

**THE DEPARTMENT OF ENERGY'S BUDGET  
REQUEST FOR FISCAL YEAR 2017**

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**HEARING**  
BEFORE THE  
**COMMITTEE ON**  
**ENERGY AND NATURAL RESOURCES**  
**UNITED STATES SENATE**  
ONE HUNDRED FOURTEENTH CONGRESS  
SECOND SESSION

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## **THE DEPARTMENT OF ENERGY'S BUDGET REQUEST FOR FISCAL YEAR 2017**

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**Thursday, March 3, 2016**

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

The Committee met, pursuant to notice, at 9:52 a.m. in Room SD-366, Dirksen Senate Office Building, Hon. Lisa Murkowski, Chairman of the Committee, presiding.

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

The CHAIRMAN. Good morning. The Committee will come to order.

We are here to consider the President's request for the Department of Energy (DOE) for Fiscal Year 2017. This is the second of three budget hearings before our Committee. Our final hearing on the budget will examine the Forest Service budget that is scheduled for next Tuesday.

Secretary, it is good to have you before the Committee. I want to, again, thank you for traveling to Bethel, Alaska and to Oscarville with myself and the Ranking Member and four other members of the Committee. It was a great field hearing. We really appreciate that you took the time to see the need, the opportunity and also the progress that we are making on energy innovation in rural Alaska.

The buzz is still going around the Tundra about the visit and the interest that was given to the region, so we appreciate what you have done there.

We also appreciate the effort that you make to work with us, and we are looking forward to your testimony today.

No surprise to you, but I have been critical of much of the President's overall budget request including his proposed \$10.25 per barrel tax on oil that will hurt families, businesses and our broader economy. The President's budget again features the usual assortment of tax hikes, fee increases and other policies that will only make our primary energy industries, oil, natural gas and coal, less productive. Despite totaling \$4.1 trillion, the President's budget also cuts the base funding for LIHEAP, the Low Income Home Energy Assistance Program, which helps thousands of Alaskan families stay warm during the cold months. These are just a few of my general criticisms of the President's budget request.

The reason that we have hearings like this is so we can take a closer look, to see if there are some things we might be able to work together on within specific areas.

To your credit, Secretary Moniz, the budget for Department of Energy has plenty that, I think, fits into that category. So I thank you for that. But I also think that it is a tribute to your leadership and to your efforts to improve your Department's performance in a cooperative as well as a bipartisan manner.

As you know, sometimes we do not always agree, but you have always given me the courtesy of an outreach and a conversation and I appreciate that.

As I mentioned, this is not the budget for the Department of Energy that I would write. I think it only partially adheres to the balanced energy policy that most of us agree on with significant increases for efficiency, vehicle and renewable technologies but a cut proposed for fossil R and D including the important work the Department should be doing to help develop methane hydrates.

I have some questions that I will ask about the mandatory spending this budget proposes. But here is the good news, even in the instances where, again, we may initially disagree, I know that you are going to work with us to find some common ground. When it comes to the importance of the innovation in America's future, particularly America's energy future, I know that you and I are on the same page. Even if our numbers do not necessarily align, I think the ultimate goal is there.

So thank you, I appreciate the opportunity to work with you and we look forward to your presentation.

With that, Senator Cantwell?

**STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON**

Senator CANTWELL. Thank you, Madam Chair, and thank you to the Secretary for being here at today's hearing.

I am very pleased to see that this year's 2017 budget request continues to push forward investments necessary for building the future of our economy through science and clean energy. The budget requests greater funding—an overall increase of ten percent—for DOE in Fiscal Year 2017, which is appreciated. The total budget request is \$32.5 billion or \$2.9 billion more than enacted in Fiscal Year 2016. This increase builds on the successful investments at DOE under Secretary Moniz's leadership, and we thank you for that.

In particular, the investments in science and energy at DOE have grown 15 percent over just the last five years, acknowledging the crucial role that innovation plays in enhancing our energy security, mitigating and adapting to climate change, boosting manufacturing competitiveness and creating jobs.

The DOE budget takes a big step forward in fulfilling the U.S.'s pledge to doubling Federal clean energy research and development investment over the next five years as part of Mission Innovation. In November 2015, President Obama and other global leaders announced the creation of Mission Innovation. This initiative is made up of 20 countries that have committed to doubling the research and development funding over five years in an effort to spur clean

energy innovation. The budget request provides details of the proposal, which would increase Federal investment from \$6.4 billion in FY 2016 to \$12 billion in FY 2021.

The budget makes the Administration's commitment clear, by providing \$7.7 billion for FY17 and funding clean energy R and D across the 12 agencies—roughly 20 percent above FY 2016.

But what is also key to this effort is successful partnerships with the private sector. At the same time the Administration announced Mission Innovation, a private sector innovation initiative was also announced.

The Breakthrough Energy Coalition, led by Bill Gates, is made up of 29 investors from ten countries that have committed to significant amounts of capital in a fund that will be focused on early-stage, innovative clean energy technologies.

These partnerships will help entrepreneurs translate investments in fundamental science and applied research and development—ranging from everything in smart buildings to energy storage and grid modernization—to the kinds of new products and services that help build strong companies and boost America's competitiveness.

Along these lines I also want to mention the proposal including the DOE budget to establish regionally-focused clean energy innovations partnerships around the country. This is a new proposal that Secretary Moniz and I have discussed—along with my colleagues—a number of times about the potential advantages of this.

The goal of these partnerships is to accelerate the pace of clean energy innovation and technology and address challenges specific to regional energy resources, customer needs and innovation capabilities of various regions of the country.

Just to be clear, this is not about new physical infrastructure. It's about partnerships. This is about regional initiatives that help us move faster. I like to say it is almost as if it is "distributed innovation." So, we have expertise in universities and research centers across the nation. I know for us in the Pacific Northwest, the fact that the FAA built a Center of Excellence on composite manufacturing took advantage of the industry that was there in aerospace. The research that was done there at the University of Washington and the research capabilities of the Federal Government allowed us to move faster in something that was game changing—aerospace manufacturing—to building lighter and more fuel efficient planes. That is the kind of innovation we would like to see in other key sectors.

I just want to say a few words about the DOE's science budget. The DOE's Office of Science is the single largest Federal sponsor of basic research in the physical sciences supporting over 24,000 investigators and over 300 U.S. academic institutions and DOE laboratories. It also plays an important and sometimes underappreciated role in climate science, as it relates to developing expertise, computing capabilities and data necessary to understand the carbon cycle.

The fiscal year budget 2017 request of \$5.67 billion for the Office of Science, which is \$325 million above the 2016 level.

These investments, I believe, allow DOE to lead basic research in the physical sciences, and operate cutting-edge scientific user fa-

cilities while strengthening the connection between advances in fundamental science and technology innovation. This funding supports initiatives like the Energy Frontier Centers, Bio Energy Research Centers, and advanced computing research.

I also am pleased to see the budget request for Energy Efficiency and Renewable Energy increase by 40 percent. For building efficiency, the Fiscal Year 2017 budget requests an \$83 million increase for a particular emphasis on emerging technologies, new software, sensors and control technologies, to make buildings and systems within buildings smarter.

Why is this so important? Well, we spend \$400 billion each year to power our homes and commercial buildings in the United States. That is more than 40 percent of our nation's total energy bill and comprises nearly 40 percent of the nation's carbon pollution. So getting smarter about the intelligence of physical structures that consume energy is a very good investment for our nation.

The global market for smart buildings technologies is an extremely lucrative opportunity for the United States, estimated to grow somewhere between \$7 and \$17 billion in the next four years. The United States, being a leader here, could help pay off significantly.

There is an area of the budget I am concerned about. The President's proposal on the Hanford, Washington budget. I was relieved to see that the proposed budget of the Office of River Protection will allow for continued progress on the construction of Waste Treatment and Immobilization plant and continued stewardship of the tank farms.

The Hanford Cleanup Project is still one of the largest cleanup projects in the entire world. I know a lot of my colleagues are familiar with the budget as it relates to clean up projects around the country and we have had some success in areas, but nothing compares to the task at hand at Hanford.

It is estimated to cost, the U.S. Government another \$107 billion to finish this cleanup. This is a massive task and a massive undertaking, so proper funding also enables that we will continue to make sure that worker safety is a top priority. These workers are doing an incredible job at cleaning up Hanford, which is a monumental task, but also doing it in a safe and secure manner.

Secretary Moniz, as a nuclear physicist I know you have a strong appreciation for the complex challenges for cleanup at Hanford and that much remains to be tackled.

But I am concerned about the implications of the current budget on the cleanup effort in the Columbia River corridor.

The Energy Department's Richland Office has done an incredible job of decontaminating, demolishing, removing waste and remediating the river corridor.

To date, 324 of the 332 buildings have been decontaminated and demolished and 11.5 million tons of hazardous waste have been moved away from the Columbia River. I invite any of my colleagues who ever want to come and visit both the history of our nation here as well as the cleanup effort, we welcome them. Five hundred seventy-four of the 580 waste sites along the river have been remediated, and all the regulatory milestones have been completed on time or ahead-of-schedule.

But I am afraid that the Richland Office is a victim of its own success, especially judging by the more than \$190 million proposed cut to its budget for Fiscal Year 2017. The Tri-Cities community and I view this as the most significant risk to the public in the area.

The funding shortfall endangers this progress and the continued maintenance of infrastructure—specifically the ground water remediation, the completion of the 618 waste site and remediation of building 324, which is highly contaminated and only a few hundred yards from the Columbia River. These are projects that are very important and extremely technically demanding.

The notion that we are dealing with groundwater remediation so close to the Columbia River, we want to do more and not worry about being cut back from success. We know that this is technically challenging cleanup work, but we know how important it is for us to continue to move forward. So I look forward to having that discussion during the Q and A.

And I just wanted also to say that I am concerned with the proposed \$130 million overall cut to some of the key non-proliferation related programs. Secretary Moniz, your tremendous work working on the Iran Nuclear Agreement was a great milestone. It is clear that the Department of Energy will continue to play a leading role in the safeguard technologies that support nuclear non-proliferation and global material strategies. So we want to make sure that is properly funded.

I certainly support the grid modernization increase and thank you for the focus on energy storage.

So thank you, Madam Chair, and I look forward to hearing the Secretary's comments.

The CHAIRMAN. Thank you, Senator Cantwell.

Secretary Moniz, nice to have you before the Committee.

I am going to offer apologies on behalf of Committee members. I know that there is an awful lot going on this morning. We started our hearing just a little bit earlier to try to accommodate it. But if you see people popping in and out, it is not because of lack of interest in the Department of Energy. It is just a lot of conflicting priorities.

So thank you for being here and if you would please proceed.

**STATEMENT OF HON. ERNEST MONIZ, SECRETARY, U.S.  
DEPARTMENT OF ENERGY**

Secretary MONIZ. Well thank you, Chairman Murkowski and Ranking Member Cantwell and members of the Committee. Actually it's good to see many of you from our trip a few weeks ago in Alaska which was really excellent and, I found, extremely educational. So thank you for that field hearing.

Turning to the budget, as was already said, the budget request for FY17 is for \$32.5 billion in discretionary and mandatory funding, an increase of ten percent from the FY16 appropriation.

First I do want to emphasize that the request for the annual appropriations is \$30.2 billion which is a two-percent increase over FY16 appropriations and in fact, two percent also applies to the national security programs and to the domestic programs at the Department.

This two percent increase is supplemented by a request totaling \$2.3 billion in new mandatory spending authority. That mandatory spending proposal includes \$750 million for three different R and D activities which I'd be happy to discuss, of course and \$674 million for uranium enrichment D and D. The latter from the USEC fund.

The \$1.6 billion, I do want to emphasize, the \$1.6 billion USEC fund is an existing, not new, mandatory spending account and our proposal is in keeping with the spirit of the current, the still current authorization that revenues from the beneficiaries of past uranium enrichment services rather than taxpayers at large, be used to pay the cost of D and D of the now shuttered facilities. And indeed in 2000, Congress recognized the applicability of the USEC fund to support Portsmouth and Paducah D and D. The USEC fund is actually only one of three funds totaling nearly \$5 billion that exist, that are applicable, to this cleanup problem of uranium enrichment D and D.

Finally, I do just want to at least in passing, acknowledge, which is very important, that underpinning all of our priorities is stewardship of the Department as a science and technology powerhouse for the country with an unparalleled network of 17 national laboratories. I can assure you and there have been recent reports that we are working very hard, we have been for several years, to strengthen the strategic relationship between the Department and our national laboratory network.

I also just want to mention that we continue with a strong emphasis on cross cutting R and D initiatives. These have been extremely successful in our view and a major focus, the biggest increases in this budget in the cross cuts, is for grid modernization and for the energy water nexus. And of course, we also continue a very important cross cut in terms of advanced computation, particularly the move to exascale computing in the next decade to do everything from nuclear weapons to energy technologies to cancer solutions.

The supporting budget details for each of these is provided in an extensive statement for the record which I request to be inserted into the record. I will just turn, in the remaining time, to some comments on Mission Innovation and why it merits your support.

Senator Cantwell already gave quite a bit of detail about Mission Innovation in which 20 countries, including of course, the United States, seeks to double our energy R and D over a five-year period. I want to emphasize those countries represent over 80 percent, approximately 85 percent, of global, public energy R and D. So this is a big leveraging opportunity in terms of raising the level of global energy R and D.

We believe Mission Innovation is long overdue. In 2010 the American Energy Innovation Council composed of CEOs of some of our major companies from multiple sectors recommended that the government triple investment in clean energy R and D. They made three key points. One, the innovation is the essence of America's strength. Two, public investment is critical to generating the discoveries in inventions that form the basis of disruptive energy technologies. And third, the cost of R, D and D are tiny compared with the benefits.

The pledge to seek to double the level of government investment is ambitious, but needed. And as you know, Bill Gates, a leader of the AEIC, has recently met with a number of members and made public statements reiterating the importance of increasing government sponsored energy R and D.

Now the objective of Mission Innovation is to greatly expand the suite of investable opportunities in clean energy technology. Certainly with the growth we are already seeing in global clean energy technology markets and in the United States as well, and the expectation of that will accelerate in the wake of the commitment by essentially every country in the world to meet their nationally determined contributions means this is indeed an enormous opportunity for American innovation and the American economy.

The scope, I want to emphasize the scope of Mission Innovation does span the innovation cycle from the earliest stages of invention through initial demonstration with a focus awaiting toward the earlier stages of R and D. It also spans all clean energy supply and demand technologies and the infrastructure that enables those technologies to contribute.

As already stated, the Mission Innovation is complemented by the breakthrough Energy Coalition, spearheaded again by Bill Gates. I just want to emphasize here another leveraging opportunity, billions of dollars of global, private capital coming to the table with exceptional risk tolerance, exceptional patience for return on their investment and a willingness for the leading technologies to go end to end, all the way to deployment. So we think this is a tremendous opportunity for our country.

I just want to make a couple of words, if I may, on clean energy innovation, on regional clean energy innovation partnerships. Again, in our field hearing in Alaska we certainly saw how different parts of the country have very, very different regional needs. These, I want to emphasize, would be not-for-profit consortia, competitively selected to manage regional clean energy R and D portfolio and they would not be performers, they would be managers of this portfolio addressing regional needs through, presumably, mainly at least, through regional institutions.

This approach tracks recommendations from the National Research Council's rising to the challenge which noted that, "until very recently U.S. Federal agencies have done little to support state and regional innovation cluster initiatives." And they recommended and again, "that regional innovation cluster initiatives by state and local organizations should be assessed and where appropriate, provided with greater funding and expanded geographically."

So I think these initiatives, both of this initiative is very much in line with what has been a long standing desire expressed by the private sector and the research community.

The Mission Innovation budget, we should emphasize, does also, of course, support increased investments in successful, ongoing innovation programs, many involving the national labs but such as ARPA-E, Energy Frontier Research Centers in the Science Office, advanced manufacturing centers, Bio Energy Centers, advanced transportation, advanced nuclear reactor technologies, advanced carbon capture technologies, to name a few.

With that, Madam Chair, I would conclude my summary. I thank the Committee for its interest and support for our programs and look forward to our discussion.

[The prepared statement of Secretary Moniz follows:]



**Testimony of Secretary Ernest Moniz  
U.S. Department of Energy  
Before the  
Committee on Energy and Natural Resources  
United States Senate  
March 3, 2016**

Chairman Murkowski, Ranking Member Cantwell, and Members of the Committee, thank you for the opportunity to appear before you today to discuss the Department of Energy's (DOE) Budget Request for fiscal year (FY) 2017. I appreciate the opportunity to discuss how the Budget Request advances the Department of Energy's missions.

**Advancing Nuclear Security, Science & Energy, and Environmental Cleanup**

The Department of Energy requests \$32.5 billion for FY 2017, an increase of \$2.9 billion from the FY 2016 enacted level of \$29.6 billion. The FY 2017 Budget Request consists of \$30.2 billion in discretionary funding—\$640 million above the FY 2016 enacted appropriation—and \$2.3 billion in new mandatory spending proposals requiring new legislation.

The DOE Budget Request supports a broad portfolio of programs, including support for the National Laboratory system of 17 laboratories to carry out critical responsibilities for America's security and economy in three areas:

- Building the Future through Science and Clean Energy;
- Ensuring Nuclear Security; and
- Organizing, Managing and Modernizing the Department to Better Achieve its Enduring Missions.

Underpinning all of these priorities is stewardship of the Department as a science and technology powerhouse, with an unparalleled network of national laboratories, harnessing innovation to successfully address national security, create jobs and increase economic prosperity, boost manufacturing competitiveness, mitigate and adapt to climate change, and enhance energy security.

Energy has been an important driver for recent U.S. economic growth, due to expanded domestic energy production and reduced petroleum imports; increased energy efficiency and productivity; and significant cost reduction and expanded market application of a variety of clean energy generation and energy-efficient industrial, commercial and consumer energy products. DOE has advanced this technology-based energy revolution by supporting the scientific foundations of energy sciences and technology, clean energy and manufacturing technological innovation, early commercial demonstration and deployments, and new technologies and standards to enhance end use energy efficiency. For example, because of DOE technology successes, favorable policies, and other factors, the cost of utility-scale photovoltaic solar power fell 59 percent and power purchase agreements for wind power fell 66 percent from 2008 to 2014. Yet work remains to enhance energy security and U.S. clean energy competitiveness while enabling global climate goals.

The DOE FY 2017 Budget Request includes a programmatic level of \$12.9 billion for energy, science, and related programs, an increase of \$2.8 billion from the FY 2016 enacted level. The FY 2017 Budget includes \$11.3 billion in discretionary funding—\$1.2 billion above FY 2016—and \$1.6 billion in mandatory spending proposals to support increased investment in leading-edge science and technology; new research facilities to advance the frontiers of science; advanced manufacturing institutes; implementation of the Administration’s strategy for nuclear waste management; and crosscutting initiatives to further technological innovation using an enterprise-wide approach to research efforts. The Budget Request takes steps to implement recommendations from the first installment of the Quadrennial Energy Review (QER), released in 2015, to strengthen U.S. energy infrastructures and enhance our collective energy security.

The Request supports ongoing implementation of the President’s Climate Action Plan and builds on the systems-based analysis of the Quadrennial Technology Review (QTR) released in 2015. The FY 2017 Budget Request also takes a significant first step toward fulfilling the United States’ pledge to seek to double federal clean energy research and development investment over the next five years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. The Request provides a total of \$5.86 billion in discretionary funding

for clean energy activities that span the full range of research and development from use-inspired basic research to demonstration, representing an increase in discretionary funding of over 21 percent above the FY 2016 baseline of \$4.82 billion. DOE's funding is 76 percent of the \$7.7 billion government-wide Mission Innovation investment in FY 2017.

The FY 2017 Budget Request also includes mandatory funding for clean energy R&D that complements activities supported by discretionary funding. The Request includes \$150 million in mandatory funding for the Advanced Research Projects Agency—Energy (ARPA-E) as part of the ARPA-E Trust proposal that seeks \$1.85 billion in mandatory funding over five years to reliably increase the program's transformational clean energy technology R&D. In addition, as part of the \$1.3 billion mandatory proposal for the DOE portion of the Administration's 21st Century Clean Transportation Plan, the Request includes \$500 million in FY 2017 to scale-up clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low carbon biofuels, in particular for intermodal freight and fleets; and establish a mobility systems integration facility to investigate systems level energy implications of vehicle connectivity and automation.

The FY 2017 Budget Request provides a programmatic level of \$12.9 billion for the National Nuclear Security Administration (NNSA), \$357 million above the FY 2016 enacted level, to support DOE's nuclear security responsibilities. The Budget Request includes funding to maintain a safe, secure, and effective nuclear deterrent without underground nuclear explosive testing, including life extension programs for major weapons systems and modernization of the Nation's research and production infrastructure.

The Request also ensures that the United States is ready to respond to nuclear and radiological incidents at home and abroad and supports programs that reduce the threats of nuclear proliferation globally, including supporting implementation and monitoring of the Joint Comprehensive Plan of Action with Iran to verifiably prevent Iran from obtaining nuclear weapons. Finally, DOE's Request for nuclear security supports activities that provide safe and effective propulsion for the U.S. nuclear Navy.

The FY 2017 Budget Request includes \$6.8 billion for Departmental management and performance programs, including environmental cleanup programs to meet the nation's Manhattan Project and Cold War legacy responsibilities. The Request includes \$6.1 billion, which includes \$5.4 billion in discretionary funding and proposes \$674 million in mandatory spending from the United States Enrichment Corporation Fund, to uphold the U.S. Government's commitment to states and communities to remediate the environmental legacy of over six decades of nuclear weapons and nuclear research, development, and production. The Request supports major management reforms, including new project oversight, assessment, and cost estimation initiatives as part of ongoing efforts to strengthen effective project and program management across the enterprise. The Request also supports continued implementation of a new and improved Human Resource Management service delivery business model and efforts to improve information technology management and further strengthen cybersecurity.

### **Science and Energy**

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The FY 2017 Budget Request provides a programmatic level of \$12.9 billion for science, energy, and related programs, which is \$2.8 billion above the FY 2016 enacted level and includes \$11.3 billion in discretionary funding and \$1.6 billion in mandatory spending. The Department's science and energy programs invest in all stages of innovation across a diverse portfolio of clean energy technologies to enhance economic competitiveness in a low-carbon world and secure America's long-term energy security. The Request takes the first step in fulfilling the U.S. Government's pledge to Mission Innovation, an unprecedented global initiative across 20 nations to double public clean energy research and development (R&D), in conjunction with commitments for private investments led by a coalition of 28 private investors from ten countries. The Request also continues to implement the President's Climate Action Plan through the development and deployment of clean energy technologies that reduce carbon pollution. Following COP-21, these investments will be a critical next step in enabling the transition to a low carbon energy future through innovation and cost reduction.

The FY 2017 Budget Request sustains DOE's role as the largest federal sponsor of basic research in the physical sciences and constructs and operates cutting-edge scientific user facilities at the National Laboratories to maintain the nation's

preeminence in science and innovation. The Request supports transformational R&D in critical technology areas, including advanced manufacturing, renewable energy, sustainable transportation, energy efficiency, electricity grid modernization, advanced nuclear reactors, and fossil energy with carbon capture and storage. The Request builds on the analytical foundation provided by the Department's 2015 Quadrennial Technology Review (QTR), as well as the recommendations of the 2015 Quadrennial Energy Review (QER), by funding measures to strengthen U.S. energy infrastructures and enhance our collective energy security posture.

#### **Mission Innovation: Enabling a Clean Energy Future**

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The President's FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next five years as part of Mission Innovation, an initiative launched by the U.S. and 19 other countries to accelerate widespread clean energy technology innovation and cost reduction. It is a widely-shared view that innovation is essential for economic growth by providing affordable and reliable energy for everyone, is critical for energy security, enhances U.S. competitiveness, and is the key to a transition to a clean energy future. Each of the 20 participating countries, which together represent over 80 percent of global governmental clean energy research and development, will seek to double its governmental investment in clean energy research and development over five years. While each country will determine its own doubling plan and portfolio, the collection of countries will provide new opportunities for synergies and collaboration.

The need for a substantial investment in clean energy research and development is clear. Many studies have examined the contribution of technological innovation to U.S. economic growth. In 2010, the American Energy Innovation Council, comprised of Chief Executive Officers from multiple industries, called for the tripling of energy research and development, citing the need for a dramatic expansion of the energy innovation pipeline to meet critical national priorities. Another report that same year from the President's Council of Advisors on Science and Technology also recommended accelerating the pace of technology innovation to meet economic competitiveness, environmental and energy security needs. The

need for greater regional innovation efforts was highlighted in a 2012 National Research Council report calling for the establishment of regional innovation cluster initiatives that build upon existing knowledge clusters and comparative strengths of a geographic region.

The President's FY 2017 Budget takes a significant first step toward fulfilling the U.S. pledge to seek to double federal clean energy research and development investment over the next 5 years by providing \$7.7 billion across 12 federal agencies, with DOE responsible for approximately 76 percent of that government-wide total. The DOE FY 2017 Request provides a total of \$5.86 billion in discretionary funding for clean energy research and development. This funding represents an increase of over 21 percent above the FY 2016 baseline of \$4.82 billion of appropriated funds.

The Budget supports clean energy activities that span the innovation spectrum from use-inspired basic research to demonstration, and encompasses all clean energy technologies, including renewable energy, energy efficiency, sustainable transportation, nuclear energy, fossil energy, and the electricity grid of the future. The DOE program components supporting Mission Innovation include elements of use-inspired basic research sponsored by the Office of Science, ARPA-E and portions of the applied energy programs that support clean energy research, development, and demonstration activities. Overall, programs supporting Mission Innovation comprise slightly more than half of the total President's FY 2017 Budget Request for science and energy, including ARPA-E.

The increased investments proposed in the FY 2017 Budget support a broad-based strategy for accelerating the innovation process. The strategy emphasizes investments strategically targeted to support innovative platforms for early stage research and technology development, as well as development and demonstration activities that target cost-reduction and advance transformational concepts that can achieve meaningful scale. For example, the President's FY 2017 Budget supports an expansion of promising existing programs, such as Energy Frontier Research Centers, ARPA-E, Clean Energy Manufacturing Institutes, the BioEnergy Research Centers, SuperTruck II, and advanced carbon capture technology pilot projects. The FY 2017 Budget also supports new initiatives, such as \$110 million to establish regional clean energy innovation partnerships, \$45 million to expand

R&D collaborations between innovators and small businesses and the DOE National Laboratories, and an advanced materials crosscutting initiative.

The President's FY 2017 Budget also includes mandatory funding for clean energy R&D that complements activities supported by discretionary funding. The FY 2017 Budget Request includes \$150 million in mandatory funding for ARPA-E as part of the ARPA-E Trust proposal for \$1.85 billion in new mandatory spending authority over five years. The mandatory spending authority will complement annual appropriations by enabling ARPA-E to support projects of a different character than can otherwise be funded under the current program. For example, the mandatory funding will support projects that are larger in scale and address more complex energy challenges that have large transformative potential. As part of the Administration's 21st Century Clean Transportation Plan, the President's FY 2017 Budget Request also includes \$500 million in mandatory funding at DOE in FY 2017 to scale-up clean transportation R&D through initiatives to accelerate cutting the cost of battery technology; advance the next generation of low-carbon biofuels, in particular for intermodal freight and fleets; and establish a smart mobility research center to investigate systems level energy implications of vehicle connectivity and automation.

Mission Innovation investments will be leveraged by private capital that drives innovation and clean energy deployment. The initiative is complemented by a separate private sector-led effort, the Breakthrough Energy Coalition (Coalition), as increased government investment, while necessary, is insufficient by itself. This parallel initiative includes over 28 investors from 10 countries and will supplement the large and growing private sector investment in commercialization of clean energy technologies by targeting new investments at an earlier stage of the innovation cycle and managing these investments through the completion of the innovation process, including the formation of new companies and the commercial introduction of new products and processes. The Coalition will be investing in technologies and projects originating in the Mission Innovation participating countries.

Together, these initiatives will drive innovation essential for economic growth enabled by affordable and reliable energy, for energy security, for U.S. competitiveness, and for a transition to a low carbon energy future.

### **Integrating Science and Energy Programs across the DOE Enterprise**

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The FY 2017 Budget Request further strengthens DOE and its national missions by fully integrating across its science and energy programs, and across the DOE enterprise with the national laboratories as strategic partners.

DOE has continued to strengthen and institutionalize its strategic relationship with the National Laboratories through organizations and forums such as the Laboratory Policy Council, the Laboratory Operations Board, and the annual National Laboratories Big Ideas summits, which convene DOE and the Laboratories on a regular basis. DOE is sustaining this strategic partnership through these ongoing collaborations and through new efforts, such as a comprehensive report on the National Laboratories. The Request also outlines how DOE will implement recommendations of the Secretary of Energy Advisory Board (SEAB) taskforce on the national laboratories and the Commission to Review the Effectiveness of the National Energy Laboratories (CRENEL). Last week, the Department submitted its detailed response to the final CRENEL report that addresses the Commission's findings and recommendations.

The FY 2017 Budget also supports DOE's crosscutting initiatives that leverage the science, technology, and engineering capabilities across programs and National Laboratory partners. DOE first proposed the crosscutting initiatives in FY 2015 to enhance enterprise-wide planning and improve collaboration across organization boundaries for key science and technology areas with impact across DOE's missions. Each crosscutting initiative reflects a comprehensive and integrated work plan to optimize programmatic objectives and efficiently allocate resources. The crosscutting initiatives help bolster DOE's efforts to institutionalize enhanced program management and coordination across program offices, while accelerating progress on key national priorities.

DOE has two years of experience with integrated planning and program management across program offices, enabling accelerated progress on key national priorities. The FY 2015 and FY 2016 appropriations have provided DOE with funding for the crosscutting initiatives, including \$1.1 billion in FY 2016 coordinated across all three Under Secretaries. Moving forward, the FY 2017 Budget Request continues six existing crosscutting initiatives, and proposes a new



initiative, Advanced Materials for Energy Innovation. Together, the initiatives closely coordinate the \$1.5 billion request, a \$330 million increase, in crosscutting R&D across the enterprise in seven technology areas:

- Electricity grid technology modernization accelerates the development of the technologies and tools to enable modernization of the grid to support U.S. economic growth, environmental quality and security objectives.
- Subsurface science, technology, and engineering coordinates efforts to develop next-generation technologies for energy generation, storage, and disposal applications through mastery of the subsurface, with a science-based focus on advanced imaging of geophysical and geochemical signals.
- Supercritical carbon dioxide technology enables large-scale commercialization of the supercritical carbon dioxide (sCO<sub>2</sub>) power cycle, which has the potential for higher thermal efficiencies with lower capital cost compared to steam-based power systems and can provide significant benefits for electric power generation, including reducing the costs of carbon capture and storage.
- Energy-water nexus accelerates the Nation's transition to more resilient and sustainable coupled energy-water systems, including a new effort on desalination technology and regional data, modeling and analysis test beds.
- Exascale computing, a joint Science-NNSA collaboration, significantly accelerates the development and deployment of capable exascale computing systems, applications and software infrastructure to meet national security needs and to provide next-generation tools for scientific discovery;
- Cybersecurity protects the Department of Energy enterprise from a range of cyber threats and improves cybersecurity in the electric power and oil and natural gas subsectors; and
- Advanced materials for energy innovations, which have the potential to revolutionize entire industries by employing advanced synthesis, modeling, and characterization to accelerate and reduce the cost of materials qualification in a wide variety of clean energy applications.

