which is called Project FORGE, is currently at a critical juncture. What activities will DOE be conducting to further geothermal research and development and the FORGE program?

A1. The Geothermal Technologies Office is prioritizing early-stage hydrothermal and Enhanced Geothermal Systems (EGS) research and development (R&D) to enable the development of geothermal energy technologies and allow hydrothermal resources and enhanced geothermal systems energy to be a fully competitive, widely available, and geographically diverse component of the national energy mix. In Fiscal Year (FY) 2018, the Geothermal Technologies Office will pursue major activities in the EGS Collab, hydrothermal R&D, and initiate new early-stage R&D in waterless stimulation.

The EGS Collab brings together a team of subsurface experts from across the National Laboratory complex, partnering with academia and industry to develop in situ intermediate scale fracturing experiments where the fundamental relationships between seismicity, stress state, and permeability (cracks in the rock) can be resolved, and thermal hydro mechanical chemical (THMC) models can be validated and verified. The basic science challenge addressed by the EGS Collab is to better understand fracture dynamics in crystalline rock and fluid flow at an intermediate scale. The fundamental concepts associated with advancing our understanding of permeability creation, enhancement, and sustainability will be directly applied at the Frontier Observatory for Research in Geothermal Energy (FORGE) EGS field laboratory.

Although Department of Energy (DOE) is not requesting funding for FORGE in FY 2018, implementation of the program will continue using prior year funding. Execution of FORGE is currently in Phase 2B, in which the teams are securing all required environmental permits, National Environmental Policy Act (NEPA) clearances, and site characterization. A down-select to the final team and approval to move into Phase 2C is expected in FY 2018. Phase 2C will entail further site characterization, full size injection well planning, technical road mapping and development of an initial competitive R&D

Funding Opportunity Announcement, as well as the establishment of the FORGE Science, Technology, and Analysis Team.

Q2a. Please describe your view of the Department's and National Lab's relationship with the private sector when it comes to cybersecurity.

A2a. Partnership with the energy sector is central to DOE's cybersecurity strategy, as about 90 percent of the Nation's energy infrastructure is owned and operated by the private sector. For nearly two decades, DOE has worked closely in a voluntary capacity with energy sector stakeholders at all levels—technical, operational, and executive—along with regional operators and state and local governments to identify and mitigate physical and cyber risks to energy systems. The energy industry and DOE have worked toward a common cybersecurity vision and roadmap first developed in 2006, and updated in 2011, with the publication of the *Roadmap to Achieve Energy Delivery Systems Cybersecurity*. The shared vision seeks to design, install, operate, and maintain resilient energy delivery control systems that can survive a cyber incident while sustaining critical functions.

DOE's strong partnership with the energy industry has created a foundation of earned trust that promotes the mutual exchange of information and resources to secure critical energy infrastructures. DOE has leveraged partnerships to share cyber threat, vulnerability, incident, and mitigation information; develop and share field-proven best practices and risk management tools for cybersecurity; and deliver innovative technologies to secure critical control systems. These relationships leverage the distinct technical expertise within industry and government to develop solutions to the highly specialized security challenges of energy delivery systems.

DOE's national laboratories serve as a critical strategic and technology partner, providing vital facilities, resources, and capabilities to support national security needs and conducting work that is not otherwise available from the private sector. DOE and the energy sector work with the national laboratories on R&D of advanced technologies, analysis of cyber security risks and threats, modeling and simulation of cyber impacts, and information sharing on evolving threats.

Fulfilling DOE's authorities and responsibilities depends on this long-standing trust and coordination. The Fixing America's Surface Transportation Act of 2015 designated DOE as the sector-specific agency (SSA) for cybersecurity for the energy sector. As the SSA, DOE serves as the day-to-day Federal interface for energy infrastructure security and resilience, including dynamic prioritization and coordination of sector-specific activities; carrying out incident coordination responsibilities consistent with statutory authority, policies, directives, or regulations; and providing technical assistance to identify vulnerabilities and help prevent or mitigate the effects of incidents.

Q2b. Where should the Department prioritize its funding for these efforts?

A2b. The Department has developed a multiyear plan with a two-fold cybersecurity strategy: address growing threats and promote continuous improvement to strengthen today's energy delivery systems, and develop game-changing solutions that will create inherently secure, resilient, and self-healing energy systems for tomorrow. The plan enjoys strong support from energy companies because it supports industry priorities in the Cybersecurity Roadmap. DOE's strategy is built around three strategic priorities:

- Strengthen energy sector cybersecurity preparedness through information sharing and situational awareness, including bi-directional, real-time, machine-to-machine information sharing tools; provide risk management tools and technical assistance; and reduce cybersecurity supply chain risks.
- Coordinate cyber incident response and recovery by developing a coordinated national cyber incident response capability for the energy sector; improving cyber incident response training and incident reporting; and conducting cyber incident response exercises. This supports the SSA role to develop and adopt procedures to enhance public-private communication and coordination to improve emergency response and recovery.
- Accelerate game-changing R&D of resilient energy delivery systems to prevent, detect, and mitigate a cyber incident in today's systems; and support next-generation systems that can survive a cyber incident. R&D priorities include:

- Anticipating future grid scenarios and design cybersecurity into emerging devices from the start.
- Enabling future power systems to automatically prevent, detect, mitigate, recover from, and survive a cyber incident.
- Building strategic core capabilities in the National Laboratories and building university collaborations dedicated to advancing cybersecurity for energy delivery systems.

This strategy, developed and implemented in partnership with the energy sector, seeks to reduce cyber-attack vectors and identify attacks quickly; enable operators to sustain grid operations during an attack and prevent equipment damage; and enable rapid recovery from a cyber-attack against critical energy infrastructure.

Q3. Advanced nuclear reactors, including small modular reactors and micro-reactors, hold great promise for clean, reliable, and secure power. DOE programs have been essential in the early and later stages of R&D and commercialization. How do you intend to use the resources of the Department to continue efforts on advanced reactors, including SMRs?

A3. The Department agrees that advanced reactors, including small modular reactors, hold great promise as a clean, reliable, and secure power source for our nation. The Department also recognizes that advanced reactors face challenges to ultimately achieve commercialization. Accordingly, the Department plans to partner with nuclear technology developers, including existing fleet, small modular reactor and other advanced reactor designs, in cost-shared research and development. This will be accomplished by a solicitation focused on, but not limited to: improvements in manufacturing; fabrication and construction techniques; sensors; instrumentation and control systems; plant auxiliary and support systems; operational inspection and monitoring capabilities; and modeling and simulation of various elements of plant life cycle. In addition to cost-shared research and development, the FY 2018 President's Budget prioritizes investments in nuclear energy research infrastructure to enable private sector innovation.

Q4. While your budget supports the need for research into methane hydrates, noting it could be the next key to supplying the world with natural gas after shale development, the natural gas technologies budget is cut 87 percent to just $5.5 million. Given the

successes that Japan and China have recently had in methane hydrate production, will the administration commit to keeping America a world leader on hydrates?

A4. The FY 2018 budget request of $3.5 million for Gas Hydrates supports early-stage and lab-based gas hydrates research. The Department received $19.8 million for gas hydrate research in its FY 2017 appropriation. This funding allowed DOE to fund the initial phases of the joint U.S.-Japan Alaska North Slope project, and will allow for DOE's continued participation in that project through FY 2018. Additionally, the initial phase of the Gulf of Mexico field research project to conduct resource characterization at a single site has been completed and the results will be analyzed to confirm the nature and regional context of those gas hydrate deposits. The research proposed in FY 2018 does not represent a field-scale testing protocol as the FY 2018 budget relies on industry to fund this type of later-stage R&D. The Gas Hydrates request is consistent with the Administration's America First Energy Policy, which provides a mechanism for U.S. global energy dominance, while being prudent with taxpayer dollars and reasserting the proper federal role as a supporter of early-stage R&D.

Q5. Microgrids are extremely important for our small off-grid communities in Alaska, because they provide the opportunity to introduce cleaner energy technologies while reducing costs for residents, industry, and military installations. In fact, in Alaska we operate over 200 microgrids. How will you leverage the work being done in Alaska on microgrids with the work being done at the Department?

A5. DOE recognizes the importance of microgrids in off-grid communities such as those in Alaska and military installations, and has made significant progress in partnership with local communities, states, and industry. For example, DOE supported the Alaska Microgrid Partnership under the Grid Modernization Lab Consortium in 2016. The project focused on developing the framework and programmatic approach to assisting stakeholders reduce diesel fuel consumption in Alaska's remote microgrids by at least 50 percent, without any corresponding increase to system lifecycle costs but with significant improvement to system reliability, security, and resilience. Moreover, DOE supported developing and testing of transactive control activities on three campuses (the Pacific Northwest National Laboratory, University of Washington, and Washington State

University (WSU) in the Pacific Northwest. The WSU campus will leverage its microgrid, major campus loads, and thermal storage to deliver transactive response. DOE will continue to work with Alaska on understanding resilience improvements and decision tools.

QUESTIONS FROM RANKING MEMBER MARIA CANTWELL

Q1. In your budget hearing testimonies, you answered questions by saying the budget proposal is just one step in the process for deciding funding levels. For the record: Do you support the President's budget request for the Department of Energy?

A1. Yes.

Q2. During your confirmation hearing you committed to protecting Hanford workers and to provide adequate funding to clean up the site. The proposed budget would not allow for progress to be made on the Central Plateau or the Hanford Tank Farms. It also cuts community support, used for oversight and outreach purposes and perhaps most importantly funding the Richland School district, by 46%. Why does the President's budget fail to provide the funding necessary to get the job done?

A2. The Fiscal Year (FY) 2018 budget positions the Department to continue making significant progress at the Hanford Site, which includes continued progress in safely removing the K Basin sludge from near the Columbia River to the central plateau, continuing pump and treat activities to remediate contaminated groundwater, and the maintenance, repair, and replacement of failing infrastructure, facilities, and systems. This includes a focus on addressing risks posed by those that are specifically clean-up related and those that support our cleanup activities.

The FY 2018 budget request is slightly greater than $2.3 billion. This funding is greater than one-third of the entire budget for Department of Energy's (DOE) Office of Environmental Management (EM).

Taking many variables into account, DOE has generally prioritized its cleanup activities as follows:

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

DOE will continue to discharge its responsibilities by conducting cleanup within a "Safety First" culture that integrates environmental, safety, and health requirements and controls into all work activities. This ensures protection for the workers, public, and the environment.

Q3. Can you guarantee that this August, you will meet with the proper DOE officials to determine what funds are needed to stabilize facilities at Hanford?

A3. Yes.

Q4. The budget for Hanford falls short by $124 million– and that's before the tunnel collapse. Every time an unforeseen event takes place at Hanford, money is shifted away from other projects to meet those needs. How do you expect the site offices to meet mandated commitments when they are constantly underfunded and having to shift money to remediate unforeseen situations?

A4. The FY 2018 budget request is slightly greater than $2.3 billion. This funding is greater than one-third of the entire budget for DOE's Office of EM.

The FY 2018 budget positions the Department to continue making progress at the Hanford Site, which includes continued progress in safely removing the K Basin sludge from near the Columbia River to the central plateau, continuing pump and treat activities to remediate contaminated groundwater, and the maintenance, repair, and replacement of failing infrastructure. This includes a focus on addressing risks posed by those that are specifically clean-up related and those that support our cleanup activities.

The grouting of Plutonium-Uranium Extraction Plant (PUREX) Tunnel 1 later this fall is estimated to cost less than $10 million. Considering the Richland FY 2017 enacted level of $916 million, this urgent requirement causes only a minor shift in schedule of lower relative risk cleanup work.

Q5. The Hanford facility in the state of Washington pioneered the plutonium extraction process and produced plutonium in support of our national defense for more than 40 years. Do you agree that it is an urgent moral and legal obligation to properly fund and proceed with the cleanup effort at the Hanford site, including construction of the Waste Treatment Plant?

A5. The Department takes its regulatory commitments seriously and is actively working to clean up the Hanford Site while continuing key risk reduction and remediation activities that may not have specific regulatory commitments. The Department continues to make progress on the Waste Treatment and Immobilization Plant (WTP), having installed the last major component in the Low Activity Waste facility this year, which is a key facility in the Department's effort to begin treating low activity waste by December 31, 2023.

Q6. How can I and the workers at the Hanford site trust that you will provide them with the resources they need when this budget fails to meet your commitments?

A6. The Department takes its regulatory commitments seriously and is actively working to clean up the Hanford Site while continuing key risk reduction and remediation activities that may not have specific regulatory commitments.

The FY 2018 budget positions the Department to continue making progress at the Hanford Site, which includes continued progress in safely removing the K Basin sludge from near the Columbia River to the central plateau, continuing pump and treat activities to remediate contaminated groundwater, and the maintenance, repair, and replacement of failing infrastructure, facilities, and systems. This includes a focus on addressing risks posed by those that are specifically clean-up related and those that support our cleanup activities.

The FY 2018 budget request is slightly greater than $2.3 billion. This funding is greater than one-third of the entire EM budget.

Q7. Will you ensure that you will impress upon the Administration that any changes in the Department's approach to the Hanford cleanup must include input from the state of Washington and the Washington delegation before moving forward, in order to avoid costly litigation that will only hamper progress?

A7. During my tenure as Secretary, I want to improve the collaboration with the Washington congressional delegation, the State of Washington, and Tribal leaders, to emphasize the importance of achieving cleanup results versus the apparent focus on increasing processes. I believe we can do a better job and I have challenged my staff to identify and evaluate specific focus areas for our consideration.

I will work closely with leaders from the State of Washington, the congressional delegation, and other important stakeholders as part of the decision-making process for the cleanup mission at Hanford.

Q8. Do I have your word you will work with the Washington delegation and state of Washington on the Hanford cleanup?

A8. The Hanford Site cleanup is a high priority for me. As a former Governor, I have a strong appreciation and understanding of the role of elected officials. I am committed to working with the state of Washington, the Washington congressional delegation and our other important stakeholders to continue to make steady cleanup progress and develop new and innovative solutions to our cleanup challenges at the Hanford Site.

As I indicated in my hearing, I want to look at opportunities to complete the Department's EM mission more efficiently and expeditiously, including the cleanup of the Hanford Site where considerable effort remains.

To that end, the Office of EM is working to identify and examine opportunities to improve the effectiveness of its cleanup efforts. This includes examining ways to advance the tank waste cleanup mission at Hanford as we continue to maintain the focus on completing construction of the WTP Low Activity Waste Facility and making glass by December 31, 2023. I would also expect us to look at opportunities to advance the overall cleanup of the site as we complete cleanup efforts in the River Corridor area and shift our focus to the Central Plateau.

Moving forward with these efforts will take leadership on all of our parts and a commitment to partnership, to think creatively and to work together to remove barriers, while still being safe and protecting human health and the environment.

Q9. In just the past month a tunnel collapsed adjacent to the Plutonium-uranium extraction facility, which contains fatally harmful radioactive constituents and, more recently, radioactive contamination was found on a workers clothing. These events highlight how dangerous Hanford is and the extreme focus we must maintain on the safety mission. Do you acknowledge the extreme risk to workers at the Hanford site?

A9. The partial tunnel collapse at the Hanford Site was a sobering reminder that the men and women who work for DOE contractors at Hanford do incredible work and can be exposed to hazardous conditions. The health and safety of the workers, members of the public, and protection of the environment is our first priority.

I will work with you, labor organizations, and other key stakeholders to better understand worker concerns and to continue strengthening the Department's safety and training processes.

Q10. Do you commit to improving worker safety and improving the worker compensation program and the Department's contribution the Energy Employees Occupational Illness Compensation Program at Hanford?

A10. The Department's Richland Office has initiated a number of actions to strengthen the state and federal compensation programs at Hanford. The actions include working with the State to obtain additional expertise related to chemical exposures to aid the state in its administration of the compensation program and improving workers' awareness of the Washington State Labor and Industries Office of the Ombudsman for Injured Workers of Self-Insured Businesses.

These enhancements resulted from Richland's close collaboration with contractors, labor unions, state, and other federal agencies. The actions are now underway and I look forward to working with you and my counterparts at other relevant agencies on further improving these programs, while ensuring communication with the workers at Hanford. These initiatives are part of a more comprehensive set of efforts to ensure workers have a safe work environment. These include title 10, Code of Federal Regulations, part 851, *Worker Safety and Health Program* (10 CFR 851), which incorporates the Occupational Safety and Health Administration's (OSHA) safety and health regulations (contained in 29 CFR), 10 CFR 850, *Chronic Beryllium Disease Prevention Program* which requires an extensive program to protect workers from exposure to beryllium and provide worker rights and benefits, and 10 CFR 835, and *Occupational Radiation Protection* which requires a comprehensive Radiation Protection Program to prevent occupational exposures to ionizing radiation.

In addition to these Rules, the Department has established a number of directives and technical standards to address worker safety and health and ensure the unique safety and health hazards associated with DOE work are addressed. The Directives include:

- Integrated Safety Management – requires a consistent integrated approach to managing safety and health issues;
- Nano Material and Biological Safety and Security – addresses these two safety concerns as they apply to facilities within the Department;
- Federal Technical Capabilities – requires qualified safety and health managers and staff; and
- Federal Oversight – establishes mechanisms for the oversight of safety and health programs.