### **Science: Providing the Backbone for Discovery and Innovation**

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DOE's Office of Science is the largest federal sponsor of basic research in the physical sciences, supporting more than 24,000 investigators at over 300 U.S. academic institutions and the DOE laboratories. The Office of Science provides the backbone for discovery and innovation, especially in the physical sciences, for America's research community.

The FY 2017 Budget Request provides \$5.67 billion for Science, \$325 million above the FY 2016 enacted level, to lead basic research in the physical sciences and develop and operate cutting-edge scientific user facilities while strengthening the connection between advances in fundamental science and technology innovation. The FY 2017 Budget Request includes a proposal for \$100 million in mandatory funding for university grants that will be made available through a competitive, merit-based review of proposals solicited from and provided by the university community in the Office of Science mission areas.

The Budget Request provides major increases for advanced scientific computing research, basic energy sciences, and biological and environmental research, and funding to operate the Office of Science's scientific user facilities at optimal levels in support of more than 31,000 researchers from universities, national laboratories, industry, and international partners.

#### **Sustaining Leading-Edge Discovery Science**

The FY 2017 Budget Request sustains leading-edge discovery science through support for the High Energy Physics and Nuclear Physics programs, a 14% increase in investments in Scientific Laboratories Infrastructure, and the new \$100 million mandatory proposal for university grants.

In these discovery science programs, Office of Science has contributed to many major recent accomplishments, including collaborating with two international experiments that led to the Nobel Prize in physics for discovering oscillations in neutrinos (fundamental building blocks of our universe that remain poorly understood); contributing to the discovery of three of the four new superheavy elements in the periodic table; opening the most advanced storage-ring-based light source facility, the National Synchrotron Light Source II (NSLS-II); and

continuing effective execution of major ongoing science construction projects—the Linac Coherent Light Source II (LCLS-II) and the Facility for Rare Isotope Beams (FRIB)—on schedule and within budget.

For High Energy Physics, the request provides \$818 million, \$23 million above the FY 2016 enacted level, to understand how the universe works at its most fundamental level by discovering the most elementary constituents of matter and energy, probing the interactions among them, and exploring the basic nature of space and time. The Request implements activities and projects based on the High Energy Physics Advisory Panel (HEPAP) May 2014 strategic plan, including \$45 million, an increase of \$19 million, to support design for a reconfigured international Long Baseline Neutrino Facility hosted at Fermilab and initial construction for the Deep Underground Neutrino Experiment in South Dakota.

For Nuclear Physics research, the Budget includes \$636 million, \$19 million above the FY 2016 enacted level, to discover, explore, and understand nuclear matter in a variety of different forms, including continued construction of the Facility for Rare Isotope Beams (FRIB).

### **Expanding Use-Inspired Research**

The Office of Science funds basic science programs that support use-inspired research towards energy and other applications. The Budget Request provides funding to increase operation of the National Laboratory user facilities to optimal levels to accommodate increases in Mission Innovation work. The Request also expands investments in foundations for key technology crosscutting areas, including advanced materials, the subsurface, and the energy-water nexus.

The FY 2017 Budget Request includes \$1.94 billion for Basic Energy Sciences, \$88 million above the FY 2016 enacted level, to provide the foundations for new energy technologies, to mitigate the environmental impacts of energy use, and to support DOE missions in energy, environment, and national security by understanding, predicting, and ultimately controlling matter and energy. The Budget Request provides \$143 million, an increase of \$33 million, to initiate five new Energy Frontier Research Centers (EFRCs) and continue to support the existing EFRCs.

The Request provides \$662 million for Biological and Environmental Research, \$53 million above the FY 2016 enacted level, to support fundamental research and scientific user facilities to achieve a predictive understanding of complex biological, climatic, and environmental systems for a secure and sustainable energy future, including an expanded focus on regional energy-water systems. The Request provides \$90 million, a \$15 million increase, to expand technology transfer activities during the last year of a ten-year program at the three existing Bioenergy Research Centers (BRC). The Request also includes \$10 million for a new initiative in microbiome research that builds on the Department's experience in fundamental genomic science of plants and microbes to understand the fundamental principles governing microbiome interactions in diverse environments.

For Fusion Energy Sciences, the FY 2017 Budget Request includes \$398 million, \$40 million below FY 2016. The Request will continue to support research to understand the behavior of matter at high temperatures and densities and to develop fusion as a future energy source. The Budget Request also includes \$125 million for the U.S. contribution to the ITER project, a major fusion research facility being constructed by an international partnership of seven governments. The Department submitted in mid-February an interim report to Congress on the status of ITER, and we are scheduled to deliver a report in early May with recommendations related to the project.

#### **Investing in High Performance Computing to Support Frontier Science**

The Budget Request provides \$663 million for Advanced Scientific Computing Research (ASCR), \$42 million above the FY 2016 enacted level, to support research in advanced computation, applied mathematics, computer science and networking, as well as development and operation of high-performance computing facilities.

Under this program, DOE has implemented the President's Executive Order on National Strategic Computing Initiative through a multi-year joint program between the Office of Science and NNSA to achieve capable exascale computing. As part of the President's national initiative, DOE announced a \$200 million supercomputer award for Argonne National Laboratory, part of a joint

Collaboration of Oak Ridge, Argonne, and Lawrence Livermore (CORAL) initiative to develop supercomputers that will be five to seven times more powerful than today's fastest systems in the United States.

The FY 2017 Budget includes \$190 million across three Office of Science programs, joined by \$95 million in NNSA, to accelerate development of capable exascale computing systems with a thousand-fold improvement in performance over current high-performance computers in support of the President's National Strategic Computing Initiative. Within the Request, the Office of Science will transition exascale funding to a formal Exascale Computing Project, which will follow DOE project management guidelines under DOE Order 413.3b. The Budget also provides \$46 million to re-compete the SciDAC partnerships, with new activities to include accelerating the development of clean energy technologies.

The Request funds research on high-performance computing applications unique to the biomedical research community, including \$9 million for the President's BRAIN Initiative, in close coordination with the National Institutes of Health. This funding will bring to bear DOE national laboratory capabilities in big data analytics, modeling and simulation and machine learning to support biomedical research challenges in cancer and BRAIN. In other DOE science programs, the Request also enables development of accelerator applications, including advanced proton and ion beams for the treatment of cancer, in coordination with NIH.

### **Energy Research, Development, Demonstration, and Deployment**

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The FY 2017 Budget Request provides a programmatic level of \$6.6 billion for energy research, development, demonstration, and deployment activities, of which \$5.2 billion is discretionary funding—an increase of \$928 million from FY 2016. The Request supports a diverse portfolio of energy technologies, including renewable electricity, energy efficiency and advanced manufacturing, sustainable transportation, fossil energy, nuclear energy, and a modernized grid.

DOE recently completed the 2015 Quadrennial Technology Review (QTR), a systems-based analytical foundation to inform program research priorities across DOE's entire portfolio of energy and science programs by examining the most promising research, development, demonstration, and deployment (RDD&D) opportunities across energy technologies to effectively address the nation's energy

needs. The 2015 QTR builds upon the first QTR conducted in 2011 by describing the nation's energy landscape and the dramatic changes that have taken place over the last four years and identifying the RDD&D activities, opportunities, and pathways forward to help address our national energy challenges.

### **Improving Cost and Performance of Renewable Electricity Technologies**

DOE's FY 2017 Budget Request for Energy Efficiency and Renewable Energy (EERE) invests \$621 million in renewable energy generation technologies, an increase of \$143 million from FY 2016. Innovations, favorable policies, and other factors have led to significant cost and performance improvements across the spectrum of renewable energy technologies, as documented in Revolution... Now<sup>1</sup> report. To name a few examples, the cost of utility-scale photovoltaic solar power fell 59 percent from \$5.70 per watt in 2008 to \$2.34 per watt in 2014; power purchase agreements for wind power fell 66 percent from 7 cents per kilowatt-hour in 2008 to 2.4 cents per kilowatt-hour in 2014; and the median installed price of residential photovoltaic solar power fell 51 percent from \$8.80 per watt in 2008 to \$4.30 per watt in 2014.

The Request provides \$285M, an increase of \$44M, to continue the SunShot Initiative on a path to achieve solar cost parity without subsidies by 2020. The Budget includes \$156 million for Wind Energy, an increase of \$61 million, to continue efforts to achieve a 16.7 cents per kilowatt-hour cost target for offshore wind by 2020, including \$30 million for offshore wind demonstration projects and \$25 million to establish an Offshore Wind R&D Consortium.

The Budget Request provides just under \$100 million, \$29 million above FY 2016, for geothermal technologies, including \$35 million to select the final site and team for FORGE, a field laboratory for enhanced geothermal systems, beginning with a down-selection from five to three teams.

The Request also provides \$80 million for water power technologies, a \$10 million increase, including \$25 million to continue the HydroNEXT initiative focusing on innovative, low-cost water diversion technologies to enable new stream reach hydropower, to progress to a cost target of 10.9 cents per kilowatt-hour by 2020

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<sup>1</sup> <http://energy.gov/sites/prod/files/2015/11/f27/Revolution-Now-11132015.pdf>

from small, low-head new stream developments. The Request also includes \$55 million, \$11 million above FY 2016, to support marine and hydrokinetic technologies, including a grid-connected open-water test facility and development of concepts for revolutionary wave-energy converters.

### **Improving Energy Efficiency and Advanced Manufacturing Technologies**

The FY 2017 Budget for EERE includes \$919 million, \$198 million above FY 2016, to invest in the development of manufacturing technologies and enhanced energy efficiency in our homes, buildings and industries.

In 2015, DOE issued 13 final energy efficiency standards as part of the Administration's goal to reduce carbon pollution. Standards issued to date will achieve cumulative reduction of 2.3 billion metric tons cumulatively by 2030. To accelerate innovation in energy efficiency and manufacturing programs, DOE continues to fund R&D at the Manufacturing Demonstration Facility, funds continuing work at the Critical Materials Institute, and is implementing a total of five Clean Energy Manufacturing Institutes in FY 2016 as part of the National Network for Manufacturing Innovation.

The FY 2017 Budget Request provides \$14 million in EERE for the sixth Clean Energy Manufacturing Institute and \$25 million to establish a new Energy-Water Desalination Hub to serve as a focal point for enabling technologies for de-energizing, de-carbonizing, and reducing the cost of desalination.

The FY 2017 Budget provides \$169 million, an increase of \$83 million, for emerging technologies that reduce building energy consumption, including \$40 million for an R&D effort to transition to refrigerant technologies with low global warming potential, and the Budget provides \$15 million for a new metropolitan systems initiative to use new sensing, communication and computation capabilities to create actionable information for decision-makers on clean energy issues. The Request also provides \$230 million, an increase of \$15 million, to support weatherization retrofits to approximately 35,700 low-income homes nationwide; \$70 million to support state energy offices; and \$26 million for a new Cities, Counties, and Communities Energy Program to provide support to local governments, public housing authorities, non-profits and other stakeholders to catalyze more extensive clean energy investments in revitalization efforts.

### **Advancing Sustainable Transportation**

The FY 2017 Budget provides \$853 million in discretionary funding, \$217 million above FY 2016, for sustainable transportation including vehicle, bioenergy, and hydrogen and fuel cells technologies.

In FY 2016, DOE will achieve high-volume modeled costs for batteries of \$250 per kilowatt-hour—down from the current cost of \$289 per kilowatt-hour—towards a goal of \$125 per kilowatt-hour in 2022 as part of the EV Everywhere Grand Challenge. EERE will initiate SuperTruck II, with up to four new competitively awarded projects to improve freight efficiency of heavy-duty vehicles. The programs will achieve at least 1.15 billion gallons per year savings from Clean Cities' initiatives and fund, with the Departments of Agriculture and Defense, three commercial-scale biorefineries to produce military specification drop-in fuels.

The FY 2107 Budget includes \$469 million for vehicle technologies, \$159 million above FY 2016, including \$60 million to fully fund the multi-year SuperTruck II program to double freight truck efficiency by 2020, and \$283 million, an increase of \$102 million, for continuing the EV Everywhere program to enable domestic production of plug-in electric vehicles that are as affordable and convenient as gasoline vehicles by 2022. The Budget provides \$279 million for bioenergy technologies, \$54 million above FY 2016, including \$52 million to continue R&D efforts on converting cellulosic and algal-based feedstocks to bio-based gasoline and diesel.

The FY 2107 Budget Request includes an additional \$1.3 billion mandatory proposal for DOE to expand investments in low-carbon transportation technologies and fueling infrastructure as part of the Administration's 21st Century Clean Transportation Plan. The proposal for DOE would invest \$500 million in clean transportation R&D, \$750 million in regional fueling infrastructures for low-carbon fuels, and \$85 million in the deployment of clean vehicle fleets for local governments and first responders.



### **Crosscutting Innovation Initiatives for Energy**

The Request for EERE includes \$215 million for new crosscutting innovation initiatives to enable the acceleration of clean energy innovation and commercialization in the United States by strengthening regional clean energy innovation ecosystems, accelerating next-generation clean energy technology pathways, and encouraging clean energy innovation and commercialization collaborations between our National Laboratories and American entrepreneurs.

The Request includes \$110 million to support Regional Energy Innovation Partnerships, a new competition to establish regionally-focused clean energy innovation partnerships around the country. These regionally focused and directed partnerships will support regionally relevant technology-neutral clean energy RD&D needs and opportunities to support accelerated clean energy technology commercialization, economic development, and manufacturing.

The FY 2017 Budget Request also includes \$60 million for a Next-Generation Innovation funding opportunity to accelerate next-generation clean energy technology pathways by supporting research, development, and demonstration (RD&D) projects with the greatest potential to change the trajectory of EERE core program technology pathways. The Request includes \$20 million for a new Small Business Partnerships program to competitively provide technology RD&D resources to small businesses through the DOE's National Labs to support their efforts to commercialize promising new clean energy. The Request also includes \$25 million for Energy Technology Innovation Accelerators that will leverage the technical assets and facilities of the National Laboratories to enable American entrepreneurs to conduct RD&D that leads to the creation of new clean energy businesses.

### **Expanding Transformational ARPA-E Programs**

The FY 2017 Budget Request provides \$500 million for the Advanced Research Projects Agency—Energy (ARPA-E), which fills a unique role in identifying scientific discoveries and cutting-edge inventions and accelerating their translation into technological innovations. Of this, \$350 million is requested in discretionary funding, \$59 million above the FY 2016 enacted level, to fund additional early-

stage innovative programs as well as to exploit the technological opportunities developed in previous ARPA-E programs.

ARPA-E has achieved considerable results to date. Through early 2015, 141 ARPA-E project teams have completed funded work. Thirty four ARPA-E projects attracted more than \$850 million in private sector follow-on funding, and over 30 ARPA-E teams formed new companies. Eight companies had commercial sales of new products resulting from ARPA-E projects, and more than 37 ARPA-E projects partnered with other government entities for further development. At the annual ARPA-E Summit being held this week, we will be announcing updated numbers demonstrating further success with ARPA-E's portfolio of projects.

The FY 2017 Budget Request will expand support for the current core portfolio of early stage innovation programs, including the release of 7-8 funding opportunity announcements (FOA) for new focused technology programs. Possible areas of focus for these FOAs include advanced sensors and analytics for energy management and improved light metals production to transform vehicle light-weighting. The Request also supports the continuation of the Innovative Development In Energy-Related Applied Science (IDEAS) FOA, which provides a continuing opportunity for the rapid support of early-stage applied research to explore innovative new concepts with the potential for transformational and disruptive changes in energy technology. Across all activities, ARPA-E will continue to emphasize supporting commercial readiness for highly successful projects.

In addition, the FY 2017 Budget Request includes a new legislative proposal for the Advanced Research Projects Agency—Energy Trust, which provides \$150 million in FY 2017 and a total of \$1.85 billion in mandatory funds over five years to add a new focus on innovative systems level development that will deliver larger, more rapid benefits to the economic, environmental, and energy security of the United States. These projects are of a different character than can otherwise be funded with annual discretionary appropriations, and include, for example, potentially transformative technologies facing significant technical challenges in scale-up, projects that integrate multiple technical advances, and projects that address system-level transformation of energy cycles. The proposed new

mandatory spending authority will accelerate transformational changes on energy systems.

### **Revitalizing the Nuclear Fuel Cycle**

The FY 2017 Budget Request provides \$994 million for Nuclear Energy, \$8 million above the FY 2016 enacted level, to help meet energy security, proliferation resistance, and climate goals. These funds will support the diverse civilian nuclear energy programs of the U.S. Government, leading federal efforts to research and develop nuclear energy technologies, including generation, safety, waste storage and management, and security technologies.

In 2015, the program funded the second 5-year program of the Consortium for Advanced Simulation of Light Water Reactors (CASL) Hub and new R&D programs for two advanced reactor technologies, pebble bed and chloride fast reactors. The FY 2017 Budget Request provides \$73.5 million for ongoing R&D in advanced reactor technologies and continued R&D support for light water reactors (LWR), \$59 million for accident tolerant fuels, and \$35 million for LWR sustainability. Funding is also requested to continue the GAIN initiative to provide streamlined access for advanced reactor developers to access the world-class nuclear energy R&D capabilities at the national laboratories. The Request includes \$89.6 million to continue funding for a cost-shared cooperative agreement for licensing technical support of a small modular reactor design, including support for a small modular reactor design (SMR) certification application to the Nuclear Regulatory Commission (NRC) by December 2016, for application review by the NRC, and to continue development of permit and license applications for the first domestic SMR deployments.

In 2015, DOE's nuclear energy program awarded a contract for a deep borehole field characterization test and issued an Invitation for Public Comment to initiate the dialogue on a consent-based siting process to support a consolidated commercial used fuel storage, a permanent repository and a separate disposal path for defense waste. The Request continues implementation of the Administration's Strategy for the Management and Disposal of Used Nuclear Fuel and High Level Radioactive Waste by providing \$76.3 million, an increase of \$53.8 million, for integrated waste management system activities in the areas of transportation,

storage, disposal, and consent-based siting. The Request includes \$39.4 million for consent-based siting, including \$25 million for grants to states, Tribes, and local governments. The Request also includes \$26 million to complete characterization of a field test borehole and to initiate drilling.

### **Enabling Fossil Energy to Compete in a Low-Carbon Energy Future**

The Budget Request provides \$600 million for Fossil Energy Research and Development (\$240 million of which is available through repurposing of prior-year balances), \$32 million below the FY 2016 enacted level, to advance research and development in carbon capture and storage, advanced energy systems, cross-cutting areas, and fuel supply impact mitigation.

In FY 2016, DOE is reaching several milestones in its support for carbon capture, utilization and storage (CCUS). DOE completed funding of two large-scale industrial CCUS projects that are in operation to demonstrate the feasibility and economics of carbon capture on an ethanol facility and the technology for carbon capture on a hydrogen production unit. Through cost-shared cooperative agreements, DOE is supporting two large-scale, coal-based CCUS demonstration projects utilizing coal gasification and post-combustion carbon capture technologies, with construction to be completed in 2016.

The FY 2017 Budget Request provides \$50 million, an increase of \$20M, to support initial construction of three large-scale pilot projects of advanced, second generation, post combustion carbon capture technologies critical to reducing cost and increasing efficiency of CCUS technologies. The Request includes \$24 million to initiate the design and construction of a supercritical carbon dioxide (CO<sub>2</sub>) pilot plant test facility at the 10 megawatt-electric (MWe) scale, and \$31 million to initiate design of a natural gas combined cycle (NGCC) demonstration facility employing CCUS technology.

The budget includes the reallocation of funding from CCUS demonstration projects that have not reached financial close to fund other projects and new initiatives, including the use of \$240 million in prior-year balances.

Also in support of CCUS technologies, the President's FY 2017 Budget Request makes available \$5 billion in proposed investment and sequestration tax credits for

qualified commercial CCUS projects. These tax credits are complemented by an existing \$8.5 billion available through DOE's loan guarantees for advanced fossil energy projects to help provide critical financing to support new or significantly improved advanced fossil energy projects, and additional mixed-use authority for loan guarantees in the FY 2017 Budget that can be used for advanced fossil and other technologies.

### **Expanding Technology Commercialization and Deployment**

Significant advances have been made in recent years in commercializing and deploying innovative technologies have been made. In 2015, DOE received 30 out of 100 R&D Magazine awards for outstanding technology developments with promising commercial potential, and the Administration announced new investment commitments from the institutional investment community of \$4 billion for deployment of clean energy technologies. The renewable energy production tax credits were also extended by the Congress in December 2015.

To expand the commercial impact of DOE's portfolio of research, development, demonstration, and deployment activities in the short, medium and long term, DOE established the Office of Technology Transitions (OTT) in 2015 to oversee and advance DOE's technology transfer mission. The FY 2017 Budget Request provides \$8.4 million for the OTT to expand the commercial impact of the DOE portfolio of activities. The Request provides for coordination of technology-to-market activities across the Department and the implementation of the Technology Commercialization Fund (TCF), approximately \$20 million in FY 2017, to catalyze seed-stage funding for collaborations with private sector partners on high potential energy technologies at the National Laboratories. The Budget Request for OTT also supports implementation of the Clean Energy Investment Center (CEIC) to provide better information on investable opportunities resulting from DOE R&D.

DOE's Loan Programs Office, in its role accelerating the domestic commercial deployment of innovative and advanced clean energy technologies, has maintained a financially sound portfolio of loans and loan guarantees. The \$32 billion portfolio of loans, loan guarantees, and conditional commitments has been supported by \$18 billion in financing from project sponsors, and 22 projects with DOE-backed loans

and loan guarantees have now successfully completed construction and initiated operation. DOE has received new applications seeking over \$20 billion in Advanced Technology Vehicles Manufacturing (ATVM) and Title XVII loans and loan guarantees

The FY 2017 Budget Request supports the Department's continued oversight of more than \$30 billion in loans, loan guarantees, and conditional commitments, as well as its administration of remaining loan and loan guarantee authority to finance projects in the areas of advanced nuclear energy, renewable energy and efficient energy, advanced fossil energy, and advanced technology vehicles manufacturing. The FY 2017 Request also proposes an additional \$4 billion of mixed-use loan guarantee authority for innovative energy projects that reduce greenhouse gas emissions.

The FY 2017 Request also includes \$23 million for the Office of Indian Energy, \$7 million above the FY 2016 enacted level, to support DOE's partnership with the Department of the Interior to address the need for clean, sustainable energy systems on Indian lands through expanded technical assistance and grant programs.

#### **Enabling Secure, Modern, and Resilient Energy Infrastructures**

The Department's energy programs also support a secure, modern and resilient energy infrastructure, including for the electric power grid. The FY 2017 Budget Request continues a focus on this mission by providing increased investments in the electricity grid of the future.

DOE has also taken major steps in implementing the Grid Modernization Initiative, supported by a Grid Modernization National Laboratory Consortium comprising 400 partners, including the release of DOE's new comprehensive new Grid Modernization Multi-Year Program Plan and the announcement of a \$220 million funding opportunity for the National Labs and partners.

The FY 2017 Budget Request includes \$262 million for Electricity Delivery and Energy Reliability, \$56 million above the FY 2016 enacted level, for grid modernization research to support a smart, resilient electric grid for the 21st century and the storage technology that underpins it, as well as funding critical emergency response and grid physical security capabilities. The Request provides

\$14 million to establish a new competitively-selected Grid Clean Energy Manufacturing Innovation Institute as a part of the multi-agency National Network for Manufacturing Innovation, to focus on technologies related to critical metals for grid application, and advances will be broadly applicable in multiple industries and markets.

The Request for Electricity Delivery and Energy Reliability also provides \$45 million for energy storage R&D, an increase of \$24 million, and \$30 million for smart grid R&D. To fortify grid security and resilience, the Request includes \$46 million to advance cybersecurity technologies and \$18 million for infrastructure security and energy restoration activities. The Request provides \$15 million for a new state energy assurance program that supports regional and state activities to continually improve energy assurance plans, improve capabilities to characterize energy sector supply disruptions, communicate among the local, state, regional, federal, and industry partners, and identify gaps for use in energy planning and emergency response training programs. The Request also provides \$15 million to launch a new state distribution-level reform program for competitive awards to states to utilize a grid architecture approach to address their system challenges.

The Budget Request also includes \$257 million for the Strategic Petroleum Reserve (SPR), \$45 million above the FY 2016 enacted level, to increase the system's durability and reliability and ensure operational readiness. The Bipartisan Budget Act of 2015 requires the Department to submit to Congress a Strategic Review of the SPR by May, 2016. The Act also authorized DOE, subject to appropriation, to sell up to \$2 billion in SPR oil to fund SPR infrastructure modernization. The results of the SPR Strategic Review will inform SPR infrastructure modernization and shall result in an FY 2017 budget amendment related to SPR modernization.

The FY 2017 Budget Request provides \$31 million for Energy Policy and Systems Analysis to continue serving as a focal point for policy coordination within the Department on the formulation, analysis, and implementation of energy policy and related programmatic options and initiatives that could facilitate the transition to a clean and secure energy economy.

EPSA also serves as the Secretariat of the multi-agency Quadrennial Energy Review (QER), and provides systems analysis to support this Administration's initiative. The Administration expects to complete the second installment of the QER in 2016, focused on the electricity sector.

The Budget Request also includes \$84 million for the power marketing administrations, including the Western Area, Southeastern, Southwestern, and Bonneville Power Administrations.

### **Enhancing Collective Energy Security in Global Energy Markets**

While DOE's work in global energy security is not a major budgetary issue, it is an important issue for the Nation. DOE has pursued an increased global focus on collective energy security—energy security for the United States and its allies—in the last several years.

For example, as part of this effort and supported by our Office of International Affairs, the G-7 recently reached an agreement to enhance cybersecurity assessments of energy systems. The FY 2017 Budget Request supports DOE's efforts to enhance collective energy security by providing \$19 million for the Office of International Affairs, which coordinates the Department's activities to strengthen international energy technology, information and analytical collaborations.

In the area of energy exports, DOE has released a two-part LNG export study for public comment evaluating the impact of increasing LNG exports from 12 billion cubic feet per day (Bcf/d) to 20 Bcf/d. The study will be used in the public interest evaluation of pending applications to export LNG to non-FTA countries. DOE also chaired the International Energy Agency Ministerial resulting in a plan to assess energy security implications of natural gas supply.

Following the North American ministerial in 2014, Canada, Mexico, and the United States have worked together to produce new integrated mapping and information products. The Budget Request for the Energy Information Administration provides \$131 million, a \$9 million increase, to build upon enhancements like these in carrying out EIA's data collection and analysis mission. The increase will provide greater regional detail and analysis of petroleum data,



enhance commercial building energy efficiency data. The Budget will also extend analysis of international data to include Canada-Mexico collaboration and Asia and expand collection of transportation energy consumption data.

### **Nuclear Security**

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The President's 2015 National Security Strategy, the 2010 Nuclear Posture Review (NPR), and the ratification of the New Strategic Arms Reduction Treaty underscored the importance of the DOE's nuclear mission and the lasting mandate for DOE to maintain a safe, secure, and effective stockpile for as long as nuclear weapons exist. DOE advances the President's vision to eliminate and secure nuclear material, reduce nuclear stockpiles, and increase global cooperation.

The FY 2017 Budget Request proposes \$12.9 billion for the National Nuclear Security Administration (NNSA), \$357 million above the FY 2016 enacted level, to invest in our nuclear security by modernizing and maintaining our nuclear security enterprise, refurbishing and extending the life of our nuclear deterrent, reducing the threats of nuclear proliferation, and supporting the safe and reliable operation of our nuclear Navy. As part of an overall focus to modernize nuclear security research and production infrastructure, the overall NNSA budget includes a total of \$1.8 billion in proposed infrastructure investments, including \$575 million for the new Uranium Processing Facility.

The Request for NNSA includes \$413 million for NNSA Federal Salaries and Expenses for the salary, benefits, and support expenses of 1,715 federal full-time equivalents (FTEs) to provide appropriate federal oversight of the nuclear security enterprise responsible for managing and executing NNSA's weapons activities and nonproliferation missions.

### **Stewardship of the Nuclear Deterrent**

August of 2015 marked the 20<sup>th</sup> anniversary of President Bill Clinton's announcement that the United States would pursue negotiations for the Comprehensive Nuclear-Test-Ban Treaty and maintain the U.S. nuclear arsenal without nuclear explosive tests. This was an important milestone for a science-based Stockpile Stewardship Program that successfully pushed the limits of

modern science and engineering to maintain the stockpile without underground nuclear explosive testing.

The FY 2017 Budget Request includes \$9.2 billion for Weapons Activities, \$396 million above the FY 2016 enacted level, to build on these accomplishments as NNSA sustains a credible and effective nuclear deterrent while continuing to reduce the size of the active stockpile. The Budget Request supports the work, as laid out in the Stockpile Stewardship and Management Plan, of the science-based Stockpile Stewardship Program to ensure a safe, secure and effective nuclear stockpile in the absence of underground nuclear explosive testing through a sustained, long-term research program.

NNSA has achieved major accomplishments in that mission, such as substantial progress on its Life Extension Programs (LEPs), including those for the B61-12, W76-1, W80-4, and W88 Alt 370 with conventional high explosive (CHE) refresh. The Inertial Confinement Fusion Ignition and High Yield Program increased the number of experiments, or “shot rate,” at Lawrence Livermore National Laboratory’s National Ignition Facility from 191 in 2014 to 356 in 2015. NNSA received the first hardware delivery for Trinity, NNSA’s next generation high performance computer, and completed the first subproject for the Uranium Processing Facility, Site Readiness, on time and under budget.

The FY 2017 Request includes \$1.3 billion for LEPs and major alterations (Alts), \$38 million above FY 2016. In particular, the Request continues timely execution of the B61-12 LEP and the W80-4 LEP. These are the first two steps in implementing the Nuclear Weapons Council-approved “3+2” strategy to consolidate the stockpile to three ballistic missile warheads and two air delivered systems, reducing the number of weapons in the deployed stockpile and simplifying maintenance requirements.

The Request provides \$223 million to support completing production of the W76 by 2019 and \$616 million to deliver the B61-12 first production unit by 2020. It also supports transitioning the W88 Alt 370 with CHE refresh to Production Engineering in February 2017 with \$281 million and provides \$220 million, an increase of \$25 million, to maintain the schedule of the first production unit for the W80-4 LEP by 2025. The Budget Request also provides \$69 million, \$17 million

above the FY 2016 enacted level, to make progress towards meeting the President's commitment to accelerate dismantlement of retired U. S. nuclear warheads by 20 percent.

The Budget Request for Weapons Activities provides \$2.7 billion for Infrastructure and Operations, \$443 million above FY 2016. The Request ensures no increase in the backlog of deferred maintenance. The Request will dispose of the Kansas City Bannister Federal Complex, and upgrade aging infrastructure to address safety and programmatic risks, improve productivity, and lower operating costs. The Request for Infrastructure and Operations also provides \$575 million, \$145 million above FY 2016, to continue the phased approach for constructing the Uranium Processing Facility, including completion of the design and continued construction on approved subprojects. The request also provides \$160 million to continue work on the Chemistry and Metallurgy Research Replacement project to support the plutonium strategy.

As part of the Office of Science-NNSA collaboration on the Exascale Computing Initiative, the Budget includes \$95 million for exascale computing, \$31 million or 48 percent above FY 2016, to develop exascale-class high performance computing to meet the needs for future assessments, LEPs, and stockpile stewardship.

The Request for Weapons Activities also includes \$283 million for Secure Transportation Asset, \$46 million above FY 2016, to continue asset modernization and workforce capability initiatives including conceptual design and systems prototyping of the new Mobile Guardian Transporter.