Safety and health best practices for hazards in the areas of worker safety and health, radiation protection, and chemical management, not covered by national consensus standards, are addressed in departmental technical standards.

The Department is committed to continuing to strengthen its administration of the Energy Employees Occupational Illness Compensation Program Act (EEOICPA) activities at Hanford and sites across the complex. DOE's role under EEOICPA is to provide records and information to the National Institute for Occupational Safety and Health (NIOSH) and the Department of Labor (DOL) to assist with reconstructing dose and adjudicating worker claims.

In addition, DOE has been working closely with DOL on a project to enhance the DOL Site Exposure Matrices (SEM) for the Hanford site, which is a relational database that identifies toxic substances present at DOE sites and links that information with site locations, labor categories, illnesses, and other pieces of information relevant to claims adjudication. The SEM is an important tool for the claims adjudication process, and the effort to update and enhance this tool is a key priority for DOE. DOE has developed a Secure Electronic Records Transfer (SERT) system that is used to send and receive EEOICPA records requests quickly and effectively.

DOE has recently funded two major scanning projects at Hanford beginning July 5, 2017, aimed at streamlining the response to EEOICPA claims. The first project is to digitize all legacy dosimetry records now existing in microfilm and microfiche. The collection is estimated to contain over 12 million separate images. The project is expected to be completed in September 2018. The second project is to complete the digitization of all legacy personnel records on site, approximately 200,000 more records in addition to the 95,000 already completed. We expect this task will be complete in May 2018.

Q11. Do you acknowledge that the Department has a lot of work to do to improve how it helps sick workers at Hanford? Will you commit to work with me to fix the Department's deficiencies and work with the unions and advocacy groups to get to the bottom of the problems plaguing the workers compensation program at Hanford?

A11. The men and women who work at the Hanford Site do incredible work and can be exposed to hazardous conditions. The health and safety of the workers, members of the public, and protection of the environment is our first priority. I will work with you, labor organizations, and other key stakeholders to better understand worker concerns and to continue strengthening the Department's safety and training processes.

With regard to the administration of the workers' compensation programs, the Department's Richland Office has initiated a number of actions to strengthen implementation of the State's workers' compensation program at Hanford. The actions include: working with the State to obtain additional medical expertise related to chemical exposures and to improve Hanford workers' awareness of the Washington State Labor and Industries Office of the Ombudsman for Injured Workers of Self-Insured Businesses.

These enhancements resulted from Richland's close collaboration with contractors, labor unions, state, and federal agencies. The actions are now underway and I look forward working with you and my counterparts on further improving this program, while ensuring communication with the workers at Hanford.

Q12. What *specific* steps have you taken and are planning to take on worker safety at Hanford?

A12. We are committed to ensuring a safe environment for workers that is protective of their health and allows them to feel comfortable to raise safety or other concerns without fear of retaliation. We apply a defense-in-depth approach to safety that builds in layers of protection to eliminate, limit or mitigate hazards to workers, the public or the environment accomplished through the use of physical and other engineered features; safety structures, systems and components; and safety management systems and other controls necessary to provide protection.

The Hanford contractors have implemented a robust integrated safety management system (ISMS) that incorporates safety into all aspects of work from planning to execution. It includes procedures and adherence to procedures that meet or exceed DOE and OSHA requirements, job hazard analyses conducted prior to work, pre-job meetings and walkdowns, workplace monitoring, worker training, and continuous improvement processes to identify and correct deficiencies and further enhance safety.

With respect to the concerns that have been raised related to tank vapors at the Hanford Site, we have taken a number of actions to address the recommendations we have received from NIOSH; the Center for Toxicology and Environmental Health, the DOE Inspector General, and the DOE Office of Environment, Safety, and Health. These actions include hiring more than 100 additional industrial hygiene professionals, investing in new detection, analysis and monitoring technologies in the tank farms, and improving both personal and area monitoring. We are currently demonstrating an integrated suite of chemical monitoring technologies in one of the double shell tank farms that allows the real-time detection of chemical vapors that will help us tailor enhanced monitoring in other areas of the site. The FY 2018 budget request continues this important investment in enhanced capabilities.

I look forward to making my first visit to Hanford later this summer, and talking with the men and women who are doing these difficult, and sometimes hazardous, jobs every day to better understand their concerns. I will use the information and the feedback I receive from the workers to work closely with labor organizations, the State of Washington, the

congressional delegation, and others to continue strengthening the Department's safety and training processes.

Q13. Will you commit to working with us to ensure the workers at Hanford are receiving the proper training and equipment and that they are not exposed to chemical vapors?

A13. Yes.

Q14. On May 9, Tunnel 1, adjacent to the Plutonium-Uranium Extraction Plant (PUREX) at Hanford partially collapsed. I visited the site within days. On the day of the tunnel collapse, you were visiting Idaho National Lab – one state over. Why didn't you visit the site following the tunnel collapse?

A14. On the date of the Hanford PUREX Tunnel #1 partial collapse, I was touring the Idaho National Lab. I was immediately notified of the situation, and was in close contact with Hanford staff as well as Emergency Operations staff in our Headquarters building. As a former Governor of Texas, I have managed through many crises, including hurricanes and other natural disasters. Rather than becoming a distraction with a last-minute visit, I chose to allow the very capable and knowledgeable local staff to respond immediately and get the situation under control.

Q15. During your confirmation process, you committed to visiting Hanford. Will you visit the site with me in August? When you visit, will you meet with the workers? Will you also commit to visiting PNNL?

A15. I look forward to visiting Hanford later this summer, and hearing first-hand from the workers their concerns. I also plan to visit the Pacific Northwest National Laboratory.

Q16. Hanford has been an interim storage site for 70-plus years, but it was not meant to be the de facto final resting place for this high-level nuclear waste. Can the people of Washington State count on you to provide a disposal option for the Defense Waste that has resided at Hanford for 70 years? Will you ensure that any decisions that are made about how waste is processed will be done with input from the state of Washington Department of Ecology and the entire Washington delegation?

A16. Addressing nuclear waste storage and disposal, enhancing national security and significantly reducing future taxpayer burdens are priorities for this Administration. The FY 2018 budget request proposes funding for nuclear waste disposal while providing sound, science-based solutions.

I will work with the State of Washington, the Washington congressional delegation, and others to ensure we are making sustainable, risk-informed, and fiscally wise decisions regarding the dispositioning of nuclear waste in this country.

Q17. During your confirmation process, you wrote in response to a Question for the Record, "Our national laboratories are the crown jewels of the nation and I plan to support and advocate for their work." However, the President's budget proposal would slash funding for the labs, eliminating 7,000 jobs across 12 of the national labs, which is about 25 percent of the workforce. Do you agree with your earlier statement that the Labs should be sufficiently funded, or do you agree with this budget, which seems to not value the Labs' work and researchers?

A17. Through our 17 national laboratories, the Department engages in cutting-edge research that expands the frontiers of scientific knowledge and generates new technologies that address our greatest energy challenges. This budget will ensure that the Department's national laboratories continue to be the backbone of American science leadership by supporting cutting-edge basic research, and by building and operating the world's most advanced scientific user facilities—which will be used by over 27,000 researchers in FY 2018.

Q18. Why did you allow these drastic budget cuts despite saying that you would support and advocate for the work of the National Labs?

A18. My goal is to ensure that the DOE, through its national laboratories, continues to support the world's best enterprise of scientists and engineers who create innovations to drive American prosperity, security and competitiveness for the next generation.
The FY 2018 Budget Request refocuses the Department's energy and science programs on early-stage research and development (R&D) at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost effective manner. The Request will refocus the intellectual prowess of our scientists and engineers on the development of technologies that the ingenuity and capital of America's entrepreneurs and businesses can convert into commercial applications and products that improve the lives and security of all Americans.

Q19. How are we going to retain U.S. leadership in science and technology development if the Department is proposing a budget that will result in a massive brain drain?

A19. Our Nation will achieve our economic, energy, and environmental goals simultaneously by ensuring the United States continues to be a leader in energy technology, development and delivery, and by unleashing America's ingenuity to unlock our natural resources. The Request refocuses the Department's energy and science programs on early-stage R&D at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost effective manner including:

- The FY 2018 Request funds $6.4 billion in early-stage R&D while reducing later-stage research, development, demonstration, and deployment programs by $3.1 billion from the FY 2017 enacted levels.

- The Request includes a $4.5 billion investment in the Office of Science (OS), to continue and strengthen American leadership in scientific inquiry with DOE as the Nation's largest Federal supporter of basic research in the physical sciences.

- The Request also provides $1.9 billion in energy R&D programs, with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace.

Q20a. I've toured PNNL and have seen their research which has made them one of the lead labs working on grid modernization technologies. DOE's R&D programs seek to improve the reliability, security and resilience of the grid. Some of this important work is being done via the Grid Modernization Lab Consortium, a collection of 14 national labs and co-led by PNNL. What is your plan to continue advancements in grid R&D?

A20a. The Department's FY 2018 budget request focuses funding to national laboratories' early stage scientific research efforts related to grid modernization. DOE expects to meet commitments concerning the existing Grid Modernization Lab Consortium (GMLC) efforts. DOE anticipates private industry will leverage DOE research for innovative applied solutions, demonstrations, and pilot projects tailored to market needs and opportunities.

Q20b. How will you keep the Consortium moving forward?

A20b. In FY 2017, DOE continues to utilize the GMLC to carry out grid modernization, including a lab call for integrated field tests and support for institutional studies. DOE also expects to meet commitments in FY 2017 and, if necessary, in FY 2018, with respect to the existing GMLC efforts.

Q21. Under the proposed budget, more than 1,000 researchers at PNNL may be laid off, despite your assurances to Rep. Newhouse that you will manage the lab "in a way that continues to keep the employment levels at the level to deliver the innovation and technology this country is going to need." Would those be the employees working on cyber security, nuclear non-proliferation, Hanford clean-up, grid reliability or buildings efficiency?

A21. The FY 2018 Budget Request for DOE's energy and science programs will place a key focus on early stage R&D at the national laboratories. Under the request, all DOE national laboratories remain open and operational.

Q22. During your confirmation hearing, you said, "I have no questions at all about whether or not the Trump Administration is going to be very supportive of keeping America strong and free, and the technologies that come out of DOE in many cases are going to play a very, very important role. I will be an advocate for that." I couldn't agree more on the important role the Department plays. For example, between 1976 and 2012, $12 billion in EERE investments yielded economic benefits of $230 billion, with an annual return on investment of 20 percent. Study after study shows that federal investments have a positive impact stimulating private sector R&D, and yet your budget slashes funding. How can you justify a budget that severely cuts investment in R&D across the board at the Department?

A22. The President's FY 2018 Budget refocuses the Department's energy and science programs on early-stage R&D at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost-effective manner. The Budget provides $6.4 billion, $4.5 billion in the OS and $1.9 billion in energy R&D programs, with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace.

Through our National Laboratories, we will continue to support the world's best enterprise of scientists and engineers who create innovations to drive American

prosperity, security and competitiveness for the next generation. The FY 2018 Budget positions us to take up that challenge while continuing to ensure our national security.

Q23. The budget proposal slashes innovation spending across DOE programs. This seems to be based on a belief that the private sector will pick up the slack. Yet only two percent of venture capital goes to energy startups, and the private sector has no incentive to invest in the time- and capital-intensive demonstration projects that are needed to test risky and unproven energy technologies. The energy industry itself is risk-averse and, in some cases, even disincentivized to invest in R&D. Meanwhile, What *specific* studies are you relying on to assert that the private sector will fill in the gap?

A23. The Budget Request provides $6.4 billion for research and development programs, with a renewed focus on cutting-edge innovation and fostering the transition of those breakthroughs to the private sector for commercialization.

The private sector plays a critical role in bringing innovations into the energy marketplace. The FY 2018 Budget refocuses the Department's energy and science programs on early-stage research and development at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost-effective manner. It focuses our investments on the basic, early-stage R&D conducted by the scientists and engineers at our 17 national laboratories who are constantly on the path to developing the next great innovations that can transform society, and bring forth a new era of prosperity for the American people.

In addition to providing $6.4 billion for early-stage research towards cutting-edge innovations, including $4.5 billion in the Office of Science and $1.9 billion in energy R&D programs, the Budget consolidates programs focused on bringing technologies to the market in the Office of Technology Transitions (OTT). Through concerted effort and coordination with our labs, this will reduce costs to the taxpayer while at the same time providing a robust technology transfer program to transfer breakthroughs from the national laboratories to the private sector.

Q24. Countries like China, Korea, and Germany are consistently increasing their public investments in energy R&D. How is the U.S. going to retain its leadership role in innovation with dramatic cuts to federal R&D spending?

A24. The FY 2018 Budget Request focuses resources on early-stage R&D, where the Federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. This shift allows the private sector to fund later-stage research, development, and commercialization of energy technologies.

By focusing on early stage R&D, the budget proposes critical investments necessary to sustain America's leadership in transformative science and emerging energy technologies—for example, in transportation, coal, renewable power, energy efficiency, and cyber-security for the grid.

This work will support the world's best enterprise of scientists and engineers who create innovations to drive American prosperity, security and competitiveness for the next generation.

Q25. In your testimony before this Committee, you said, "I support the academic and the Government mission of basic research, even when you may not see the results of that for a generation." And you added that "I am a big believer that we have a role to play both in basic research obviously, but also in that applied research, to bring new technologies, new commercialization, new economic development opportunities to this country." Could you please clarify your position on the role DOE plays in supporting basic research vs. early stage research vs. applied research?

A25. While the Budget reduces later-stage research, development, demonstration, and deployment programs by $3.1 billion from the FY 2017 Enacted levels, it also includes $6.4 billion for early-stage R&D with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace. The Department's energy and science programs will focus on early-stage R&D our national laboratories to advance American primacy in scientific and energy research in an efficient and cost-effective manner.

In the area of basic science research, the DOE is the Nation's largest Federal supporter of basic research in the physical sciences, and the President's FY 2018 Budget provides $4.5 billion for the OS to continue and strengthen American leadership in scientific inquiry. By focusing funding on early-stage research, this Budget will ensure that the

Department's National Laboratories continue to be the backbone of American science leadership by supporting cutting-edge basic research, and by building and operating the world's most advanced scientific user facilities—which will be used by over 27,000 researchers in FY 2018.

In the area of applied R&D, the Department also supports energy R&D programs—supported by $1.9 billion in the President's FY 2018 Budget—with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace.

Finally, we consolidate programs focused on bringing technologies to the market in the OTT. Through our focus on early-stage research and concerted efforts to coordinate with our labs on technology transfer, the Budget will reduce costs to the taxpayer and spur world-leading energy innovation—while at the same time providing a robust technology transfer program to transfer breakthroughs from the national laboratories to the private sector.

Q26. How exactly does this budget support basic research, early stage research, and applied research, all while slashing spending across the board?

A26. The Budget focuses the intellectual prowess of our scientists and engineers on the development of technologies that the ingenuity and capital of America's entrepreneurs and businesses can convert into commercial applications and products that improve the lives and security of all Americans.

The Budget provides $6.4 billion, $4.5 billion in the OS and $1.9 billion in energy R&D programs, with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace. While reducing later-stage research, development, demonstration, and deployment programs by $3.1 billion from the FY 2017 enacted levels, these investments will ensure that the DOE, through its National Laboratories, will continue to support the world's best enterprise of scientists and engineers who create innovations to drive American prosperity, security and competitiveness for the next generation.

Q27. During your confirmation process you said, "I believe that the Department of Energy should continue to invest in the basic research that will spur the innovation that will keep America's economy, including its wind and solar industries, competitive." Earlier this week, the American Energy Innovation Council – a coalition of corporate leaders including Bill Gates, Norm Augustine, and John Doerr – warned that "the U.S. innovation system may be in danger of losing ground to other nations, which are simply making greater commitments to innovation than the United States." Meanwhile, the United States ranks only 12th in energy R&D intensity, which measures energy R&D spending as a percentage of GDP. How can the United States remain a global leader in innovation if we slash our investments in it?

A27. Our job is to create innovations to drive American prosperity, security and competitiveness for the next generation, and the President's FY 2018 Budget Request positions us to take up that challenge while continuing to ensure our national security.

By focusing funding on early-stage research, this Budget will ensure that the Department's National Laboratories continue to be the backbone of American science leadership by supporting cutting-edge basic research, and by building and operating the world's most advanced scientific user facilities—which will be used by over 27,000 researchers in FY 2018. The President's FY 2018 Budget provides $4.5 billion for the OS to continue and strengthen American leadership in scientific inquiry.

The Department also supports energy research and development programs—supported by $1.9 billion in the President's FY 2018 Budget—with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace.

Through these investments and by refocusing the Department's energy and science programs on early-stage R&D at our national laboratories, the President's FY 2018 Budget will advance American primacy in scientific and energy research in an efficient and cost-effective manner.

Q28. As you know, Mission Innovation is a multinational effort to accelerate public and private investment in clean energy innovation. Twenty countries, including the United States, committed to doubling their clean energy R&D investments over the next five years. This budget obviously undermines that commitment. Do you support Mission Innovation, and how can the United States live up to its international commitments under this budget proposal?

A28. The United States is committed to supporting the development of affordable and reliable energy as a foundation for economic growth and energy security. Indeed, reliable, affordable energy goes hand in hand with a strong economy. Innovation in science and technology has been a cornerstone of America's economic progress. The private sector funds and performs the majority of U.S. R&D, but the Federal government has an important role in funding R&D in areas that industry does not have a strong incentive to invest.

Innovation continues to be a top priority for the United States through both strategic public funding for early-stage R&D and strong private sector investment to support the development and commercialization of the most promising ideas. Novel technologies open fresh avenues to expand domestic energy supplies and drive down energy costs. Broad access to affordable and reliable energy will further stimulate economic growth—bringing jobs and prosperity to millions of U.S. consumers and businesses and throughout the global economy. Many of the most innovative technologies shaping global energy markets today can trace their origins to public investments in basic science, exploratory research, and early-stage technology development. Innovations arising from these investments have created new technologies and lowered their cost, which in turn have had transformative effects on whole industries.

The DOE's National Laboratories have worked with American universities, research institutions and industry partners, and international collaborators around the world, to push the frontiers of basic science and research. They explore novel concepts to meet high-priority national needs. They discover new knowledge, share it with private partners, and create a wellspring of ideas that help spur technological breakthroughs. The U.S. government plans to continue to support investments in early-stage research to advance energy technology innovation. The outcomes are expected to feed the innovation pipeline, stimulate entrepreneurs, attract investors, and enable U.S. companies to secure leadership positions in global energy markets. The United States seeks to nurture an efficient research enterprise that will realize the overarching goals of Mission Innovation, namely, to make clean and advanced energy technology widely accessible and affordable worldwide.

Q29. Five months ago, when testifying during your confirmation hearing before this Committee you said: "I believe some of [climate change] is naturally occurring. I believe some of it is caused by manmade activity. The question is, how do we address it in a thoughtful way?" – adding "I am committed to making decisions based on sound science." You also promised, "I'm going to protect all of the science whether it's related to the climate or to the other aspects of what we're going to be doing." But in an interview with CNBC, you stated that CO2 is not the "primary control knob" affecting climate change, citing ocean waters and other environmental factors. Could you please elaborate on the science that underpins that belief?

A29. I believe the climate is changing and man is having an impact. There are several 'control knobs' which contribute to that change. My focus as Secretary of Energy is to utilize American innovation and technology to produce energy in an environmentally responsible manner that enhances our economic security.

Q30. Control knob" is an interesting choice of words, because a 2010 report by leading NASA climate scientists – titled "Atmospheric CO2: Principal Control Knob Governing Earth's Temperature" – concluded "it is clear that CO2 is the key atmospheric gas that exerts principal control over the strength of the terrestrial greenhouse effect." That report found that "atmospheric CO2 control knob is now being turned faster than at any time in the geological record." I'd like to give you an opportunity, once and for all, to clarify whether or not you agree with 97 percent of climate scientists – scientists who conclude that the climate is changing and that manmade greenhouse gas emissions are the primary driver.

A30. As I have previously stated, the climate is changing and man is having an impact. There are several 'control knobs' which contribute to that change. My focus as Secretary of Energy is to utilize American innovation and technology to produce energy in an environmentally responsible manner that enhances our economic security.

Q31. Please elaborate on how we can address this challenge in a "thoughtful way" based on "sound science" if the budget proposal slashes Biological and Environmental Research within the Office of Science – the office that supports climate science – by 43 percent.

A31. The FY 2018 Budget Request for Biological and Environmental Research implements the Administration's decision to shift focus to more fundamental research across DOE. Through careful prioritization and ensuring that funding goes to the most promising research, this budget will ensure that the Department's national laboratories continue to be the backbone of

American science leadership by supporting cutting-edge basic research and to advance American primacy in scientific and energy research in an efficient and cost effective manner.

In alignment with this, investments in certain areas are discontinued and the Climate and Environmental Sciences subprogram is retitled “Earth and Environmental Systems Sciences” to reflect its new focus. The FY 2018 Budget Request gives priority to supporting specific aspects of earth system models, maintaining current U.S. leadership in high-resolution earth system modeling and model development, and other science research underpinning ultimate use in energy and infrastructure planning and policy.

Q32. Please comment on how you will "protect all of the science" when, in 2010, you referred to climate science as a "contrived phony mess" and blamed a "secular carbon cult" of scientists who manipulate data to show evidence of climate change.

A32. The Department will continue to abide by the OS merit review system to ensure the quality and integrity of all funded research. The research will focus on fundamental earth system science.

I have been consistent in my support of our National Laboratories, the crown jewels of science in America. They tackle some of the toughest scientific challenges and develop mind-boggling technologies. They also keep us safe, through research that defends us from terrorism and keeps our nuclear stockpile secure, modern, and effective. I fully support the work of the National Laboratories system in all its endeavors that cover the spectrum of challenges facing America today.

Q33. You have stated that we need a "Red Team" approach to examining climate science. But that is exactly the nature of the scientific and peer review processes. Are you aware that this already exists on a regular basis?

A33. The OS merit review system ensures the quality and integrity of all funded research, and additional review could contribute towards a robust scientific dialogue. The specific process for a Red team exercise has not yet been developed.

Q34. The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 by the World Meteorological Organization and U.N. to provide policymakers with regular assessments of the scientific basis of climate change. These assessments are written by hundreds of leading scientists and undergo multiple rounds of drafting and review to ensure they are

comprehensive and objective and produced in an open and transparent way. How would your Red Team exercise possibly expand on what has already been done by the entire scientific community?

A34. Office of Science merit review system ensures the quality and integrity of all funded research, and additional review could contribute towards a robust scientific dialogue. The specific process for a Red team exercise has not yet been developed.

Q35. The budget proposes to eliminate ARPA-E. In March, you tweeted, "Innovators like the ones supported by our @ARPAE program are key to advancing America's energy economy." The National Academies released a report this month stating, "There are clear indicators that ARPA-E is making progress toward achieving its statutory mission and goals" and "the committee found no signs that ARPA-E is failing, or on a path to failing, to deliver on its mission and goals." Do you agree with the Budget's proposal to eliminate ARPA-E? If so, what changed your mind from publicly supporting ARPA-E to calling for its elimination?

A35. I support the President's Budget. The Budget will spur world-leading energy innovation, while also reducing costs to the taxpayer.

Q36. The budget proposes to eliminate the Weatherization Assistance Program and State Energy Program, which provide critical technical assistance and state-controlled competitive grant funding to all 50 states. The Weatherization Program supports approximately 8,500 direct and indirect jobs – which can't be outsourced – each year, growing the energy workforce. Please provide an explanation of the anticipated reductions in homes that will be weatherized as a result of terminating DOE's Weatherization Assistance Program. What are the key technical assistance functions DOE currently performs that will not be replicated at an individual state level?

A36. In FY 2018, the Weatherization Assistance Program (WAP) will weatherize approximately 23,725 homes as the program is closed out, using funds appropriated with FY 2017 funds. WAP will weatherize approximately 35,000 homes in FY17.

Maintenance of the Standard Work Specifications for Home Energy Upgrades, accreditation of training centers, and support for the National Energy Audit Tool are some specific examples of technical assistance functions that will not be provided through WAP. However, states, utilities, and other stakeholder groups may re-prioritize resources to support these programs as appropriate.

Q37. The budget proposes to cut funding for the Office of Science by 17 percent. The office is the largest federal sponsor of basic research in the physical sciences, supporting over 24,000 investigators at over 300 U.S. academic institutions and the national laboratories. Their facilities support more than 31,000 researchers from universities, national laboratories, industry, and international partners. Do you agree that Federal investments in basic research are critical for maintaining U.S. leadership in science and technology and creating jobs? If so, why does the Department's budget call for cutting Science funding by 17 percent?

A37. The President's FY 2018 Budget Request refocuses the Department's energy and science programs on early-stage R&D at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost effective manner. This includes a $4.5 billion investment in the OS, to continue and strengthen American leadership in scientific inquiry with DOE as the Nation's largest Federal supporter of basic research in the physical sciences. The budget also maintains the most critical core capabilities and infrastructure at our national laboratories to support that groundbreaking early R&D. With continued construction of cutting-edge projects like the Linac Coherent Light Source-II, the Facility for Rare Isotopes Beam, and the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment, while also supporting our world-leading science and technology workforce at the national labs, we will ensure we continue to drive innovation for the Nation.

Q38. The Biological and Environmental Research (BER) Program in the Office of Science took nearly a quarter of the office's cuts. As you may know, BER supports basic research biological systems and earth systems science. This proposed budget for BER appears to target earth systems science, possibly because this administration has said it intends to dismantle any program that appears to be affiliated with climate science. Do you agree that basic science research programs that help contribute to innovation and drive economic growth are important? How do you plan to ensure that BER meets its missions at the proposed funding level?

A38. The FY 2018 President's Request supports priorities within BER in the areas of Genomic Sciences, Earth and Environmental Systems, and scientific user facilities. The basic science generated from these activities provides the research that drives innovation and growth for applications with broad economic benefits to society.

Q39. A 2016 DOE study found that a portfolio of R&D investments at the Office of Energy Efficiency and Renewable Energy totaling $12 billion from 1976 to 2012 yielded net

economic benefits to the United States of $230 billion (nearly 20 times multiplier) with an annual return on investment of 20 percent. Given this return on investment and the trillions of dollars that will be invested globally in renewable energy and energy efficiency, why are you undermining U.S. energy leadership by proposing to cut EERE by 70 percent?

A39. The FY 2018 Budget focuses Energy Efficiency and Renewable Energy (EERE) resources on early-stage R&D, where the Federal role is strongest, and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. The Budget emphasizes energy technologies best positioned to support American energy independence and domestic job-growth in the near to mid-term. The Budget maintains America's leadership in transformative science and emerging energy technologies in sustainable transportation, renewable power, and energy efficiency.

EERE early-stage research focuses on technology challenges that have the potential for high return on investment, but which present a significant degree of scientific or technical uncertainty across a relatively lengthy time span, making it unlikely that industry will invest significant R&D on their own. Thus, this budget maintains the most critical core capabilities and infrastructure at DOE National Laboratories related to sustainable transportation, renewable power and energy efficiency technologies. Technology solutions derived from EERE early-stage R&D give U.S. industries, businesses, and entrepreneurs the competitive edge needed to excel in the rapidly changing global energy economy. Industry deployment of these technologies creates jobs, reduces U.S. reliance on imported oil, increases energy affordability, improves energy security, ensures environmental responsibility and offers Americans a broader range of energy choices.

Q40. The budget proposal cuts the Building Technologies Office – a program that costs less than $2 per household and helps consumers save almost $500 per year – by two-thirds. Do you agree that it's critical to use the Department of Energy's capabilities to help building owners make retrofit and construction choices that employ smart technologies to make dramatic reductions in building energy consumption?

A40. The Building Technology Office's (BTO) proposed Building Energy Research & Development (BERD) subprogram sponsors early-stage R&D in energy-efficient building technologies, enabling a range of U.S. industries in fields like building

construction and renovation as well as appliance and material manufacturing to develop and deploy novel building technologies. BERD's technology areas are Buildings-to-Grid; Heating, Ventilation and Air-Conditioning & Refrigeration (HVAC&R); Windows & Envelope; Solid State Lighting; and Building Energy Modeling (BEM). This work leverages the National Laboratories' researchers and high performance computing capabilities as well as unique National Laboratory facilities needed for BTO to enable industry to achieve the goal of reducing the average energy use per square foot of all U.S. buildings by 50% from 2010 levels, thus saving consumers money while enhancing productivity and comfort.

Q41. In your opinion, isn't helping energy bill payers cut energy waste in order to unleash American productivity an important function of the premiere energy R&D agency?

A41. In FY18, EERE's energy efficiency portfolio will build on the considerable progress made over the last 40 years and pursue early-stage R&D targeted at high impact technology areas such as advanced lighting, space heating and cooling, building envelopes, and manufacturing materials and processes. The overall goal of the energy efficiency portfolio is to strengthen the body of knowledge that enables businesses, industry and the Federal government to improve affordability, energy security-resiliency, and energy productivity of our buildings and manufacturing sectors. The knowledge outputs of this research can support a foundation for economic growth and job creation as businesses, consumers, and energy managers develop and deploy new energy-efficiency and manufacturing technologies and best practices.

Q42. I'd like to know what's taking so long for the DOE to finalize common-sense energy efficiency rules for portable air conditioners, backup battery systems for electronics, air compressors, walk-in coolers and freezers, and commercial heating boilers. Together these standards would save consumers $11 billion on their energy bills over 30 years. These standards were developed through DOE's rigorous rulemaking process and completed in December 2016. Can you please explain what the holdup is and when we can expect to see these rules finalized?

A42. The Department of Energy is the Defendant in a lawsuit concerning the subject matter of this question. The Department cannot comment on an issue subject to ongoing litigation.

Q43. The President's budget proposes to reduce DOE's appliance standards work by half. DOE's work in this area has cut U.S. electricity usage by 13 percent compared to what it would be without energy efficiency standards, so I think crippling the program is the wrong way to go. How will DOE continue help Americans billions in energy costs if this program is radically scaled back?

A43. DOE is committed to meeting its legislatively mandated deadlines for covered appliances and equipment. The Energy Policy and Conservation Act (as amended) mandates the Department's test procedure and standards rulemaking activities. The rulemaking schedule, and thus the level of program activity, is determined by existing statute.

In FY 2018, the Appliance and Equipment Standards subprogram will fund all necessary and feasible steps to finalize legally required efficiency standards and test procedures, and meet all applicable judicial and statutory deadlines. DOE will, as appropriate, undertake activities regarding the certification and enforcement of existing energy conservation standards.

Q44. Previous Administrations, Republican and Democrat, have advanced energy saving goals for our federal government. What will you do to further reduce the energy waste in our federal buildings?

A44. The Federal Energy Management Program (FEMP) FY 2018 Budget Request of $10 million supports federal agencies in meeting statutory energy and water management related goals and requirements. In FY 2018, FEMP will focus on reducing the operating costs of the government by assisting Federal agencies in identifying, designing, and completing energy-savings projects, building upon previous accomplishments. FEMP works with our stakeholders to enable federal agencies to meet energy related goals, identify affordable solutions, facilitate public-private partnership and provide energy leadership to the country by identifying government best practices. FEMP provides technical project development assistance for energy savings performance contracts (ESPC), utility energy savings contracts, and power purchase agreements in pursuit of energy and water efficiency improvements and demand reduction services.

FEMP will provide technical assistance that leverages performance contracting and power purchase agreements, helping agencies meet their statutory requirements, and

enhancing workforce development. In conjunction with technical assistance, FEMP will provide portfolio planning guidance to promote strategic integration of advanced technologies into power supply and master facility planning, helping DOE as a whole strengthen national energy security by increasing energy supply, diversity, resiliency, and reliability. FEMP will also foster Federal building and fleet optimization by providing guidance and tools focused on metering, auditing, operations and maintenance, and water use. As part of this support request by Federal agencies, the Federal Energy Management subprogram, working directly through experts at the DOE National Laboratories, will:

- Offer portfolio planning guidance to promote strategic integration of advanced energy technologies (such as renewable energy, micro-grids and advanced battery storage) into site/facility power supply and master site planning;

- Develop best practices for implementing resilient energy management strategies in Federal facilities;

- Develop best practice approaches to address the challenges and risks organizations face from cyber threats to the energy management platform;

- Standardize steps agencies can take to secure their energy-related hardware and data while integrating effective energy management; and

- Improve facility resiliency through enhanced energy management technologies and tools focused on optimization and cost reduction.

FEMP will continue to work with agencies to fulfill energy management performance statutory requirements through proactive engagements and enhanced workforce development services and opportunities.

Q45. Public Private Partnerships are a key way to advance energy savings. Please let us know what PPP tools you will be encouraging at the Department of Energy and how?

A45. The Department utilizes a variety of public-private partnership models in the FY18 Budget Request to address critical early-stage R&D challenges. Additionally, DOE

anticipates private industry will use the results of DOE-funded research to conduct later stages of applied research as well as provide investments to fund industry demonstrations and pilot projects. The publically available *Report on Technology Transfer and Related Technology Partnering Activities at the National Laboratories and Other Facilities for Fiscal Year 2014* provides many examples of past public private partnership models DOE has utilized. The Fiscal Year 2015 report is forthcoming.

Q46. Forty years ago, we created the Strategic Petroleum Reserve (SPR) to prevent economic and security impacts of crude oil supply disruptions. It is our most important federal energy security asset. Yet the President's Budget proposes to sell approximately half the SPR crude oil by 2027. Do you agree that we should auction off our energy security by selling the Strategic Petroleum Reserve?