### **Controlling and Eliminating Nuclear Materials Worldwide**

The FY 2017 Budget Request includes \$1.8 billion for Defense Nuclear Nonproliferation, \$132 million below the FY 2016 enacted level, to continue the critical missions of securing or eliminating nuclear and radiological materials worldwide, countering illicit trafficking of these materials, preventing the proliferation of nuclear weapon technologies and expertise, ensuring that the United States remains ready to respond to high consequence nuclear and radiological incidents at home or abroad, and applying technical and policy solutions to solve nonproliferation and arms control challenges around the world. Note that while the overall program level for DNN is down, the programmatic

funding level in the FY 2017 Budget Request is roughly flat with FY 2016 due to the availability of prior-year carryover balances and termination of the Mixed-Oxide (MOX) Fuel Fabrication Facility Project.

DOE has taken major steps in the nuclear threat reduction missions. We recently issued the first nonproliferation strategic plan, *Prevent, Counter and Respond—A Strategic Plan to Reduce Global Nuclear Threats*<sup>2</sup>, to define and describe our missions.

Supported largely by the DNN program and capabilities, we also provided scientific technical analysis to support the U.S. delegation during the Joint Comprehensive Plan of Action (JCPOA) negotiations. Following finalization of the agreement, twenty nine scientific leaders deeply familiar with nuclear issues (familiar names such as Garwin, Drell, Dyson, Hecker, Richter, and others), focusing on the agreement’s nuclear dimensions, wrote to the President: “This is an innovative agreement, with much more stringent constraints than any previously negotiated nonproliferation framework.” These experts were referring to aspects of the agreement such as weaponization constraints and bans on nuclear weapons R&D that mark an unprecedented approach to such agreements—and highlight the critical role that DOE plays in providing unparalleled scientific and technical capabilities.

As part of NNSA’s goal to minimize and, when possible, eliminates weapons-usable nuclear material around the world, we have also recently completed removal or confirmed disposition of fissile nuclear material, bringing the number of countries free of all highly enriched uranium (HEU) to 28, plus Taiwan. We have also down-blended additional HEU to achieve a cumulative total of 150 metric tons of U.S. excess, weapons-usable HEU.

And in the area of nuclear counterterrorism and incident response, NNSA realigned its counterterrorism and counterproliferation functions to more efficiently respond to nuclear or radiological incidents worldwide and to sustain counterterrorism capabilities through innovative technology and policy-driven solutions. The program continues to train and exercise to strengthen emergency

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<sup>2</sup> [http://nnsa.energy.gov/sites/default/files/NPCR%20Report\\_FINAL\\_4-14-15.pdf](http://nnsa.energy.gov/sites/default/files/NPCR%20Report_FINAL_4-14-15.pdf)

preparedness and response capabilities, including nuclear forensics operations, domestically and worldwide.

Looking ahead, the FY 2017 Budget Request will support continued successful execution of the mission to control and eliminate nuclear materials worldwide. NNSA will support the President's fourth and final Nuclear Security Summit in March-April 2016, continuing the President's aim to achieved tangible improvements in the security of nuclear materials and stronger international institutions that support nuclear security.

DOE and its national laboratories will continue to provide technical support to the International Atomic Energy Agency (IAEA), including to implement the JCPOA, and will remain highly engaged in providing training and technologies and other support to support the IAEA. The Request includes \$13 million to support implementation of the JCPOA, including \$10M to support JCPOA material management activities and \$3 million for technical and in-kind support for the U.S. interagency process and the IAEA.

In the area of plutonium disposition, the Budget Request will terminate the Mixed Oxide (MOX) approach and move to a dilute and dispose approach that will be faster and significantly less expensive than the MOX option. Specifically, the FY 2017 Budget Request provides \$270 million, \$70 million below FY 2016, to terminate the MOX Fuel Fabrication Facility, and an additional \$15 million to pursue a dilute and dispose (D&D) approach that will disposition surplus U.S. weapon-grade plutonium by diluting it and disposing of it at a geologic repository. The Department will complete pre-conceptual design for the D&D option and begin conceptual design in late FY 2017.

In other nonproliferation areas, the Request includes \$272 million, \$37 million above FY 2016, to sustain emergency response and nuclear counterterrorism capabilities that are applied against a wide range of high-consequence nuclear or radiological incidents and threats. It proposes \$394 million for the Defense Nuclear Nonproliferation Research and Development program to advance technical capabilities to monitor foreign nuclear weapons program activities, diversion of special nuclear material, and nuclear detonations. The Request provides \$341 million for Material Management and Minimization to support HEU and

plutonium disposition, the conversion of research reactors and medical isotope production facilities from the use of HEU to the use of low enriched uranium (LEU) fuels and targets, and removal of excess HEU and separated plutonium. The Request also provides \$337 million for Global Material Security to build international capacity to secure, and prevent smuggling of, nuclear and radiological material through equipment installations and upgrades, and capacity-building workshops and trainings. In addition, the Request provides \$125 million for the Nonproliferation and Arms Control program to strengthen the nonproliferation and arms control regimes by enhancing international nuclear safeguards; controlling the spread of nuclear material, equipment, technology, and expertise; and verifying nuclear reductions and compliance with nonproliferation and arms control treaties and agreements.

#### **Advancing Navy Nuclear Propulsion**

Finally for NNSA, the Naval Reactors program continues its tradition of providing the design, development and operational support required to provide militarily effective nuclear propulsion plants and ensure their safe, reliable and long-lived operation. In carrying out this mission, the Naval Reactors program has marked many major accomplishments.

The program continues to provide technical support and 24/7 reachback support for the Navy's nuclear fleet of 73 submarines and 10 aircraft carriers. The program successfully achieved criticality in the first reactor of the new Gerald R. Ford-class aircraft carrier, and continued reactor plant design for the Ohio-class submarine replacement and advanced technology development in refueling of S8G land-based prototype reactor, including the insertion of new materials and technology for the Ohio-class submarine replacement. Naval Reactors also operated the MARF (Modifications and Additions to a Reactor Facility) and S8G land-based prototype reactors, delivering 2,832 trained nuclear operators to the fleet—a 17 percent increase over FY 2014.

The Request includes \$1.4 billion for Naval Reactors, an increase of \$45 million from the FY 2016 level, to support U.S. Navy nuclear propulsion. The Request provides \$214 million to continue development of the Ohio-class submarine

replacement reactor, and \$124 million to continue refueling of the Land-Based Prototype reactor.

In support of necessary facilities for handling naval spent nuclear fuel, including the capability to receive, unload, prepare, and package naval spent nuclear fuel, the Request provides \$100 million to complete design and initiate construction of a new Spent Fuel Handling Recapitalization Project at Naval Reactors Facility in Idaho.

### **Management and Performance**

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The FY 2017 Budget Request provides \$6.8 billion for Departmental management, performance, and related corporate support activities to position the Department to meet the nation's Manhattan Project and Cold War legacy responsibilities and to continue institutionalizing an enterprise-wide focus on improving the efficiency and effectiveness of DOE programs through the effective management of DOE's infrastructure and workforce.

#### **Strengthening Project Management**

The Department is aggressively pursuing implementation of a Secretarial initiative to improve project management. We have made progress to that end through several recent initiatives and reforms, including establishing independent project review capabilities within each Under Secretary organization, as well as a central Project Management Risk Committee (PMRC). We have also formalized the role of the Energy Systems Acquisition Advisory Board (ESAAB) and instituted process changes to ensure that the ESAAB takes a proactive role in reviewing major projects. In addition, we established a new independent office on project management oversight and assessments.

It is notable the Government Accountability Office (GAO) has narrowed the focus of its watch list to DOE's major projects, and we continue to work towards improving our implementation of those projects. The Department's continuing goal is to control costs to within 10 percent of the baseline estimate for at least 90 percent of our construction projects.

The FY 2017 Budget Request includes several proposals to further implement these project management improvements. The Request provides \$18 million for the

independent office of Project Management Oversight and Assessments (PMOA). With senior management focus on DOE's total project portfolio, DOE will be able to hold contractors and programs accountable for large and at-risk projects, receiving early warning notifications and quarterly updates.

The Budget Request also includes \$5 million to establish an independent office, similar to that at the Department of Defense, to set cost estimating policy and provide timely unbiased program evaluation analysis and cost estimation.

### **Cleaning up Nuclear Legacy Waste**

The FY 2017 Budget Request includes \$6.1 billion for Environmental Management (EM), \$99 million below the FY 2016 enacted level, to address its responsibilities for the cleanup of large quantities of liquid radioactive waste, spent nuclear fuel, contaminated soil and groundwater, and deactivating and decommissioning excess facilities used by the nation's nuclear weapons program. The \$6.1 billion Request includes \$5.4 billion in discretionary funding and proposes \$674 million in mandatory funding from the USEC Fund, for Uranium Enrichment Decontamination and Decommissioning (UED&D) Fund activities.

While difficult challenges lie ahead with some of our remaining Environmental Management projects, it is important to note that when the program started, there were 107 sites to be closed—and today we have cleaned up all but 16 sites. The remaining sites will not be simple to remediate, but we started with over 3,000 square miles to remediate, and only 300 square miles remain.

In our ongoing efforts to remediate our legacy sites, we have continued construction activities necessary to initiate direct feed of Low Activity Waste (LAW) at Hanford, and we have continued technical issue resolution of the Pretreatment and High Level Waste facilities at the same site. We have cleaned up and demolished more than 800 facilities at Hanford, and we have remediated over 1,200 waste sites along the River Corridor. At the Savannah River Site, we have closed the seventh waste tank, and we have revitalized the EM Technology Development and Deployment Program in response to a Secretary of Energy Advisory Board (SEAB) recommendation.



Looking forward, the FY 2017 Budget Request includes \$271 million to maintain critical progress toward resuming waste emplacement in the underground at the Waste Isolation Pilot Plant (WIPP) by the end of 2016. WIPP, the Nation's only mined geologic repository for the permanent disposal of defense-generated transuranic waste, suspended operations following a February 5, 2014 fire involving an underground vehicle and an unrelated radioactive release that occurred February 14, 2014. The Request for WIPP includes activities to resume waste emplacement operations by the end of 2016, including continued implementation of corrective actions and safety management program improvements, completion of Operational Readiness Reviews and commencement of waste emplacement operations. Activities include mine stabilization, mining, mine habitability activities in all underground areas, continued decontamination of contaminated areas, and upgrades, support for completion of repairs of New Mexico Roads used for the transportation of DOE shipments of transuranic waste to WIPP, and community and regulatory support. The budget supports the Central Characterization Project and maintains shipping capability between the generator sites and WIPP. The Request also includes funding to support progress in design of a new permanent ventilation system that is needed to support normal operations.

The FY 2017 Budget Request provides \$1.5 billion for the Office of River Protection, \$86 million above the FY 2016 enacted level, to support the Department's proposal to amend the Consent Decree between DOE and the State of Washington for completion of the Waste Treatment and Immobilization Plant and retrieval of waste from 19 Single Shell Tanks. The Budget Request would enable construction of a new facility to allow DOE to begin treating low level waste by the end of 2022, avoiding the need to wait for completion of other facilities affected by the technical issues. The Request continues construction of the low activity waste (LAW) facility, the analytical laboratory, and balance of facilities while addressing technical issues with the pretreatment facility and the high-level waste facility as well as support for the planning and design of the LAW pretreatment system at the tank farms.

The Request also provides \$800 million for cleanup of the Richland Site. Cleanup activities include soil and groundwater remediation, facility decontamination and decommissioning, stabilization and disposition of nuclear materials and spent nuclear fuel, and disposition of waste other than the tank waste managed by the

Office of River Protection. The FY 2017 Request for Richland will provide for continued achievement of important cleanup progress required by the Tri-Party Agreement. The Budget Request for Richland supports completion of cleanup at the Plutonium Finishing Plant, planning and initiation of procurement in preparation for cleanup of the 324 site, and other activities. The decrease of \$191 million from FY 2016 is attributed to completed scope and facility modifications to prepare for installation of sludge removal systems for the K West Basin, as well as purchase of the engineered containers for sludge repackaging; and completion of remediation in the 300 area, 100K area and 618-10 trenches.

The Request provides \$1.5 billion, \$111 million above FY 2016, for the Savannah River Site to support remaining construction and commissioning of the Salt Waste Processing Facility, processing 19 million gallons of salt waste and nuclear materials in H-Canyon, and site-wide infrastructure. The Request will ramp up commissioning of the Salt Waste Processing Facility to enable start-up in 2018. The Request devotes significant funding to support the Liquid Tank Waste Management Program, as the liquid waste tanks pose the highest public, worker, and environmental risk at the site. The Request also supports the Savannah River Site to operate H Canyon in a safe and secure manner, provides safe, secure storage for spent (used) nuclear fuel in L-Area, and supports continuity of K-Area operations to include maintaining K-Area to store special nuclear material safely and securely. The increase over FY 2016 provides additional support leading to startup of Salt Waste Processing Facility in 2018; supports tank closure and bulk waste removal activities to meet FY 2016 enforceable milestones; and provides additional funding for Salt Disposal Unit #7 design activities.

The FY 2017 Budget Request includes \$370 million, \$32 million below FY 2016, for the Idaho Site to support key requirements to continue progress in meeting the Idaho Settlement Agreement commitments. The Idaho Cleanup Project is responsible for the treatment, storage, and disposition of a variety of radioactive and hazardous waste streams, including removal and disposition of targeted buried waste sitting above the Snake River Plain Aquifer. The project is also responsible for removing or deactivating unneeded facilities, and removing DOE's inventory of spent (used) nuclear fuel and high-level waste from Idaho. The Request will continue retrieval and processing of transuranic waste via the Advanced Mixed Waste Treatment Project and the Remote-handled Waste Disposition Project. It

will also support continued progress toward closing the tank farm, including continued treatment and disposition of sodium bearing waste and progress toward buried waste exhumation under the Accelerated Retrieval Project. The decrease from the FY 2016 level is attributed to progress in treatment, packaging, and certification of Idaho Settlement Agreement remote-handled transuranic waste, delays in processing waste at the Integrated Waste Treatment Unit, and a one-time funding increase in FY 2016 for procurements.

The FY 2017 Budget Request provides \$391 million for cleanup at the Oak Ridge site, including \$178 million in proposed mandatory funding, to support direct shipments of Uranium Solidification Project material, continue design and construction of the Mercury Treatment Facility, continue contact- and remote-handled debris processing at the Transuranic Waste Processing Facility, and continue the K-27 Decontamination and Decommissioning project. The Request will maintain the facilities in a safe, compliant, and secure manner as well as operate waste management facilities. The Request will continue development of Comprehensive Environmental Response, Compensation and Liability Act documentation for the new On-Site Disposal Facility. The processing of legacy transuranic waste debris will continue at the Transuranic Waste Processing Center and technology maturation and design will continue for the Sludge Processing Facility Buildout project. Additionally, the Request supports direct disposition of Consolidated Edison Uranium Solidification Project material from Building 3019, assuming resolution of stakeholder concerns.

The Budget Request includes \$323 million, including \$258 million in proposed mandatory funding, to support the deactivation and decommissioning project at the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio. In addition to supporting deactivation and decommissioning of gaseous diffusion plant facilities and systems, disposal of waste, small equipment removal, and other related activities, the request also includes funding for design and construction of a potential on-site landfill for the disposal of waste generated from the demolition of the Portsmouth Gaseous Diffusion Plant and associated facilities. In addition, the Request will continue the safe operation of the DUF6 Conversion facility that converts depleted uranium hexafluoride into a more stable depleted uranium oxide form suitable for reuse or disposition. The Request for the Portsmouth is supplemented by

continuing transfers of uranium for cleanup services at the Portsmouth Gaseous Diffusion Plant.

The Request provides \$272 million for the Paducah site, including \$208 million in proposed mandatory funding, for a multifaceted portfolio of processing and cleanup activities. In addition to ongoing environmental cleanup and DUF6 operations, the Budget Request supports activities to continue the environmental remediation and further stabilize the gaseous diffusion plant, including uranium deposit removal, facility modifications, surveillance and maintenance, and activities to remove hazardous materials. The Request supports the design of the Paducah potential On-Site Waste Disposal Facility project, if the project is selected as the appropriate remedy.

The FY 2017 Budget Request includes \$30 million to expand the technology development program through carefully targeted projects to develop and demonstrate new technologies and approaches tailored to the specific contamination issues at individual sites. The FY 2017 Budget Request includes an emphasis on robotics research and development of test beds in support of DOE's cleanup mission.

#### **Refinancing Uranium Enrichment Decontamination and Decommissioning**

Continued progress towards decontaminating, decommissioning, and remediating the former gaseous diffusion uranium enrichment sites, and towards meeting our uranium/thorium reimbursement commitments, remains a priority for DOE. We have made significant strides at the Oak Ridge, Portsmouth, and Paducah sites, but we have an estimated \$22-24 billion in remaining cleanup costs.

Throughout the history of these sites, the government has collected funds from the public and private entities that utilized the enriched uranium produced at the facilities to pay for operation, privatization, and cleanup of these three sites—some provided by utility fees, and others provided by Congress. Three government accounts— Uranium Enrichment Decontamination and Decommissioning Fund, Uranium Supply and Enrichment Activities Account, and the United States Enrichment Corporation (USEC) Fund—hold nearly \$5 billion of these funds.

The FY 2017 Budget Request proposes to make progress on our cleanup missions at Paducah, Portsmouth, and Oak Ridge, and the Title X Uranium/Thorium Reimbursement Program by harnessing some of these funds through a mandatory proposal to make available \$674 million from the United States Enrichment Corporation Fund.

Through the Energy Policy Act of 1992, Congress authorized annual deposits to the Uranium Enrichment Decontamination and Decommissioning (UED&D) Fund from an assessment on nuclear utilities for 15 years—from fiscal years 1993 through 2007. The Budget Request proposes to reinstate these fees to offset proposed new mandatory spending for uranium enrichment cleanup. The Budget also includes \$155 million of defense funding for deposit into the UED&D Fund, reflecting the shared responsibility of both industry and the federal government for these costs.

#### **Investing in Departmental Infrastructure**

The FY 2017 Budget Request supports safe and reliable world class facilities by investing in new infrastructure in all mission areas and establishing a sustainable trajectory for the Department's existing infrastructure.

As part of our effort to manage the enterprise's infrastructure in a sustainable manner to support DOE missions, beginning in FY 2016, we have implemented a policy to halt increases in deferred maintenance across the DOE complex. We have also taken steps to bolster DOE's enterprise-wide inventory by compiling the first uniform assessment of general purpose infrastructure at all National Laboratories and NNSA plants and sites through the National Laboratory Operations Board (LOB), and forming a LOB working group to assess and prioritize the disposition of excess facilities.

Building on these efforts, the FY 2017 Budget Request continues a comprehensive program of infrastructure modernization and improved maintenance across the complex, including expanded funding for general purpose infrastructure projects. The Budget proposes, for example, \$200 million for the disposal of the Kansas City Bannister Federal complex. Finally, we are seeking to improve the energy efficiency and sustainability of government facilities, including use of Energy Savings Performance Contracts.

### **Building and Supporting the Energy Workforce**

DOE's continues to work to attract, manage, train and retain the best workforce to meet its future mission needs.

In support of managing the workforce and hiring new personnel, we have activated two Consolidated Human Resources (HR) Service Centers, at Cincinnati and Oak Ridge, as part of a new service delivery model to consolidate 17 current HR service centers to five, which should allow for a more efficient and effective HR model across DOE. The FY 2017 Budget Request completes the HR Shared Services Centers consolidation and invests in implementing recommendations resulting from a talent management study conducted in FY 2016, which will help to develop a corporate approach to talent acquisition in order to consistently and effectively attract, develop, and retain the best workforce to meet mission needs.

The DOE Office of the Chief Information Officer (CIO) and related offices continue to build the information technology (IT) infrastructure in support of DOE's mission needs. DOE is expanding Multifactor Authentication Program for improved cyber security. The FY 2017 Budget Request strengthens cybersecurity across the enterprise with an investment of \$285 million, an increase of \$23 million across 13 offices and the Working Capital Fund.

The \$93 million FY 2017 Budget Request for CIO, \$20 million above FY 2016, also supports several critical IT improvements, including implementation of Federal Information Technology Acquisition Reform Act (FITARA) requirements to provide a common baseline for roles, responsibilities, requirements, and authorities for the management of IT in federal civilian agencies. The Request also includes efforts to modernize and further secure the Department's IT infrastructure, including core networking layers, data centers, and access technologies.

The Department has established a Labor-Management Forum to further encourage opportunities for collaboration and partnership between contractors and management.

The Department has established the Office of Energy Jobs Development, consolidating ongoing activities across the Department formerly coordinated via the Jobs Strategy Council. The Request includes \$3.7 million to support the office

and to compile survey data and deliver the energy jobs and workforce report that would detail job growth/shifts in the energy and advanced manufacturing industries; fill the gaps that currently exist in data gathering on renewable energy, energy efficiency, and advanced manufacturing jobs; and compile data on energy job skill needs of employers and public agencies.

#### **Advancing DOE's Critical Missions**

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In conclusion, the FY 2017 Budget Request of \$32.5 billion invests in its science and technology capabilities, its workforce, and its critical infrastructure to advance DOE's core missions.

The Request supports the Department's efforts in science and energy to enable a clean energy future through innovative lower-cost energy technologies; to support secure, modern and resilient energy infrastructure and emergency response capabilities; and to provide the backbone for discovery and innovation, especially in the physical sciences, for America's research community.

The Request invests in the Department's nuclear security missions to maintain a safe, secure, and effective nuclear deterrent without nuclear explosive testing; to modernize the nuclear security research and production infrastructure; to reduce global nuclear security threats; and to propel our nuclear Navy.

And the Request continues taking steps to further the Department's management and performance missions to clean up from the Cold War legacy of nuclear weapons production; to manage infrastructure in a sustainable manner to support DOE missions; and to attract, manage, train and retain the best workforce to meet mission needs.

Thank you, and I would be pleased to answer your questions.

The CHAIRMAN. Thank you, Mr. Secretary. I appreciate you highlighting some of the things that we have been working on. It was several years ago when we introduced Energy 20/20 and brought up for discussion the energy/water nexus as a priority. It is good to see the Department taking that and running with it, as you have mentioned.

Also highlighting the public/private partnerships that Mr. Gates is leading many of us on this Committee have had the opportunity to sit down with him, as well as you, for further discussion there, so we appreciate that.

I want to go a little more parochial and my first round of questions will be focused on Alaska specific initiatives. Again, thank you for coming to Bethel. Thank you for your commitment to try to make a difference in places where there is no energy grid, so to speak.

You mentioned at our field hearing that you recognize the DOE Office of Indian Energy was understaffed and that you were intending to add new staff members to the Alaska office. Can you give me any update when we might expect to see additional staff put in place there?

Secretary MONIZ. Yes.

We have, well we have, the job description posted for the first of those positions. I'm certainly looking to get at least two positions filled in the next say, half year, but we'd like to get people there as soon as we can.

The CHAIRMAN. Yes.

Secretary MONIZ. And we have to go through a process, obviously, of advertising and competing.

We'd also hope and frankly, you could help make sure that we have an excellent applicant pool from Alaska itself because local knowledge could only help be most effective.

The CHAIRMAN. Well, we want to work with you on that because, we too, think that there needs to be a priority there of those who have lived and worked and raised their families in the regions and know some of the challenges but also how we can overcome them.

Secretary MONIZ. And may I add?

The CHAIRMAN. Yes.

Secretary MONIZ. The evident innovation that's been displayed already.

The CHAIRMAN. Absolutely.

Secretary MONIZ. Within the state.

The CHAIRMAN. Absolutely. Thank you for recognizing that.

I want to ask more specific to the issue of microgrids themselves. You heard from our Alaskan expert, Gwen Holdmann, there at the University of Alaska's Center for Energy and Power. Recognizing that we have these islanded systems in Alaska, what are your views on the Department possibly changing the definition of microgrids to recognize that these systems in rural Alaska that are independent and not part of anybody else's grid are also a form of microgrids because we have come up with some definitional challenges here?

Secretary MONIZ. I will look into whether there is a precise definitional issue in the Department, but I can assure you we are and will be looking at both grid-connected microgrids and completely off



grid microgrids. In fact, we are funding the Alaska microgrids partnership with three remote communities there.

We have also had or have our national labs working on a design support tool for microgrids that will, you know, work with the Alaska. Of course we all know in Fairbanks, in particular, there's a very strong energy research center. So we are working on isolated microgrids. Indeed, as you use the word island, and in fact two years ago we produced a document on island energy systems that we are, that is drawn from experience in Hawaii. It's being applied in the Caribbean and many of the same physical features, in effect, occur in Alaska.

The CHAIRMAN. Well, let's work on that one because if there is something that we need to correct, we would like to do that with you.

Secretary MONIZ. Okay.

The CHAIRMAN. As we were saying hello here before the Committee began we discussed very briefly the DOE award that went to the Village of Igiugig and what they are doing within their river system to generate marine hydrokinetic energy. It is really quite exciting and I appreciate the Department stepping up and helping to facilitate that.

The Office of Water and Power, though, appears to be emphasizing wave power research and demonstration projects over current projects, over tidal power technologies. Is that somehow purposeful?

When you look at the budget that is one of the conclusions that you are left to draw, and we think that given what we have with the Kuskokwim and the Yukon, you saw the Kuskokwim when it was frozen solid, but it is moving underneath there. Being able to harness the power of our rivers as well as 33,000 miles of coastline is something that we are very, very interested in. Am I incorrect somehow in my observation that the emphasis seems to be on wave power research?

Secretary MONIZ. Well, we do have programs across all of the hydrokinetic and wave power. I will look more closely at that in terms of the balance of title, to be honest, but—

The CHAIRMAN. Look at the funding because that is what got our attention.

Secretary MONIZ. Okay.

But may I just add that the Alaska project with the turbine, and I will not attempt to pronounce the name.

The CHAIRMAN. Igiugig.

Secretary MONIZ. Of the village. But I think it's been a tremendous success. You know, it was already pulled out and re-optimized which gave a tremendously better performance in its second year. It significantly cut diesel fuel use there. And so now, with this new grant, it will be about taking advantage of that designing something which could be placed, of course, a number of other locations as well.

The CHAIRMAN. It is really exciting.

Secretary MONIZ. Very exciting.

The CHAIRMAN. Thank you for recognizing that.

Secretary MONIZ. Yeah.

The CHAIRMAN. Senator Cantwell had to go off to another Committee, so let's turn to Senator Heinrich.

Senator HEINRICH. Thank you very much, Madam Chair.

Secretary Moniz, I am very pleased to see your continued focus on getting WIPP reopened, and I want to thank you for the focus that DOE has put on safety throughout that entire process.

I just want to ask you, are you on schedule and are there any budget or schedule issues that should concern me at this point?

Secretary MONIZ. Senator Heinrich, no. We believe we are on schedule for safely restarting operations later.

Senator HEINRICH. December?

Secretary MONIZ. Later this year.

Senator HEINRICH. Okay.

Secretary MONIZ. Exactly, yes. And the budget request for FY'17 is on track, for our program, right.

Senator HEINRICH. Fantastic.

Secretary MONIZ. We will, as you know, then, down the road need more capital funding for the full ventilation system.

Senator HEINRICH. Yes.

Secretary MONIZ. For full scale operations at the beginning of the next decade.

Senator HEINRICH. We look forward to working with you on that.

Switching to Los Alamos real quick. I was hoping you could talk a little bit about why we do not have a current consent order in place with the state to be able to guide budgeting and spending issues as well as just what priority updating that consent order has with the Department of Energy.

Secretary MONIZ. No, it's very important, and that is under very active negotiation with the state. We are hoping that in the reasonably near future that will be completed, at least for comment, and that we will then be in a position to adjust appropriately our long range cleanup plan.

Senator HEINRICH. Great.

As you know I have, for a long time, been a champion of efforts to improve tech transfer from our labs as an engine of domestic and economic development. I am really pleased with the small business voucher initiative from your Office of Technology Transitions (OTT) and also the recent technology commercialization fund.

However, I understand that there may be some issues with a cost sharing requirement and I wanted to see if you could talk a little bit about what those issues are and what we can do to help solve some of that.

Secretary MONIZ. Well, first let me say, I appreciate your interest and that of a few other members in terms of the tech transfer business. And I would just say that there was quite a few initiatives, including establishing the OTT, the fund. We've also established, within that office, an Energy Investment Center. We just hired an excellent person in January to head that, so I think it's certainly been elevated in the visibility.

Senator HEINRICH. And we appreciate that very much.

Secretary MONIZ. Great, yeah.

Senator HEINRICH. I think a lot of people are excited about those efforts.

Secretary MONIZ. Good.

With regard to the fund, yeah, I think our interpretation is that we need, kind of, 50/50 cost sharing there. But certainly more flexibility is, I mean, would always, frankly, be welcome. I mean, we, as you know, in various of our programs there are some cases, sometimes in which, 20 percent cost sharing is called for versus 50 percent. So that's certainly something we'd be happy to work with you on that.

Senator HEINRICH. I look forward to that.

And if there are specifically authorization issues.

Secretary MONIZ. Yes.

Senator HEINRICH. And language issues that we can work with you on.

Secretary MONIZ. That could be helpful.

Senator HEINRICH. We are happy to do that.

Obviously DOE's battery storage hub is now in its fourth year. If you look at the storage market broadly in this country, I think I saw a headline this morning that said it grew something like 243 percent last year. Obviously starting from a very small place, but growing incredibly quickly.

This is going to be a critical link in the evolution of the grid from, sort of, a centralized grid that my dad knew as a lineman to the distributed structure that we see more and more around the country.

Are there advanced battery chemistries beyond the lithium ion chemistry that we are all familiar with that are under development, that might meet future cost and energy goals or what are you seeing within that program that is exciting to you at this moment?

Secretary MONIZ. Well, first of all the JCESR hub, I think, has been doing very well. And as you say, actually and their first five period will end of the end of 2017 so we will soon be getting into the kind of reviews to talk about a potential extension. The hub is working both on grid scale and on transportation batteries.

On the transportation side the principle activity is on Lithium Sulphur and they've made some excellent progress there. By the way and the goals are basically five times the energy density at one fifth the cost.

And by the way, as you said, I want to emphasize that this is one of the areas and there are others. I love driverless vehicles, as an interesting thing.

But the point is in these cases, including storage, you know, they're coming at us much faster than people thought. And I think it's not always recognized.

So on the grid side the main activity is on some of the flow batteries where you use liquids instead of solid electrodes.

Another chemistry being looked at is magnesium and the idea, sorry for the technical word, but it's the IR valence opportunity which can greatly increase the energy density.

So it's a variety of issues at JCESR. I do want to emphasize that in addition to that hub, of course, I think, I'm not sure, I think we have about \$225 million in various programs addressing energy storage. It's a game changer and the costs have come down, let's say for vehicle batteries by 70 percent in the last six or seven years.

Again, I think people are not internalizing all of this and you're seeing more and more storage introduced on the grid. For example, you're seeing novel uses of let's say, used vehicle batteries coming in for voltage support in grids.

So a lot is happening, and when that penetrates to the consumer end, I think we will see another big shift.

Senator HEINRICH. Thank you, Secretary.

The CHAIRMAN. Thank you.

Senator Barrasso?

Senator BARRASSO. Thank you, Madam Chairman.

Mr. Secretary, good to see you again.

I just noticed on Friday the Wall Street Journal had a front page story and it was entitled, "Europe Energy Escape Valve, U.S. Gas." So the escape valve for Europe for energy is U.S. gas. The Gulf Coast exports are expected to loosen Russia's grip on the market. That is the sub headline.