A46. The United States now produces oil and gas at historically high rates, which is our first and best way to build our energy security. The SPR was created in the 1970s, when the United States imported 5-6 million barrels of oil per day from OPEC countries. Today, the United States imports roughly half that from OPEC countries despite a significantly larger economy. Independent projections from the U.S. Energy Information Administration (EIA) indicate that 10 years from now, U.S. net petroleum imports will be even lower, putting even less of a strain on the U.S. economy in the event of a petroleum supply disruption. While the SPR continues to remain a vital national energy security asset, given increased reliance on and availability of domestic sources of production, the Administration believes the U.S. can meet its energy security requirements with a smaller SPR.

Q47. If we sell the additional amounts from the SPR, how will the United States meet its international obligations?

A47. The United States has two primary oil stockholding requirements to meet obligations under the International Energy Program: (1) To hold stocks equivalent to 90 days of net petroleum imports, and (2) To contribute a proportionate share of the total required stock release (currently approximately 43%) in the event of a collective action response by the International Energy Agency (IEA) to a global oil supply disruption.

For requirement (1) – At the conclusion of required sales in 2027, the SPR would be able to meet its requirement to provide 90 days of net petroleum import protection, based on a projected SPR crude oil inventory level of 250-260 million barrels and U.S. EIA projections of U.S. net petroleum imports of 1.72 million barrels per day (EIA 2017 Annual Energy Outlook Reference Case). An SPR of this size would accordingly supply roughly 150 days of net petroleum import protection.

For requirement (2) – The half liquidation sale would result in a projected SPR crude oil Inventory of 250-260 million barrels and would also close two of the four SPR storage sites, reducing the SPR's design drawdown rate from its current level of 4.415 million barrels per day to a maximum of 2.8 million barrels per day. The United States would be able to meet its proportionate share for any IEA collective action response, provided that the United States proportionate share requirement of the daily flow rate and total volume of oil released does not exceed the above parameters after the half liquidation sale is completed. Further, if, as the EIA projects, the US's demand for petroleum products continues to hold steady or decrease slightly while other IEA Member Countries demand increases and/or new Members Countries join the IEA – the US contribution to a collective action could decrease.

Q48. Do you believe oil markets are subject to price volatility that affects U.S. consumers?

A48. As globally traded commodities, crude oil and petroleum products are subject to price volatility on a daily basis for a variety of reasons. In the world's spot markets, prices for petroleum can be reflective not only of current views of supply and demand fundamentals but also of longer term political stability in producing countries and economic growth in consuming countries. In addition, spot markets are located in different parts of the globe and trade different qualities of petroleum such that price volatility can also be caused by more localized factors such as ship loading restrictions or pipeline and storage constraints.

Petroleum product prices at wholesale terminals typically change only once during the day so that distributors can properly plan truck shipments and pricing for their fuels on delivery to end use sellers. Retail prices at the consumer level are also affected by oil price volatility, as gasoline price changes are significantly driven by crude oil price

changes. However, due to large, visible price signage and the ability of retail consumers to readily switch stations, retail gasoline prices move more slowly than crude oil prices, as gasoline retailers are reluctant to change prices often given that they are unsure of their competitors' potential responses.

Q49. Do you believe the core policy reasons for the establishment of the Strategic Petroleum Reserve still exist today?

A49. The SPR was established to protect the United States from the impacts of severe petroleum supply interruptions. At the time of the SPR's establishment, Organization of the Petroleum Exporting Countries (OPEC) dominated global oil production, the Arab oil embargo had just ended, and the primary energy threat to the United States was a physical curtailment of oil imports. The reduction in crude oil imports in recent years, stemming from increased domestic production and stagnant consumption, has reduced U.S. exposure to physical oil supply shortages. However, crude oil is a globally traded commodity and supply disruptions anywhere in the world result in price increases that can harm the U.S. economy. The SPR remains an important national energy security asset, protecting the national economy from potential GDP losses caused by shocks to the world oil market.

Q50. As you well know, our energy sector is changing and we need to ensure we have a skilled energy workforce that can keep up. The most recent Department of Energy employment report found that 73 percent of energy companies found it difficult to hire skilled employees. At your confirmation hearing, you stated that "we need to equip our workforce with what they need to succeed." Then why did the Administration not request funding for workforce training at the Department? And how will you ensure workforce training is a DOE priority?

A50. The DOE's core mission is to support early-stage R&D leading to cutting-edge innovation. The FY 2018 Budget focuses its investments on the basic, early-stage R&D conducted by the scientists and engineers at our 17 national laboratories who are constantly on the path to developing the next great innovations that can transform society, and bring forth a new era of prosperity for the American people.

Workforce training is not within the Departments' core missions and is better left to mission agencies and the private sector. However, we recognize the importance of the

next generation of America's science and technology workforce, and our budget request supports targeted programs like the Solar Decathlon which will continue to attract students to science and energy technology fields. In addition, the FY 2018 budget continues to support students and post-doctoral researchers at our national laboratories.

Q51. Although we have mandatory cybersecurity standards for electric utilities, natural gas pipelines are subject to merely voluntary guidelines issued by the Transportation Security Administration (TSA). DOE's most recent Quadrennial Energy Review (QER) suggested that DOE should assess whether any additional or mandatory cybersecurity guidelines are necessary for natural gas pipelines given the increased dependence between the electric and natural gas sectors. Given your statements in response to a Question for the Record – that "cybersecurity is a critical issue and a significant part of DOE's mission. I will prioritize it with the incoming Administration and Congress" – do you agree with the QER recommendation?

A51. Cybersecurity is indeed a critical issue and a significant part of DOE's mission. As consumption of natural gas for electric power production has increased, the cybersecurity of the natural gas infrastructure has grown in importance.

For the past 15 years, the Department has engaged in an active, voluntary public-private partnership with the natural gas industry through the Oil and Natural Gas Subsector Coordinating Council. This forum helps develop priorities and share best practices for cybersecurity for natural gas infrastructure. The Department continues to support cybersecurity solutions for natural gas infrastructure as part of its ongoing cybersecurity program.

Q52. One week before your budget testimony, the Washington Post reported that "[h]ackers allied with the Russian government have devised a cyber-weapon that has the potential to be the most disruptive yet against electric systems that Americans depend on for daily life." During your confirmation hearing, you reassured the committee that cybersecurity was one of your top two priorities, but your budget slashes cyber funding by 32 percent. How can cybersecurity be a top priority if you have cut its funding by 32 percent?

A52. Securing our Nation's power grid remains an urgent concern.

The $20 million, or 32%, decrease to Cybersecurity for Energy Delivery Systems (CEDS) primarily results from the completion of funding for several activities; base CEDS funding is maintained.

- A $5 million reduction is for the Virtual Energy Sector Advanced Digital Forensics Analysis Platform, which was initially funded in FY 2016, and will complete implementation and begin transitioning to the private sector in FY 2017.
- The industry-scale electric grid test bed was a congressionally directed project initiated in FY 2014 as a 3-year project. The FY 2017 appropriation provided an additional $9 million, which will fund preparation for construction of a dedicated transmission line feed during FY 2018, and also fund construction of the feed, which may not begin until FY 2019.
- The FY 2016 and FY 2017 appropriations included congressional direction of $5 million for each year to develop cyber and cyber-physical solutions for advanced control concepts for distribution and municipal utility companies.

Q53. How can you and DOE keep our country safe from Russian cyberattacks if you do not have the funds to do so?

A53. DOE takes the cybersecurity threats to the grid seriously, and has put together a multiyear plan based on a successful public-private partnership that leverages technical and financial resources from industry and government. This strategy enjoys strong support from energy companies due to our dedication to collaboration with the industry, our understanding of electric sector system needs, and our ability to help the sector develop and deploy the innovative tools, technologies, and other expertise of the DOE national laboratories.

DOE's cybersecurity budget focuses on three tenets to support the security of the Nation's energy sector:

- Strengthen electric sector cybersecurity preparedness—DOE will continue its close coordination with the private sector through the energy sector coordinating councils, trade associations, manufacturers, utilities, and individual companies to facilitate information sharing programs, deploy systems for real-time situational awareness, support self-assessments of cyber-risk and cybersecurity maturity, and implement best practices such as response readiness.
- Coordinate cyber incident response and recovery—DOE will continue its incident response program, which aligns with the industry-led cyber mutual assistance

programs and includes information sharing and rapid adoption of lessons-learned to help detect and mitigate cyber incidents at the earliest stages, thus decreasing their potential impact.

- Support game-changing R&D of resilient energy delivery systems—DOE will continue its innovative R&D program to prevent, detect, and mitigate a cyber incident in today's systems, and develop next-generation resilient energy delivery systems that can survive a cyber incident.

The Department helps ensure program success by sustaining strategic core capabilities throughout its national laboratories. These capabilities are called upon as needed, and conducted in close partnership with the private sector, to develop innovative technologies that reduce the risk of a cyber-incident disrupting energy delivery.

Q54. In regards to your ongoing grid study, it is troubling that the Administration appears to be suggesting that adding more renewable energy threatens grid reliability, especially when our National Labs have repeatedly found this is not true. Are you aware that NREL has found that the eastern grid and the western grid could each reliably accommodate 30 percent renewable energy rates without grid changes, and that a separate NREL study concluded that renewable energy will be able to reliably generate 80% of U.S. power needs by 2050 if we invest in increased grid flexibility?

A54. The National Renewable Energy Laboratory studies, which were in part funded by DOE's Office of Electricity Delivery and Energy Reliability, are important building block studies showing the potential to handle large amounts of variable renewable energy within the grid structure. The studies, however, did not conclusively model the impact of high penetrations of variable renewable energy. For example, the study indicating the potential for 80 percent renewable generation showed modeling feasibility only if there were also grid changes equivalent to building over 40 new 1,000 megawatt transmission lines across the Nation and grid operations managed by a single balancing authority over the 48 contiguous states.

By 2020, sections of the transmission system are scheduled to operate with over 60 percent wind energy in Kansas, Oklahoma, and Texas. Grid operators in those and other states are searching for real world solutions to reliably manage the grid; it is not yet proven that they will be able to do so on a consistent, reliable basis under a highly

variable, highly distributed generation mix. Part of the work being done in the GMLC is to further model and understand how to bridge the gap between our ability to model and the ability to operate the grid.

Q55. Do you agree with the fact that low natural gas prices, not renewable energy, are making coal and nuclear power uncompetitive?

A55. EIA has tracked trends in electricity generation from coal and nuclear power plants over the last several years. The declining share of coal generation results from a number of separate factors. Low natural gas prices have been a leading factor during recent shifts in the generation mix, and in reducing the competitiveness of coal and nuclear power. Increasing generation from renewables, stagnant demand for electricity, excess electric generating capacity, and new electric power-sector emission regulations have also played a role. EIA has not specifically analyzed the relative importance of each of these factors.

Q56. As a former governor of Texas, you know the enormous potential of wind power and the benefits it provides. Do you believe that wind harmed the grid in Texas, and that it poses a threat to the grid in general? Please provide a "yes" or "no" answer.

A56. The Department, in response to my direction, has undertaken an internal review to examine the state of electricity markets and grid reliability and produce a study aimed at ensuring that our electric grid remains reliable, resilient, and affordable. The study is an impartial review of the state of electricity markets and related policies, and there are no preconceived notions as to the findings and recommendations that will result from this review.

I appreciate the value of all energy sources. My track record speaks for itself. As Governor of Texas, I helped oversee an enormous increase in wind energy such that Texas is now the largest wind energy producing state in America. Texas has to date had a successful integration of wind energy. This has been due to extensive planning; implementation of supporting legislation and alternative grid system support, like demand response and distributed generation; constant vigilance as the grid operations went into practice; and continued planning and modeling as some areas try to manage large amounts of variable renewable energy.

Q57. Can you commit that the Department will not attempt to preempt state renewable energy programs, such as renewable portfolio standards, in an attempt to bolster less competitive sources of energy, such as coal?

A57. There is no national renewable portfolio standard authority that could serve as a basis under which the Department could preempt state renewable portfolio standards.

Q58. The President and DOE cannot ignore statutory requirements or funding direction provided by appropriations legislation for Fiscal Years 2016 and 2017. I am glad there seems to be progress on these issues, particularly at ARPA-E and the small business grants. Will you commit that DOE will follow the law to fund projects as directed by Congressional intent and appropriations for the current and previous fiscal years, despite what is included in the Administration's budget proposal?

A58. Yes, the Department of Energy will follow the law.

Q59. Are you aware that the budget proposal triggers the national labs, universities, and businesses to begin planning for this worst-case scenario, including creating workforce reduction plans?

A59. DOE takes very seriously its responsibilities under Section 3161 of the National Defense Authorization Act of Fiscal Year 1993, codified at 50 U.S.C. 2704, to develop plans when it becomes necessary to restructure the workforce at its defense nuclear facilities. DOE has plans in place at all of DOE's defense nuclear facilities, including many of the national labs, universities, and businesses you reference. DOE contractors are responsible in the first instance for managing their workload and workforce in an effective and fiscally responsible manner, consistent with their contracts with the Department. To that end, DOE contractors continuously re-evaluate their priorities, and certainly in the case of budget proposals. DOE actively works with its contractors, especially in these circumstances, to ensure that the contractor employees, and key stakeholders, are kept abreast of any developments.

Q60. In my home state of Washington, the proposed budget request would result in a cut of approximately $190 million and a loss of over 1,000 jobs to the Pacific Northwest National Laboratory, a powerhouse of innovation. With these cuts, how will you ensure that the Department and its National Labs continue to make significant contributions to our global leadership in science and energy?

A60. All DOE national laboratories remain open under the FY 2018 Budget Request and with available funding, the budget prioritizes funding to mitigate impacts at the national labs.

Through careful prioritization and ensuring that funding goes to the most promising research, the Department of Energy will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our missions ensuring the Nation's security and prosperity.

Q61. The Department of Energy's Title 17 Loan Program, which was signed into law by President George Bush in 2005, is one tool that can help fill the infrastructure investment gap. The Department of Energy's loan programs have a significant amount of money remaining in loan authority that can be utilized for investments in a broad range of new energy infrastructure. Why would the Administration, which has pledged to invest in rebuilding our infrastructure, eliminate a program that has a track record of success and existing funding that can be used for energy infrastructure?

A61. To support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's FY 2018 budget reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage R&D.

Q62. In response to a Question for the Record, you wrote, "I commit to reviewing the loan guarantee program and evaluate its successes and failure. I am committed to both investing in energy innovation and using taxpayer dollars responsibly." Does this mean you conducted a full review of the loan guarantee program and concluded that it should be eliminated?

A62. In the development and preparation of the FY 2018 Budget, all of the Department's programs and priorities were reviewed. In order to support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's FY 2018 budget reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage R&D.

Q63a. President Trump has continually pushed auto executives to build more manufacturing plants in the United States. The Department of Energy's Advanced Technology Vehicle Loan Program is one tool that could provide the financing to make that happen. Since 2009, 18 facilities in 8 states were retooled or built with ATVM loans that directly employ almost 38,000 people. But the Administration's budget would eliminate the

ATVM program. In response to a Question for the Record, you wrote, "I will review the ATVM program to makes sure it achieves it goals. I will be committed to transparency and accountability with respect to government investments." Have you completed this review prior to supporting the President's budget?

A63a. In the development and preparation of the FY 2018 Budget, all of the Department's programs and priorities were reviewed. In order to support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's FY 2018 budget reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage R&D.

The President's FY 2018 budget proposal calls for the cancellation of all remaining loan volume and appropriated credit subsidy for the Advanced Technology Vehicles Manufacturing (ATVM) loan program.

Q63b. How does eliminating the ATVM program help support American manufacturers and autoworkers?

A63b. To support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's FY 2018 budget reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage R&D.

Q64. I was particularly disturbed to see the proposed cuts to the Office of Electricity Delivery and Energy Reliability's R&D programs. At a time when we require more advanced and integrated R&D to improve the security, resiliency and reliability of the grid, why in the world would the administration propose these deep cuts?

A64. The FY 2018 budget request focuses funding on early stage research efforts to improve the security, resiliency and reliability of the grid, allowing for private industry to leverage this research for innovative applied solutions, demonstrations, and pilot projects tailored to market needs and opportunities. R&D programs focused on activities where the

private sector has substantial incentive to invest are better conceived and managed through market-based disciplines.

Q65. In response to a Question for the Record, you wrote, "I assure you that I am committed to energy reliability and to fulfilling this important mission of the Department." Nevertheless, the President's proposed budget for fiscal year 2018 cuts the non-cyber programs at the Office of Electricity Delivery and Energy Reliability by 46 percent, including an 80 percent cut to the Resilient Distribution Systems program. These cuts would eliminate critical advanced modeling, research into new synchrophasor applications, evaluation of transactive controls, microgrid demonstrations, and grid-scale storage demonstration projects. If the Department ceases to fund the important work described above, what other entities have demonstrated a willingness and financial ability to pick up the slack?

A65. The FY 2018 budget request focuses funding on early stage research efforts, allowing for private industry to leverage this research for innovative applied solutions, demonstrations, and pilot projects tailored to market needs and opportunities. Some states are also supporting technology demonstrations to support their grid modernization goals. In general, activities where there are sufficient and substantial incentives for market-based investment are better facilitated by the private sector.

Q66. The President's budget proposes to auction-off to the highest bidder the Bonneville Power Administration's transmission facilities and the transmission assets owned by the other Federal power marketing administrations (PMAs). This proposal would increase rates for BPA customers between 26 and 44 percent, allowing private companies to substantially raise transmission rates and thus increasing power prices for consumers in more than 30 states. Is the Department seriously going to pursue this proposal to auction off the PMA transmission lines?

A66. While the Budget proposes to divest the PMAs of their transmission assets, privatization of the PMAs has been proposed by Administrations in the past, and I recognize your concerns regarding the proposal.

As Secretary of Energy, I want to assure you that I value the goals of affordable, reliable power and transmission services to ratepayers and consumers. I understand how important those goals are, particularly to rural communities, and the significance of transmission systems to your region's economy. I commit to work with you as the discussion of this proposal continues.

Q67. Please provide a detailed explanation of how the Department can justify pursuing this proposal to auction off the PMA transmission lines, including those owned by the Bonneville Power Administration.

A67. Divestiture of Federal assets can encourage private capital investment in the Nation's infrastructure and relieve long-term pressure on the deficit related to future capital investments. The vast majority of the Nation's electric infrastructure is owned and operated by for- profit private utilities. Ownership of transmission assets is best carried out by the private sector where there are appropriate market and regulatory incentives. Eliminating or reducing the PMA's role in electricity transmission and increasing the private sector's role will encourage a more efficient allocation of economic resources and mitigate risk to taxpayers.

As Secretary of Energy, I want to assure you that I value the goals of affordable, reliable power and transmission services to ratepayers and consumers. I understand how important those goals are, particularly to rural communities, and the significance of transmission systems to your region's economy.

Q68. By eliminating ARPA-E, the proposed budget would also have an adverse impact on DOE's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs, reducing funding for these successful public-private partnerships by 25%, or nearly $57 million, when compared to FY 2016 numbers. What is the impact of the budget cuts on the SBIR and STTR programs compared to FY 2017 numbers by dollars and percent?

A68. The table below summarizes the FY 2017 Enacted level and FY 2018 President's Budget Request for the DOE SBIR and STTR programs.

	FY 2017 Enacted ($M)	FY 2018 President's Request ($M)	Change ($M)	Change (%)
SBIR	222	152	-70	-32%
STTR	31	21	-10	-32%

Q69. You have the discretion not to cut SBIR/STTR programs. Have you considered transferring the SBIR/STTR funding that would have been administered through ARPA-

E to the Office of Science to administer, and therefore not reduce, public-private partnerships with small firms? Will you review this option and provide details on your decision, including why you made the decision?

A69. DOE has historically determined the budgets for the SBIR/STTR programs administered by the OS and Advanced Research Projects Agency-Energy (ARPA-E) by applying the congressionally-mandated percentages for SBIR and STTR to its extramural R&D budgets. DOE values the contribution made by small businesses through the SBIR and STTR programs, but also values the extramural R&D performed by the DOE national laboratories, universities and other organizations. Increasing SBIR/STTR allocations beyond the minimum required, decreases the amount of research funding that goes to these other groups. In some years, based on the quality of applications received, DOE has elected to contribute more than the minimum required by statute to the SBIR and STTR programs. DOE has not considered a policy change to permanently fund the SBIR and STTR programs above their minimum levels and does not anticipate doing so in the near future.

ARPA-E will continue to administer its own SBIR/STTR program. ARPA-E fully funds its SBIR/STTR projects at the time of award and therefore those projects funded from a given fiscal year appropriation will be supported as long as they continue to demonstrate technical success.

Q70. Can you commit to ensuring that all future SBIR and STIR funds will be made in a timely fashion?

A70. DOE works to ensure that SBIR and STTR obligations are made in a timely fashion each fiscal year. Obligation of SBIR and STTR funds are impacted by the appropriation process. In some years, late enactment of appropriations have resulted in SBIR and STTR obligations being delayed until the next fiscal year.

Q71. Some small businesses fear DOE will move away from the Congressional mandate to review proposals based on technical merit and move towards proposals that are based more on an ideology, reducing exploration of technologies regarding clean technology or mitigating climate change. Will you commit to preserve merit-based reviews of SBIR and STTR applications, and ensure transparency in any process changes?

A71. As stated in DOE's Guide to Financial Assistance: "It is DOE policy that all discretionary financial assistance, competitive or noncompetitive, be awarded through a merit-based selection process. Merit review means a thorough, consistent, and objective examination of applications based on pre-established criteria by persons independent of those submitting the applications and knowledgeable in the field of endeavor for which support is requested." SBIR and STTR applications have been and will continue to be subject to merit-based reviews. The merit-based review criteria are published in each SBIR/STTR Funding Opportunity Announcement.

QUESTIONS FROM SENATOR RON WYDEN

Q 1. The president's budget calls for auctioning off the transmission assets of the Department of Energy's Power Marketing Administrations, including the Bonneville Power Administration in the Northwest.

Selling off BPA would amount to highway robbery for families in the Northwest, whose dollars are already stretched too thin without the administration trying to raise their monthly utility bills. Public power customers in the Pacific Northwest have paid for the system, which runs successfully without interference from the federal government. Their investment should not be put up for sale.

Can you explain how the administration's proposal to sell off the transmission assets of power marketing administrations like BPA is in the best interests of families in the Northwest?

A1. The Administration's proposal seeks the best operation of these transmission assets with appropriate market and regulatory incentives in the private sector. As Secretary of Energy, I understand how important the goals of affordable, reliable power and transmission services are to Pacific Northwest families.

Q2. The National Energy Technology Laboratory campus in Albany, Oregon has been an integral part of the Energy Department's national energy research since it was created in 1943. Scientists in Albany have contributed valuable research on the Department's classified national security programs and a broad range of research for the public.

On what basis, in the few short months that you have been in charge of the department, did you decide to close it? I want to see the actual, written analysis that you used to make this decision. Please provide that to the Committee and to me within a week.

A2. As part of the Department's effort to operate more efficiently, the FY 2018 Budget Request proposes a phased approach to consolidation of NETL's Albany research operations into NETL's Eastern sites. The Department has funded a Mission Alignment study to begin in FY 2017 to evaluate this approach. The study will: (1) Evaluate alternatives for locating NETL's Alloy Metallurgy Capabilities; (2) Study of Environmental Impacts Responsibility & Remediation at the Albany site; and (3) Analysis of Alternatives for Configuration of NETL's Eastern Sites.

In looking at consolidation of the Eastern sites, the Department will consider factors such as the cost of operations at each site, percentage of the workforce that is located at each

site, mobility of functions, and proximity to regional resources and partnerships. It is likely that this activity will take several quarters to complete, at which time a final report will aid informing next steps regarding the long-term configuration of NETL's footprint. This is a process that will include input from our workforce and other stakeholders. Any decisions made are to ensure the long-term strength and sustainability of the Department's science and technology enterprise.

Q3. It's been over a month since a tunnel holding railroad cars full of radioactive waste collapsed at the Hanford site. That collapse is yet another reminder that decades of environmental missteps and shortcuts are coming home to roost.

Residents and workers in the Pacific Northwest are tired of being put at risk. During your confirmation hearing, you committed to working with members of the Senate to clean up the site and move forward on a Hanford cleanup plan. So it defies explanation that your department's budget cuts funds from the very account at Hanford that funds the cleanup of this tunnel, other contaminated sites at Hanford.

Last month, Sen. Cantwell and I joined with a bipartisan group of senators and representatives from Oregon and Washington. We asked the Government Accountability Office to literally get to the bottom of radioactive sites at Hanford and give us a report card on what DOE needs to do to clean up this mess. Cleaning up Hanford is not a partisan issue. It's DOE's issue. And now as Energy Secretary, it's your issue.

What are you going to do to restore funding for clean-up at Hanford, and what are you going to do to restore the confidence of citizens and workers in the Northwest in the DOE's ability to make Hanford safe?

A3. The Department takes its regulatory commitments seriously and is actively working to meet its cleanup commitments. The safety of our workers, the public and the environment are overriding values in performing our cleanup mission.

The FY 2018 budget positions the Department to continue making progress at the Hanford Site, which includes continued progress in safely removing the K Basin sludge from near the Columbia River to the central plateau, continuing pump and treat activities to remediate contaminated groundwater, and the maintenance, repair, and replacement of failing infrastructure, facilities, and systems. This includes a focus on addressing risks posed by those that are specifically clean-up related and those that support our cleanup activities.

The FY 2018 budget request was slightly greater than $2.3 billion. This funding is greater than one-third of the entire budget for Department of Energy's Office of Environmental Management.

As a former governor, I have a strong appreciation and understanding of the role of elected officials. I am committed to working with you, the state of Washington, the Washington delegation and our other important stakeholders to continue to make steady cleanup progress and develop new and innovative solutions to our cleanup challenges at the Hanford site.

Q4. During your confirmation hearing, you indicated that you would support investments in "the basic research that will spur innovation that will keep America's economy, including its wind and solar industries, competitive."

When this administration withdrew from the Paris agreement, you promised the United States would remain "the world leader in the development of next generation technology." You said that "instead of preaching about clean energy, this Administration will act on it."

Apparently, acting on it means slashing support for research and innovation. You have proposed cutting clean energy research by 70 percent. You've proposed gutting funding for the National Labs, including a 35 percent cut to the Pacific Northwest National Lab. You've proposed eliminating DOE's advanced research division. Meanwhile, China and Germany are investing billions in clean energy research.

Clean energy presents an opportunity for good paying, red-white-and-blue jobs, here in the United States.

How does this administration intend to be a world leader in clean energy research and innovation while gutting funding for research and innovation?

A4. Through careful prioritization and ensuring that funding goes to the most promising research, the DOE will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our missions ensuring the Nation's security and prosperity.

The FY 2018 Budget Request focuses resources on early-stage research and development (R&D), where the Federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. This shift allows the private sector to fund later-stage research, development, and commercialization of energy technologies. By focusing on early stage R&D, the budget proposes critical investments necessary to sustain America's leadership in transformative science and emerging energy technologies.

Q5. If you haven't discovered already, the DOE is a very secretive place. Often, the only way Americans and their elected officials learn about problems at DOE is from whistleblowers. Nowhere is that more true than at Hanford. Last year the Government Accountability Office sent a report to me and Sen. McCaskill and Sen. Markey documenting DOE's repeated failure to protect whistleblowers from retaliation. In March, we wrote you two urgent letters aimed at addressing problems raised by GAO.

The first asked you to immediately reinstate regulations making sure DOE could take action against its contractors for retaliating against whistleblowers. It's unfortunate that suspending those rules was one of the very first things the new administration did.

We are still waiting for a response to that letter. The second letter asked you to protect a whistleblower at Savannah River who was fired for cooperating with the Government Accountability Office on its investigation into whistleblower abuses at the Energy Department.

Again, we are still waiting for a response.

First, when can I expect your response to these letters, and second, what are you going to do as secretary to end DOE's culture of retaliation against whistleblowers?

A5. As Secretary of the DOE, I am committed to promoting a strong safety culture across the Department that ensures that federal and contractor employees are able to speak out, raise issues, and share concerns about safety without fear of retaliation. Retaliating against an employee who reports violations of law, mismanagement, waste, abuse, or dangerous/unsafe workplace conditions is prohibited by statute, regulation, and contractual provisions. The Department currently has robust procedures in place for investigating—and remedying if appropriate—any and all claims of retaliation.

To further the commitment to whistleblower protection, the Department recently issued a final rule, which became effective in March 2017, clarifying that the Department may issue civil penalties against certain contractors and subcontractors for instances of whistleblower retaliation that concern nuclear safety.

In recent years, a small number of whistleblower claims against the Department or its contractors have been substantiated—both relative to the size of the DOE workforce and in absolute terms. Nevertheless, I, and DOE as a whole, take these claims very seriously. A notable example is the case of Sandra Black, a contractor employee at the Savannah River Site. The Department recently issued a final decision in her case and determined that there was a sufficient basis to conclude that she was subject to reprisal.

Q6. The United States has signed the Comprehensive Test Ban Treaty (CTBT), which establishes a global moratorium on nuclear testing. Although the US has not ratified the treaty, Presidents from both parties have followed George H. W. Bush's moratorium on new testing. Do you support continuing this bipartisan moratorium on nuclear testing?

A6. The United States is continuing to implement our long-standing moratorium on nuclear testing. Through National Nuclear Security Administration's (NNSA) Stockpile Stewardship Program, we're able to confidently certify that the nuclear stockpile is safe, secure, and effective without nuclear explosive testing. On CTBT itself, the Administration is conducting a thorough review of U.S. arms control and nonproliferation policy, including the CTBT, and this review is not yet complete.

Q7. The President's budget requests $1.79 billion for Department of Energy Nuclear Nonproliferation priorities. That's about $90 million less than Congress provided last year and almost $150 million less than the year before that. Do you agree that preventing the spread of nuclear weapons and nuclear materials should be one of the top U.S. priorities? If yes, then can you explain to this Committee why you asked Congress to cut funding this year rather than to increase funding?

A7. Yes, the Administration agrees that preventing the spread of nuclear weapons and nuclear materials should be one of the top U.S. priorities. The $87 million (4.6 percent) reduction in the DNN budget in FY 2018 relative to the FY 2017 enacted is misleading because the reduction is driven by a decline in University of California (UC) Legacy pension costs and a

shift in DOE's strategy in its plutonium disposition program. Specifically, the $87 million reduction is a result of three things:

- $56 million less requested for MOX construction;
- $42 million less requested for UC Legacy Pension; and,
- $11 million in increases to other DNN activities.

This Administration is committed to pursuing an aggressive nonproliferation agenda, even in this tight budget environment. NNSA is requesting more money in FY 2018 for its core nonproliferation, counterterrorism, and counterproliferation work than requested in FY 2017. NNSA is effectively asking for the same amount as enacted in FY 2017, excluding UC Legacy pension payments and the MOX construction program:

- Compared to the FY 2017 request, the core non-proliferation program (NA-20) is 4.0 percent higher; DNN is 3.6 percent higher including both the core nonproliferation program and National Counterterrorism and Incident Response (NCTIR).

- Compared to the FY 2017 enacted, the core non-proliferation program (NA-20) is 0.4 percent ($4.9 million) lower; DNN is 0.04 percent ($0.6 million) higher including both the core nonproliferation program and NCTIR.

QUESTIONS FROM SENATOR DEBBIE STABENOW

Q1. In your written testimony, you mention that you wish the Senate confirmed you earlier so you could have been "a full participant in crafting this (budget) proposal." I am assuming this means you would have sought changes to the budget request.

How would the budget look differently had you been confirmed by the Senate earlier? Would it not be proposing a $920 million cut to the Office of Science or a $1.5 billion cut to the Energy Efficiency and Renewable Energy office? Would it not be proposing to zero out the SuperTruck program and many other programs administered by the Vehicle Technologies Office?

A1. The FY 2018 Budget refocuses the Department's energy and science programs on early-stage research and development (R&D) at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost effective manner. This includes a $4.5 billion investment in the Office of Science, to continue and strengthen American leadership in scientific inquiry with Department of Energy (DOE) as the Nation's largest Federal supporter of basic research in the physical sciences.

The FY 2018 Budget focuses Energy Efficiency and Renewable Energy (EERE) resources on early-stage R&D, where the Federal role is strongest, and reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies. The Budget emphasizes energy technologies best positioned to support American energy independence and domestic job-growth in the near to mid-term. The Budget maintains America's leadership in transformative science and emerging energy technologies in sustainable transportation, renewable power, and energy efficiency.

EERE early-stage research focuses on technology challenges that have the potential for high return on investment, but which present a significant degree of scientific or technical uncertainty across a relatively lengthy time span, making it unlikely that industry will invest significant R&D on their own. Thus, this budget maintains the most critical core capabilities and infrastructure at DOE National Laboratories related to sustainable transportation, renewable power and energy efficiency technologies. Technology solutions derived from EERE early-stage R&D give U.S. industries, businesses, and

entrepreneurs the competitive edge needed to excel in the rapidly changing global energy economy. Industry deployment of these technologies creates jobs, reduces U.S. reliance on imported oil, increases energy affordability, improves energy security, ensures environmental responsibility and offers Americans a broader range of energy choices. As we move forward over the coming weeks and months, I look forward to working with you and your colleagues to finalize the funding for the DOE.

Q2. Thank you for your commitment to visit the Facility for Rare Isotope Beams project at Michigan State University. When completed, it will be the world's most powerful radioactive beam facility and advance new defense, environmental science, and medical technologies. The project will generate $1.7 billion in wages and $4.4 billion for Michigan's economy.

I was surprised that you would mention in your written testimony that the budget includes $80 million for the FRIB when that amount is $17.2 million less than what is required to keep the project on track and when your department acknowledges these cuts would drive up the project's cost by $20 million.

I appreciated your comments to me last week that you are committed to ensuring FRIB remains on budget and on schedule for completion. How will you work with me and the Congress to ensure this objective is achieved when the budget does not include the resources necessary to make this happen?