[The information referred to follows:]



We have talked about this. The article discusses the first shipment of liquefied natural gas (LNG) from the continental United States. It took place last Wednesday. It explains that exports of U.S. liquefied natural gas will give countries like Lithuania, Poland and Bulgaria greater political independence from Russia. As one Lithuanian Mayor put it, "U.S. LNG is more than just about gas. It's about freedom."

So the article goes on to cite that Deutsche Bank estimates that the U.S. could catch up with Russia as Europe's biggest gas supplier within a decade with each nation controlling about a fifth of the market. It is not going to be easy. Russia controls about a third of Europe's market right now and it may wage a price war, I read, to maintain its share of the market.

Iran is also interested in exporting LNG to Europe. Senator Cantwell mentioned your role in the negotiations with Iran in January. The Wall Street Journal also ran a story on the front page of the business section, "Iran seeks ways to ship out gas as sanctions ease."

[The information referred to follows:]

## Iran Seeks Ways To Ship Out Gas As Sanctions Ease

27 Jan 2016 7:47 am

(FROM THE WALL STREET JOURNAL 1/27/16)

By Benoit Faucon

TEHRAN -- Iran is pushing to find new ways to extract and export its vast natural-gas reserves, including developing facilities to liquefy the commodity and ship it to Europe in two years, now that Western sanctions have lifted, according to a top Iranian official.

Iran holds the world's largest reserves of natural gas, but has long lacked the export infrastructure of competitors such as Russia and Qatar. They have networks of international pipelines as well as liquefied-natural-gas facilities that enable them to export gas by ship.

Tehran is exploring several options to help the country "join the international LNG club," said Alireza Kameli, managing director of National Iranian Gas Export Co., in an interview.

One project would involve restarting work on the country's most advanced LNG project, Iran LNG, which was 40% complete when tightened Western sanctions forced work to be abandoned in 2012. It could take another three to four years to complete the project, Mr. Kameli said.

Another option would be building a pipeline beneath the Persian Gulf to Oman, which has LNG facilities that Iran could potentially use, Mr. Kameli said. Oman has agreed to build the pipeline within two years. Omani officials didn't respond to requests for comment.

Mr. Kameli said his company is also in talks with European companies, including Oslo- and Nasdaq-listed Golar LNG Ltd., to build floating LNG facilities -- offshore vessels on which the gas would be liquefied. Such a project would take "less than two years," he said. Golar declined to comment.

Once LNG facilities are in place, Mr. Kameli said, exports to "Europe definitely could be considered."

Last week, Hellenic Petroleum, Greece's largest refinery, agreed to buy oil from National Iranian Oil Co., marking the first sale of Iranian crude to a European country since the lifting of trade sanctions against the Middle Eastern nation. Other European companies are promising billions in new deals in Iran as Iranian President Hassan Rouhani visits Europe this week to revive trade and political ties.

European Union officials have said Iran could be a key supplier of natural gas and help the bloc reduce its reliance on Russia.

But the two-year horizon "doesn't sound very realistic," one EU official said, citing internal assessments from the European Commission, the bloc's executive arm. The commission has been working to rebuild energy ties with Iran over the past year, once it became clear that sanctions would likely be lifted. It plans to send an assessment mission to Iran in February to scope out possibilities.

Iran exports small quantities of gas to Azerbaijan, Armenia and Turkey, typically about 9 billion cubic meters a year. Another Iranian gas official said last year that Iran could export about 30 billion cubic meters to the EU in the long term. That estimate is consistent with one EU assessment, which put EU imports at between 25 billion and 35 billion cubic meters of gas a year from Iran by 2030, if LNG facilities are developed.

It is a difficult time to launch new LNG projects, which generally cost billions of dollars and take years to build. The slump in oil prices has hit LNG hard, as consumers typically pay for the product on oil-linked contracts.

On top of that, plenty of new LNG supplies are expected to come into production by the end of the decade. The price for LNG in Asia -- the fuel's main market -- has collapsed.

Low prices could stimulate new LNG demand from industrial users, said John Hall, chairman of U.K. consultancy Alfa Energy. "In two years, there will be room for another player in Europe," he said.

National Iranian Gas Export Co. also plans to invest in gas infrastructure such as distribution networks, plants or pipelines, Mr. Kameli said.

Sending Iranian gas by pipeline through Turkey is generally considered the shortest route to Europe, but building the infrastructure enough to increase exports "doesn't seem feasible" economically, Mr. Kameli said.

Iran is also talking about supplying gas to its neighbors in the Persian Gulf, notably Kuwait and the U.A.E., which don't have sizable gas reserves and could be supplied with short pipelines.

One possible regional market is Saudi Arabia, Iran's main political rival in the Middle East, which is trying to shift away from using crude oil for power generation. The kingdom has gas reserves that are too expensive to produce at today's prices.

"Saudi Arabia is a big potential customer. They don't have the choice but to approach Iran," Mr. Kameli said. Saudi officials weren't reachable for comment.

Relations between Saudi Arabia and Iran have deteriorated in the past year as the two countries have sided with different interests in wars in Syria and Yemen. Saudi Arabia cut off diplomatic ties to Iran after its embassy in Tehran was set on fire following Riyadh's execution of a prominent Shiite cleric.

Mr. Kameli said renewed trading ties could help soothe tensions. "Piped gas can help political relations between countries," he said.

(END) Dow Jones Newswires

January 27, 2016 02:47 ET (07:47 GMT)

That article explains that Iran may be able to export LNG to Europe within two years.

I am concerned that Europe may develop a dependency on Iranian gas as it tries to reduce its imports from Russian gas. Now that is why I believe it is critical that we continue to make U.S. liquefied natural gas available on the world market.

So the question is will you commit to acting promptly on LNG export applications for the remainder of this Administration?

Secretary MONIZ. Yes, we have and we will.

If I may add a comment?

Senator BARRASSO. Please.

Secretary MONIZ. Because I completely share your interest and the importance of natural gas diverse supply for Europe. First of all, I would question that two years. I think that is not very likely, to be honest.

But I want to emphasize that in addition to U.S. LNG the Southern corridor bringing Caspian gas is well underway. We have supported that and, frankly, directly been helping with some of the conversations there.

But also we're very encouraged at the prospects of Eastern Mediterranean gas, Cypress, Israel, etcetera. And there's an interesting question there on Turkey, Egypt, going on.

As an aside I'll be in Israel beginning of April and be able to discuss some of that gas development there as well.

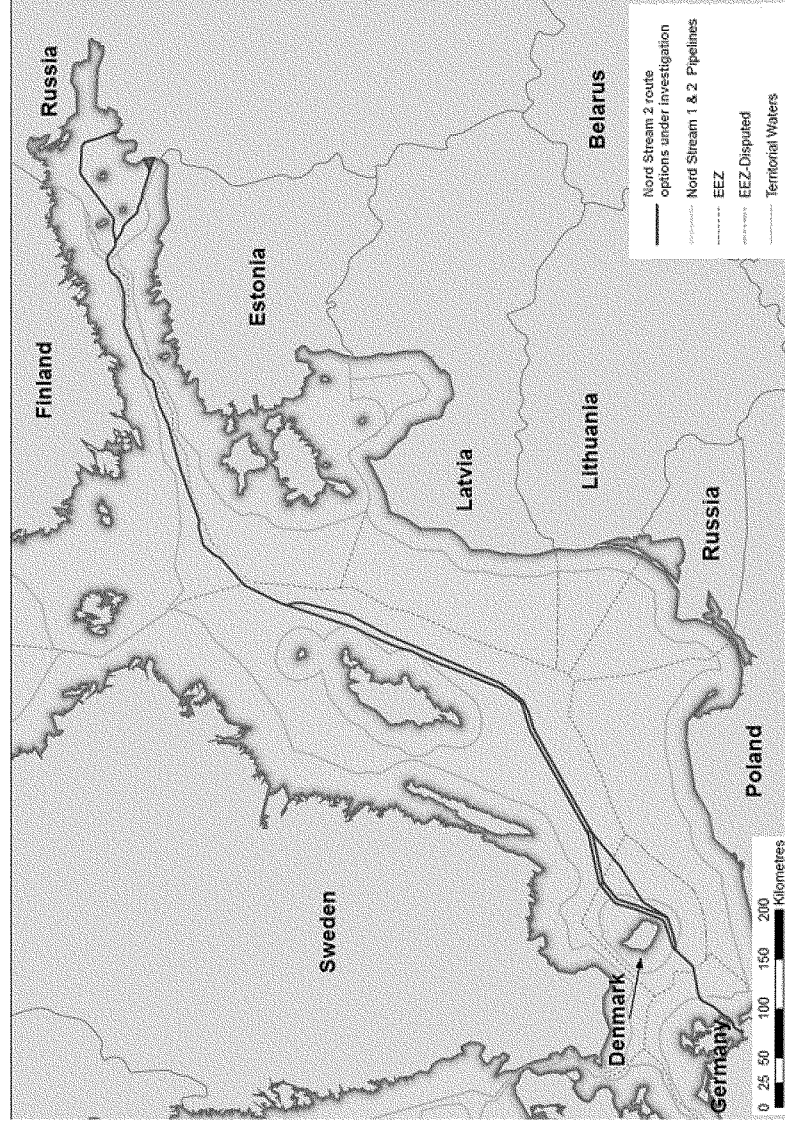
Senator BARRASSO. The two-year idea came because the sanctions against Iran had stopped the construction of their LNG facilities. They have huge resources of natural gas and their thought that was in terms of the just renewing the construction that they could actually within two-years get things going.

But along the line that you have been talking about in terms of other sources, I would like to turn to the Nord Stream 2 pipeline which is one of those potential sources. This project, as you know, would run from Russia under the Baltic Sea directly to Germany, and the Nord Stream 2 would follow the path of the original Nord Stream pathway.

[The information referred to follows:]



## Nord Stream 2 Natural Gas Pipeline Proposal



It would significantly boost Russia's gas exports to Germany. So Russia is playing an additional role.

Ten European countries, mostly from Eastern Europe are asking the European Union to block this project. These countries believe that this Nord Stream 2 would undermine sanctions on Russia, would increase Russia's political leverage over Eastern Europe.

It is estimated that this pipeline would cost Ukraine about \$2 billion annually in natural gas transit fees they would lose. Last week Richard Morningstar, a former U.S. Ambassador to the European Union, said that this is a really bad idea, the Nord Stream 2, and went on to say that if you want to kill Europe's LNG strategy, go ahead with Nord Stream 2, put much more dependent on Russia.

So to date, Germany's Chancellor Angela Merkel has, kind of, defended the project. We discussed this issue last October in the Committee. Since then I have heard very little from top ranking Administration officials.

So, does the Administration have a plan to stop this project and, if so, what is it?

Secretary MONIZ. Well clearly this is, in the end, a European decision. I would note that the European Commission has certainly emphasized the diversity of supply and this project would do nothing to increase diversity of supply. It may even, as you said, may even strengthen—

Senator BARRASSO. Add to more dependence on Russia.

Secretary MONIZ. Correct.

And it certainly is a geopolitical tool as well in terms of Eastern Europe and Ukraine. So we remain active in discussions but clearly it's a European decision, and there is considerable public disagreements within Europe.

Senator BARRASSO. Well, let me be clear. I think President Obama should do everything he can to kill this Nord Stream 2. I just wonder if the President has discussed this with Chancellor Merkel.

Secretary MONIZ. Well I'm not free to discuss what those conversations are.

Senator BARRASSO. Thank you, Madam Chairman.

The CHAIRMAN. Thank you.

Senator Franken?

Senator FRANKEN. Thank you, Madam Chair.

Mr. Secretary, I am pleased to see that the Administration has increased funding for our shared priorities of energy efficiency, renewable energy, storage and research.

I want to turn to something that you and I have discussed in the past, the Tribal Indian Energy Loan Guarantee Program. This program was authorized by the Energy Policy Act of 2005 to help tribes overcome challenges in securing financing for energy projects, but it has never received Federal funding.

This program would allow DOE to guarantee loans issued to an Indian tribe for energy development. Developing these energy resources would bring high quality jobs to Indian Country, which Indian Country desperately needs. That is why I support this program as do many members of this Committee on both sides of the aisle.

Last year you had put in your budget about \$11 million for that program which would have leveraged about \$90 million in projects. I was very disappointed to see that the program was not included in the President's budget request. I am going to do everything to make sure that Congress appropriates funding in this bill because it has a lot of allies.

Secretary MONIZ, I know that this is an issue that you care about. We have talked about it in this Committee. Would you also press Senate appropriators to fund this program?

Secretary MONIZ. As you say, I am certainly very, very supportive of the Indian Energy program. I think it's important. And I would note that a piece of the current energy bill in the Senate, I think, is a step forward by providing for the tribes' and Alaska Native Corporations' access to the Section 17, Title 17 Loan Program. So I think that's a good start.

I would note that it would be even more powerful if it also included, at least modest access, to the credit subsidy part of the Energy Efficiency and Renewable Title 17 Loan Program.

Senator FRANKEN. Is it the 1703 program?

Secretary MONIZ. 1703 program, yes.

Senator FRANKEN. Yes, well I was going to ask you about that, but thank you.

Let me move on to the transformer reserve. In 2013 we saw a gunman attack a substation in Northern California and severely damage 17 transformers. Fortunately, this incident did not cause major outages. However, this attack made it clear that our grid is vulnerable to massive disruptions from physical attacks and even cyber-attacks or extreme weather.

Mr. Secretary, what is the current capacity for utilities in terms of having a reserve of transformers that could be used in emergencies to respond to a coordinated attack on our grid?

Secretary MONIZ. Well some of the large IOUs have taken some steps in this direction. But if you look across the country as a whole, I would say we are still quite vulnerable.

We are now doing a significant study of this, and we will report that back to the Congress. And depending upon its outcomes, of course, we may talk about some Federal role in establishing a more complete coverage.

We might also talk about that and frankly we have talked about it as potentially a North American strategy, particularly with our very strong integration with the Canadian grid.

Senator FRANKEN. Yes, well I do know that we have a study, but I filed an amendment to the Energy bill to authorize DOE to create a reserve, to create a strategic transformer reserve. This authorization was included in the Energy bill passed out of the House. It is my understanding that the Edison Electric Institute and some others have expressed concerns that a Federal reserve would be duplicative and could interfere with the industry's current voluntary sharing programs.

Do you think that the industry's voluntary sharing program goes far enough?

Secretary MONIZ. Well I think that's part of the study that will come out. But as I said, I mentioned the independent or the investor-owned utilities which EI represents.

Senator FRANKEN. Right.

Secretary MONIZ. But they do have many other structures for electricity delivery in this country and I don't want to prejudge the outcome of the study, but I think that that diversity of utility structures will probably end up suggesting the need for some—

Senator FRANKEN. Some reserves.

Secretary MONIZ. Some reserve, yeah.

Senator FRANKEN. When will the study be completed?

Secretary MONIZ. It's due in December but we had started it, actually, earlier than the congressional directive to do it within one year. So we may be able to get it there earlier.

Senator FRANKEN. Okay. Well thank you very much, Mr. Secretary.

Secretary MONIZ. Yeah.

Senator FRANKEN. Thank you, Madam Chair.

The CHAIRMAN. Thank you, Senator Franken.

Senator Daines, you are up next.

Senator DAINES. I used to be in the supply chain business. This is called "just in time" right here.

Secretary Moniz, good to see you again. I very much enjoyed our time in Alaska. I enjoyed talking about gravitational waves, the 27th dimension and getting insights into your amazing mind in terms of nuclear physics.

Secretary MONIZ. And your insights into social media. [Laughter.]

Senator DAINES. It was a great snapchat trip.

On that visit one of the aspects that we focused on was the energy challenges certainly facing Alaska Native villages and the Office of Indian Energy. This office was created by Congress in 2005 and has a statutory authority to facilitate energy development in Indian Country.

I recognize your budget asks for nearly \$23 million above the enacted \$16 million for FY'16, and I'll be submitting some questions for the record on this account.

Your budget proposes \$600 million in FY'17 including \$240 million of which is available from repurposing funding for clean coal projects, \$32 million below the enacted level.

At the same time the budget proposes \$2.9 billion in energy efficiency and renewable energy which is \$829 million above FY'16.

We have stepped back in looking at the global demand for coal. It is going to increase in the coming years. When you look at the pie charts of coal consumption, the U.S. consumes about ten percent of the world's coal. The rest of the world consumes the other 90 percent.

As we think about global stewardship, environmental stewardship, I believe the United States should be leaders in clean coal technologies and I am concerned your budget proposal does not reflect that sentiment.

I spent five years working in mainland China for Proctor and Gamble and saw first-hand the challenges they face environmentally over there. I am just concerned that if we do not continue to lead and invest in clean technology, clean fossil fuel technology, that we may abdicate that leadership perhaps to China or to India

or somewhere else or perhaps, nobody takes those reins and leads with it.

I think taking away money from one of the few larger scale, clean coal technology programs and repurposing it for the projects is troubling. This is at a time when the Administration through the EPA Power Plan is threatening to take away affordable power from the grid such is the case with the coal strip plant in my home State of Montana.

So the question is why are we undercutting projects that are applying clean coal and carbon capture technologies at a commercial scale?

Secretary MONIZ. Well, let me make a few points, Senator Daines.

First of all, by the way, I might note that I think just today there was an article that China announced that its coal production, its coal use went down by three percent in one year. They probably have peaked in terms of use and they're closing another 1,000 coal mines in China. So that's an interesting development.

Now—

Senator DAINES. Excuse me, just on that point, that other data suggests that China is building a new coal-fired plant every ten days for the next ten years. And as we look at the global forecast between now and 2040 for coal consumption and, of course these are all forecasts and you take them based on assumptions, but the global coal use looks to increase by a most respectable forecast between ten and 15 percent from where we are at today and 2040. So the trend line, globally, is still going up for coal.

Secretary MONIZ. No, I agree.

But China is by far the largest coal user. It is significant, I think, that they have come down several percent in 1 year and may have peaked. I'm not saying they have, but they may have peaked.

Senator DAINES. Right.

Secretary MONIZ. And as far as building, they're doing a lot of shutting older, inefficient plants, replacing them with more modern plants, of course, addressing their very, very serious pollution problems.

In terms of our domestic program. First of all, I do want to emphasize that there are many aspects of support for coal going forward that are not simply in the fossil energy budget. I'm not going to go through all of them, but includes, in particular, I do want to emphasize the probably \$5 billion both production tax credits and investment tax credits proposed for carbon capture and sequestration. So that's a pretty big, we think, we hope, incentive toward deploying new projects.

With regard to the fossil energy support, we, I would, we did not undercut any projects. We have three large projects that are either already operating, one for three years, a carbon capture project and some that are coming on in 2016, we'll have three. We did do the repurposing of projects that even though we gave extensions of time could not meet the criteria, could not meet any financial close. So those funds being repurposed to actually develop new, what we hope will be, very competitive technologies. For example, going to things like ten megawatt pilot projects for new technologies like

chemical looping and oxy combustion which could be important for the future.

Another point is that apart from those explicitly carbon capture projects, R and D and/or tax incentive, we also have going on things that are, you know, they're not called coal, but they are very directly relevant to, for example, higher efficiency coal plants. One is we have a substantial increase for our pilot program on super critical carbon dioxide cycles which would get much higher efficiency for any thermal plant, of course including coal, and it's led by fossil because of coal basically. Secondly, things like in the Office of Science and in fact, we propose a new cross cut initiative in this budget for advanced materials in extreme environments that would include going to the very high temperatures and pressures for going to ultra, ultra, super critical coal plants. So there's quite a bit in there.

Senator DAINES. Thanks for the insights on that. I am out of time but just in closing, the projections, coal use globally will be higher in the next 20, 30 years than it is today by most forecasts. I just hope the United States can continue to lead in clean coal technology. I think as leaders here we will be the best guardians overall of global stewardship, and I would like to see the continued investments here and certainly in clean coal technology.

Secretary MONIZ. Well and I think that this portfolio of investments is one that, I think, will accomplish the goal.

Senator DAINES. Okay.

Thanks, Secretary Moniz.

The CHAIRMAN. Senator Cantwell?

Senator CANTWELL. Thank you, Madam Chair.

Mr. Secretary, thank you again for working so diligently on this budget proposal.

As you can imagine I have, well, I have many questions. But I have four specific questions, and they are all related to Hanford, as you can imagine—a greatly important subject for our entire nation but particularly important in the State of Washington as we are integrally involved in making sure that the tri-party agreement and many things are lived up to.

I have a question about the buildings I mentioned, the 324 and the 618–10, and the fact that this budget decreased. I think I have said practically to every Energy Secretary that I have had the opportunity of working with since I have been in the Senate, I firmly believe that the Energy Secretary should be for life or until Hanford is cleaned up because as I mentioned with a budget number—

Secretary MONIZ. That would extend beyond life. [Laughter.]

Senator CANTWELL. I hope not.

I think the issue is that with such a large budget need, from time to time people come in with ideas and notions of how to, they think, cut corners, save dollars. I have seen so many different proposals that have gone by the wayside where people try to implement something, it doesn't work, and then they come back a few years later and fold on that only to cost us billions.

So one of the things I wanted to discuss, on this river corridor project, they are making good progress but why not continue to make progress, given that this radioactive plume is so close in

proximity to the river and that we want to make sure that there is an important Hanford-wide service account, which ensures proper maintenance of the infrastructure and makes sure that we continue to move ahead? So that's one question.

Second, I want to understand what we are going to do in the next year on additional public meetings for focusing on defense waste cleanup. That is an initiative that, you know, separating commercial and defense waste and moving forward on that proposal—is very important for us to continue to do. I know that there were cuts to the community support budget. This is something that is very important to the people in the Tri-Cities.

Last year there was a decision made to decouple defense waste and commercial waste, and then there was a process of holding meetings to define what consent agreements mean. I have noticed that this proposed budget cuts the community and regulatory support. So this is important to places like Benton and Franklin and Grant counties so that they can focus on having comments in this process.

Lastly, I also see that the Hanford National Historic Park budget does not reflect a contribution from the Department of Energy, and I am concerned about that and want to make sure that DOI and DOE are going to work together to move forward on that.

But my main question is will you take a second look at this cleanup priority for the river corridor? Looking at that budget cut and looking at how challenged we are on the site itself, what can we do to remedy that cut?

Secretary MONIZ. Well, thank you, and I think I have the four questions.

Well first of all, of course, we'd be very happy to sit down and kind of, work through what the constraints and the opportunities are in the budget. Obviously we are working with an overall constrained budget in which we try to optimize for the highest priorities. And frankly, the area across the country which includes, but includes Hanford, for sure, that is the, in many ways, we consider to be the highest risk is the, our tank waste, you know, addressing that. And so we certainly have a very high priority at three sites for tank waste.

Now on the river corridor, specifically over the FY'17 budget for Richland. First of all, I very much appreciate your acknowledgment that there's been a lot of progress along the corridor. The budget will support several major priorities. We could always do more but it will, major priorities, to finish the demolition of the plutonium finishing plant which has always been viewed as one of the most hazardous places, to remove sludge from the K basins very, very close to the river, to continue, certainly in the plateau, to do the pumping, the cleanup of the undergroundwater.

And with regard to Building 324, we are moving forward but there are safety issues and to clean up underneath the building is going to require a robotics approach. And we are developing it but we feel that to do it safely we're going to have to succeed in developing that technology.

Senator CANTWELL. So you think this is partly a timing issue about the technology that is needed?

Secretary MONIZ. Yes. So we're working on that, but we need to develop a remote capability to be able to clean up the area underneath the building.

Senator CANTWELL. Would you commit to sitting down with Senator Murray and I and discussing this issue?

Secretary MONIZ. Sure.

Senator CANTWELL. In which we might remedy.

Secretary MONIZ. I would be happy to, of course, yes.

But again, we're also, I'm in the spirit of trying to recognize physical realities and I know you are as well. And that was certainly part of the whole, I think you indirectly alluded to it, the necessary redesign phased approach to the WTP, I mean, it was an example where we just had to recognize the physical realities, the safety issues, the criticality challenges to change that approach which, I think, is going along well in terms of addressing the low activity waste.

But obviously, as you know, we are still in litigation and discussions with ecology about the consent agreement.

On the public meetings——

Senator CANTWELL. I am over my time and I want to respect my colleagues. So will you provide answers in writing?

Secretary MONIZ. Okay.

Senator CANTWELL. On those other——

Secretary MONIZ. Okay.

Senator CANTWELL. Other three from you. That would be so helpful.

Secretary MONIZ. Sure.

[The referenced information was not provided as of the date of printing.]



Senator CANTWELL. Or if we have a second round you and I could talk about it.

I am sure, Madam Chair, we could have an entire meeting on Hanford, and I am not sure we shouldn't at some point in time. [Laughter.]

Senator CANTWELL. Again, with another \$107 billion needed to clean up this site, I think our colleagues need to be very well aware of what the United States' obligations are here.

Thank you.

The CHAIRMAN. Thank you.

Secretary MONIZ. May I just add a comment, Madam Chair, on that?

The CHAIRMAN. Very quickly.

Secretary MONIZ. Just to say that, yes, just to say that, I think, this is, again, a case that where if one sees, if members can go there and see what, for example, a waste treatment plant is about. It's kind of eye opening and one understands the challenge.

The CHAIRMAN. Senator Portman?

Senator PORTMAN. Thank you, Madam Chair, and thanks to Senator Cantwell because you could have gone on and on. [Laughter.]

Not that you do, but you could have.

I have got to tell you, I found your comment just then very interesting. You said if members would just go and see these cleanup sites they would understand it. As you know I am profoundly disappointed in the way you have handled the cleanup at Piketon and the new technology, the uranium enrichment technology, that you just pulled the plug on.

In the confirmation hearings where I supported you, strongly, I asked you if you would come out and take a look at Piketon. And I have asked you at every one of these hearings. I think you would have a different perspective if you would come out and see it.

It is not just a huge facility, thousands of acres, but the building alone for UET is a \$6 billion, Federal taxpayer initiative that you are pulling the plug on. I just think it is really disappointing.

I wish I could talk to you today about energy efficiency, and I thank you for supporting the Portman/Shaheen legislation which is part of the broader Murkowski/Cantwell Energy Policy Modernization Act that we expect to have on the floor next week.

I also wish I could talk to you about the exciting new work that Bill Gates is doing with others on this early stage energy innovation fund, and you talked about that, but I have got to talk to you about Piketon.

I mean, it is amazing to me that we are pulling the plug on the one American source, the only American-owned source, of enriched uranium which we need for nuclear power, we need for our nuclear Navy, we need for tridium for a nuclear arsenal which you have acknowledged.

We have to have it, and we need it for our non-proliferation efforts. We cannot go to the countries of the world and say, we are going to provide you enriched uranium because we do not have any source now, thanks to the decision that you just made.

I will tell you, 60 people lost their job this week. Their last day of work is going to be tomorrow. The remaining 140 people are going to work themselves out of a job because they are forced to

deconstruct our best technology, the best centrifuge technology that we have, that you have supported. You said it is the best technology. And you know, they are going to dismantle this stuff and throw it into the desert.

I think it is just wrong, and I think it is going to be very expensive for the taxpayers. You have said in your own reports that we are going to need more Logan-enriched uranium to produce tritium for our nuclear arsenal within ten years. You have also told me, or at least I have heard from other experts, maybe you even told me this specifically, you can counter me if you like, that it would take probably seven years at a minimum to reconstruct what we have there now.

You lose the supply chain, you lose the workers, and you lose all this expertise. And for those who do not follow this closely, you have to have a lot of centrifuges lined up in order to have a train of centrifuges. That is what we have now at Piketon. We have 120 of them.

We are pulling the plug on all those, and as Americans we should all be concerned about this. We are going to take down to Oak Ridge, I guess, a couple of centrifuges and do some research. It is a little like saying that we are going to test, sort of, a single computer chip to see if a laptop will function because we won't have the ability to test the train anymore. Regardless of how you feel about nuclear energy, we need to have this capability. It is part of our national security.

So I would just ask you today, you said you can find various sources of enriched uranium out there and, sort of, pull them together, stockpiles that are out there to be able to keep things going for the next ten years. Then you said you have identified some options that could extend that timeline. You said it carried, they carried, significant cost and risks associated with them. Let's say that you cannot find those other sources after the first ten years. Then you would have to reconstruct a centrifuge capability in the United States of America, not relying on the Russians and others. How long would it take to rebuild that capability?

Secretary MONIZ. Well thank you, Senator.

Obviously we do have a disagreement here. But let me say a few things, if I may.

Number one, because I have been to the site and I've seen the buildings.

Senator PORTMAN. When were you at the site?

Secretary MONIZ. No, that was twice in the, during the Clinton years. I've not been——

Senator PORTMAN. During the Clinton years, yes. I have asked you to come during these years to see what we are doing there now. I am talking about——

Secretary MONIZ. No, I know. So I was about to add.

Senator PORTMAN. The ACP project that was not there then.

Secretary MONIZ. Well, no, but the—well the building was there and there were centrifuges.

Senator PORTMAN. But not the ACP project. The ACP project we just got back in the 2000's.

Secretary MONIZ. Well, there were ACP——

Senator PORTMAN. Yes, but what I want you to see is, what is going on now. I want you to talk to these people that work there and see what we are doing.

Secretary MONIZ. I would be happy to talk about a visit again.

Senator PORTMAN. And to see the cleanup which we are going to talk about in a second.

Secretary MONIZ. I'd be happy to do that, to go there.

Senator PORTMAN. Well you said that before. What's— [Laughter.]

Secretary MONIZ. No I have not said that before with all due respect.

Senator PORTMAN. Yes, you have. You said you would be happy to do that and you have not come out.

Secretary MONIZ. We can work on a schedule.

Senator PORTMAN. Well, that is great.

Secretary MONIZ. Okay.

Senator PORTMAN. I would love to do that.

Secretary MONIZ. Do that.

Second, again, we are not pulling the plug on the technology. The third, we absolutely still need a national security-based capability, sometime, probably in the next 20 years or so. If we had several billion dollars now we could start building that national security train.

The current machines, as we've discussed before, will not be part of that. It's not like they are the beginning of it. They are not part of it, and the problem right now is that we have passed the useful life of that cluster. But we do need a national security train. And right now, I've said it before, today, certainly, the only American technology that we have is the ACP.

Senator PORTMAN. Is that project.

Secretary MONIZ. Yeah.

Senator PORTMAN. Let's talk for a second about the cleanup.

As you know, in 2008 President Obama made all kinds of commitments that he was going to clean it up. You, yourself, have made commitments. In 2009, DOE said they were going to accelerate the cleanup to complete the work by 2024. This is for the old technology, for those who do not have to follow this as closely as some of us do. I mean, the old technology is gone. It is just a matter of cleaning it up. And the cleanup is incredibly important for the community, for the environmental impact, also for reindustrialization of the site.

2024. So the latest is because of the lack of funding from the Administration which we have to fight for every year to put back in the appropriations process because you under fund it every year. 2044.

So let me just ask you this quickly because my time is expiring. I apologize to my colleagues, but this is important to me.

We almost had 500 workers at the site laid off just before Christmas last year. We came in at the last minute, members of this Committee and others, and saved them.

This year you put in your budget, okay, we are going to put more funding in for the cleanup to try to at least keep the people that are there, not to meet the commitment you said before, but at least keep people who are there. But you are using funds from this old

USEC corporation that you told us before are not available. And more than half of the cleanup you are proposing, the new funding, is going to come from this. Tell us why you think that funding is currently available. Where is the authority for it and where is the offset for it since it is a mandatory spending?