A2. Construction of the Facility for Rare Isotope Beams (FRIB), which will provide world-leading capabilities for nuclear structure and nuclear astrophysics, is a high priority for the Department and strongly supported within the FY 2018 President's Request. The project has made impressive progress since it started in FY 2014 and it is over 70% complete. The project will be re-baselined to reflect an increased Total Project Cost and schedule delay as a result of a decrease in its funding in FY 2018 relative to the current funding baseline profile. Even in the context of competing priorities, the Department is committed to supporting the project through to its successful completion, enabling U.S. world-class nuclear structure and astrophysics research.

Q3. I was very disappointed to see that the Department's budget proposes to zero out the SuperTruck program, along with most other programs in the Department of Energy's Vehicle Technologies Office.

SuperTruck is a 50/50 cost-shared, public-private partnership that promotes the research, development, and demonstration of technologies that improve the efficiency of tractor trailer trucks by more than 100% by 2020.

Trucks, which include Class 8 vehicles, haul as much as 80% of the goods transported in the country. Although they only make up 4% of vehicles on the road, they use about 20% of the fuel. Adoption of technologies because of SuperTruck will save millions of gallons of fuel per day and significantly reduce carbon emissions.

I understand budgeting requires hard choices. However this $20 million program that creates strategic public-private partnerships seems to exemplify the type of projects your Department should be engaged in, and moreover, reflect the programs you spoke favorably about to this Committee and with me personally. Why then is the budget eliminating funding for SuperTruck?

A3. SuperTruck II builds on the success of the SuperTruck I program and seeks to achieve greater than 100 percent improvement in freight efficiency (ton miles per gallon) as well as 55 percent engine brake thermal efficiency, with a focus on technologies with realistic potential for cost effectiveness.

The FY 2017 Consolidated Appropriations Act provided a second year of SuperTruck II funding at $20M and specified adding a fifth award. The Department plans to comply with this direction over the next few months, consistent with the competitive bid process. Since FY 2017 would be the final year of funding for this work, all awards will be modified to accommodate the $40M in enacted funding ($20M in FY 2016 and $20M in FY 2017) while increasing the program to five awards. The Department will continue to work with the five awardees and reflect DOE's overall commitment to focusing on early stage R&D.

Q4. During our conversation in January we discussed the Iran Deal and nuclear nonproliferation. At that time, you mentioned needing to learn more about the agreement and that one of your first actions as Secretary would be to meet with former Secretary Moniz to get more information. Have you met with Secretary Moniz and with experts at the International Atomic Energy Agency? If yes, are you confident that the Department of Energy has the tools necessary to enforce the agreement?

A4. Yes, I have met with former Secretary Moniz. DOE does not "enforce" the Joint Comprehensive Plan of Action (JCPOA) with Iran, but we play a leading role in developing and supporting the tools necessary for the United States to assess Iranian

compliance. For example, through technical support and training, DOE supports the International Atomic Energy Agency's (IAEA's) ability to monitor and verify Iran's nuclear activities. Since 1980 every IAEA inspector receives nuclear material measurement training at Los Alamos National Laboratory (LANL).

I met with IAEA Director General Yukiya Amano in March and look forward to meeting with additional IAEA experts in the future. Close collaboration with the IAEA is central to maintaining U.S. confidence in the IAEA's monitoring and verification activities and, by extension, Iran's continued compliance with the deal.

Many of the tools and capabilities available to the IAEA for JCPOA monitoring were also developed through DOE safeguards cooperation. For example, the On-line Enrichment Monitor, jointly developed by Oak Ridge National Laboratory (ORNL), LANL and the IAEA, allows the IAEA to determine if Iran enriches uranium above permitted levels. I am confident that the Department of Energy has the tools necessary to assess Iranian compliance with the JCPOA.

Q5. In your nomination hearing and in our conversations, you shared your commitment to sound science and the Department of Energy's essential role in supporting critical research and development. As you stated in January before this committee, research and development carried out at DOE has the potential to change the world and make a real positive difference in quality of life and the economy in our country – a sentiment I agree with.

However, multiple programs such as the Advanced Manufacturing Program and ARPA-E are severely cut or eliminated in this budget proposal. This budget does not seem to reflect the essential role you have described that DOE plays in technological advancements that improve people's lives and drives our economy.

According to a report from Ranking Member Cantwell, the cuts in your budget would result in 420 scientists in Michigan losing their jobs and future annual economic growth in my state being reduced by nearly $165 million annually. What impacts on technological advancements for our Country would you anticipate in the coming years as a result of the proposed cuts?

A5. Through careful prioritization and ensuring that funding goes to the most promising research, the DOE will continue to be a world-leading science and technology enterprise

that generates the innovations that fulfill our missions ensuring the Nation's security and prosperity.

The FY 2018 Budget Request focuses resources on early-stage R&D, where the Federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. This shift allows the private sector to fund later-stage research, development, and commercialization of energy technologies. By focusing on early stage R&D, the budget proposes critical investments necessary to sustain America's leadership in transformative science and emerging energy technologies.

Q6. Secretary Perry, in your interview with CNBC on Monday morning, you were asked whether you thought carbon dioxide was the 'primary control knob' for the temperature of the Earth and the climate. You responded: "No, most likely the primary control knob is the ocean waters and environment that we live in."

You went on to say that being a skeptic about the causes of climate change was "quite all right" and that if someone does not believe the science on climate change is settled, that person is wrongly treated as a "Neanderthal."

I don't have a problem when an individual has questions about anything. What I do find concerning is when someone holds a position that seems to disregard near scientific consensus – be it from NASA, NOAA, or the Intergovernmental Panel on Climate Change.

Given this scientific consensus, what information appears to have led you to think human activities are not the leading cause of climate change?

A6. I believe the climate is changing and man is having an impact. There are several 'control knobs' which contribute to that change. My focus as Secretary of Energy is to utilize American innovation and technology to produce energy in an environmentally responsible manner that enhances our economic security.

QUESTIONS FROM SENATOR AL FRANKEN

Q1. Mr. Secretary, I believe there is an important federal role in helping Tribal Nations develop electricity projects. Congress created the Tribal Energy Loan Guarantee Program in the Energy Policy Act of 2005 to help tribes overcome challenges in securing financing for electricity projects by allowing the DOE to guarantee loans. But until this year, the program had never received funding. Thanks to the help of many of my colleagues on this committee from both sides of this aisle—including Chairman Murkowski and Senators Hoeven and Barrasso—the Fiscal Year 2017 omnibus provided $9 million. Now the Department needs to set up the program and start issuing loan guarantees. This program can help develop energy resources and bring high-quality jobs to Indian Country, where they are badly needed. Will you commit to me that you will set up the program and expend the funding that Congress provided the Department?

A1. The FY 17 omnibus was enacted shortly before the FY 2018 Budget was released. The Budget proposes to terminate the Loan Programs, and the Department is currently in the process of evaluating how the credit subsidy provided in the omnibus fits within the loan program proposal in the budget.

Q2a. Secretary Perry, in April you ordered a 60-day review of U.S. electricity policy to determine whether coal and nuclear plants are being "unfairly" pushed off the grid. You suggested that renewable resources—like wind and solar—were threatening grid reliability and that because of that, we need to prop up coal and nuclear plants. What do you expect this study to find?

A2a. The Department, at my direction, has undertaken an internal review to examine the state of electricity markets and grid reliability and produce a study aimed at ensuring that our electric grid remains reliable, resilient, and affordable. The study is an impartial review of the state of electricity markets and related policies, and there are no preconceived notions as to the findings and recommendations that will result from this review.

I appreciate the value of all energy sources. My track record speaks for itself. As Governor of Texas, I helped oversee an enormous increase in wind energy such that Texas is now the largest wind energy producing state in America. The study raises important and timely questions about the electric grid. For example, it asks why so many

baseload plants—like coal and nuclear—have closed, whether wholesale energy and capacity markets are adequately compensating important resilience and reliability attributes, how electric markets have evolved, and whether regulatory burdens, subsidies, and mandates have forced premature retirements. I have directed the Department to conduct rigorous analysis to answer these questions and to recommend sound policies to protect the Nation's electric grid.

Q2b. How will you use the findings?

A2b. The study is an important step toward determining how to ensure a well-functioning electric grid for the long term. We expect that the study will show that many actors outside the Federal government have an important role in grid resilience and reliability. We plan to articulate a wide range of possible actions, ranging from immediate actions falling within the scope and authority of the Department to broader solutions the Department cannot undertake alone. The study is intended to inform and motivate further discussion and action within and across the electric stakeholder community. We look forward to a fruitful dialogue once the study is completed.

Q2c. Are you familiar with an extensive two year study, completed by the Department of Energy last year, which found that the U.S. energy grid could accommodate up to 80 percent wind and solar power with no loss of reliability? If so, why do you need an additional study?

A2c. This important building block study, which was in part funded at National Renewable Energy Laboratory by Department of Energy's (DOE) Office of Electricity Delivery and Energy Reliability, showed the potential to handle large amounts of variable renewable energy within the grid structure. It did not, however, conclusively model the impact of high penetrations of variable renewable energy. For example, the study showed modeling feasibility only if there were also grid changes equivalent to building over 40 new 1,000 megawatt transmission lines across the Nation and grid operations managed by a single balancing authority over the 48 contiguous states.

Q2d. In justifying the study, you claim that centralized power from coal and nuclear must be preserved as a matter of national security, yet DOD is moving toward a more diverse set of power sources precisely to increase reliability and security, in the U.S. and abroad. Why are these two agencies moving in what appears to be opposite directions?

A2d. American families and businesses deserve a power system that is affordable, supports national security through fuel diversity and fuel assurance, and is technologically advanced, resilient, reliable, and second to none. Because these goals may conflict and require delicate balancing by policymakers—for instance, high levels of reliability can become expensive, which works against affordability—and given growing levels of uncertainty and volatility from technology, finance, world threats, environment, etc., it is prudent to compile diverse portfolios that can provide a variety of important attributes. The study essentially asks how we should go about building and maintaining such portfolios, and seeks to understand the consequences for the Nation's electric resource portfolio options should significant amounts of coal and nuclear resources become unavailable to serve in current and future portfolios.

Q3. Secretary, during the hearing you said, "Is ARPA-E the holy grail of how government needs to be structured? I will suggest to you, maybe not." What did you mean by this statement? Other than proposing to end the program, are you planning on proposing reforms to ARPA-E, and if so, when will you share them with Congress?

A3. The Administration remains committed to responsible spending that supports early-stage energy research and is prioritizing high-impact early-stage research that the private sector is unlikely to undertake. There is concern about the potential for Advanced Research Projects Agency-Energy's (ARPA-E) efforts to overlap with Research & Development (R&D) being carried out, or which should be carried out, by the private sector. The proposed elimination of ARPA-E reflects both a streamlining of Federal activities and a refocusing on the proper Federal role in energy R&D.

Q4. According to DOE's FY 2018 budget submission, the MOX project has "experienced a 350 percent cost growth and a 32 year schedule slip since 2007." The MOX approach to plutonium disposition is now projected to cost approximately $50 billion, while the dilute and dispose alternative is less than half that—at about $17 billion. I commend you for proposing termination of the MOX project and instead pursuing the dilute and dispose alternative to plutonium disposition. I would also like to know, does DOE's current cost estimates for MOX include the decontamination and decommissioning of the facility at

end of the project? If current cost estimates do not include this, what is a rough order of magnitude estimate of the cost of decontaminating and disposing of the MOX facility once the project is finished?

A4. DOE's current cost estimates for the MOX project does not include decontamination and decommissioning of the facility. We do not have a rough order of magnitude estimate for these costs since this will be dependent on the negotiated final end state of the facility.

Q5. Recent news reports have revealed a series of safety violations at Los Alamos National Laboratory, in particular a lack of safety culture and repeated violations of safety rules involving plutonium. According to the *Washington Post* story, almost all of the people hired to enforce the safety procedures have quit in frustration. Apparently, these problems have been going on for 4 years, if not longer. What is DOE doing to immediately improve the handling of plutonium at Los Alamos and to insure that any safety procedures are enforced?

A5. The *Washington Post* article discussed a series of safety infractions at Los Alamos National Laboratory (LANL) dating back to 2011. The article characterizes these events as on-going occurrences. However, most of the events described in the *Post* article happened prior to 2014. Regardless of the timeframe, corrective actions and improvements have been underway during the past, approximately, four years. Though we have made substantive progress, we understand that we need to continue to make improvements since the Lab has not yet attained the level of excellence DOE expects.

As a result of the issues identified in 2011, initial improvements in staff training were completed in 2012. Those improvements, however, did not resolve all the underpinning issues that ultimately led to significant criticality safety staff attrition by 2013. The Laboratory Director paused plutonium operations in 2013 principally due to problems in work execution, which was compounded by insufficient criticality safety professional staffing. The Laboratory began a corrective action plan to improve the Laboratory's safety culture and staffing. Actions under that plan continue today.

Initial efforts focused on improving plutonium handling processes. Improvements included revising procedures used to handle plutonium, enhanced training in plutonium

handling, and strengthening and increasing senior management reviews up to and including reviews with the Laboratory Director on actions and progress.

The Laboratory Director resumed lower risk operations in 2014. DOE federal staff reviewed the resumption process and the operations as they were restarted. Higher risk operations were resumed using a very structured process requiring federal verification that procedural and operational improvements were institutionalized within the Laboratory. Federal and contractor staff collaborated to ensure stockpile surveillance and production mission milestones were adequately managed. NNSA deployed resources from headquarters to assist the on-site field office in addressing these issues.

The result of this multi-year effort is a demonstrated improvement in plutonium handling processes and procedures. Six extensive federal assessments have verified that operational improvements and the underpinning training and culture are in place to support safe handling of plutonium in support of the mission.

The Laboratory has also strengthened the criticality safety division. The management that contributed to the staff attrition was replaced, and aggressive hiring to rebuild the criticality safety division continues. The division has been elevated within the organizational reporting structure to improve visibility and quickly obtain senior management help when needed. Currently, the criticality safety division staffing numbers are reaching the levels needed to fully support all Laboratory operations where significant quantities of nuclear materials are handled, although several staff remain in training. These efforts will continue until the LANL criticality safety division is a sustainable, world-class safety department.

Q6a. NNSA is reportedly considering alternatives for facilities to produce pits for nuclear weapons and earlier this month implied that pit production might be moved out of Los Alamos. One alternative being considered is the Savannah River Site. Is NNSA considering moving pit production to the Savannah River Site?

A6a. NNSA is conducting an Analysis of Alternatives (AoA) to evaluate all plausible options that could provide enduring plutonium infrastructure capable of supporting pit production

capacity of 80 pits per year. Multiple sites within the Nuclear Security Enterprise, including Los Alamos National Laboratory and the Savannah River Site, are being considered within the analysis. The AoA itself is not a decision, but a tool used to gather and analyze pertinent data as needed to inform the decision-making process. The AoA is expected to be complete in the summer of 2017.

Q6b. Is NNSA considering repurposing the MOX building for pit production?

A6b. Repurposing the MOX building for pit production is one of the alternatives being considered in the Analysis of Alternatives. The AoA itself is not a decision, but a tool used to gather and analyze pertinent data as needed to inform the decision making process. The AoA is expected to be complete in the summer of 2017.

Q6c. Is the Administration still committed to disposing of the excess weapons plutonium intended for MOX fuel or does it now intend to use this plutonium in the production of new nuclear weapons pits?

A6c. The Administration remains committed to disposing of our excess weapons-grade plutonium.

Q7a. In contrast to previous years, the FY 2018 budget request does not contain any information about the estimated appropriations necessary for the five year period of the Future Years Nuclear Security Program. This five year projection is helpful for understanding future implications for today's spending decisions and helps Congress better understand how to prioritize scarce resources. This is especially important with respect to the Weapons Activities account because, as you are aware, there is substantial disagreement and uncertainty over the cost of nuclear modernization.

Why did the FY 2018 budget submission include information about costs for FY 2018 only?

A7a. Estimates for the FY 2019 – FY 2023 base budget topline for the NNSA reflect FY 2018 levels inflated by 2.1 percent annually. This outyear topline does not reflect a policy judgement. The Presidential Memorandum on Rebuilding the Armed Forces, released on 01/27/17, directed a series of defense reviews including the initiation of a new Nuclear Posture Review, to ensure that the U.S. nuclear deterrent is modern, robust, flexible, resilient, ready, and appropriately tailored to deter 21st century threats and reassure our allies. Once the National Security Strategy and Nuclear Posture Review are completed,

the Administration will make a policy judgement on amounts for the NNSA's FY 2019 – FY2023 topline in the FY 2019 Budget.

Q7b. When can Congress expect to receive information about the remaining years of the Future Years Nuclear Security Program?

A7b. The Administration will make a policy judgement on amounts for the NNSA's FY 2019 – FY 2023 topline in the FY 2019 Budget, in accordance with the National Security Strategy and Nuclear Posture Review that are currently under development.

Q8. I am concerned that the budget request for the Department of Energy proposes severe reductions to the Office of Energy Efficiency and Renewable Energy, cutting funding by 65 percent for wind power, 66 percent for solar power, and 76 percent for water power technologies. These reductions, if implemented, would reduce progress made over the last several decades in reducing America's dependence on foreign oil and increasing our clean energy. Additionally, I am concerned that these cuts would negatively impact DOE's efforts to bring high-risk/ high-reward research in renewable power – like that conducted at the St. Anthony Falls Laboratory in Minnesota – across the innovation "valley of death." Can you explain to me how this budget supports, in your view, American innovation, clean energy, and a sustainable energy future?

A8. Through careful prioritization and ensuring that funding goes to the most promising research, the DOE will continue to be a world-leading science and technology enterprise that generates the innovations that fulfill our missions ensuring the Nation's security and prosperity.

The FY 2018 Budget Request focuses resources on early-stage R&D, where the Federal role is strongest, for energy technologies best positioned to enable American energy independence and domestic job-growth in the near to mid-term. This shift allows the private sector to fund later-stage research, development, and commercialization of energy technologies. By focusing on early stage R&D, the budget proposes critical investments necessary to sustain America's leadership in transformative science and emerging energy technologies.

Q9. The DOE employs advanced computing and simulation to accomplish its core mission of advancing scientific frontiers and safeguarding Americans. While the budget request increases funding for Advanced Scientific Computing Research, sufficient funding is not provided for important areas of fundamental research, such as applied and computational

mathematics and Artificial Intelligence. Meanwhile, other countries, including China, are increasing investments in these areas. What is DOE's strategy for this research? Does the Department have plans to engage the current community of university researchers in applied mathematics and similar fields?

A9. The decrease in the math and computer science research budgets from FY 2016 reflects a transfer of exascale related funding to the Office of Science Exascale Computing Project. The base research budgets continue to support fundamental research in areas such as data intensive science, Artificial Intelligence, and computing beyond Moore's Law. For example, ASCR currently supports a handful of small-scale research projects for exploring potential growth areas at the intersection of applied mathematics and Artificial Intelligence (AI). These will be used to spark larger-scale University and DOE national laboratory research investments and computational efforts involving AI. This effort engages universities as performers of research either directly funded by ASCR or in partnership with our national laboratories.

Q10. As you know may know, Minnesota experienced a serious propane shortage a few years ago due to pipeline outages, a large corn crop that needs propane for grain drying, and an extremely cold winter. This shortage caused the price of propane to skyrocket, making it very expensive for over 200,000 Minnesotans to heat their homes during an extremely cold winter. Although changes have been made, I'm concerned that propane stocks are falling again this year. What is being done to prevent another shortage?

A10. As the U.S. Government's provider of energy statistics and analysis, the Energy InformationAdministration (EIA) provides data and projections that can be used to inform the public. In response to the propane shortage experienced during the 2013/14 winter and current developments, EIA has taken the following actions:

- Starting with the 2014/15 heating season, EIA issues the Propane Situation Update briefing deck every Wednesday afternoon, from the first Wednesday in October to the last Wednesday in March. Michigan and Kansas are reported individually and the remaining Midwestern states are reported in groups, https://www.eia.gov/special/heatingfuels/resources/Propane_Briefing.pdf
- In October 2014 EIA expanded, in cooperation with participating states, the number of states covered in its State Heating Oil and Propane Program (SHOPP). The SHOPP

program surveys and reports average propane and heating oil prices at the state level, https://www.eia.gov/petroleum/heatingoilpropane/

- In January 2017 EIA began reporting rail movements of propane, in addition to pipeline and waterborne movements, at the regional level, https://www.eia.gov/dnav/pet/pet_move_railNA_a_EPLLPA_RAIL_mbbl_m.htm

- EIA is tracking propane inventories in the Midwest and sub-regions within it on a weekly basis.

- EIA has already engaged in discussions with industry and staff from Senate offices regarding current propane markets.

- EIA will brief staff from the offices of Senators Franken (MN) and Baldwin (WI) on issues affecting supply of propane in the Midwest at the end of July, when they will have additional data on propane inventory builds. Delegations from other states and associations have also been invited.

QUESTIONS FROM SENATOR JOE MANCHIN III

Q1. Secretary Perry, as you know, the United States is entirely far too dependent on other nations for our supply of rare earth elements. These elements, also called "REEs" or "critical minerals", are used in countless consumer products such as cell phones, televisions, and medical equipment. And these elements are increasingly the subject of national security concerns because our supply is imported from China. In fact, the Congressional Research Service reports that "refined rare earth metals are almost exclusively available from China. The United States has the expertise but lacks the manufacturing assets and facilities to refine oxides into metals…" That wasn't always the case. So, it's time we took a hard look at how to redevelop a domestic industry for these. West Virginia University is doing a lot of great work on extracting these materials from coal mine byproducts. Once commercialized, these processes could be a critical means of standing up a domestic market for rare earth elements. In the FY 2017 spending bill, we included a $15 million plus-up for R&D into the extraction and recovery of rare earth elements and minerals from U.S. coal and coal byproducts.

Can you please comment on the national security concerns associated with these elements?

How would you address these concerns in the context of this budget which would put constraints on this type of research?

A1. The U.S. is now largely import dependent for rare earth elements (REEs), which are needed in manufacturing in the communications, defense, information technology, medical, and renewable energy sectors. Billions of dollars are now spent on imports of these technologies, which include components made from REEs, that could instead be manufactured in the United States if the needed minerals can be supplied domestically. The potential economic benefits are substantial. Some of the raw materials for fiber optics systems, lasers, carbon fibers, and products needed for U.S. infrastructure improvements can be produced domestically. Department of Energy's Office of Fossil Energy is working within the current budget to establish the technical and economic feasibility of producing these key materials domestically from coal and coal products. Our current focus is production of REEs in coal country to reduce our import dependence, to help insulate these U.S. regions from swings in markets for conventional coal products, and to attract advanced manufacturing facilities to one source of the materials - U.S. coal country. This research on extracting rare earth elements from domestic resources like coal is a complement to the research at the National Labs like Idaho, Ames, Oak Ridge and Livermore that focus on new approaches to subsequent

chemical separation and processing of rare earth materials into technologies like magnets, phosphors (for TVs, lighting and cell phones) and other items important to our strong domestic energy and manufacturing sectors.

Q2. West Virginia is known for coal. But what we're less known for is the work we've done to burn that coal more cleanly. The DOE's fossil energy research is headquartered at the National Energy Laboratory in West Virginia, where NETL has worked with the private sector on the technologies we use to remove particulates and other harmful substances from coal. The National Energy Technology Lab in Morgantown, West Virginia is an extraordinary complex that is near and dear to my heart and employs 612 people. Your budget proposes consolidation of the 3 lab facilities that make up NETL in a phased approach. First, Albany would be consolidated in to the Eastern sites and, as your written testimony notes, the Department will "evaluate alternatives for the consolidation of NETL's eastern sites" in Pittsburgh and Morgantown. I believe that research and development is critical to the Department of Energy mission and the national lab system is vital to ensuring that we are on the cutting edge of energy technology development. The Morgantown facility is seen as a mainstay of fossil fuel technology development. Their projects on carbon capture, efficient utilization of coal, and how to integrate fossil fuel systems with renewable energy are vital to our energy future.

What is the goal behind this consolidation of the NETL facilities in Morgantown, Pittsburgh, and Albany, Oregon as proposed?

Can you provide additional details?

A2. The Department's goal is to ensure we deliver cutting edge research that meets the needs of the energy industry and the American public by ensuring we have aligned and streamlined our scientific talent, physical assets and capabilities to serve this mission in the most cost-effective manner. To achieve this goal, we are launching a comprehensive study to analyze the costs and benefits of the National Energy Technology Laboratory three-site configuration as well as options to maximize its capabilities. The results of this comprehensive study will inform the best approach to achieving this goal.

Q3a. West Virginia is hurting. The decline of the coal industry has been devastating. We are losing businesses and population. So, in addition to doing everything we can to stop the bleeding and help our people in the near-term, we are also looking for ways to revitalize our home state economy. I recently introduced the Capitalizing American Storage Potential Act which will help create an Appalachian Storage Hub. It would maximize the opportunities associated with our vast reserves of natural gas liquids (NGLs). According to the Mid-Atlantic Technology Research & Innovation Center, about 20% of the value in the Marcellus Shale alone is ethane, propane, and butane – also known as natural gas

liquids, attracting investments and creating jobs. So, the Hub will attract manufacturers that need reliable affordable access to these products. With safety and the environment top of mind, I'd like to see the Storage Hub move forward and that's why I introduced a bill making the storage hub eligible for Title XVII – to provide access to low cost financial capital to help overcome private sector concerns about risk.

Putting aside that the President's budget proposes the elimination of the loan program, what is your perception of this program which has a 97.78% repayment rate?

A3a. To support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's FY 2018 budget proposal reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage research and development. Consequently, the budget reflects terminating loan originations after September 30, 2017.

Q3b. Can you commit to work with me on how the Department of Energy can help the Appalachian Storage Hub?

A3b. I look forward to continuing our dialogue on the Appalachian Storage Hub. Our roundtable discussion on the project was very productive, and I look forward to engaging you and your staff further.

QUESTIONS FROM SENATOR MARTIN HEINRICH

Q1. I am pleased to see the Office of Technology Transitions is again funded in your budget. Last year, DOE successfully piloted a new approach to promote technology transfer from the DOE labs using a voucher program that pairs businesses with lab scientists and engineers to help speed up commercialization of technologies. I've been an advocate for voucher programs that help move technologies from the labs. What are your specific plans to promote tech transfer from the labs using the funding set aside in the Technology Commercialization Fund, and will you support a second round of vouchers to bolster the commercial application of lab-developed technologies?

A1. DOE is aware that it is a statutory requirement to provide funding to support the Technology Commercialization Fund (TCF) and will adhere to that policy. We are in the final stages of selecting the 2017 TCF awardees, having recently completed the merit review process for the proposals submitted in response to our FY 2017 request during the first quarter of the fiscal year. I am pleased to report that there was increased interest and we received an increase of almost 25 percent in the number of proposals submitted for funding by the TCF in 2017 versus 2016.

As required under the statute, all TCF awards require matching private funds. In order to promote tech transfer from the labs, those labs that are contractor operated may use non-appropriated funding to submit proposals in two topic areas: Topic Area 1: Projects for which additional technology maturation is needed to attract a private partner; and Topic Area 2: Cooperative development projects between a lab and industry partner(s), designed to bolster the commercial application of a lab-developed technology. All labs are eligible to submit and receive awards in Topic 2. All projects selected for the TCF must receive at least an equal amount of non-federal funds to match the federal investment.

There have been two separate voucher type programs that have been pursued by DOE on a pilot basis over the past two years. One is a Small Business Voucher program in which funding and lab mentoring is provided to small businesses that are developing promising technologies that may or may not have originated at a National Lab. That pilot was begun in the Energy Efficiency and Renewable Energy program and has expanded to the Nuclear Energy program. The other pilot is the Energy I-Corps (previously known as Lab-Corps),

which partners national lab scientists and engineers working on energy technologies that have shown potential for commercial application with industry mentors. This activity provides a two-month intensive hands-on training for our lab scientists and engineers to learn how the private sector approaches decision making on technologies and products so the technologies (and companies licensing them) can successfully compete in the marketplace. This is accomplished using the energy technologies that have already been developed at the lab. The opportunity for training and mentorship by private sector experts enhances the ability of the national labs to successfully identify technologies with high potential for commercialization. Both the Small Business Voucher and the Energy I-Corps programs are under evaluation to determine their effectiveness and whether they merit continuation.

Q2. You committed to the president your 60-day internal study of grid reliability and energy markets would "provide concrete policy recommendations and solutions." You indicated today your study is now due in early July. Given this is an internal report that could have wide-ranging implications on future markets, will you consider providing an opportunity for public review and comment on a draft of the report before the recommendations are finalized?

A2. We intend to publish the report, and we recognize the great interest that this internal review has garnered. In the spirit of transparency, we will welcome stakeholder input on the finished product. We are establishing a mechanism now to catalog those comments. All interested stakeholders will have ample opportunity to comment on the actual contents of the study.

While the Department receives a great deal of input from its stakeholders, we see this study as an important step in determining how to ensure a well-functioning electric grid in the long term. The Department has no preconceived notions as to the findings and recommendations that will result from this review. We look forward to a fruitful dialogue once the review is completed.

Q3a. In responding to my question today, you indicated your forthcoming internal grid study would address issues of reliability in states such as Texas. As you well know, wind generation in West Texas has grown dramatically over the last few years and now accounts for about 23 percent of power generation for the Electric Reliability Council of Texas (ERCOT). Further, ERCOT believes close to 100% of new electricity generation that will be added in Texas over the next 10 years will likely be either solar and wind power. Do you agree with ERCOT's technical assessment that it can accommodate such high penetration levels of renewable energy?

A3a. It is technically feasible to do many things on the grid that may not be economic or prudent to do on a large scale or an extended basis, so changes such as you describe require careful study and planning. When large amounts of variable renewable generation capacity (such as wind and solar) are added to the grid, they typically have to be backed up by some combination of highly flexible alternatives, such as gas-fired generation, energy storage devices, or demand response capacity, all of which need to be economically viable so that they will continue to be available when needed. Increasingly, given the design of today's wholesale electricity markets (including ERCOT), the addition of large amounts of zero-marginal cost wind and solar (and sometimes even negatively-priced wind because of the Federal production tax credit) into the markets can conflict with the economic viability of the generation resources necessary when the electricity from wind or sun are not available. Further, the addition of large amounts of renewables often requires the development of substantial additional transmission capacity, which typically takes significant time and capital investment, the cost of which generally falls to ratepayers. If ERCOT and the Texas electric power industry are able to bring on significant amounts of additional renewables while also doing the other things necessary to keep their system reliable and economic, that would be a welcome outcome.

Q3b. If not, what federal policy remedies will you recommend to correct Texas's decision to increase its share of competitive renewable generation?

A3b. It is unlikely that we will make specific recommendations to Texas (or any other state) about how it should balance its generation portfolio.

Q4. In a letter dated July 25, 2014, the Nuclear Weapons Council gave Congress its commitment to build modular structures to maintain plutonium production and associated

support capabilities at Los Alamos National Laboratory consistent with section 3114 of the National Defense Authorization Act for 2013, as amended by section 3117 of NDAA for 2014. The NWC also stated the modular building strategy at LANL met the requirements for maintaining the nuclear weapons stockpile over a 30-year period. The plutonium strategy endorsed by the Nuclear Weapons Council and required by the NDAA will require substantial new investments at LANL over the next five years. I understand CD-0 was approved in August 2015 to construct two new modular structures for plutonium research at LANL not later than 2027. What is the status and timeline to complete the required Analysis of Alternatives? When do you now expect CD-1 and CD-2 to be approved?

A4. Critical Decision (CD)-0 approval recognized NNSA's need to provide high-hazard, high-security laboratory space for conducting plutonium operations required for the enduring stockpile stewardship and management activities over the long term. Consistent with DOE Order 413.3B, and GAO best practices, an Analysis of Alternatives (AoA) is being conducted after CD-0 approval. The AoA evaluates options to address that need, and is expected to be complete in the summer of 2017.

Once the AoA is complete, and a preferred alternative is selected, National Nuclear Security Administration (NNSA) will initiate conceptual design and other activities to prepare for Critical Decision (CD)-1 submittal, which is anticipated in FY 2018. NNSA anticipates achieving CD-2 in FY 2020.

Q5. I understand as governor you were interested in hosting temporary storage of high-level commercial nuclear waste and spent nuclear fuel in Texas. In 2012, the Blue Ribbon Commission's report on nuclear waste made very clear that the only possible path forward is through a consent-based approach to siting both temporary storage and permanent disposal facilities for high-level waste. Will you continue DOE's policy of consent-based siting? What in your mind constitutes "local consent" for siting nuclear waste facilities?

A5. As Secretary, I continue to see the benefits that consolidated interim storage could provide in removing waste from some 120 sites around the country to one or a few consolidated storage facilities as we work towards a permanent disposal solution. With regards to an interim storage facility, it would need to be sited in accordance with local, state, and federal laws and regulations. Currently, the procedures for pursuing geologic disposal are prescribed by the Nuclear Waste Policy Act.

Q6. Interstate energy transmission projects take significant investments and have long lead times. For project developers, it is critical to have some certainty in the timing and scope of federal permitting reviews. Under the energy Policy Act of 2005, the Department of energy was given multiple authorities to facilitate the timely construction of interstate electric transmission facilities. What steps is the Department taking under its existing authorities to facilitate the required reviews of multi-state high-voltage transmission lines?

A6. On September 23, 2016, Department of Energy (DOE) issued a Final Rule for Coordination of Federal Authorizations of Electric Transmission Facilities establishing an Integrated Interagency Pre-Application (IIP) process. The IIP process was developed under the specific authorities found in section 216(h)(3) of the Federal Power Act, which requires the Secretary, to the maximum extent practicable under Federal law, to coordinate the Federal authorization and review process with any Indian tribes, multi-state entities, and state agencies that have their own separate permitting and environmental reviews. Section 216(h)(4)(C) also requires the Secretary to establish an expeditious pre-application mechanism to allow project proponents to confer with Federal agencies involved and for each such agency to communicate to the proponent any information needs relevant to a prospective application and key issues of concern to the agencies and public. The Final Rule went into effect on November 23, 2016.