Secretary MONIZ. Well first of all, I don't believe I said it was unavailable. Quite the contrary, we have three funds totaling almost \$5 billion which can be used for this.

Senator PORTMAN. The Department's request from 2009 to 2015 characterized the fund as, "unavailable." Period.

Secretary MONIZ. That was a decision taken. It was not, it's not like it's unavailable by statute or anything. It's mandatory funding.

Senator PORTMAN. Oh.

Secretary MONIZ. And we proposed an offset, a direct offset which would be returning to the quarter mil per kilowatt hour from the users of the facility. This is the way it was. When that fee was discontinued and it was a higher fee, when it was discontinued the full cost of the D and D at the three sites was not understood. We now say it's probably like \$22 billion. We now understand that. And so the current authorization is that the users pay for it. So it will be about a quarter mil per kilowatt hour would cover the offset for using the USEC fund which is an existing, authorized fund which has been sitting there.

Frankly back in 2000 there was an explicit action taken of the Congress, frankly, Senator McConnell led that for explicitly recognizing the utility of the USEC fund to address D and D costs.

So—

The CHAIRMAN. Mr. Secretary, I am going to ask you to wrap up.

Senator PORTMAN. Madam Chair, I apologize to my colleagues.

So if you could, Mr. Secretary, please give us in writing what the authorization is, why you think it is now available, even though previously you said it wasn't. And then also, the offsets in more detail.

Senator PORTMAN. Thank you very much, Madam Chair.

Secretary MONIZ. And we can send somebody up to talk to you if you like, our CFO.

Senator PORTMAN. Yes.

The CHAIRMAN. Senator Warren?

Senator WARREN. Madam Chair.

Thank you for being here, Mr. Secretary.

For months the massive gas leak at Porter Ranch, California spewed methane from an underground storage facility into the air. The leak was finally sealed a few weeks ago but not before it released the same amount of greenhouse gases as half a million cars driving for an entire year.

It was the worst natural gas leak in history, the climate equivalent of the BP oil spill, but it is not the only leak. There are a huge number of gas leaks from pipelines and storage systems, some of which have been ignored for decades.

In Massachusetts more than 20,000 leaks have been identified in the Boston area alone. They spew about \$90 million worth of methane into the air every year. Massachusetts has decent information because state law requires utilities to report every gas leak.

Secretary Moniz, do we have any similar national reporting system in place to track all of the gas leaks and how much methane they are emitting?

Secretary MONIZ. Senator Warren, well first of all, of course, I think, as you know, the Department of Energy does not have that.

Senator WARREN. No, I understand that. I'm not——

Secretary MONIZ. But PHMSA does.

My understanding is that PHMSA requirements, although I do emphasize we could check with them and make sure we are giving you the correct information, that my understanding is that apart from unusual circumstances leaks above three million cubic feet need to be reported to PHMSA directly. To give you a scale, by the way, Aliso Canyon was five billion——

Senator WARREN. Yes.

Secretary MONIZ. Cubic feet.

But as you say, and we have been working on this directly for the last couple of years. The leaks are not only in production or in that case, in gas storage, but all the way to the, especially urban, distribution systems, like Boston.

And in our Quadrennial Energy Review we made a specific recommendation for accelerating the replacement of those pipes and giving support for low income people. And that was discussed. It was temporarily, at least, in the House bud bill——

Senator WARREN. So Secretary Moniz, let me just—I have got more to this question.

Secretary MONIZ. Good.

Senator WARREN. Let me just take that as a no. There is not a national reporting system that requires that all gas leaks be reported and that requires how much methane that is being leaked?

Secretary MONIZ. To my knowledge, no.

Senator WARREN. It is just not happening.

Secretary MONIZ. To my knowledge.

Senator WARREN. I am very concerned about the lack of information about natural gas leaks because it permits the problem to go on without being fixed. I am especially worried because it is not clear who is supposed to take charge of this problem.

With Porter Ranch and with other underground storage facilities, Federal regulators pass the buck to the State regulators. And in California we know that the State regulators then fell down on the job.

The problem, as you rightly point out, is not limited just to these underground facilities. There are problems across the entire natural gas transmission, distribution and storage infrastructure.

So again, I know that this is not your agency's responsibility, Secretary Moniz, but can you explain who exactly is responsible for overseeing America's natural gas infrastructure?

Secretary MONIZ. Well again, for pipes in general, moving gas and oil and other commodities, PHMSA, in the Department of Transportation, is responsible. EPA then also has responsibilities to the extent that it impacts air quality.

Senator WARREN. Yet we have seen the Federal regulators out in California just hand this over to the states.

Secretary MONIZ. Well, yes, the states have, of course, California has an extensive apparatus and I actually met with CEC Chairman Weisenmiller yesterday, but——

Senator WARREN. Well I am concerned.

Secretary MONIZ. Yup.

Senator WARREN. That the regulations here just are not working that leaks occur, sometimes large and dangerous ones, and that we are not doing enough to fix them. In many cases it appears that regulators do not even know that they exist.

This issue seems especially critical right now because in many regions, including New England, big, new natural gas pipelines and other gas projects have been proposed. But until there is a clear accounting for the scope of the problems with the existing pipelines and storage facilities, until there are meaningful steps to repair those problems and safeguard our communities and our climate from the risks that they pose, it is hard to support building any more of them.

So, that is it for me.

Thank you.

The CHAIRMAN. Thank you.

Senator Flake?

Senator FLAKE. Thank you and thank you for your testimony.

As a result, as you know, of the year's long drought on the Colorado River along the basin there has been a significant reduction in hydro power generation. I understand that Hoover Dam has seen approximately about a 25 percent reduction in power generating capacity since 2000, falling from approximately just over 2,000 megawatts to 1,500.

These reductions clearly have implications for power users and power marketing administrations. These are an important source, not just because of the power they provide, but the load balancing functions as well.

Can you tell me what you are doing with your budget to address or the planning, the R and D on how to deal with, we often look at just the water function but the power function as well. And what is DOE doing to address that?

Secretary MONIZ. Senator Flake, in our budget actually, we propose a more than tripling of our energy water program in FY'17 to nearly, I forget exactly, nearly \$100 million because we think the whole set of energy water challenges is so important.

One part of that is a new, which may not be useful in Arizona, but a new desalination hub for advanced R and D on much more energy efficient desal. But it also includes the energy water interactions for power. It includes waste water treatment.

And certainly not in the energy water program, but different from that, we support a lot of modeling about the implications of continuing warming on drought to understand those patterns so that we can then respond in a system way.

But it's a very, as you well know, extremely serious.

Senator FLAKE. Thank you.

In October GAO issued a report on unobligated balances analyzing where the balances exist in certain agencies, the size of these balances and the opportunities for savings.

Among these findings GAO noted the unobligated carryover balances for WAPA, or the Western Area Power Administration, exceeded the levels necessary to maintain certain activities and manage risk for those activities. For example, in 2014 the unobligated balance was about \$92 million or \$40 million more than the officials deemed necessary to avoid risk.

What is the DOE doing to implement the recommendations that GAO made with this budget request?

Secretary MONIZ. Senator, I'll have to look at that offline. I'm not aware of the unobligated balance issues at WAPA, specifically, so I'll have to get back to you on that.

Senator FLAKE. There is continuing concern among the users about WAPA and the lack of transparency there and how funds are spent and obligated. It is an issue that we have had for a while that I will encourage you to look at.

Secretary MONIZ. And if it would be helpful, certainly the Administrator, Mark Gabriel, would be happy to have them come in and meet with you, if that's helpful.

Senator FLAKE. That would be.

In a related question, in the PMA portion of the budget WAPA is seeking about 51 new FTEs to, among other things, I think, deal with cyber security challenges related to the grid. But Southeastern and Southwestern Power Administrations presumably have the same needs and have addressed those needs without the need for new FTEs.

Can you also look to see whether those requests are justified?

Secretary MONIZ. We certainly will. I will note that WAPA, the fact is on the output side, they do provide energy at a pretty attractive price. And WAPA is a much more complicated system than SWAPA, for example. And with all of the challenges, cyber, I mean, NERC and NERC requirements, drought, certain parts of their stuff, old infrastructure renewal. So they do have a major need but—

Senator FLAKE. I can understand that.

Secretary MONIZ. Yes.

Senator FLAKE. Fifty-one FTEs as opposed to zero on the other side seems a little off.

Secretary MONIZ. We'll look at that. Thank you.

Senator FLAKE. I would like to know as you look into that whether this budget request relies on these aforementioned, unobligated balances to cover those FTEs or if that is where we—how they are doing that.

Secretary MONIZ. Okay.

Senator FLAKE. Thank you.

Secretary MONIZ. And I'm just—the last note just to make that unobligated balances, we have to look very carefully because often they really are vector specific projects. But I don't know in this case.

Senator FLAKE. Okay. Thank you.

The CHAIRMAN. Senator Manchin?

Senator MANCHIN. Thank you, Madam Chairman, and thank you, Mr. Secretary, for being here again.

Everybody has been talking about all the hardships they have and Senator Portman was very adamant about the loss of jobs. I just want to verify some things.

First of all, the EIA energy projections in basically in 2013, I think, your energy projections at that time was or their accuracies were coal was about 39 percent of the energy being produced for the United States. Gas, natural gas, was 27. And then nuclear was 19. Renewables was 13, and petroleum was one. In 2014 you still had the projections and if they have changed, I would like to know.

You have got coal at 34 percent, expected to produce the energy the nation needs up to 2040. Gas goes up to 31 percent. Nuclear goes down to 16 percent, renewables come up to 18 percent, and petroleum stays at about one.

Have those been changed at all, projections up through 2040, or do they seem to be fairly accurate, do you think?

Secretary MONIZ. I don't know if the latest EIA reports have changed that but on the ground things have certainly changed. So last year, 2015 I believe, coal came slightly below that and natural gas slightly above that. Certainly for at least for 5 months of the year natural gas had a higher market share than coal last year.

Senator MANCHIN. Because of price, yes.

Secretary MONIZ. I think nuclear hung closer to 19 for last year but if you mean out to 2040 I'd have to go back and—

Senator MANCHIN. Okay, I am just saying so in that ballpark, let's say if coal is either at 34 or 30, whatever it is going to be in that 30 range. If it, I mean—

Secretary MONIZ. I think I've seen some projections that would go lower.

Senator MANCHIN. Lower.

Secretary MONIZ. Below 30, but—

Senator MANCHIN. Let me tell you what is happening, Mr. Secretary, is, just to give you an idea, just a sketch of what is happening in this and the unbelievable damage that has been done to West Virginia.

I will give you just three counties, three of my most highest producing coal counties in Southern West Virginia, Mingo County, Logan County and Boone County. That is in southern West Virginia. That is where our highest qualities of coal come from, low sulphur, stoking coal. In 2009 the unemployment rate in Mingo County was 4.9 percent, and it is now 11.9 percent. In Logan County it was 4.5 percent, and it is now 10.7 percent. In Boone County it was 4.3 percent, and it is now 8.8 percent.

In just between July 2014 and July 2015 in my State of West Virginia, we lost 19,000 jobs, 19,000 jobs. And we are the only state losing population.

It just seems, Mr. Secretary, that this Administration is so insensitive to the damage it has done economically without trying to help us transition. We are not arguing against technology. We are, you know, renewables, we are for all that. But if you are going to be needing a base load of power that you have counted on for a long time and will count on for a longer period of time, then there has to be some support and some certainty.

And I will use this. This segways into what you have, I think you all have requested cutting \$240 million in de-obligated funds. I



think those de-obligated funds are all coming from the Summit Power Group's Texas Clean Energy project, and you are using that as part of your new money going back into clean coal technology.

The only thing I would ask is if you all are not going to commit to seeing these projects to their fruition, to see if carbon capture sequestration can work on commercial load and you are pulling \$240 million from the original grant of \$450. You are cutting it over half, pulling money back.

I don't know then. You are asking people that they should be these tax credits—They have no idea—They can't get from the Treasury Department. Well how much tax credits have been used? What is left? What they can count on? So there is no certainty in it, and I think when you see they are not taking the guaranteed loans again. So even though I know we are talking. We talk, and I know the Administration has the appearance of wanting to do clean coal technology. Nothing is happening.

I think you saw Senator Daines talking about basically what is happening around the world, more use of this coal. If the rest of the world is going to use the most abundant energy supply they are using, the same as we built our country on and we want them to follow suit. If they follow suit with what is happening in my State of West Virginia, the economic damage that has been done, there is no way they are expected to follow that.

I think the technology is where we should be going. So this is where I am, and that is the reason I am there. I am just, you know, people lose 500 jobs and that hurts. I understand that. Try losing 19,000 jobs in a state the size of West Virginia.

Go look at these people. Look at the families. Schools, we've got schools closing, sir. I have got teachers that are losing their jobs. There are no more kids in these schools, just unbelievable. So it does not seem like that you all are committed too. I mean, it looks good on paper but the \$240 million project that is directly pulled from a job and a project you were working down in Texas.

Secretary MONIZ. If I may?

Senator MANCHIN. Yes.

Secretary MONIZ. If I may respond, Madam Chairman?

The CHAIRMAN. You may.

Secretary MONIZ. As I mentioned, we all obviously feel very, very much appreciate the social impacts of that kind of job loss, etcetera.

I do want to emphasize that first of all, we do have, there are Administrative-wide programs with regard to helping transition communities, the Power Plus Plan. But I want to say specifically and again, make an offer. You know, two years ago I brought in two excellent people to startup a jobs strategy council focusing on specifically jobs in energy.

In this budget, by the way, I think it's gone so well, frankly, that we are proposing that that become a new budget line rather than collecting money from various offices. It's rather, rather modest, but they've done a terrific job. They have gone to coal country in Virginia, for example. I'd be delighted to send them up to visit you in West Virginia.

Senator MANCHIN. Coal in Virginia is never, I mean, we love our southwest Virginia coal miners, but they have never been considered coal country.

Secretary MONIZ. Well you consider it that it was like a practice run, okay?

Senator MANCHIN. Practice, okay.

Secretary MONIZ. But we'd be happy to do that for West Virginia.

But I have to say on the \$240 million we have to understand in the CCPI program there's a portfolio of major demonstration projects put out there. Some have succeeded, are operating. Some could not meet the financial closing criteria.

So the program, and I want to emphasize this, is the program decided that its optimal approach was to take that money and essentially—still by the way, hoping that other things could happen to have those projects work which I can discuss offline.

The CHAIRMAN. We've got to—

Senator MANCHIN. I know. If I can just follow, one thing, sir.

I would love to sit down with you. You keep saying you are going to come, and I know you are going to come to West Virginia. I appreciate that, and I want you.

Secretary MONIZ. When I'm welcomed.

Senator MANCHIN. You are welcome. I want you to come. But the bottom line is I want you to know this.

Secretary MONIZ. Yup.

Senator MANCHIN. If the United States of America still needs West Virginia to do the heavy lifting and produce the energy that this country has always counted on from our little state, we want to do it. If you are projecting through 2040 you need 30 percent of it, give us some certainty so we can give you the energy you need.

Don't keep beating the living crap out of us to where you say, well we really need you but I don't want you. That is what is happening, and the uncertainty is killing us, sir. I will end on that.

Thank you.

The CHAIRMAN. Thank you, Senator Manchin.

You know, I will tell you it hurts to hear that when a state is losing 19,000 jobs, losing an economy, losing, really, a source of family income for generations and generations, and the response from the Administration is we are going to send you some job training folks to help out. Boy, that is not the answer either.

It is how we access our resources in a way that is responsible, that provides for the economy, for a resource that we all need and boy, know that my heart is with you because the answer is not to send more job training or retraining programs. It is to figure out how we access our resources.

Senator MANCHIN. Just let us do our jobs.

The CHAIRMAN. For the benefit of the country.

Senator MANCHIN. Let us do our job.

The CHAIRMAN. Let us do our job.

I have got to go to an Appropriations Committee and very quickly ask some questions. Senator Cassidy is next. Senator Gardner will follow and Senator Capito after that. Senator Gardner, you will have the gavel in my absence here.

Thank you.

Senator CASSIDY. I also associate with Senator Manchin's comments. A family is now on dependency which formally was self-sufficient and able to send their kids to better schools, etcetera, and that is a result of government policy.

That said, Secretary Moniz, we have spoken before about the MOX program. And Congress, in Fiscal Year 2016, gave clear direction that it wished the facility to continue to be developed. The President's budget calls for the termination of this facility in 2017 as well as a 90-day work stoppage at some point in the near future.

Now Congress just said, we want it to happen. So I see you shaking your head, no. I hope I have this incorrect. I hope that there is some guarantee that the MOX will continue to be developed and constructed in 2016 without any sort of work stoppage, interference and overtime or procurement necessary, etcetera. Any thoughts on that?

Secretary MONIZ. The construction is continuing as directed by Congress. There's no surprise that we've been talking for about the need for a lot more money for that project to work, and the 90-day work stoppage is something that would happen in 2017, if the Congress agrees with the change of direction.

Senator CASSIDY. Okay.

There was a question about re-baselining the expenses. Has that re-baselining been executed or planned on, etcetera?

Secretary MONIZ. I'm a little bit confused. You mean re-baselining of the project cost profile?

Senator CASSIDY. An updated performance baseline. Instruct the DOE, in Section 3119 of the Fiscal Year 2016 National Defense Authorization Act DOE was asked to submit in the 2017 budget request an updated performance baseline for the MOX project. When can we expect the re-baselining to be complete?

Secretary MONIZ. Let me look into that, Senator.

Certainly we have carried out a number of studies in baselines, so. But I'll see if we still owe a new re-baselining. I'm sorry. I'll look at that.

[The referenced information was not provided as of the date of printing.]

Senator CASSIDY. Gotcha.

Knowing that you are the nuclear guy, this is an easy question for you. But it is one, when I read there is concern because I think there is a lot of interest in the Administration to move this plutonium to New Mexico and dilute it somehow.

What I have read is that the New Mexico facility has to be guaranteed for 10,000 years. What I have read is that the density of this plutonium is so great it would have to be diluted some 250 times or something such as that exhausting the capacity of that facility and requiring it to be further built out.

That field is in the Permian Basin which is always being drilled for oil and there are aquifers flowing through. So the point of this article in *Nature* was that moving the energy to New Mexico, as I gather the Administration would like to do, is fraught with we ain't going to keep it safe for 10,000 years. I mean we are fooling ourselves to say so because of the natural geologic processes and man-made projects.

Any thought about that? I suspect you dispute that, but you are the expert. So that is why I ask.

Secretary MONIZ. Yes, sir.

Again, I do want to, well first of all start off by emphasizing that we do have nearly five tons of the same kind of material already in WIPP. And we have performed a NEPA analysis, not for the full amount of plutonium being discussed here but for 13 tons. And in fact, six tons from Savannah River are—have been for some time already vectored as a preferred alternative to go to WIPP.

There have been, first of all, the salt bed is almost by definition fairly, pretty stable, because if there were substantial water flow it wouldn't be there. So salt has always been viewed as very favorable medium. And finally there has been a recent paper arguing about criticality or safety risks. We had Sandia National Laboratory look at that, and they find the paper to be without merit.

Senator CASSIDY. Gotcha.

Lastly, there seems to be some confusion as to how complete MOX is. I have here, let's see, two different government officials. One, Administrator Clots testifying to the Senate Arms Services Committee that it was over 60 percent complete. A year later the National Nuclear Security Administration testifying 35 to 41 percent complete. How would we reconcile those two? Can you give us an idea?

Secretary MONIZ. Well first of all let's distinguish two different things. One is and this has been a lot of confusion about comparing apples and oranges. One point is that the MOX facility is only one piece of a bigger, bigger project that requires multiple facilities to do it.

So when the contractors, for example, you know, AREVA, etcetera, are talking about it, they're talking about that one facility. Even for that facility there is substantial disagreement, shall we say, on the level of completion. They talk about 60 to two-thirds finished. We do not believe that that's the case. We believe that the cost, even of that facility, is many billions of dollars more than what the claim is.

In that context working with Senator Graham, now already, I think, two years ago, we sat down with them. We worked through

an offer, a different contract structure in which a part of it would be a fixed cost, for example, since they were so confident and they were almost done. Well, let's just say, that was not accepted.

Senator CASSIDY. Let me investigate because I was told they would accept the fixed cost. They would accept going at risk and may find out—

Secretary MONIZ. If I may say precisely what the discussion was, the definition of fixed cost they came back was fixed cost unless we go over by a lot. [Laughter.]

And then you pay. It's the truth.

Senator CASSIDY. Then I will go back and check. I have learned to say what I have been told, not what I know.

Secretary MONIZ. Please.

Senator CASSIDY. Thank you very much.

Senator GARDNER. [presiding]: Thank you, Senator Cassidy and thanks to the Chair and the Ranking Member for holding this hearing today. Mr. Secretary, thank you for being here.

I will take my turn at the questions here, I guess, then turn to Senator Capito.

First of all I want to thank you for being a taxpayer in Colorado. I believe that is the case. Is that correct?

Secretary MONIZ. That is correct.

Senator GARDNER. Very good. Thank you.

Secretary MONIZ. I am supporting it.

Senator GARDNER. Supporting it, supporting a great state. Thank you very much.

I want to talk a little bit about the National Renewable Energy Laboratory (NREL), if I could, the cyber security, for a moment.

You know, NREL is located in Golden, Colorado and the health of our national laboratories is critical to the work that we are doing across the country, particularly the work done at NREL is truly appreciated. It is a leader in clean technologies, wind. We all know what NREL does, and we are very proud of it.

But many of these technologies that we are developing and under considerations, innovations at NREL and others, are sharing energy data and information through the Cloud. While this has allowed us to do some pretty amazing things and I have been through some, like the wind model, the wind power generation tunnels and modeling 3D centers that they have there, it does open energy infrastructure to cyber security threats.

We hear anecdotes in the papers or committees about hackers being able to access smart refrigerators, electric vehicles, those kinds of things. Those are anecdotes that we can pick up on. But could you talk a little bit about the Department's extensive efforts in cyber security for the grid and other energy infrastructures and plans for investigating cyber protections and how our national laboratories could play a role?

Secretary MONIZ. Yes, thank you.

First of all, let me say that we have a cross cutting cyber initiative which is proposed at something like \$330 million this year which is about a \$10 million increase from last year but we have many other activities.

I just want to emphasize we do have three different cyber responsibilities. One is protecting our own, kind of, administrative in-

formation. Second is our nuclear secrets, and third is working with the energies, the private energy sector, mostly because we have PMAs but mostly private on cyber protection.

First of all the threats have been escalating, there's no question about that, in recent years. The national laboratories are a major resource here. We actually have, I believe, ten national laboratories which includes NREL in various aspects of a bigger cyber security program from technology to kind of, systems, systems analysis and modeling to test beds where we can look at various attack vectors and address those.

So the labs are very, very critical. We have a Cyber Council I formed, actually one of my first things at DOE that cuts across things on the labs, plays a very important role intersecting with that. The Deputy Secretary chairs that.

Senator GARDNER. Thank you for that.

In terms of some of the cyber issues that we faced, we just passed a North Korea sanctions bill. The U.N. just passed some sanctions yesterday in a strong resolution. They did not include any cyber methods against North Korea.

Are you aware of any attacks, recent attacks, to our grid or energy infrastructure or perhaps to the nuclear side of your responsibilities directed out of or from North Korea or China?

Secretary MONIZ. I would just say that there are increasing probes of our energy infrastructure from a variety of sources.

Senator GARDNER. And perhaps maybe we can have a discussion of this in a different setting.

Secretary MONIZ. We can express that in a different setting. Yup.

Senator GARDNER. Let me ask this another way.

Do you believe that China is living up to the terms of the agreement that it signed with the President last year in terms of its willingness to not hack for commercial purposes?

Secretary MONIZ. Again I think that would be best discussed with probably others from the intelligence community at the moment.

Senator GARDNER. Okay, thank you.

I want a just brief answer if I could from you about energy savings performance contracts. I have tried to come up with a better bumper sticker name because that name takes up the entire bumper. [Laughter.]

But are we on track? Is the Department on track to ensuring the President meets his \$4 billion goal to save dollars through the use of energy savings performance contracts?

Secretary MONIZ. Well, so far the—we're at about the \$2.5 billion mark. Projects under—in the pipeline would extend that to about \$5.5 billion. There are, I believe it's 128 projects that are now, right now, expected to get across the finish line. And if you scale that from the projects that are done, we would get over the \$4 billion mark.

Senator GARDNER. Very good. Well if there is any assistance we can provide to help make that goal a reality.

Secretary MONIZ. I really appreciate the interest in that because I agree. I think you agree with me and I agree with you that this is a critically important—

Senator GARDNER. Absolutely it is and we have got some good language in the energy bill that we are working through that right now. And hope we can get that passed.

Final question. There have been reports days prior to North Korea's latest nuclear test that the Administration was talking about a peace negotiation with North Korea without any preconditions and that there were some talks, at least anecdotal again that an Iran nuclear deal, kind of, agreement might have been under consideration for North Korea.

Were you a part of any discussions like that or any discussions with North Korea's nuclear stockpile or ambitions?

Secretary MONIZ. Again, I think that would be a discussion you'd have to have with the National Security Council or the Department of State.

Senator GARDNER. Okay, but you are not involved in any kind of nuclear analysis or considerations of North Korea's capabilities or stock pile or centrifuge?

Secretary MONIZ. I apologize but I really cannot discuss, you know, these kinds of internal discussions. But again, if we meet on some of these other issues offline we could perhaps go into that in more detail.

Senator GARDNER. Okay, because I am just really trying to get in just to see if the Administration is using the Department of Energy's expertise to analyze any aspect of North Korea.

Secretary MONIZ. Let's just say historically, certainly, in all of the nuclear discussions with any country, including North Korea, DOE experts were always engaged to provide the technical support.

Senator GARDNER. Thank you, Mr. Secretary.

Senator Capito, I think the Ranking Member is here.

So you take over at this point or?

Senator CANTWELL. I think you said it, Senator Capito. [Laughter.]

Senator CAPITO. Thanks to both of you, and thank you, Mr. Secretary.

I want to begin my remarks by associating myself with the Senator from West Virginia, Senator Manchin. He is not exaggerating here. We took the trip to Alaska. We saw some of the same phenomenon in Alaska, as the Chairman said.

But just to add to what she said. A \$360 million state budget in the hole. We are losing not just coal jobs, transportation jobs, work, equipment providers, manufacturers. It is a very pessimistic, desolate, new pockets of poverty that are being created that are very, very difficult. I just want to associate myself with those remarks.

My first question is about the energy labs. In the hearing last year, you and I discussed some of the concerns that I have regarding CRENEL, the CRENEL report on the national labs. My question is does your budget request include a position concerning the DOE lab commission's recommendations pertaining to NETLs, separating NETLs R and D and its program responsibilities or in transitioning NETL to a go-co to a go-go?

Secretary MONIZ. Senator, no, we are not considering that. We are implementing most of the CRENEL recommendations but not that one.

Secondly and a different thing which may be related is in the fossil energy budget, I believe, it is a good step forward to more clearly identify the R and D and infrastructure budget lines at NETL which were previously impossible to find.

I would just add that the Director, Grace Bochenek, was really a driver of wanting that kind of structure to allow her to strengthen the R and D activities.

Senator CAPITO. Well I appreciate that. You kind of segued nicely for me to my next question because as we were going through the budget and the fossil energy R and D accounts, you have changed a lot of the names and maybe this is a result of what you just said to more clearly identify. But it has made it a little bit difficult for us to interpret where the money is, how much is in certain accounts and what that could mean.

Is that the rationale, the rationale you gave me previously, is that the rationale for the change, so you can more specifically identify?

Secretary MONIZ. Yes, we'll be able to see much more clearly what the NETL funding is. And by the way it's gone up in this budget request with a particular piece driving it is, in my view, finally addressing the super computer upgrade needs at NETL.

Senator CAPITO. Okay. What I would like to have is a commitment from you that the DOE will work with me and my staff so we can more easily parse these new categories.

Secretary MONIZ. Sure.

Senator CAPITO. And understand what actually—

Secretary MONIZ. Sure, we'd be happy to go up there and walk through the, kind of, line by line.

Senator CAPITO. I would appreciate that.

My final question is we were in a meeting several months ago talking about the future of coal and the research and development, and we talked about CCS and we talked about CCUS. If I am misquoting you, you can correct me, but I believe, well the impression that I had was that the future of coal really lies in the U part of that, the utilization area.

What I want from you, as a scientist and all the research that goes on at DOE, in terms of the utilization of carbon, where are we, on a scale of one to ten, in terms of the research? Are we at a one? Are we at a seven? Are we getting closer? I do believe if we are going to keep the energy mix with coal as a very vital part, we have got to figure it out. We can capture it.

Secretary MONIZ. Well you mean specifically on the U.

Senator CAPITO. On the U.

Secretary MONIZ. Right.

So what I would say is I would divide the U into two different areas. One is the most transparent U, is enhanced oil recovery.

Senator CAPITO. Right.

Secretary MONIZ. Which is what's going on right now, etcetera. And that has been an essential component of the financial model used for current projects. Now, frankly, that's suffered with the steep decline in oil prices.

Senator CAPITO. Right.

Secretary MONIZ. Because you don't get as much bang for the U.



Senator CAPITO. So is that technology at a nine/ten? I mean it could be improved but——

Secretary MONIZ. Oh yes, as far as technology goes——

Senator CAPITO. It is done.

Secretary MONIZ. I mean, we know how to do it.

Well, yes, in conventional, so called, tertiary oil recovery. But there are some other ideas. For example, one of your colleagues on the Committee, not here, Senator Hoeven, I think is very enthusiastic about the idea of CO<sub>2</sub> stimulation of shale to enhance oil recovery.

Senator CAPITO. Right.

Secretary MONIZ. And there, I think, we still have some work to do. But then there are other ideas.

We do have a small pilot project right now in Texas involving a cement factory. There have been various ideas about using CO<sub>2</sub> in essentially in building materials because that's something with big scale where you can get a lot of CO<sub>2</sub>. But so far the costs have not, are still not low enough.

Senator CAPITO. Right.

Secretary MONIZ. And then there are more exotic ideas which are potential grand slams but they are very low on the scale, on your scale of one to ten.

Senator CAPITO. Right.

Secretary MONIZ. In terms of maturity, such as using say, sunlight, water and CO<sub>2</sub> to produce a hydro carbon fuel. So there's lots of ideas, and I think this U is an area for looking at taking chances, taking risks on new ideas.

Senator CAPITO. Right.

Secretary MONIZ. For potentially transformational.

Senator CAPITO. I think that too does hold a lot of our future, some of our future anyway. I would encourage you at the Department, I know you have already, but I would encourage you to keep pursuing in that area.

Thank you.

Secretary MONIZ. Thank you.

Senator GARDNER. Thank you, Senator Capito.

Senator Hoeven is here and I am sure he has some questions just when you thought you were off the hook, ready to go. You were going to make lunch.

Secretary MONIZ. I already answered his question. I just did. [Laughter.]

Senator GARDNER. And so I don't know, Senator Hoeven, this is your first question?

Senator HOEVEN. Yes.

Senator GARDNER. This is your second round?

So we will go to Senator Hoeven if you are ready for your questions.

Senator HOEVEN. Absolutely.

Thank you, Chairman Gardner. I appreciate you and the Ranking Member holding this hearing. Secretary Moniz, it is good to see you. Thanks so much for being here. Thanks for your trips to North Dakota. We appreciate it very much.