The IIP is voluntary and timing for the process is driven by the transmission community. The IIP allows perspective transmission project proponents to engage in DOE-facilitated early project information sharing to inform any subsequent environmental review by Federal agencies under National Environmental Policy Act. An important strength of the process is that other agencies (Federal, regional, state, local, and tribal) with authorizations or permit decisions for a proposed transmission project are invited to participate so the information is shared at one time. This provides a transmission developer an opportunity to substantively discuss a proposed project with all agencies, to ensure that potential issues are identified by permitting agencies and tribes before a project proponent files an application, and to enjoy time savings through better early project planning. The deliverable of the IIP process is a Final IIP Resources Report—essentially an applicant-prepared Environmental Assessment—that is submitted to the lead agency conducting subsequent environmental review following application for

Federal authorizations. This document and its contents, which are vetted by the participating agency and tribal staffs, is incorporated into agencies' administrative record for permitting decisions, thereby using this early information to inform Federal agency decisions.

DOE's implementation of Section 216(h) authorities is on-going and DOE is currently developing policy and guidance with the Administration's focus on increased electric infrastructure development to effectively and efficiently meet the reliability and resiliency needs of the Nation's electric grid.

Q7. The FYI8 budget request for Science and NNSA provides increases in funding to accelerate the development of exascale computing. Exascale technology is important to the United States' national interests: With exascale technology, we can fight diseases, better maintain our nuclear stockpile and analyze the potential of foreign threats against the United States, and catalyze industry to produce products faster, cheaper, and more safely. Previous agency plans have called for exascale development in the 2023 timeframe, but the President's budget has included funding to accelerate its development to 2021. What specific factors led to your decision to accelerate the project delivery of at least one exascale-capable system in 2021?

A7. The 2021 date is result of a request for information issued in early 2017 and subsequent discussions with U. S. computing vendors. Based on this work, it was evident that results of previous high performance computing activities yielded sufficiently innovative technologies that, with the appropriate investments, make exascale achievable in 2021. Achievement of exascale requires new hardware and software designs and technologies – not just more of the same technologies strung together – to overcome challenges in parallelism, energy efficiency, and reliability. We and our private-sector partners will be pushing our state-of-the-art fabrication techniques to the limit to achieve exascale. Significant one-time investments in engineering ("non-recurring engineering") and design by the vendors in conjunction with DOE's team must be started as soon as possible in order to deliver an exascale system in 2021. Considerable concurrent investments are needed to develop software and applications to effectively use an exascale system on scientific problems and nuclear weapons applications. The 2021 delivery of hardware is aligned with the timeframe for completion of the necessary software and application development.

Deploying at least one exascale system in 2021 will keep the U. S. competitive in the international exascale race. As the Council on Competitiveness stated, "A country that wishes to out-compete in any market must also be able to out-compute its rivals." Exascale computing is critical to the national security, scientific, and energy missions of the Energy Department. Exascale also is critical to ensure U.S. primacy in computing to advance economic competiveness in technological and manufacturing processes. Achievement of exascale will deliver breakthrough computer performance to both the Federal and private sectors. The accelerated investments in design and engineering over the next 3-4 years will keep the U.S. at the forefront of computational platforms. This will allow us to continue to lead in: scientific and engineering progress; advances in manufacturing techniques and rapid prototyping; nuclear security missions including stockpile stewardship without testing; and, the ability to explore, understand and harness natural and engineered systems that are too large, too complex, too dangerous, too small, or too fleeting to explore experimentally.

Q8. Your 2018 budget request provides for a substantial decrease in funding for the Department's Office of Electricity (OE). OE is one of the most critical parts of DoE because of its role in funding a wide range of grid modernization research and deployment programs, as well as leading-edge grid security and reliability programs. Grid modernization is especially important to help propel the US economy forward. Is there a way that these programs can be shielded from such severe funding damage so that these valuable efforts can continue?

A8. DOE agrees that grid modernization is critical to our economy and security, however the current fiscal environment requires thoughtful prioritization of Federal investments. The FY 2018 budget request focuses Federal funding on early stage research efforts, allowing for private industry to leverage this research for innovative applied solutions, demonstrations, and pilot projects tailored to market needs and opportunities. Where market incentives exist to undertake research and development activities like those previously supported by OE, such activities may be better initiated and managed by the private sector.

QUESTIONS FROM SENATOR MAZIE HIRONO

Q1. During your confirmation hearing in January, I asked you how the Department of Energy under your leadership would be able to effectively pursue an all-of-the-above energy strategy – as you testified the Department would do – if the Trump Administration held true to its threat to completely eliminate a core program like the Office of Energy Efficiency and Renewable Energy (EERE) which focuses on transitioning to a cleaner, renewable energy economy. You said, "Well, Senator, maybe they'll have the same experience I had and forget that they said that." While this was a humorous response, we now know that the Trump Administration did not forget. The President's budget proposes to cut the EERE program by 70 percent. The program was funded at $2.1 billion in FY 2017 and is proposed to be funded at $636 million in FY 2018. How can the Department lead an all-of-the-above energy strategy if so much of the Department's all-of-the-above capabilities are being eliminated or marginalized through drastic funding cuts? I recognize that work on this budget proposal was underway before you were confirmed, but do you support actually making these cuts?

A1. I support the President's Fiscal Year (FY) 2018 Budget which refocuses the Department's energy and science programs on early-stage research and development at our national laboratories to advance American primacy in scientific and energy research in an efficient and cost-effective manner.

The FY 2018 Budget focuses its investments on the basic, early-stage research and development (R&D) conducted by the scientists and engineers at our 17 national laboratories who are constantly on the path to developing the next great innovations that can transform society, and bring forth a new era of prosperity for the American people. These investments span technologies across the entire energy sector, including coal, natural gas, unconventional fossil energy, nuclear energy, renewable energy, energy efficiency, advanced transportation, the electric power grid, and basic science research. Across all of these areas, the Budget provides $6.4 billion, $4.5 billion in the Office of Science and $1.9 billion in energy research and development programs, with a renewed focus on cutting-edge innovation and transitioning those breakthroughs to the private marketplace. These comprehensive and focused investments will allow the Department, through its National Laboratories, to continue supporting the world's best enterprise of scientists and engineers who create innovations to drive American prosperity, security and competitiveness for the next generation.

Q2. Hawaii has relied on imported fossil fuels for over 90 percent of our energy production. Thanks in large part to a memorandum of understanding signed first under President George W. Bush, the DOE has been a key supporter of Hawaii's efforts to shift towards sustainable locally produced renewable energy. Technical assistance and grants from DOE's State Energy Program have played a crucial role in accelerating the shift away from imported oil. In calling for the elimination of the State Energy Program, you assert in your testimony that "later-stage R&D, demonstration, and deployment responsibilities" should be shifted to the private sector and the States. Please explain to me your rationale for cutting off Hawaii's access to what you describe in your testimony as the "world's best enterprise of scientists and engineers who create innovations to drive American prosperity, security and competitiveness for the next generation."

A2. The Administration is committed to energy policies that lower cost for hardworking American's and maximize the use of American resources, freeing us from dependence on foreign oil. The President's FY 2018 Budget Request for the Department of Energy (DOE) demonstrates the Administration's commitment to reasserting the proper role for what has become a sprawling Federal Government and reducing deficit spending. It reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage research and development. The DOE anticipates that the states, to the extent practicable, will re-prioritize state budgets and resources to support these programs as appropriate within their states.

Q3. On June 20, the Natural Energy Laboratory of Hawaii Hawaiian Electric Light Company and others announced their plans to install an advanced flow battery using the element vanadium order to test its ability to provide long-duration grid-scale energy storage in a warm weather environment. DOE's Office of Electricity and the Sandia National Laboratory offered expertise, coordination, and financial support in helping this project happen. Energy storage technologies like this can help the whole country make use of greater amounts of energy from renewable sources like solar and wind and help Hawaii reach its goal of 100% renewable sources electricity by 2045. Given the promise of energy storage technologies and the reluctance of electric utilities to be the first to try out a new and capital-intensive technology on its own, do you agree with me that it is incredibly short-sighted to for this budget to propose cutting the Office of Electricity's energy storage program by 60 percent?

A3. Energy storage is a promising technology for grid modernization. It provides the flexibility for variability in electricity supply and demand, enhances asset utilization, and contributes to electric system reliability and resilience. The FY 2018 budget request focuses Federal funding on early stage research efforts, allowing for private industry to

leverage this research for innovative applied solutions, demonstrations, and pilot projects tailored to market needs and opportunities. States may choose to support these efforts based on local priorities. DOE will continue to work with the private sector and the states to ascertain technological needs.

Q4. The budget targets electric transmission and reliability, smart grid research and development, and energy storage for deep cuts, ranging from 64 to 80%. Hawaii has been on the leading edge of grid modernization, benefitting our residents, businesses, and military installations with a more reliable electricity supply. Why is the Administration trying to cut support for work that makes our grid more efficient, affordable, reliable, and less vulnerable at a time when cyber threats and threats from extreme weather and climate change are increasing?

A4. DOE agrees that efforts to make our grid more efficient, affordable, reliable, and less vulnerable are important. However, the current fiscal environment requires thoughtful prioritization of Federal investments. The FY 2018 budget request focuses Federal funding on early stage research efforts, allowing for private industry to leverage this research for innovative applied solutions, demonstrations and pilot projects. States may choose to support these efforts based on local priorities. DOE will continue to work with the private sector and the states to ascertain technological needs. Moreover, where market incentives exist to undertake R&D activities like those previously supported by OE, such activities may be better initiated and managed by the private sector.

QUESTIONS FROM SENATOR BILL CASSIDY

Q1. As you know, many of my constituents and I, have an interest in the Lake Charles Methanol project. The project received a conditional commitment from DOE for a loan guarantee last December. While the Department recommended in its budget for FY 2018 that the Loan Program be terminated, the budget recommendation did not rescind budget authority for projects that received a conditional commitment prior to October 1, 2017. My reading of DOE's proposal is that the Department will honor the conditional commitment for the Lake Charles project when the project is presented for financial close.

Given this budget was already written by the time you were confirmed, are there specific reforms you would like to implement to the DOE Loan Program that would give you greater confidence that taxpayers are being protected, while at the same time making financing available for first of a kind innovative energy projects?

A1. The Loan Programs Office underwrites and structures its loans and loan guarantees to protect the interests of taxpayers and maximize prospects for full repayment. The Government Accountability Office (GAO) has stated in one of their past reports that some private lenders have noted that the Department's due diligence is as rigorous – or more so – than that performed in the private sector.

However, to support the Administration's commitment to reasserting the proper role of what has become a sprawling Federal Government and reducing deficit spending, the President's Fiscal Year (FY) 2018 budget reflects an increased reliance on the private sector to fund later-stage research, development, and commercialization of energy technologies and focuses resources toward early-stage research and development. Consequently, the budget reflects terminating loan originations after September 30, 2017.

Q2. The President's budget calls for a significant reshaping of the Strategic Petroleum Reserve. The budget requests additional sales of approximately 270 million barrels of crude by 2027, on top of the sales included in legislation last Congress. The budget also calls for the closure of 2 of the 4 SPR sites. While I do not support such a drastic reduction in the SPR, Congress will ultimately decide if additional sales are appropriate. What I am most interested in hearing are your plans on utilizing the Energy Security and Infrastructure Fund to modernize the SPR facilities. What is your assessment of the readiness and condition of the SPR facilities?

A2. While the Strategic Petroleum Reserve (SPR) remains operationally capable and ready to drawdown its crude oil inventory if directed to do so, a significant amount of

infrastructure is approaching or has exceeded its 25 year design life and is in need of replacement. To address this issue, the SPR has initiated the Life Extension Phase II project as part of its SPR Modernization program. This project is on schedule, with an anticipated completion date between FY 2022 and FY 2024. Section 404 of the Bipartisan Budget Act of 2015 (Public Law 114-74) authorizes the Secretary of Energy to sell up to $2 billion of SPR crude oil over four fiscal years commencing in FY 2017 through FY 2020. Receipts from these sales are deposited to the Energy Security and Infrastructure Modernization Fund to fund SPR Modernization program activities. In FY 2017, the SPR sold 6.28 million barrels of crude oil resulting in receipts of $323.2 million, to be applied towards the Life Extension Phase II project.

Q3. The Strategic Petroleum Reserve is decades old, and there have been recent reports of tank roof collapses and water pipe damage. What specific steps do you plan to take to ensure that this vital national resource is maintained and is fully operational if needed?

A3. While the SPR remains operationally capable and ready to drawdown its crude oil inventory if directed to do so, a significant amount of infrastructure is approaching or has exceeded its 25 year design life and is in need of replacement. To address this issue, the SPR has initiated the Life Extension Phase II project as part of its SPR Modernization program. The purpose of this project is to modernize aging SPR infrastructure, SPR storage sites and the St. James marine terminal through systems upgrades and equipment replacement to ensure the SPR's operational readiness to meet mission requirements. The project is on schedule, with an anticipated completion date between FY 2022 and FY 2024.

Q4. Southwest Louisiana and Texas have been leading the way on development of LNG Export facilities. Louisiana is expecting its second facility to begin exporting globally next year. According to Shell, global LNG demand is expected to increase 4-5% annually until 2030. We need to be in a position to fill that demand with U.S natural gas as the demand grows.

Unfortunately, the past Administration prolonged the export approval process for several projects, including one project which waited 1,642 days for approval. In the current competitive market, foreign buyers are looking for certainty before agreeing to long-term offtake agreements.

Do you believe exporting natural gas is in the national interest of the United States, and if so, what specific actions can you take as Secretary to ensure these approvals do not languish at DOE, as they have in the past?

A4. To date, Department of Energy (DOE) has issued 28 final Liquefied Natural Gas (LNG) export authorizations to any country in the world where trade is not prohibited by law, in a cumulative volume of exports totaling 21.33 billion cubic feet per day (Bcf/d) of natural gas. In these orders, DOE has discussed the many benefits of exporting U.S. LNG, including environmental benefits, improved energy security for our allies and trading partners, and economic growth as measured by U.S. gross domestic product. DOE has found that these benefits are consistent with the public interest. DOE has acted on all applications ready for final DOE action. Thus far in 2017, DOE has granted the applications to export LNG from the proposed Golden Pass, Delfin and Lake Charles LNG export projects. DOE intends to continue taking prompt action on all applications that are ready for final action at DOE.

DOE's review of applications to export LNG to non-free trade agreement countries requires a public interest review under the Natural Gas Act, as well as an environmental review under the National Environmental Policy Act (NEPA). For large-scale LNG projects, the NEPA reviews are led by the Federal Energy Regulatory Commission (FERC) or U.S. Department of Transportation Maritime Administration (MARAD), with DOE acting as a cooperating agency. Given the size and scope of LNG projects, NEPA reviews that include issuing a Record of Decision or a Finding of No Significant Impact can take more than two years. Once the lead agency (FERC or MARAD) completes the NEPA review and issues a Record of Decision or Finding of No Significant Impact for a particular LNG export project, DOE typically acts within days or weeks to complete its public interest review and issue a final order.

Ultimately, the market will determine how much U.S. LNG export capacity is built and utilized. The most recent long-term forecast by the U.S. Energy Information Administration, the *Annual Energy Outlook* 2017, sees U.S. LNG exports reaching a high of 12 Bcf/d of natural gas by 2040. According to data submitted to DOE, LNG export

projects accounting for nearly half of the total LNG volume approved to date for export to any country in the world (10 Bcf/d of the 21.33 Bcf/d total) are currently under construction. In addition to promptly reviewing LNG export applications as part of our regulatory responsibility, DOE is working with the Administration, industry, other Federal and state government agencies, and our international partners to help U.S. companies maximize opportunities in the global LNG market.

Q5. In the President's FY18 Budget, the Administration proposes to spend $279 million to terminate the Mixed Oxide Fuel Fabrication Facility (MOX). This is a position that was shared by your predecessor Secretary Moniz but Congress has continued to reject this approach. The issue that has come up time and time again is the "re-baselining' of the project, or in other words figuring out what the project would likely cost to finish. I am told that your Agency "re-baselined" the MOX project without consulting with the contractor, which appears to go against the clear intent of Congress.

If it is true that the "re-baselining" of the MOX facility was done improperly, without consulting those who would actually be working on the project, then why would the Department of Energy make a final determination to terminate the project with incomplete data?

A5. In response to the FY 2016 National Defense Authorization Act requirement, the Department updated the performance baseline for the MFFF project. This detailed estimate, which was prepared in collaboration with the U.S. Army Corps of Engineers and included consultation with the Contractor, was transmitted to Congress on September 14, 2016. The GAO has determined that the estimate is reliable. The estimated cost to complete the facility is roughly $12 billion. The project would bring total construction costs to $17 billion, when including $5 billion in sunk-costs to date.