What I would like to focus on for just a few minutes is carbon capture technologies. The Administration is putting forward regula-

tions that require reduction in CO<sub>2</sub> emissions, but the carbon capture technology is not commercially viable in the market. So how can the DOE help our coal-fired electric companies and utilities actually implement carbon capture technology that is economically and commercially viable?

Secretary MONIZ. Well I think we've had this discussion before and certainly we have technologies that work. And of course, in the, I think what you're referring to in terms of clean power plant, I would just note that what's required there are partial captures, not the kind of like 90 percent capture that we have used in our demonstration plants.

But as we go into the FY17 budget we have also repurposed, if you like, funds to emphasize developing other novel approaches that may result in even substantially lower costs like chemical looping and oxy combustion. So we're proposing smallish, ten megawatts pilot plants with these new approaches.

Senator HOEVEN. Are those going to be ready in time to help the power plants meet the clean power plant requirement?

Secretary MONIZ. Well we have whole set of available solvent technologies. Something like oxy combustion, there's been some small scale tests before. It frankly, to me, does not seem technologically, you know, risky. I think a big issue there on the cost side will be continuing to drive down the costs of air separation. Chemical looping is probably a little bit behind that in terms of maturity.

Senator HOEVEN. What programs do you have to help do that? I mean, how are you helping these companies implement that new technology? What can you do to help them?

Secretary MONIZ. Well as I say we are, we want to go forward with pilot projects to demonstrate those technologies.

I might add there are other technologies that are not carbon capture but would affect, let's say, efficiency of thermal plants like our proposed increase for the pilot project on super critical CO<sub>2</sub> and for advanced materials in extreme environments which would be relevant to working in much higher temperatures and pressures.

Senator HOEVEN. The only plant that I know of that captures CO<sub>2</sub> and actually sequesters it for tertiary oil recovery is Dakota Gasification Company in North Dakota which you have been to.

What I am trying to figure out is how we help develop more of those projects because the only way we are going to get the technology out there to do it is to have the R and D done. I get that it is technologically feasible but it is not commercially viable. We have got to somehow drive that cost curve down or do more with enhanced oil recovery to create a revenue stream.

This is where you have got to help do it. You have got to help these companies do it because of the cost. I mean, this is your basic R and D function translating into commercialization of new technologies.

Secretary MONIZ. Yeah. I would just add that, of course, there are other aspects besides the technology R, D and D and as you well know there's also the \$8.5 billion fossil loan program for projects.

But I would just add something that I think is very important and maybe merits enhanced discussion is the Administration proposal for both production tax credits and investment tax credits for

carbon capture and sequestration, probably \$5 billion worth of credits in that proposal which is in the FY'17 budget. Not in the DOE budget, but for Treasury.

Senator HOEVEN. Alright.

Well I think that is going to be the key in terms of finding ways to develop this technology and deploy it in terms of making it commercially viable and economically viable, not just technologically viable. And that that has to match up with the regulatory environment.

Secretary MONIZ. Well, we'll continue to drive the cost down. As with all of the low carbon technologies, it's all a question of keep going with innovating, deploying and driving the cost down.

Senator HOEVEN. We have a project called the ALEMS cycle that we are working on. I do not know if you are aware of it but that is exactly the kind of thing we are talking about and would appreciate DOE participation and assistance in that ALEMS cycle project.

Secretary MONIZ. Yeah, I'm not familiar with it. I understand it does involve a super critical CO2 element at least.

Senator HOEVEN. Exactly.

Secretary MONIZ. Which again, is the demonstration that we are also funding but perhaps there needs to be a briefing of our fossil energy people on what it is.

Senator HOEVEN. We have utility—

Secretary MONIZ. I'm not familiar with it.

Senator HOEVEN. We have utility companies that are working on it. The State of North Dakota is working with them. The State of North Dakota is willing to put resources into it, and we would want to partner with DOE as well.

Secretary MONIZ. Okay. Well and I think a technology briefing would be the first step.

Senator HOEVEN. Okay.

Secretary MONIZ. Yeah.

Senator HOEVEN. Thank you.

Secretary MONIZ. Thank you.

The CHAIRMAN. [presiding] Thank you, Senator Hoeven.

Secretary, I am going to ask another few, final questions and then turn it over to Senator Cantwell. I have got another, yet another, hearing that I have got to race off to, so I apologize again for jumping up and down.

So back to definitional issues as I raised in my first round. Clean energy, clean is referenced frequently in the budget response in terms of R and D innovation and goals. Within DOE's definition of clean energy do you include hydropower?

Secretary MONIZ. I certainly do.

The CHAIRMAN. I know you do. [Laughter.]

But for purposes of making sure that everything meets these criteria and eligibility, are we defining, as you know, in our energy bill, the Energy Policy Modernization Act, we define hydropower as clean energy or renewable energies.

Secretary MONIZ. Yes.

The CHAIRMAN. And it is renewable.

Secretary MONIZ. Yeah, and it's in our renewable energy portfolio.

The CHAIRMAN. Okay. So you consider hydro to be clean, then, in that sense?

Secretary MONIZ. Yeah, it's explicitly part of our renewable portfolio.

The CHAIRMAN. Good, good, we want it to be explicitly part of that.

SPR, the Strategic Petroleum Reserve. Can you give us any updates in terms of the drawdowns that were mandated under the bipartisan Budget Act and the FAST Act last year? Are you facing any challenges on this? Are you on track? Where are we?

There was going to be an update in terms of SPR modernization that we were expecting this spring. Where are we with the Strategic Petroleum Reserve?

Secretary MONIZ. Yes, to be honest I certainly don't anticipate any drawdowns this year in terms of the FAST Act. But on the SPR modernization, the report is due in May. We are trying to accelerate that as best we can.

The CHAIRMAN. Yes.

Secretary MONIZ. And to have that accompanied by a budget amendment that would start us moving, at least on the first tranche of the modernization.

The CHAIRMAN. So that would be sometime later this summer?

Secretary MONIZ. Well May is the target date, the current target date.

The CHAIRMAN. Okay.

Secretary MONIZ. As I say we are trying to move that ahead, if we can, because we feel that it would be good to get it before the Congress as soon as possible.

The CHAIRMAN. I agree.

Let me ask about small modular reactors and advanced nuclear. You have spoken often about the necessity of including nuclear energy in the portfolio of clean energy technology. I absolutely agree. You have also spoken about the development and deployment of small modular reactors.

As we are seeing this SMR licensing technical support program come to a close, and hopefully this first full application is submitted for license, what is next here? Will the DOE strategy be to support further license work for light water SMRs through a similar large competitive public/private partnership or is more focus going to be placed on advanced reactor technologies? How do you see this playing forward now?

Secretary MONIZ. Well I think it's important that we work across the board. I'll just give three different examples.

One is that we just renewed the very successful nuclear power plant simulation hub which is located at Oak Ridge with others involved including Idaho lab and others, North Carolina State University, MIT. So that's about advanced light water reactors, advanced fuels, etcetera.

Then when you go to SMRs, still the same basic technology of light water but novel design. And there we think we're on track for the new scale NRC submission later this year.

But frankly I would say I was disappointed that unfortunately we had to end the other small modular reactor that we had supported called Empower because we thought it was also a very good

technology, but they made a corporate decision to stretch it out to beyond our time horizon. So but I'm still interested in more of that.

Third, we also just gave, recently, two awards to companies who had consortia, including labs in EPFRIE, etcetera. One for pebble bed reactors and another for molten salt reactors which is a reactor design that started at Oak Ridge some years ago.

So we're working on, kind of, evolutionary current reactors, SMRs and advanced cycles.

The CHAIRMAN. So you have a \$28.2 million decrease in program support for advanced reactor technologies. On the one hand you are saying we are forward in a way that you feel relatively confident. But the budget—

Secretary MONIZ. Well we just gave \$80 million, up to \$80 million, to get those two new advanced concepts going.

The CHAIRMAN. Okay.

Secretary MONIZ. And this year, frankly in FY'17 budget in balancing things out, the SMRs, certainly protecting the SMR was important.

And secondly, really trying to launch, well we did launch this year, we are launching now, but to pick up the whole consent based process for the back end.

The CHAIRMAN. Right, right.

Secretary MONIZ. Because that remains extremely important to us. We hope with the FY'17 money, especially on interim storage, that we'll be able to move to community grants for those places that have serious interest.

The CHAIRMAN. Of course we have been working with you on that along with Senator Alexander and Senator Feinstein. So look forward to continuing that.

I just want to bring to your attention a question for the record that you will see, and that is a request for more information on DOE's involvement with the State Department on the 2015 renewal of the U.S./Israel oil supply agreements. So we will be asking for more information on that. I wish that I could take more time here with you.

Secretary MONIZ. I might just add—

The CHAIRMAN. But I am going to run off and ask my questions.

Secretary MONIZ. I would just, as you are leaving, just say that I'll be in Israel in early April and that will be one of the topics of discussion.

The CHAIRMAN. Great. Maybe we can look forward to getting a little bit of update.

Again, thank you for all you do. Thank you for your commitment to making the time to come to Bethel.

Secretary MONIZ. Thank you.

The CHAIRMAN. It meant a lot to many people.

Secretary MONIZ. Good, thank you.

The CHAIRMAN. Senator Cantwell, if you can just wrap us all up?

Thank you.

Senator CANTWELL. [presiding]: Well thank you, Madam Chair, and good luck in your other post and making sure we remember these issues of energy and water.

Mr. Secretary, thank you for your time this morning. I just want to follow up from my first round on a couple of those issues; the

next steps on defense waste and separating defense waste from commercial waste. What are the next steps we need to do?

Secretary MONIZ. Well, so right now we have a request for information out to the public at all the elements of the back end, storage facilities, both pilot and large, defense waste disposal, geological disposal and commercial spent fuel disposal.

So we're going through a three phase process this year, and the hope is that in the first quarter of FY'17 we would be able to start direct discussion with communities, states and regions.

Senator CANTWELL. I mentioned earlier that that resource was cut within the budget to have communities give input, so if you would look at that, that would be appreciated.

Secondly, we need a permanent funding and partner source between DOE and DOI on the new historic national park.

Secretary MONIZ. Yes.

So on the historical park, we are moving forward. There's, yes, there's no explicit budget line in FY'17 for DOE, but we have the funds to keep moving toward making available the sites and of course, at Hanford, we already have one major site open to the public.

But going forward—

Senator CANTWELL. So you are saying the funds exist within your budget?

Secretary MONIZ. Yeah, for this year, for this year.

However, after that I would be very surprised if we didn't need to come for, or someone come for explicit funding for the maintenance and upgrade for the public of certain facilities at the three sites. But for this year we'll be covered.

Senator CANTWELL. In '17? Do you mean in this proposal?

Secretary MONIZ. FY'17, I'm sorry, FY'17.

Senator CANTWELL. Okay, thank you.

Secretary MONIZ. Using FY'16 and '17 funds.

Senator CANTWELL. For '17 we'll be covered.

Secretary MONIZ. Correct.

Senator CANTWELL. Okay, that is what I wanted to understand. Thank you for that. We will look forward to working with you on the details of that.

I wanted to bring up a couple of other issues. One, I know that the Department of Energy has been involved in so many issues as it relates to where we are going on renewable energy.

We have a facility in Moses Lake, Washington which is the only commercially operating plant in the world to employ technologies that use about ten percent of the energy costs. Costs less, produces more pure product than just about any place and competing with polysilicon. But we are in a trade dispute currently. And if this trade dispute is not resolved soon, REC has said it will be forced to lay off approximately 400 workers.

So we cannot, not only lose this site in our state, but also lose the technology that we are able to produce there as it relates to polysilicon. So I want to get the Department's commitment to advocate on behalf of U.S. polysilicon producers and how we can resolve this trade dispute with China.

Perhaps the Advanced Manufacturing Office could take an interest in looking at the supply chain and give comments to the Administration on this.

Secretary MONIZ. Okay.

I'd like to learn more about the specifics, to pursue that. It certainly is an important area. And also, I'd be certainly happy to talk to our trade rep, Mike Froman and try to understand a little bit better what the trade situation is because I'm afraid I'm just not up to speed on that.

Senator CANTWELL. Yes, but I guess the importance of bringing it up this morning and asking for your engagement.

Secretary MONIZ. Yeah.

Senator CANTWELL. It is the issue of the supply chain and getting people to understand.

Secretary MONIZ. Right.

Senator CANTWELL. I am a firm believer, when it comes to all of these energy sectors, in our expertise. I see it, obviously in aviation. If you have the supply chain, you will have the jobs.

Secretary MONIZ. Right.

Senator CANTWELL. So if we have the supply chain—whether it is in solar or wind, if we have, truly, a strong supply chain—we will have jobs in the U.S.

Secretary MONIZ. I might add, as you well know, that it's along the supply chain where you may find the highest margin opportunities also.

Senator CANTWELL. Which is why this in particular is so frustrating because they are located there because of the cheap hydro-power so they can produce a cost effective product. So not having them caught in what has basically been a panel dispute between U.S. and China and the retaliation then on the supply chain is what we are facing. I would appreciate your input. That would be so helpful.

The smart building budget, as I mentioned, I am very excited that is where the budget is, but also in our energy bill that we are moving that Section 10–14, the smart building accelerator. This is about paving the way for innovative technologies and smarter buildings. And we have everything from the Bullet Center to the Brooks Corporate Headquarters to Swedish Hospital in Issaquah, the most, probably, energy efficient hospital in the world.

So we have all of these examples. How does the budget proposal allow for evaluation of what is working in current smart buildings for both public and privately owned facilities? You increase in the advanced R and D in the deployment of smart building technologies, so I see a 44 percent increase in the Building Technologies Office. I just want to understand how that is going to focus on this particular effort, smart buildings.

Secretary MONIZ. Well the Building Technologies Office program is certainly going to look at smart buildings. That's, obviously, very, very critical. And also it's the issue of linking the building from behind the meter to the distribution system which is where new services can come in. So that's very important.

Another point I would make which is not directly relevant, so much, to like, individual homes, but to bigger, let's say commercial facilities is something like the Better Buildings Challenge which is

not doing the R and D but taking advantage of opportunities to get building efficiency.

A core part of that is the promulgation of best practices. That's a requirement to be part of the program.

So that's actually also, frankly, even though it's not an R and D investment, it's been extremely effective, I think.

But buildings, as you—

Senator CANTWELL. You mean, DOE's leadership in helping to define that.

Secretary MONIZ. Yeah, so we have a convening role then the companies make pledges which is a minimum of 20 percent energy reduction by 2020, some reach that in three or 4 years and have doubled down. And but then part of that, frankly, they get a bit of a branding and but as a requirement to share best practices so that we can help promulgate that and bring the best practices, the best technologies to bear.

Senator CANTWELL. Thank you.

The last question I want to wrap up with is last year I requested a joint DOT/DOE study on crude oil characteristics and volatility to make sure that we are setting the proper standard. It was very frustrating to find that our PHMSA agency did not believe that they had the power to regulate here. Can you give us an update on the crude by rail study that is being jointly conducted?

Secretary MONIZ. Yes. Well I haven't—

Senator CANTWELL. Is DOT cooperating and doing its share?

Secretary MONIZ. Ah yes, no, it's being absolutely cost shared. The work is centered at Sandia, and I think it's on track for 2017 which was the initial date. Everyone would like it to be faster but they will be going into a physical combustion test regime and sometime in 2017.

I haven't, to be honest, I haven't checked in very recently, but I can do that. But 2017 was always the target year for the completion of the study.

Senator CANTWELL. And this is about volatility?

Secretary MONIZ. It's about volatility, yes, understanding what are the important parameters, etcetera. But also going into combustion tests to really understand accident scenarios and the like.

Senator CANTWELL. Well thank you, Mr. Secretary. You have been generous with your time.

Secretary MONIZ. Oh, I might just add one factoid.

Senator CANTWELL. Yes.

Secretary MONIZ. You may know that actually in the last year oil movements by rail have gone down 19 percent.

Senator CANTWELL. I think there was some just recent indication that they are about to go back up though, so to me every city in our state is impacted by this and we are proud to be a Pacific state and see the growing benefits of Asian markets.

We just invested in a national freight strategy in prioritizing the movement of freight, but we have got to have safety standards on the volatility of these products moving through, not just our state.

We just had another derailment issue; that was a propane/ethanol issue. But we have to pay attention to making sure that the public is going to be safe and setting the standard and making sure that the agencies who regulate that do their job.



So we are so happy that DOE has stepped up. We will look forward to hearing the results of, that analysis.

Secretary MONIZ. Great.

Senator CANTWELL. Again, thank you for your time this morning and for your commitment to all of our colleagues on these important issues.

We're adjourned.

[Whereupon, at 12:05 p.m. the hearing was adjourned.]

## **APPENDIX MATERIAL SUBMITTED**

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**Department of Energy**  
Washington, DC 20585

September 19, 2016

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

Dear Madam Chairman:

On March 3, 2016, Secretary Ernest Moniz testified regarding the Department of Energy's budget request for Fiscal Year 2017. To complete the hearing record, please find enclosed answers to the questions submitted by Ranking Member Maria Cantwell, Senators John Barrasso, Ron Wyden, Debbie Stabenow, Jeff Flake, Al Franken, Steve Daines, Joe Manchin, III, Martin Heinrich, Mazie Hirono, Rob Portman, Angus King, Jr., 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,

A handwritten signature in dark ink, appearing to read "Jed D'Ercole", is positioned above the typed name.

Jed D'Ercole  
Deputy Assistant Secretary for Senate  
Affairs  
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Maria Cantwell  
Ranking Member



Printed with soy ink on recycled paper.

## QUESTIONS FROM CHAIRMAN LISA MURKOWSKI

- Q1. **\$10.25 Oil Tax** - Since the Administration announced its proposed tax or “fee” on oil as part of the budget, I have been working with the Congressional Research Service to analyze its impacts. The first report from CRS concluded that such a fee would raise costs for consumers and slow economic growth, all things equal. The second concluded that the apparently minor difference between \$10.00/barrel, as originally advertised, and \$10.25/barrel, as was finally proposed, actually constitutes an additional \$8 billion tax hike. The third, which I released the morning of the hearing, lists no fewer than eight key areas of uncertainty, or unanswered questions, about various aspects of this proposal. There is more to come.
- Q1a. Has the Department of Energy conducted any analysis about the impact this new tax – especially in combination with all of the other taxes, fees, and requirements that are being proposed in this budget – would have on domestic oil production?
- A1a. The Department of Energy (DOE) has not conducted any analysis about the impact the proposed oil fee may have on domestic oil production.
- Q1b. Has the Department of Energy undertaken any analysis to determine how this significant tax hike would impact economic growth?
- A1b. The DOE has not conducted any analysis to determine whether the proposed oil fee may impact economic growth.
- Q2. **Defining Clean Energy** - “Clean” energy is referenced frequently in the budget request in terms of research and development, innovation, and goals. What does DOE define as “clean” energy? Is any type of hydropower or marine hydrokinetic power excluded from the administration’s definition of “clean” energy technologies?
- A2. Clean energy technology is defined as energy-related hardware, software, systems, or practices that avoid, reduce, or sequester greenhouse gas emissions or other air pollutants. This includes technologies that convert, convey, or store energy resources, improve energy efficiency, or reduce energy consumption. The Office of Management and Budget (OMB) uses this definition to guide clean energy data collection and reporting, as evidenced by OMB’s 2015 report “[Government-Wide Funding for Clean Energy Technology](#)”. The spectrum of Federal clean energy activities is extremely diverse. It includes research, development, demonstration, and deployment programs that address an

array of technologies such as solar, water, wind, carbon capture and storage, nuclear, and buildings.

Hydropower and marine and hydrokinetic energy are both considered to be clean, renewable energy. The primary DOE office that supports hydropower and marine and hydrokinetic applied research, development, and demonstration (RD&D), as well as mitigating barriers to commercial deployment, is the Water Power Program within the Office of Energy Efficiency and Renewable Energy (EERE). While all of the Water Power Program's hydropower and marine and hydrokinetic activities support clean energy, some of the portfolio funds activities that are not characterized as RD&D, including administration of the Hydroelectric Production Incentive, standards development, and development of a regulatory and permitting toolkit.

- Q3. **SMR/Advanced Nuclear Technical Assistance in Licensing** - As the technologies emerge and develop over the coming decade, from light water SMR deployment to advanced reactor deployment, how will the DOE support evolve?
- A3. The DOE Office of Nuclear Energy (NE) is considering the next generation of programs that will serve to reduce regulatory, technical and financial risk to industry deployment of advanced nuclear technologies of both light water and more advanced reactor designs. As the Small Modular Reactor (SMR) Licensing Technical Support program concludes in Fiscal Year (FY) 2017 after supporting the certification and licensing of near-term SMR designs, we are examining the optimum next steps to support the commercialization of these designs.
- Q4. **Methane Hydrates** - I am concerned that the Administration plans to abandon any research into whether methane hydrates can be produced commercially, and instead focus on the amount of hydrate deposits in the Gulf of Mexico. I support a better inventory of our hydrate deposits, but we should learn everything we can about how to control methane hydrate production now, not later on, because we will need even more natural gas than we use today in the decades ahead.

Given the huge potential for hydrates to be a dominant source of global energy in the future – with Alaska alone estimated to hold 32,965 trillion cubic feet of hydrates, or enough hydrates by itself to meet U.S. energy needs for a millennium – why is the

Department not providing stable research funding to make America the global leader in tapping this resource?

- A4. The Program is managed within the DOE by the Office of Oil and Natural Gas and conducted through the National Energy Technology Laboratory (NETL). The fundamental goals and nature of the program for FY 2017 remain as in prior years – conduct collaborative research and development (R&D) to deliver science and technology to further understand the nature and regional context of gas hydrate deposits, the physical properties and characteristics of gas hydrate-bearing sediments and environmental implications of naturally-occurring methane hydrate.

The FY 2017 Budget Request of \$2.5 million for methane hydrates will be used to continue ongoing resource characterization research in the Gulf of Mexico to confirm the nature and regional context of those gas hydrate deposits.

- Q5. **Microgrids** - While in Bethel last month, you heard from the University of Alaska's Center for Energy and Power about its desires to make America a world leader in the development and engineering of microgrids.

What are your views about the Department's role in helping to advance microgrid development?

- A5. DOE plays an important role in helping advance microgrid development to improve the overall electricity delivery performance with the following objectives: reliability, system efficiency, CO<sub>2</sub> emissions reduction, cost-effectiveness, and community-specific resilience. This role was defined through broad stakeholder engagements in 2011 and 2012 and was further refined in the aftermath of Superstorm Sandy. To fulfill this role, the Department implemented a systems approach, in R&D through implementation, to grid-connected microgrids, remote/off-grid microgrids, and networked microgrids. A key part of the Department's role is to help meet the needs of U.S. communities in all settings (urban, rural, remote, and island), not only to improve the common performance objectives facing the world community, but also to enhance climate preparedness and resilience against future weather hazards in the United States.

- Q6. **Geothermal-Ground-Source Energy** - Your budget calls for a large increase in geothermal funding (a \$28.5 million increase, to \$99.5 million) for the Office of

Geothermal mostly to fund the expensive portion of the FORGE project, to improve the technology for enhanced geothermal system technology. But in Alaska there is a move to use ground-source heating and cooling. There is a proposal in Juneau for a demonstration project utilizing ocean seawater in a distributive heating system to cut the cost of space heating, utilizing the same type of heat exchangers used in ground-source geothermal applications.

- a. Are there any federal assistance programs in your Department to help such efforts proceed?
- b. Is your Department planning any research or providing financial assistance for ground-source geothermal?

A6. In FY 2016, the Geothermal Technologies Office (GTO) does not currently offer federal assistance for ongoing R&D in ground-source heating (also known as Geothermal Heat Pumps) and cooling technologies in Alaska. However, these thermal applications are very much in keeping with GTO's planned direct use R&D efforts.

The FY 2017 budget request includes funds to conduct feasibility studies for the evaluation of prospective direct use/low temperature systems in geologically distinct parts of the country. Alaska, among other states, is eligible to apply to participate in the feasibility studies. Pending availability of funds, GTO plans to competitively award \$4 million for geothermal direct use R&D (also known as thermal applications), which harvests the heat from geothermal brines and uses it to directly heat (or cool) buildings, as well as for other beneficial thermal processes. By displacing high-temperature power generation with low-to-medium temperature geothermal, significant energy conservation gains can be achieved from end-use processes with moderate temperature requirements.

Q7. **GAIN Initiative** - At the end of 2015, the President announced the Gateway for Accelerated Innovation in Nuclear (GAIN) initiative. The Department of Energy states that the GAIN initiative provides the nuclear energy community with access to the technical, regulatory, and financial support necessary to accelerate the commercialization of advanced nuclear energy systems. This effort has been commenced over the past few months.

Can you provide us with more information about the GAIN initiative, including more concrete goals and milestones?

A7. As detailed in the Climate Action Plan, President Obama is committed to using every appropriate tool to combat climate change. Nuclear power, which in 2014 generated

about 60 percent of carbon-free electricity in the United States, continues to play a major role in efforts to reduce carbon emissions from the power sector. As America leads the global transition to a low-carbon economy, the continued development of new and advanced nuclear technologies along with support for currently operating nuclear power plants is an important component of our clean energy strategy. Investing in the safe and secure development of nuclear power also helps advance other vital policy objectives in the national interest, such as maintaining economic competitiveness and job creation, as well as enhancing nuclear nonproliferation efforts, nuclear safety and security, and energy security.

On November 6, 2015, the Administration announced the GAIN initiative to enable accelerated innovation in nuclear energy systems.

**Launching the Gateway for Accelerated Innovation in Nuclear:**

DOE is establishing the GAIN to provide the nuclear energy community with access to the technical, regulatory, and financial support necessary to move new or advanced nuclear reactor designs toward commercialization while ensuring the continued safe, reliable, and economic operation of the existing nuclear fleet. GAIN will provide the nuclear community with a single point of access to the broad range of capabilities – people, facilities, materials, and data – across the DOE complex and its National Lab capabilities. Focused research opportunities and dedicated industry engagement will also be important components of GAIN, ensuring that DOE-sponsored activities are impactful to companies working to realize the full potential of nuclear energy. GAIN will feature:

- **Access to Capabilities:** Through the Clean Energy Investment Center in DOE’s Office of Technology Transitions (OTT), GAIN will provide a single point of contact for users interested in a wide range of nuclear energy related capabilities and expertise. As an initiating step, Idaho National Lab will serve as the GAIN integrator for Office of Nuclear Energy (NE) capabilities.
- **Nuclear Energy Infrastructure Database:** DOE is also publishing the Nuclear Energy Infrastructure database (NEID), which provides a catalogue of existing nuclear energy related infrastructure that will enhance transparency and support



nuclear community engagement through GAIN. NEID currently includes information on 802 (R&D) instruments in 377 facilities at 84 institutions in the United States and abroad. Nuclear technology developers can access the database to identify resources available to support development and implementation of their technology, as well as contacts, availability, and the process for accessing the capability.

- **Small Business Vouchers:** To support the strong interest in nuclear energy from a significant number of new companies working to develop advanced nuclear energy technologies, DOE plans to make \$2 million available in the form of vouchers to provide assistance to small business applicants (including entrepreneur-led start-ups) seeking to access the knowledge and capabilities available across the DOE complex. This will enhance the ability of GAIN to serve a broader segment of the nuclear community.
- **Assisting Navigation of the Regulatory Process:** The Nuclear Regulatory Commission (NRC), consistent with its role as an independent safety and security regulator, will provide DOE with accurate, current information on the NRC's regulations and licensing processes. DOE will work through GAIN with prospective applicants for advanced nuclear technology to understand and navigate the regulatory process for licensing new reactor technology.

Specific FY 2016 GAIN initiative objectives include:

- Develop and publish a GAIN execution plan to serve as the organizing principle for the relevant Federal nuclear energy R&D programs, especially for the advanced reactors vision and strategy;
- define generic, non-design specific R&D needs for a given technology;
- conduct a series of workshops with stakeholders;
- establish an expert working group to develop a licensing framework with gradual risk reduction to be proposed to NRC; and
- define a streamlined process for Work for Others (WFO) and Collaborative Research and Development Agreement (CRADA) to facilitate easier access to government-owned research capabilities.

- Q8. **Advanced Reactor Technologies Cost Share Program** - On January 15, DOE announced two new advanced nuclear cost-share awards, to X-energy and Southern Company. These awards were meant to further develop advanced nuclear reactor designs, supporting work on technical challenges to design, construction, and operation. Despite the many challenges, the companies had to demonstrate a path to reactor demonstration in the 2035 timeframe. These awards would be for an initial \$6 million cost share and could be extended in a multi-year cost share up to \$80 million for both companies. The nuclear energy budget request specifically says “does not include funding for two ongoing industry cost-shared awards made in early calendar year 2016 to further the development of two performance-based advanced reactor concepts.”

If these awards were just made by your Department, for FY 2016, why is funding not being requested to support them in FY 2017?

- A8. DOE sees considerable value in cost-shared support for the further development of advanced reactor concepts. The FY 2017 request supports a number of priorities including completion of the SMR Licensing Technical Support program, maintenance of the existing fleet through the Light Water Reactor Sustainability program and the development of accident tolerant fuel, and activities to address used fuel storage, transportation, and disposition.

- Q9. **Strategic Transformer Plan** - Last fall, in section 61004 of the Fixing America’s Surface Transportation Act (P.L. 144-357), DOE was directed to develop and submit to Congress a Strategic Transformer Reserve Plan for the storage of spare large power transformers and emergency mobile substations in sufficient numbers and in strategically located facilities. Strategically-located spare large power transformers and emergency mobile substations would diminish the vulnerability of the United States to multiple risks facing electric grid reliability, including physical attack, cyber-attack, electromagnetic pulse, geomagnetic disturbances, severe weather, and seismic events. This plan is to include the funding options available to establish, stock, manage, and maintain the Strategic Transformer Reserve.

What is the status of that required plan?

- A9. The Oak Ridge National Laboratory (ORNL) began work on the project in January 2016. The Office of Electricity Delivery and Energy Reliability (OE) is establishing a technical panel of representatives from the organizations mentioned in the Act to be consulted. This panel will meet during the summer to review the interim work product and provide feedback to the ORNL team. The ORNL team’s analysis of the size, scale, and scope of

a reserve is due September 2016. The study will inform Administration decisions regarding the Strategic Transformer Plan.

- Q10. **Cyber Security and the Grid** - We know that electric utilities are regularly the subject of attempted cyber security attacks. With the passage of the 2005 Energy Policy Act, Congress sought to safeguard the electric industry through the establishment of the Electric Reliability Organization and the imposition of mandatory reliability standards, including those aimed at bolstering cyber security defenses. And with the enactment of the 2015 Fixing America's Surface Transportation Act, Congress codified DOE as the sector-specific agency and provided the Secretary with the authority to direct emergency actions to protect critical electric infrastructure from cyber or physical attacks.
- Q10a. Given the Congressional focus in this area and in light of a recent incident in Ukraine where a cyber-attack appears to have led directly to a power blackout, why is the Administration proposing to cut the Office of Electricity's Cybersecurity budget by 26 percent?
- A10a. The Department addresses cybersecurity priorities by investing in R&D of resilient systems, and increasing energy sector awareness and adoption of cybersecurity tools, techniques, and best practices. The FAST Act authorized the Department to lead energy sector cyber incident coordination with critical asset owners and operators, and public sector stakeholders.

Securing the Nation's power grid remains an urgent concern and a priority for the Department. The \$16.5 million, or 26.6%, decrease to Cybersecurity for Energy Delivery Systems (CEDS) results from the completion or transfer of several activities, without which the FY 2017 budget request would have been flat with the FY 2016 enacted level:

- A \$5 million reduction reflects the Wireless Testbed project at Idaho National Laboratory, for which development funding is completed in FY 2016.
- The Virtual Energy Sector Advanced Digital Forensics Analysis Platform is a two-year project with a planned funding reduction from \$10 million in FY 2016 to \$5 million in FY 2017, when the platform will have completed implementation and will begin transitioning to the private sector.
- Incident coordination is moved to the Infrastructure Security and Energy Restoration (ISER) budget line in FY 2017, a \$1.5 million decrease to CEDS. ISER will provide a comprehensive all-hazards response to incidents.

- A \$5 million reduction reflects the Advanced Control Concepts project, which is fully funded in FY 2016.

Q10b. How does the proposed budget serve to enhance DOE's cybersecurity incident management efforts?

A10b. The DOE budget supports programs that jointly advance cybersecurity R&D, energy emergency response efforts, and planning and preparedness for cyber incident response. For instance, the proposed budget invests in cybersecurity research, development, and technical assistance programs that strengthen the resilience of the Nation's energy delivery systems in response to cyber incidents. The Department will enhance procedures and protocols for cyber incident coordination internally and with public and private sector, collaborate with other agencies to support development of the National Cyber Incident Response Plan, and integrate cyber incident coordination within the Department's emergency response function. The Department will also invest in responder training and exercises in alignment with the new integrated physical-cyber incident coordination approach.

Q11. **Distribution Projects** - The FY 2017 Budget requests seeks funding for two new distribution level projects (State Distribution-Level Reform, and the State Energy Assurance), an area traditionally within the purview of state jurisdiction.

Q11a. Why is the federal government focusing these efforts on the distribution system? Where does the Department see the state/federal jurisdictional divide?

A11a. The availability and economic productivity of new grid-related technologies, particularly at the distribution level, have raised new questions about how best to design and operate future distribution systems. Officials from state and local agencies and utilities turn to DOE and its national laboratories for technical assistance in dealing with these challenges. The Department's role is to provide these officials with useful information and analytic tools, while respecting their authorities and responsibilities.

The traditional divide between state and Federal jurisdiction still holds, with the Federal Energy Regulatory Commission (FERC) responsible for regulation of wholesale electricity sales, and the states responsible for the regulation of retail sales. However,

increased coordination and cooperation among Federal and state officials is essential to maintaining this jurisdictional arrangement in light of new technologies that could challenge existing distinctions.

Q11b. What is the “grid architecture approach” discussed in the State Distribution-Level Reform program?

A11b. The “grid architecture approach” is a systematic method to plan for and manage change in grid structure and operations. It stresses the importance of maintaining a holistic perspective so as to achieve fundamental public policy and corporate goals efficiently and avoid unintended consequences. This method enables analysts and decision-makers to cope with the extreme complexity of the grid by allowing them to shift back and forth as needed from the big picture to subsystem details, and to give appropriate attention to important interactive relationships among grid component systems.

Q11c. The budget request notes that distribution design will require Federal government leadership. What role do you envision DOE playing in the design of distribution level systems? What legal authority allows DOE to perform such a role?

A11c. State and local officials are responsible for the design of distribution-level systems. Federal leadership and technical assistance better enables these officials to identify, analyze, and evaluate their options before they make their decisions. DOE has a strong history of providing technical assistance to states to help inform their electricity policy related decisions, including those regarding the distribution system. Specifically, DOE’s Office of OE has historically provided technical assistance in accordance with statutory authorities—including the Public Utility Regulatory Policies Act of 1978, the Energy Policy Act of 2005, the Energy Independence and Security Act of 2007, and the American Recovery and Reinvestment Act of 2009.

Q12. **State Energy Assurance Program** - The FY 2017 Budget seeks \$15 million for a new State Energy Assurance program that is intended to assist local, tribal, and territorial stakeholders in planning for energy emergencies.

Q12a. What outreach does the State Energy Assurance program plan to do in Alaska to determine the state’s needs in planning for energy emergencies?

A12a. The State Energy Assurance program will reach out to states, including Alaska, both through state associations such as the National Association of State Energy Officials (NASEO) and directly to state Governors' offices. The program scope will address regional challenges for states, localities, territories and tribes in planning for energy emergencies. Alaskan communities face challenges that can be significantly different from those affecting the rest of the country and these perspective will be reflected among the scenarios exercised by the State Energy Assurance program.

Q13. **Distributed Wind** - When you joined us in Bethel, Alaska last month for the field hearing our Committee held to examine energy technology innovation and deployment opportunities for Alaska's future, you heard a lot about the ways wind is being utilized to help rural Alaskan villages reduce their reliance on expensive diesel fuel. In rural Alaska, wind energy systems are typically distributed generation, small in scale, and designed to be used in a hybrid system with diesel. There are more than 30 of these wind-diesel hybrid systems installed in Alaska, but there have been challenges with integrating wind energy on our small, isolated microgrids, and further innovation is necessary to make many of these systems work as intended. From what I can tell, of the \$156 million DOE is requesting for wind energy, \$87.5 million is for technology research, development and testing (RD&T), and only \$4.4 million of that is slated to support "investment in activities to increase the economic viability of distributed wind energy systems." Is that \$4.4 million where the Annual Distributed Wind Market Report and the "newly developed Distributed Generation" program get their funding from as well? How will your wind energy budget meet the needs of the distributed, "small" wind industry that is so vital to communities like the one you saw last month in Bethel? Wouldn't it make sense to allocate a bigger chunk of the \$87.5 million for wind RD&T than \$4.4 million (~5%) to the growth and technological advancement of distributed wind, which is a much younger industry in comparison to large-scale wind?

A13. In order to reduce the cost of wind energy, accelerate the deployment of wind power, and contribute to the Nation's role as a leader in renewable energy technology, DOE remains committed to developing and deploying a diverse portfolio of wind technologies. This includes both onshore and offshore wind, and distributed wind.

In FY 2017, the Department will support a comprehensive approach to increasing the economic viability of distributed wind. This effort includes various activities, including awarding a competitively selected project targeting soft cost reductions for distributed wind systems; continuing support for the Competitiveness Improvement Program, which will address component improvement, manufacturing process upgrades, certification

testing, and type certification; the annual Distributed Wind Market Report; and completing the development of the Distributed Generation (dGen) model to provide an analytical framework for understanding future distributed wind deployment.

In addition to supporting distributed wind, in FY 2017 the Program also plans to support technology- and deployment-agnostic efforts that apply to all wind energy technologies, including distributed wind. For example, under the Mitigate Market Barriers subprogram, the Wind Program's Wind Exchange and its six Wind Energy Regional Resource Centers help communities understand the impacts and benefits of wind energy and make informed wind development decisions, which often involve distributed wind systems. DOE also invests in distributed wind cost modeling to enable policy scenario impact analysis; and addresses market barriers to the integration of distributed wind, including integrated control of distributed wind with other Office of EERE-supported technology areas, such as building control systems.

With finite taxpayer resources, as well as other critical efforts across the Wind Program, the Department believes its efforts to increase the economic viability of distributed wind are robust and appropriately allocated.

- Q14. **Solar Energy** - A stated goal for the SunShot Initiative is to “make solar power cost-competitive without subsidies by 2020, equivalent to a cost of solar power of \$0.06/kWh.” What does/would solar cost right now without subsidies? How, if at all, does DOE's budget request for FY 2017 address the concept of community and shared solar generation? Another goal specified in the Budget in Brief document is to reduce “soft costs” of solar installation – please define “soft costs” and detail how the Department proposes to reduce them.

- A14. At the end of 2015, U.S. photovoltaics system prices were \$1.33/Watt (W) for a utility system; \$2.03/W for a non-residential system; and \$3.50/W for a residential system, without subsidies.

As overall solar prices have dropped, the U.S. has enjoyed unprecedented growth in both solar installations and jobs through the development of successful business and deployment models across the country. Hardware costs now account for less than half the installed price of solar and addressing “Balance of System-Soft Costs” presents the

most substantial opportunity to spur strong U.S. growth in solar deployment in the coming years.

The Solar Energy Technologies Office's Balance of Systems Soft Cost Reduction (BOS) subprogram supports a diverse portfolio of soft cost activities, working with a broad range of stakeholders to expand access to solar energy to every home, business, and community. Soft costs are transactional costs that include installation labor, labor invested in executing permitting and interconnection, permit fees, customer acquisition costs, financing, transaction costs, sales tax, supply chain costs, installer or developer profit, and indirect corporate costs. In addition to these measured soft costs, there are also barriers to deployment that can restrict solar access for customers.

Developing new business models, such as shared and community solar models, is critical to the continued growth of the solar industry. A recent DOE and National Renewable Energy Laboratory report estimates that nearly 50 percent of consumers and businesses are unable to host photovoltaic systems due to a number of factors, such as not owning their building or not having access to sufficient roof space. The Department estimates that because of its potential, shared and community solar could represent a large part of the distributed photovoltaic market by 2020 in terms of both cumulative deployment and investment. Through the BOS subprogram, the Department supports the National Community Solar Partnership whose mission is to help unlock community solar potential for economic growth across the United States by expanding solar access to new markets (demographic and geographic). The Partnership convenes relevant stakeholders to assess market barriers and catalyze deployment in low and moderate-income communities. In FY 2017, DOE will continue to address soft costs through solutions like shared and community solar in competitive solicitations like the Solar Market Pathways Funding Opportunity Announcement.

- Q15. **Offshore Wind Energy** - An area of stated emphasis for wind energy in the budget request is offshore wind. What is the current status of siting offshore wind? When do you expect to have the country's first offshore wind project in commercial production? Where do you expect that project to be located?



- A15. Offshore wind in the United States is still in early development phases, but significant progress is being made to facilitate siting, leasing, and construction of offshore wind power projects in both federal and state waters. The main siting concerns focus primarily on questions of competing use, environmental impacts, and constraints due to the availability of technology to meet some challenging design conditions (e.g. water depth issues). Other issues include the timelines and investment required to develop new port facilities, heavy-lift construction vessels, and supply chains for major components. Additional stakeholder concerns over coastal viewshed issues, understanding of offshore wind resources, and grid interconnection and integration issues also require further investigation.

The Department of the Interior's Bureau of Ocean Energy Management (BOEM) is the lead agency charged with leasing and permitting offshore wind sites in federal waters on the outer continental shelf (OCS). BOEM continues to work diligently to facilitate environmentally responsible offshore wind development along the OCS by identifying wind energy areas using a coordinated approach with extensive environmental analysis, public review, and large-scale planning. BOEM has been working with industry, state policymakers, other regulatory agencies, and stakeholder groups to identify priority offshore wind energy areas (WEAs) on the Atlantic outer continental shelf. BOEM has conducted Environmental Assessments in several WEAs and published "Findings of No Significant Impact," which cleared the way for the commercial leasing process and site assessment activities. As of February 2016, BOEM has issued eleven commercial offshore wind energy leases, including two issued through the non-competitive lease negotiation process (one for the Cape Wind project proposed for Nantucket Sound, Massachusetts, and another for a potential project offshore Delaware) and nine through the competitive lease sale process (two offshore Rhode Island-Massachusetts, two offshore Maryland, one offshore Virginia, two offshore Massachusetts, and two offshore New Jersey). Competitive lease sales have generated more than \$16.4 million in bonus bids for more than 1.18 million acres in Federal waters. BOEM has also executed 6 limited/research leases. The bureau is currently engaged in renewable energy planning efforts for areas offshore North Carolina, South Carolina, New York, Oregon, and

Hawaii. BOEM is also making progress on siting demonstration and technology testing projects for wind and marine hydrokinetic energy offshore both the Atlantic and Pacific coasts.

The first leases for development rights within the Rhode Island/Massachusetts WEA and the Virginia WEA have been competitively auctioned. Together these leases grant development rights to more than 270,000 acres of submerged land, which could support up to 5 gigawatts of offshore wind capacity. These lease sales, with a total up-front payment of \$5.4 million (and additional payments as and if development proceeds), verify the commercial interest in developing offshore wind projects.

A few offshore wind projects have been proposed and permitted in state waters (within three nautical miles from the coast in most cases). In addition, many states on the Atlantic coast have proactively established site selection and marine spatial planning processes for state waters that have designated areas for offshore wind development, and have implemented project review and permitting processes supporting development. The waters of the Great Lakes are also under state jurisdiction. All offshore wind projects are also subject to some level of state permitting due to the need for transmission cables to shore and interconnection with the grid.

With so few permitted offshore projects in the United States, however, the regulatory process for offshore wind is largely untested. While the Department of the Interior manages activities in federal waters, state agencies lead permitting efforts in state waters, including federal consistency through the Coastal Zone Management Act and state-delegated authority for water quality permits under the Clean Water Act, plus, typically, wetlands approval and a submerged lands lease. Offshore wind plants in state waters also have to comply with all applicable federal regulations.

The Department's Wind Program is working to address various market barriers associated with offshore wind deployment, including permitting. As part of this investment, DOE supports demonstration and testing of new technologies at commercial scale, including engineering and design of offshore systems, as well as addressing market

barriers like finalizing necessary National Environmental Policy Act permitting processes and securing necessary power offtake arrangements. Demonstrations of new technologies such as floating offshore wind like those supported by the Department may also transform markets by removing existing market barriers such as the lack of U.S.-flagged offshore wind installation vessels, as mentioned above.

It is expected that the Block Island Wind Farm off the coast of Rhode Island will support the first offshore wind turbines commissioned in the United States in fall 2016.

- Q16. **Indian Energy Funding** - Again, thank you for coming to rural Alaska and seeing first-hand the status of energy infrastructure in many of the state's 263 rural villages. Secondly, thank you for all work that DOE has done with villages. Last year after this hearing you sent me a comprehensive report that indicated that in the previous five years DOE programs had provided technical help to 27 Alaska villages and somewhat more substantive funding help for energy projects in 10 other villages. What is really needed is greater financial assistance to help finance and construct improved power systems, emphasizing renewable energy where feasible in communities that because of poverty and lack of infrastructure do not necessarily qualify for the Department's loan assistance programs. The leading complaint that I get in rural villages is that there are not enough grants provided by DOE (or USDA's RUS, or RDA or Commerce's EDA programs) to help build lower-cost systems. Instead, only technical information is provided from these federal government programs and that information is often already available from State Energy Agencies, like the Alaska Energy Authority or university programs.
- Q16a. Is the Department able to provide more grants for actual construction of renewable energy projects in Indian country? Even \$10 million for construction grants will materially improve the lives of those served, especially in a state like Alaska where the average cost of power even today is six to eight times the national average (in Lime Village it tops out at \$1.77 per kwh—16 times the national average.)
- A16a. The Energy Department recognizes the unique energy challenges in remote Alaskan communities. On March 22, 2016, DOE announced over \$9 million for 16 clean energy and energy efficiency projects affecting 24 communities, of which 11 are Alaska communities. The core intent of this funding opportunity announcement was to provide funding to Indian tribes to construct renewable energy deployment systems by way of wind turbine and solar installations, marine hydrokinetic power installations, and other renewable energy power mechanisms. In addition, since 2007 the Office of Indian Energy (IE) and its predecessor, the Tribal Energy Program (TEP) within EERE,

provided funds for 34 deployment (construction or installation) grants, valued at nearly \$53 million and representing a DOE investment of nearly \$20 million.

For example, in the Native Village of Fort Yukon, DOE provided funds for the purchase of wood boilers to displace up to 90% of the fuel oil used to heat 5 buildings. This project is a combined heat and power project with the State of Alaska and the U.S. Department of Agriculture and the Gwitchyaa Zhee Native Corporation.

Also, in FY 2010, DOE invested \$750,000 in the Chaninik Wind Group for incorporating thermal heating systems into their wind-diesel system, where those heating elements have reduced the consumption of fossil fuel by 40% in four Lower Kuskokwim Alaska villages, displacing 200,000 gallons of diesel fuel by tapping into those wind resources of which 65% being captured and stored for use as heat in these remote villages.

Q16b. In the 2007 Energy Independence and Security Act, I authored a program (Section 803 of EISA) that allows the Department to make matching grants to entities in high-cost areas (where power costs 150 percent of the national average) of up to 50 percent to pay for the construction of renewable energy projects. Why has the Department never moved to implement this Congressionally authorized program?

A16b. The Department recognizes the energy conditions that exist in many Alaska villages, particularly the high cost of energy and the logistical challenges associated with transporting diesel and heating oil to remote villages. The Department has worked extensively with Native Alaskan's in local communities, with local and state governments, Native Corporations, and its federal partners to assist with addressing these challenges.

For example, since 2007 the Office of IE and the former TEP in EERE have funded 121 clean energy tribal projects. These clean energy projects, valued at \$82.4 million and representing a DOE investment of nearly \$40 million, include a combination of planning grants (35), feasibility studies (45), development grants (7), and deployment (construction or installation) grants (34). Those 34 deployment grants are valued at nearly \$53 million and represent a DOE investment of nearly \$20 million.

Below are a few examples of these clean energy projects of reducing energy use in Alaskan communities where the cost of power is high.

- 1) The Alaska Native village of Shishmaref is remote, located on a barrier island about 20 miles below the Arctic Circle. In early November 2015, Shishmaref installed a 2.4-kilowatt wind project funded by a DOE grant (\$210,323 in DOE funds; \$11,150 cost share), as well as energy efficiency upgrades to two community buildings: the clinic and the tannery. The wind turbine is estimated to save \$3,000 per year in electricity costs—or more than \$60,000 over the system's projected lifespan of 20 to 30 years, and the building retrofits are projected to reduce Shishmaref's annual energy costs by more than \$4,500, resulting in an anticipated payback period of fewer than five years.
- 2) In FY 2014, DOE provided funding to Gwitchyaa Zhee Gwich'in Tribe in Fort Yukon Alaska (\$124,735 DOE and \$127,578 cost share) who implemented energy efficiency upgrades to reduce diesel fuel use by up to 48% and installed an 18-kilowatt solar photovoltaic (PV) system—offsetting enough diesel generation from the power plant to avoid 11,589 pounds of CO<sub>2</sub> emissions.
- 3) In FY 2010, DOE invested in the development of hydropower resources, such as the 50/50 cost share (\$1,110,500 each) hydroelectric development project in Angoon which envisions their 1 MW hydropower project at Thayer Creek as a means to completely displace the use of fossil fuel and be 100% powered by renewable energy.
- 4) In December 2015, the Office of IE and Office of EERE released a Notice of Opportunity for Technical Assistance (NOTA) for the Remote Alaska Communities Energy Efficiency Competition DE-FOA-0001479. The Department asked eligible Alaskan communities and native villages to sign a pledge to improve community energy efficiency by 15 percent or more by 2020. Sixty-four communities pledged and were designated as Community Efficiency Champions and will become part of a peer network and eligible to apply for technical assistance to prepare implementation plans. The technical assistance initiative will support community efforts to adopt

energy-efficiency measures by evaluating community energy use; developing long-term, sustainable, and replicable energy-efficiency plans; and supporting the implementation of proposed plans. Later in 2016, the communities selected to receive technical assistance will be eligible to compete for up to \$1 million in grant funding (\$3.3 million total) to implement energy saving measures. This opportunity is focused on energy efficiency; however, building integrated renewable technologies and those replacing other inefficient forms of power are eligible.

- Q17. **MHK Testing facilities** - In the 2007 Energy Independence and Security Act, Congress authorized the Department to create test centers in conjunction with institutes of higher education. Oregon State University and the University of Washington created a great testing facility at two sites in Corvallis and Newport. Last year and again this year your budget proposes to spend \$5 million to replicate or replace the Oregon State facility somewhere else, perhaps in California. Why spend limited resources to replicate a facility that already is working well, at least in the eyes of the MHK industry?
- A17. In FY 2016, the marine and hydrokinetics (MHK) subprogram intends to competitively select a project and fully fund the detailed front-end engineering and design of an open water wave test facility. If constructed, this test facility would be unique from other U.S. test facilities due to the fact that it would be a multi-berth, full-scale, grid-connected open water wave test facility capable of testing and demonstrating wave energy converter components and systems year-round under operating and survival conditions. In FY 2017, the MHK subprogram will commence procurement for and construction of the open water test facility, including construction of shore-based infrastructure and grid interconnection. Subsequent phases will be subject to a programmatic go/no-go decision to pursue facility construction. If constructed, this project is expected to leverage the results from the MHK subprogram's FY 2013 awards to the Northwest National Marine Renewable Energy Center (NMREC) and the Cal Poly Corporation California Wave Energy Test Center, which are evaluating site locations and delivering preliminary designs and cost estimates. Results from these site location evaluations are forthcoming in FY 2016.

The open water test facility effort is supported by FY 2016 appropriations Joint Explanatory Statement report language, which directs DOE to "continue development

and construction for an open water, fully energetic, grid-connected wave energy test facility.”

Since their inception, NMRECs have established capabilities in MHK energy and have demonstrated their value to the sector. For example, the Northwest NMREC’s Pacific Marine Energy Center has established wave and tidal test capabilities through investments made from 2008 to 2013 at various scales and durations. Developers seeking early opportunities for scaled demonstrations continue to leverage its expertise. Wave energy developers utilizing the U.S. Navy’s Wave Energy Test Site to test grid-connected technology also leverage the capabilities of the Hawaii NMREC. In addition, once operational, the Southeast NMREC’s infrastructure and permits for ocean current testing will fill a unique capability that no other test center in the United States provides. Prior DOE investments in NMRECs’ capabilities have positioned them to continue to play a role in future MHK technology advancements.

In general, university- or consortium-relevant MHK R&D funding opportunities are expected to be made available using a competitive solicitation mechanism (i.e. Funding Opportunity Announcements open to U.S. universities). U.S. universities have shown interest in this model, and have been successfully funded under competitive solicitations.

- Q18. **Natural Gas Distribution System** Development - In most of America private financing can readily meet the capital needs for installation of natural gas distribution systems. But in Alaska, most utilities must use diesel fuel for backup power generation, and many individuals must use diesel oil for home and building heating. But since natural gas produces 37 percent less carbon dioxide when burned than diesel, it would make sense for this nation to encourage gas usage. Right now in Southeast Alaska a utility (Avista/AEL&P in Juneau) wants to import LNG to meet utility and community space heating needs, but finds it cannot quite make the project pencil out without some governmental assistance to install the expensive infrastructure. Does DOE have any grant or loan programs, or by regulation could you generate such funds, to help utilities convert to natural gas from diesel fuels for electrical power and heating uses?
- A18. DOE’s existing grant and loan programs do not include funding for building natural gas infrastructure like those described in the question. The Department’s Loan Programs Office administers the Title XVII loan guarantee program, which has an open solicitation for Advanced Fossil projects and \$8.5 billion in available loan authority. These funds are

available to support innovative, advanced fossil energy projects located in the U.S. that avoid, reduce, or sequester greenhouse gases.

DOE's Title XVII Section 1703 Innovative Technology Loan Guarantee Program provides loan guarantees to support the commercial deployment of clean energy projects that utilize a number of eligible technology areas including advanced fossil energy, advanced nuclear energy, renewable energy, and energy efficiency. Projects supported by DOE loan guarantees must meet threshold criteria to 1) avoid, reduce, or sequester greenhouse gases; 2) employ new or significantly improved technologies compared to commercial technologies; 3) be located in the United States; and 4) offer a reasonable prospect of repayment of the principal and interest on the guaranteed obligation.

In December 2013, the Department issued a new Advanced Fossil Energy Projects Loan guarantee solicitation. The solicitation details the eligibility requirements for potential applicants, which includes a requirement that the project employ new or significantly improved technology. DOE will consider all applications received, but notes that the projects as described in the question do not appear to meet the innovation requirement of employing new or significantly improved technology.

- Q19. **Grid Transformation** - DOE notes in its budget request that it plans to make use of appropriated funds to "coordinate efforts to transform the electric grid." What exactly does the Department mean by "transform"?
- A19. Today's grid is still a 20<sup>th</sup> century grid to a large extent, and is not the grid needed to meet the requirements of a highly digitized and interactive 21<sup>st</sup> century economy. The future grid will be much more complex and challenging to plan for and operate. DOE's role is to facilitate the transformation by working with utilities, regulators, and others to develop new advanced technologies such as sensors and power flow controllers, new fast-response tools for grid operators, and new analytic methods and tools for grid planners and regulators.
- Q20. **Grid Modernization Initiative** - Exactly what policy questions are the DOE's Grid Modernization Initiative focusing on? What aspects of market design and business model



building are DOE focusing on? What expertise does a Federal government agency have in planning business models?

- A20. Across the Nation, many utilities are facing slow load growth, while the need for new investment remains high to deal with aging infrastructure, install new kinds of control systems, and meet physical and cyber security challenges. As a result, utilities and their regulators find that traditional business models based on commodity sales of electricity don't generate sufficient revenue to cover new investments in transmission and distribution networks, which we still depend on utilities to design, build and operate. This has created vigorous public discussion about alternative utility business models. Other emerging policy topics of major interest include valuing the costs and benefits resulting from the deployment of new technologies, such as energy storage devices and solar energy systems, and how to design equitable retail rates for a wider range of utility services.

These questions are typically novel and extremely complex. However, the Department is able to bring some of the best minds from our national laboratories and universities to bear on them and to foster and maintain a collective dialogue through which grid experts can address the needs faced by utilities and regulators.

DOE and its national laboratories are exploring grid architecture, interconnection of distributed resources and the implications of doing so, and data access and use. These issues inform market design and business model development by states, regional entities like PJM Interconnection and California Independent Service Operator (CAISO), and utilities.

DOE is providing information and design scenarios based on decades of study in partnership with states, universities and industry. State-level decisions belong to the state, but states value DOE and national laboratory expertise; several states have testified to Congress in the past few years how working with DOE has helped in grid modernization.

Our role is to enable these decision-makers to better understand their options and make more informed choices that meet local needs, without becoming prescriptive.

Q21. **Energy Storage** - The FY 2017 budget request for Energy Storage notes that it would initiate three to four new highly leveraged, cost-shared demonstrations with states encompassing 5MW+ of energy storage assets.

Q21a. Please provide more information on these demonstration projects. In which states will they be located? What specific storage technologies will be demonstrated? What specific goals will be accomplished by the demonstration projects?

A21a. The storage program will launch an open solicitation for funding of collaborative energy storage projects with the states. All states will be eligible to submit projects. Criteria will involve economic feasibility, innovative application, novel technology, cost share, local support, and geographic diversity. The specific goals will include: generation of cost effective projects that can function as a seed for further regional involvement in storage technology; accurate cost-benefit determination; strengthening business cases; and stimulating the development of appropriate regulatory environments. Technical support will be provided from the national laboratories. The Department anticipates these demonstrations overall will actually result in eight or more megawatts of energy storage assets.

This solicitation will be in addition to ongoing projects in Vermont, Washington, and Oregon, as well as recently initiated projects in Alaska, Massachusetts, and Hawaii.

Q22. **Grid Clean Energy Manufacturing Innovation Institute** - Does the Grid Clean Energy Manufacturing Innovation Institute require Congressional approval to establish? If not, under what authority is it being pursued?

A22. The Grid Clean Energy Manufacturing Innovation Institute (Grid Institute) does not require new authorization legislation. Similar to the other DOE Manufacturing Innovation Institutes, the Grid Institute is being pursued under authorities granted under the Energy Policy Act of 2005. Specifically, DOE has the authority to implement transmission and distribution programs through consortia involving participants from industry, institutions of higher education, and national laboratories.

- Q23. **Transformer Resilience and Advanced Components** - With regard to the Transformer Resilience and Advanced Components (TRAC) program, where would the next-generation transformers being developed be manufactured? How does this fit in with DOE's requirement to develop a Strategic Transformer Reserve Plan to Congress?
- A23. In FY 2017, the next-generation transformers developed under the TRAC program will be research prototypes selected through a competitive solicitation. The technology designs and concepts will be developed domestically, while eventual manufacturing locations will be determined through supply chains and the availability of manufacturing capabilities. The Grid Institute proposed in the FY 2017 Budget Request will complement TRAC program objectives by helping to ensure a robust ecosystem for manufacturing advanced transmission and distribution grid components is established domestically.

TRAC program activities are being coordinated with Strategic Transformer Reserve Plan development. While the plan focuses on assessing the location, size, scale, and scope of a potential transformer reserve, details of a stockpile are part of a broader portfolio of activities to increase the resilience of the grid from the loss of multiple large power transformers. Next-generation transformers being developed under TRAC will promote greater standardization and be more flexible and resilient than existing designs, which could augment some of the plan recommendations.

- Q24. **Open Source Operating Systems** - The budget request notes that in 2016 DOE will "develop the specifications for an open source distribution operating system."
- Q24a. How will you address the cyber security concerns that accompany open source operating systems?
- A24a. The Department's Advanced Distribution Management System (ADMS) R&D will be developing an open source integration platform with the interface specifications for integrating existing and new vendor products (Supervisory Control and Data Acquisition [SCADA]; outage, distribution, and enterprise management systems; etc.) to manage and optimize distribution grid operations. Cybersecurity will be addressed in the integration platform and individual vendor products, including the supply chain and communications network, to comply with the latest guidelines and standards. In addition, industry best

practices in securing cyber-physical systems will be adopted. Ongoing engagements with the Smart Grid Interoperability Panel-Cyber Security Working Group (SGIP-CSWG) and the ADMS Steering Committee, which includes thought leaders and experts representing pertinent areas of ADMS development, will help support mitigation of the risk areas concerning cybersecurity.

Q24b. Who is DOE working with to develop these specifications?

A24b. Development of the interface specifications and the ADMS open-source platform was awarded through the FY 2016 Grid Modernization Research Call. The project team members include the Pacific Northwest National Laboratory (as the project lead) and National Renewable Energy Laboratory, in partnerships with Washington State University, Incremental Systems, and Modern Grid Solutions.

Q24c. What role do FERC and NERC have in the development of this open sourced distribution operating system?

A24c. No direct involvement by FERC or NERC in the development is anticipated. However, compliance with the NERC Critical Infrastructure Protection (CIP) guidelines, as well as the Guidelines for Smart Grid Cyber Security (NISTIR 7628), will be required for the developed platform. The Department's ADMS program will have ongoing engagement with the industry working group, SGIP-CSWG, to help ensure the developed platform will comply with the latest and emerging cybersecurity guidelines and standards.

Q25. **Medical Isotope Production** - What is the funding level included in the President's FY17 budget request for activities to implement the American Medical Isotope Production Act of 2012 (AMIPA), including funding under approved cooperative agreements? Please provide a breakdown.

A25. The FY 2017 budget request for the National Nuclear Security Administration's (NNSA) Molybdenum-99 (Mo-99) Program under the Office of Material Management and Minimization is \$33,000,000. Of this amount, \$30,900,000 is designated to support activities to implement the AMIPA. \$2,100,000 is designated to support the finalization of conversion of international Mo-99 producers from the use of highly enriched uranium (HEU) targets to low-enriched uranium (LEU) targets.

- Q26. **Molybdenum-99 and Medical Isotope Production** - What is the significance of a secure domestic supply of Molybdenum-99 (Mo99) as you see it?
- A26. Establishing a domestic supply of Mo-99 remains a priority because the global Mo-99 supply chain needs new, commercial, replacement Mo-99 production infrastructure that does not use HEU. Domestic production of Mo-99 would decrease the risk to the U.S. Mo-99 supply, help ensure U.S. medical needs are met, and support U.S. nuclear nonproliferation commitments.
- Q26a. Has the National Nuclear Security Administration (NNSA) imposed a cap of \$25 million total for each qualified Mo99 project?
- A26a. Yes. NNSA's 2010 Funding Opportunity Announcement (DE-FOA-0000323) states "NNSA's portion of the agreement will be capped at \$25 million. If the total cost of the project is less than \$50 million, the cost of each party's cost share will be 50% of the total cost. Any project cost above \$50 million must be borne by the commercial partner."
- Q26b. Does AMIPA require such a cap? If not, please confirm whether the cap is self-imposed as a matter of NNSA's discretion?
- A26b. No, AMIPA does not have a funding limit. The \$25 million cap was established by NNSA in the 2010 Funding Opportunity Announcement (FOA). NNSA implemented the \$25 million cap to be consistent with policy principles issued by the Organization for Economic Cooperation and Development's Nuclear Energy Agency (OECD-NEA) designed to support the transition of the global production of Mo-99 to a reliable, sustainable, non-HEU-based industry.
- Q26c. What is the legal basis for the cap?
- A26c. The \$25 million cap is not legislatively mandated.
- Q26d. How much funding would each of the qualified Mo99 projects require in FY17 to stay on track for completion and production by FY19?
- A26d. NNSA's contribution is up to \$25 million per project, and each commercial project has a different total project cost. As of October 2015, all of NNSA's commercial partners are projecting domestic Mo-99 production by FY 2019.

Q26e. Does the cap of \$25 million affect the likelihood that any project would not be in production by FY19?

A26e. No. As of October 2015, all of NNSA's commercial partners are projecting domestic Mo-99 production by FY 2019.

Q26f. Does the cap of \$25 million affect the likelihood that the US would be fully self-sufficient with a 100% domestic supply of Mo-99 by FY19?

A26f. No. NNSA's programmatic objective to meet at least 100% of U.S. demand for Mo-99 requires at least two of its commercial projects to be successful. As of October 2015, all of NNSA's commercial partners are projecting domestic Mo-99 production by FY 2019. These schedules are dependent on several factors, including receiving regulatory approval for patient use, and assume that projects receive full commercial funding.

Q26g. Based upon unclassified information, what are Iran's plans for domestic Iranian medical isotope production?

A26g. Iran has repeatedly stated that it plans to manufacture medical isotopes with the redesigned Arak reactor, but has not been specific about what medical isotopes or how much of those isotopes they plan to produce.

Q26h. Based upon unclassified information, do you agree that it appears Iran has plans for such production?

A26h. Iran has repeatedly stated that it plans to manufacture medical isotopes with the redesigned Arak reactor.

Q26i. If so, do you believe that Iran is subsidizing production and construction of facilities as part of its own medical isotope program?

A26i. Iran has not been specific about what medical isotopes or how much of those isotopes they plan to produce, and therefore there is insufficient information to form a conclusion.

Q26j. Is it plausible that Iran could have its own domestic supply of medical isotopes before the United States will reach this milestone?

A26j. Iran has not been specific about what medical isotopes or how much of those isotopes they plan to produce, and therefore there is insufficient information to form a conclusion.

Q26k. If so, is this an acceptable outcome, especially in light of AMIPA?

A26k. Iran has not been specific about what medical isotopes or how much of those isotopes they plan to produce, and therefore there is insufficient information to form a conclusion.

Q26l. In the event that Iran has a domestic supply of medical isotopes before the United States has achieved that milestone, what role, if any, will the \$25 million cap for each qualified Mo99 project have had in that outcome?

A26l. Iran has not been specific about what medical isotopes or how much of those isotopes they plan to produce, and therefore there is insufficient information to form a conclusion.

Q26m. More broadly, what are the “pros and cons” of the \$25 million cap?

A26m. Advantages:

- The \$25 million cap is the clear, long-established, and consistent level of funding that was established by the 2010 FOA. The FOA was designed to be consistent with early drafts of AMIPA that signaled a program lifecycle budget that led to a \$25 million limit for each the cooperative agreement projects.
- NNSA’s \$25 million cap is consistent with policy principles issued by the Organization for Economic Cooperation and Development’s Nuclear Energy Agency (OECD-NEA) designed to support the transition of the global production of Mo-99 to a reliable, sustainable, non-HEU-based industry.
- Most cooperative agreement partners have not yet accessed the full \$25 million to date, and NNSA has funding available to meet its full \$25 million for the remainder of the projects once NNSA has received proposals for additional funding.

Disadvantages:

- Some Mo-99 stakeholders who are unaffiliated with and have not received support from NNSA’s program have expressed the view that any NNSA funding, including

within the \$25 million cap, creates a disadvantage for their commercial endeavors to produce Mo-99 in the United States.

- Q27. **NPC Report** - On October 25, 2013, Secretary Moniz, you asked the National Petroleum Council (NPC) to conduct a study of the research and technology needs to “enable prudent development of U.S. Arctic oil and gas resources.” The resulting NPC Arctic Report, released on May 27, 2015, had a number of recommendations for the Department of Energy, outlined in Appendix C of the Report. What progress has been made on these recommendations, with specific focus on the recommendations under “Government Leadership and Policy Coordination,” pages C-6 and C-7?
- A27. The NPC study aligns with priorities identified in the National Strategy for the Arctic Region. The study provides valuable insights to inform DOE’s future research program agenda across the Department and enhance DOE contributions to interagency coordination and collaboration with stakeholders in support of Arctic policy implementation. DOE has a role to play in four areas: science and technology, integrated analysis of infrastructure needs and related policy, interagency coordination, and engaging the State of Alaska. DOE has long and productive working relationships with Alaska institutions that can be built upon in the planning and conduct of DOE Arctic-related initiatives. Our efforts to strengthen our understanding of Arctic issues and take action accordingly are relatively new and will continue to evolve. The NPC study has heightened DOE’s appreciation of issues related to Alaskan energy development and infrastructure. It is also worth noting that, through its normal review process, DOE reached natural gas regulatory decisions in 2015 and 2016 pertaining to Alaskan liquefied natural gas.
- Q28. **Wind for Schools Project** - This program helps develop a future wind energy workforce by providing teacher training and hands-on curricula at the K-12 level, bringing wind turbines into the classroom through interactive and interschool research tasks, engaging young people interested in science. At the college level, dozens of students have now graduated after being involved in Wind Application Centers. Do you view the Wind for Schools Project as a success so far? What level of funding is included for it in DOE’s budget request?
- A28. The Wind for Schools project aims to equip students for a career in the wind industry by engaging them in Wind Application Centers while helping to deploy wind energy in communities through projects at local elementary and secondary schools. Wind



Application Centers in turn provide technical assistance to help K-12 schools and communities install small wind turbines. Students in Wind Application Centers provide needed expertise, assisting in the assessment, design, and installation of the small wind systems at the host schools.

The Wind for Schools program has been a success and has met its goals. Projects have been supported in 12 states, and there were 147 systems installed at host schools under the program. At the university level, as you note, dozens of students graduated with active involvement in the project's Wind Application Centers. Because the program has met its goals, no funds are requested for Wind for Schools in FY 2017, during which the Department's focus is planned to shift from implementation to evaluation of Regional Resource Center performance to measure the success of the three-year effort and inform the future direction of the program's education and outreach. Under current funding, DOE is working to transition Wind for Schools to the private or non-profit sector so that existing state Wind Application Centers, curriculum development, and K-12 teacher training can continue without sustained federal support. This is consistent with Office of EERE and DOE practice for similar efforts throughout the technology programs.

To address ongoing workforce needs in the wind industry, DOE has developed the Collegiate Wind Competition as well as a number of career resources that are available on its website. The WINDEXchange online portal offers career resources including a Wind Career Map, an online directory of wind energy educational programs, webinars, podcasts, and many other workforce development initiatives to foster a growing wind workforce. The Collegiate Competition challenges teams of undergraduate students to design a wind turbine based on market research, develop a business plan to market the product, build and test the turbine against set requirements, and demonstrate knowledge of current and emerging issues facing the wind industry. The inaugural Competition took place in 2014 with over 150 students from 10 institutions across the country participating.

- Q29. **Wind Energy Regional Resource Centers** - DOE's Regional Resource Centers provide unbiased wind energy information to communities and decision makers to help them evaluate wind energy potential and learn about wind power's benefits and impacts in their

regions. Your budget request states that “six Regional Resource Centers are scheduled to complete their work in FY 2017,” thus the focus of the three year effort will shift from implementing the program to evaluating and determining the future direction of it. When are these Regional Resource Centers expected to complete their work? What are the criteria DOE will be using to gauge the success of these completed Regional Resource Centers?

- A29. As indicated in the original 2013 Request for Proposals (RFP) and agreed to by subcontractors, Regional Resource Center (RRC) awards would run an anticipated 36 months at maximum. Because FY 2016 enacted funding for the DOE Wind Program was lower than both the President’s FY 2016 Budget Request and the FY 2015 enacted level, the Program is currently in the process of evaluating options that would allow for continued support for the RRCs. The Program is committed to exploring every possibility that will allow for all of the RRCs to be funded through the end of their final contract year, which ends during FY 2017. After that time, the Department’s focus would shift from implementation to evaluation of RRC performance to measure the success of the three-year effort and inform the future direction of the program’s education and outreach.

After FY 2017, evaluation of the RRCs will include performance targets to address the metrics specific to measuring engagement, consideration, and acceptance. The RRCs will be evaluated against these measurable stakeholder performance indicators over the three year contract. Working within the budget, the program plans on conducting a formal evaluation in FY 2017.

- Q30. **Mission Innovation** - The Budget in Brief document mentions that the \$2.898 billion request for the Office of Energy Efficiency and Renewable Energy includes \$2.108 billion for the support of Mission Innovation. Was addressing climate change the primary driving force behind the creation of Mission Innovation? What other agencies beyond DOE are involved?
- A30. The Mission Innovation-related areas of the FY 2017 Budget Request support clean energy activities, which span the innovation spectrum from use-inspired basic research to demonstration, and encompass all clean energy technologies, including renewable energy, energy efficiency, sustainable transportation, nuclear energy, carbon capture and storage, and the electricity grid of the future. Innovation is essential for economic growth

by providing affordable and reliable energy for everyone. It is also critical for energy security, a means to enhance U.S. competitiveness, and the key to a transition to a clean energy future. While important progress has been made in cost reduction and deployment of clean energy technologies, the pace of innovation and the scale of transformation and dissemination remains significantly short of what is needed to address global climate change. DOE is undertaking an innovation strategy that focuses on lowering costs, reducing risks, and providing new solutions across all sectors to help achieve our clean energy goals.

The FY 2017 Budget Request takes a significant first step toward fulfilling the U.S. pledge to seek to double Federal clean energy R&D investment over 5 years by providing \$7.7 billion across 12 Federal agencies, with DOE responsible for approximately 76 percent of that government-wide total. Additional information on the U.S. Government's commitment to Mission Innovation and the pledge is included in the various volumes of the FY 2017 President's Budget, including the [Budget of the United States Government, Fiscal Year 2017 \(pg. 19\)](#), as well as in the [Advancing Clean Energy FY17 Budget fact sheet](#).

- Q31. **21<sup>st</sup> Century Clean Transportation Plan** - Part of DOE's budget request for EERE is \$1.335 billion in mandatory funds for the Administration's 21<sup>st</sup> Century Clean Transportation Plan, including \$500 million for "clean" energy research and development. Which technologies would that funding support? Please provide a detailed breakdown.
- A31. The Administration's 21st Century Clean Transportation Plan proposes \$500 million for clean energy research and development in FY 2017 for the DOE, including:
- \$200 million for Clean Transportation R&D, to scale-up of R&D through initiatives to accelerate cutting the cost of battery technology and; public-private partnerships to achieve lowest carbon end-to-end intermodal transport for freight and fleets;
  - \$100 million for Next-Generation Biofuels R&D, for competitive selection of cutting-edge projects to focus on transformational developments that address technical barriers in feedstock logistics by innovative at-scale demonstrations of new logistic models (depot concepts), decreased conversion costs through new research into

process intensification, enhanced economics of biofuel production through focus on high value co-products and, certification of new fuel pathways.

- \$200 million for Smart Mobility Research, to expand collaborative research programs by establishing a smart mobility research center that will investigate the intersection of information and communication technologies, vehicle technologies, low carbon fuels, and disruptive transportation business models with the goal of reducing overall system level GHG emissions and petroleum consumption.

Q32. **Sustainable Transportation & Vehicle Technologies** - Discretionary funding in the budget request under Sustainable Transportation includes a 34.1 percent increase (nearly \$217 million). The “Transportation as a System” initiative is new for FY 2017 – what does it entail? The Budget in Brief document states that “major funding changes are the result of enhanced support for these activities, in particular, and for increased investment in next-generation lithium-ion technology and beyond lithium-ion R&D.” Where and how, specifically, are these major funding changes being targeted?

A32. EERE’s sustainable transportation portfolio supports a comprehensive and analysis-based strategy to accelerate the development and widespread use of a variety of promising sustainable transportation technologies. Broadly, Sustainable Transportation pursues two key parallel solution pathways: (1) using less petroleum-derived fuel to move people and freight (vehicle efficiency) and (2) replacing conventional fuels with cost-competitive, domestically produced, sustainable alternatives (alternative fuels) that reduce carbon pollution.

Complementing these efforts, the Transportation as a System initiative will identify and explore energy efficiencies beyond the traditional vehicle-level focus to accelerate sustainable transportation at the system level. In FY 2017, the Transportation as a System initiative will evaluate how transportation assets, travelers, and the transportation system interact and influence each other using multi-scale, multisystem models, with the longer-term goal of optimizing the transportation system. The FY 2017 Budget Request reflects funding changes as Transportation as a System moves from Outreach, Deployment and Analysis (\$5.9 million decrease) to Vehicle Systems (\$20 million increase), which is consistent with program evolution from foundational, exploratory, and prioritization analyses to applied vehicle systems modeling and simulation.

This effort combines broad expertise from National Laboratories, industry, and other government agencies in an integrated framework, building on and leveraging existing models and tools to create a highly effective virtual test bed system for advanced vehicle technologies and alternative fuels and infrastructure. Research topics include Mobility Decision Science, Connectivity and Automation, Multi-Modal Communications, Urban Science; and Vehicle and Infrastructure Systems.

With respect to lithium-ion batteries, the EV Everywhere Grand Challenge will continue to support technologies that advance next generation lithium-ion technology in the three major areas of Battery Technology research and development (R&D): Advanced Battery Materials, Advanced Battery Development, and Advanced Processing. Based on battery performance modeling efforts, next generation lithium-ion technology has the potential to meet the EV Everywhere Grand Challenge 2022 cost target of \$125/kWh, while meeting vehicle battery performance targets. The primary focus of this work will be to develop new higher voltage/higher capacity lithium ion cathodes, advanced electrolytes, and new intermetallic anodes. R&D will focus on increasing the power capability, cycle life, and safety of these technologies while significantly reducing battery cost.

In addition, the FY 2017 Budget Request supports an increased emphasis on beyond lithium-ion R&D, which is driven by the evolution of advanced battery materials R&D and is a promising pathway for achieving the EV Everywhere Grand Challenge battery cost target by 2022. Most of the battery industry defines “beyond lithium-ion” as either a non-lithium containing cell (like Zinc or Magnesium), or a cell that uses a lithium metal anode (as opposed to a graphite or intercalation anode which is used in lithium-ion cells). Vehicle Technologies R&D will focus on electrochemistries that couple a lithium metal anode with either a high capacity cathode (like sulfur) or a metal oxide intercalation cathode (similar to those used in lithium-ion batteries).

The chemistries under study are not new, however, the approaches proposed for solving the issues with these chemistries are new. For example, the configuration of the metal

oxide cathode will be new as it will involve a much thicker electrode, three-dimensional architectures, and operate at higher voltages, than has traditionally been used. In addition, the sulfur cathode will be paired with a solid electrolyte to resolve the polysulfide issues, and the lithium metal anode will be embedded in a three-dimensional carbon architectures to improve structural integrity. Finally, the anode and cathode interfaces will be decoupled to permit greater flexibility in the internal interface design.

Based on battery performance modeling efforts, these beyond-lithium-ion materials show great promise to meet battery cost goals if specific technological challenges such as very low cycle life and low power capability are resolved. The R&D focus will be to mitigate lithium dendrite formation and polysulfide dissolution, which limit cycle life, and increase ionic conductivity to increase power capability. Lithium dendrites can be an issue with lithium-ion cells, but not under normal operating situations. Under high rate charge or very low temperature operation, lithium dendrite growth in lithium-ion cells can become an issue. However, in cells using a lithium metal anode, lithium dendrites can form under relatively normal operating conditions, leading to a short circuit and possible thermal runaway. Thus, lithium dendrite mitigation is a major issue and research focus associated with cells containing lithium metal anodes.

- Q33. **Advanced Manufacturing** - Part of DOE's budget request for energy efficiency includes supporting "the deployment of one additional Clean Energy Manufacturing Innovation Institute." Where is this additional Institute going to be located? Does its deployment require Congressional approval or can it be done administratively?
- A33. The FY 2017 Advanced Manufacturing R&D Facilities funding of \$129 million includes support for one new (\$14 million) and five existing (\$70 million) Clean Energy Manufacturing Innovation Institutes. A specific technical topic will be identified for the new institute in FY 2017, which will be selected from the limited set of high priority technical focus areas that have been developed by DOE through extensive engagement and consultation with private sector firms, non-profits, universities, and National Laboratory partners, and others across the department and are outlined in DOE's FY 2017 budget. The advanced manufacturing challenges identified in the DOE Quadrennial Technology Review (QTR) published in 2015 align with these focus areas. The

Department will then solicit applications under the chosen topic through an open and competitive funding opportunity announcement to determine the selectee. As such, the physical location of the Institute requested in FY 2017 is not yet known. In addition the FY 2017 Budget proposed a second new Institute funded through the Office of OE.

Several statutes grant the Department the authority to advance energy efficiency efforts across the Office of EERE. Current authority allows the Department to address clean energy manufacturing and industrial energy efficiency challenges through pre-commercial technology development through facilities and manufacturing consortia, including the Clean Energy Manufacturing Innovation Institute modality.

- Q34. **Federal Energy Management Program (FEMP)** - The budget request for FEMP in FY 2017 is an increase of \$16 million (+59.3 percent) over FY 2016. Specifically, what “aggressive energy, water, greenhouse gas and other sustainability” goals and targets are Federal agencies required to meet?

A34. The majority of the increase proposed in the FY17 Budget is to enable FEMP to assist other agencies meet these aggressive goals through direct financial and technical assistance. The Federal Government is pursuing a number of challenging energy and sustainability goals established through Executive Order and statute. Statutory federal energy and sustainability statutory goals were set forth by the National Energy Conservation Policy Act, Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007, among others. A full list of the statutory and executive requirements for federal energy use and sustainability can be accessed here: <https://www4.eere.energy.gov/femp/requirements/>.

The FEMP collects data from Federal agencies on their progress toward reaching the following key goals:

- EO 13693: Reduce agency building energy intensity (in British thermal units (Btu) per square foot) by 2.5% annually through the end of FY 2025, amounting to at least a 25% reduction from a FY 2015 baseline.
- EO 13693: Use clean energy (renewable or alternative) equivalent to at least 25% of total electricity use in FY 2025.

- EO13693: Use renewable electric energy equivalent to at least 30% of total electricity use in FY 2025.
- EO 13639: Reduce water consumption (gallons per square foot) by 36% in FY 2025, through 2% annual reduction from a FY 2007 baseline.
- EO 13639: Reduce vehicle fleet GHG emissions per mile by 30% in 2025 from a FY 2014 baseline.

- Q35. **Building Technologies** - According to the Budget in Brief document, FY 2017 funding for building technologies supports an increased emphasis on emerging technologies R&D “needed to support the reduction of the Nation’s energy use by 50 percent.” Where did that 50 percent reduction goal come from?
- A35. In 2015, the Building Technologies Office (BTO) refined and updated its goals to focus on reducing building energy use per square foot, using a metric known as Energy Use Intensity (EUI), which is calculated by dividing the building sector’s primary annual energy use by the building sector’s total floor area. BTO’s goal is to reduce the U.S. building sector’s energy use per square foot by 30% by 2030, relative to 2010—with a long-term goal of achieving a 50% reduction in energy use per square foot. Achieving this 2030 goal would decrease total energy use by more than 5 quadrillion British thermal units (Btu), total energy-related carbon dioxide emissions by 450 million metric tons, and save building owners and occupants over \$100 billion annually in energy costs (compared to 2010). This aligns with the President’s goal of doubling energy productivity by 2030, as well as the goal of reducing greenhouse gas emissions by 17 percent by 2020 and 26 to 28% by 2025 (relative to 2005).

To ensure that all BTO activities align with this goal and to enable BTO to track progress toward achieving it, BTO has developed an integrated goals framework underpinned by rigorous analysis, explained in detail in BTO’s FY 2016-2020 Multi-Year Program Plan. BTO considered a variety of scenarios from the U.S. Energy Information Administration’s (EIA) 2014 Annual Energy Outlook and the potential impacts of BTO and other efforts directed at accelerating the development and deployment of energy-efficient building technologies. Based on this preliminary assessment, BTO determined that a 30% sector-wide reduction in average EUI by 2030 is an ambitious but achievable



target. This target formed the basis of BTO's time-bound sectoral outcome analysis.

With a 2010 baseline of 147 thousand Btu (kBtu)/feet squared (ft<sup>2</sup>) (the average energy use of all residential and commercial buildings), the 2030 target is 103 kBtu/ft<sup>2</sup>.

Achieving BTO's goal will require accelerated technology development, market stimulation for adoption of technologies and solutions, and more energy-efficient codes and standards—the elements of BTO's ecosystem.

- Q36. **Weatherization and Intergovernmental Programs** - Part of the \$326 million (\$61 million increase from FY 2016, +23 percent) request for Weatherization and Intergovernmental Programs includes support for a Cities, Counties and Communities Energy Program “that will provide technical assistance and competitively-awarded funds to help catalyze more extensive clean energy solutions in community development and revitalization efforts.” Does this Program require Congressional authorization? How much grant money for these “competitively-awarded funds” is DOE expecting to distribute? Is there any sort of matching requirement associated with these funds?

- A36. The FY 2017 President's budget requests \$26 million for a new Cities, Counties and Communities Energy Program within the Department of Energy's Weatherization and Intergovernmental Programs Office. Authorization for this new program is provided under Section 911 of the Energy Policy Act of 2005; therefore, no new Congressional authorization is required.

This new program will provide technical assistance and competitively-awarded funds to local governments, public housing authorities, and other locally-focused eligible entities to catalyze more extensive clean energy solutions in community development and revitalization efforts. DOE will work closely with the Department of Housing and Urban Development (HUD), including the HUD Choice Neighborhoods Program, and other agencies as appropriate as it establishes and executes this new program to ensure energy efficiency and renewable energy technologies can be effectively and efficiently utilized in community development and revitalization efforts.

DOE will work with other federal agencies and stakeholders to: (1) build out a program that it will implement through one or more funding opportunities to achieve these goals; (2) determine the appropriate proportion of funding to provide in competitive awards and

for technical assistance; and (3) evaluate the feasibility of matching/cost share requirements that take the diversity of communities into consideration. Mechanisms that DOE will examine for reaching a diversity of communities and locally-focused entities through this program include specifying eligibility, including program policy factors in the selection of awards, and joint merit reviews with appropriate federal departments and experts. DOE anticipates that the majority of the funding will be used for competitive awards.

Q37. **Crosscutting Innovation Initiatives**-This entire subsection of the budget request is new, is that correct?

There are four programs identified in the Budget in Brief document:

- a. Regional Energy Innovation Partnerships: a competition to establish regionally-focused clean energy innovation partnerships around the country.
- b. Next-Generation Innovation: funding opportunities open to off-road RD&D projects with the greatest potential to change the trajectory of EERE core program technology pathways.
- c. Small Business Partnerships: competitively provided technology RD&D resources to small business through the DOE's National Labs to support their efforts to commercialize new clean energy.
- d. Energy Technology Innovation Accelerators: technical assets and facilities of the National Labs will be leveraged to enable American entrepreneurs to conduct RD&D that enables the creation of new clean energy businesses.
- e. Are there any other programs that are part of the Crosscutting Innovation Initiatives? Do any or all of these programs require Congressional approval to be implemented? How much grant money for these competitively provided funds is DOE expecting to distribute? Is there any sort of matching requirement associated with these funds?

A37. Yes, it is correct this subsection is new. No, there are no other programs that are part of the Crosscutting Innovation Initiatives. As requested, these programs require new funding in the FY 2017 Energy and Water Development Appropriations Act.

- The FY 2017 Budget Request includes \$215 million for these Crosscutting Innovation Initiatives, in order to enable the required acceleration of clean energy innovation and commercialization in the U.S. These programs will strengthen regional clean energy innovation ecosystems, accelerate next-generation clean energy technology pathways, and encourage clean energy innovation and commercialization collaborations between DOE's National Laboratories and American entrepreneurs. This includes four programs:

- \$110 million for Regional Energy Innovation Partnerships, a new competition to establish regionally-focused clean energy innovation partnerships around the country. These regionally focused and directed partnerships will support regionally relevant technology neutral clean energy RD&D needs and opportunities to support accelerated clean energy technology commercialization, economic development, and manufacturing. The program design and portfolio composition for each partnership will be based on regional priorities. As research portfolio managers – not performers – the partnerships will connect resources and capabilities across universities, industry, innovators, investors and other regional leaders to accelerate the innovation process within each region. This approach tracks recommendations from the National Research Council’s *Rising to the Challenge* which noted that “until very recently, U.S. federal agencies have done little to support state and regional innovation cluster initiatives” and recommended that “...regional innovation cluster initiatives by state and local organizations should be assessed...and where appropriate provided with greater funding and expanded geographically.”
- \$60 million for a Next-Generation Innovation funding opportunity, the program will accelerate next-generation clean energy technology pathways. This funding opportunity will be open to off-roadmap RD&D projects with the greatest potential to change the trajectory of EERE core program technology pathways.
- \$20 million for a new Small Business Partnerships program will competitively provide technology RD&D resources to small businesses through the DOE’s National Labs to support their efforts to commercialize promising new clean energy technologies.
- \$25 million for Energy Technology Innovation Accelerators that will leverage the technical assets and facilities of the National Laboratories to enable American entrepreneurs to conduct RD&D that leads to the creation of new clean energy businesses.

Cost share requirements for these programs would be pursuant to the regular legal requirements for Department of Energy financial assistance, including those required by Section 988 of the Energy Policy Act of 2005 (Public Law 109-58).

Section 988 requires a cost share from the grant recipient of not less than 20 percent of the cost of a research or development activity; not less than 50 percent of the cost of a demonstration or commercial application activity; and no cost share for a basic research or development activity.

- Q38. **Long-Range, National Hydropower Vision Study** - The publication of a “long-range, national Hydropower Vision study” is listed as a DOE planned accomplishment for FY 2016. What will this study entail? What are its specific goals?
- A38. The National Hydropower Vision report, to be released in FY 2016, is a multi-year, collaborative analysis that will include: a close examination of the current the state of the hydropower industry; a discussion of the costs and benefits to the nation arising from additional hydropower; and a roadmap addressing the challenges to achieving higher levels of hydropower deployment within a sustainable national energy mix. The DOE-led project involves hundreds of individuals and organizations to ensure a diversity of opinions, and includes representatives from equipment manufacturers; environmental organizations; Federal, state, and local government agencies; utilities; developers; independent power producers; research institutions and laboratories; and industry associations.

Specific goals of the Hydropower Vision report include: leading the development of a cohesive long-term vision for the benefit of the broad U.S. hydropower community; analyzing a range of aggressive but attainable industry growth scenarios; providing best available information relative to stakeholder interests; and providing objective and relevant information for use by decision makers.

- Q39. **Energy Efficiency Standards** - Also listed as a DOE planned accomplishment for FY 2016 is the issuing of “14 final energy efficiency standards as part of the Administration’s goal to reduce carbon pollution by at least 3 billion metric tons cumulatively by 2030.” Specifically which 14 energy efficiency standards are those?

A39. The DOE, through the BTO, sets minimum energy efficiency standards for approximately 60 categories of appliances and equipment used in homes, businesses, and other applications, as required by existing law. The Department maintains a summary table of current rulemakings and notices, which provides an update on the most recent activity. As with all appliance and equipment efficiency standards, manufacturers, product importers and distributors, energy suppliers, efficiency and environmental advocates, and other members of the public are encouraged to participate in rulemakings. In support of the Climate Action Plan goal of reducing carbon pollution by at least 3 billion metric tons cumulatively by 2030 through efficiency standards, the DOE has issued, as of the date of this hearing, 1 final rule of the 14 planned for calendar year 2016. These final rules include:

The Department also has issued the following proposals in fiscal year 2016 and is working on others. These products include:

- Ceiling Fans – proposal issued 12/23/2015
- General Service Lamps – proposal issued 2/12/2016
- Commercial Package Boilers – proposal issued 3/11/2016

Q40. **Energy-Water Desalination Hub** - The FY 2017 budget request seeks to establish a new Energy Water Desalination Hub to serve as a focal point for RD&D on desalination to provide clean and safe water. Does the establishment of this Hub require Congressional authority? Where is DOE planning to locate this new Water Desalination Hub?

A40. Several statutes grant the Department the authority to advance energy efficiency efforts across the Office of EERE, including the Energy Policy Act of 2005. Current authority allows the Department to address clean energy manufacturing and industrial energy

efficiency challenges through pre-commercial technology development through facilities and manufacturing consortia, such as the proposed desalination Hub.

The Department will solicit applications for the Energy-Water Desalination Hub through an open and competitive funding opportunity announcement to determine the selectee.

As such, the physical location of the Hub is not yet known.

- Q41. **Nuclear University Fellowships Programs** - I have spoken often about both the energy security and national security implications of U.S. leadership in nuclear technologies. In order to maintain this leadership, the federal government has responsibility to ensure a strong nuclear workforce pipeline. The Energy Policy Act of 2005 states that the Secretary of Energy “shall conduct a graduate and undergraduate fellowship program to attract new and talented students.” However, for the last several years, the DOE budget request includes removing the Integrated University Program (IUP) funding, which provides these fellowships. Each year Congress has worked to reinstitute these important funds. It is important that the Department have fellowship programs that are strategically aligned with the Department’s mission and goals.

If you are not planning to provide the IUP, what is your plan?

- A41. Consistent with the Administration’s science, technology, engineering, and mathematics (STEM) reorganization efforts, no funding is being requested in FY 2017 for the IUP. To help ensure the existence of an adequate and stable nuclear energy workforce, several programs have been established by government, industry, and unions to foster improved STEM skills among students, as well as to ensure the availability of associated technical trade crafts.

The Department focuses its nuclear energy workforce development activities on the next generation of researchers. Through the Nuclear Energy University Program, the Department has competitively awarded 421 university-led research projects supporting the NE mission totaling \$403 million, while each year directly and indirectly supporting hundreds of early-career faculty, post-doctoral, graduate and undergraduate students representing the future nuclear energy research workforce.

Further, the Department works with other agencies, industry and unions to help address the full range of future nuclear workforce development needs. Examples include:

Nuclear Energy Institute Nuclear Uniform Curriculum Program addresses nuclear tradecraft workforce needs by working with the nuclear industry, community colleges and trade schools to establish regional training programs with an emphasis on addressing industry workforce needs.

- Center for Energy Workforce Development has a section titled “Troops to Energy Jobs” specifically to assist veterans seeking jobs.
- Nuclear Power Institute Workforce Industry Training Program is open to both male and female high school students in Texas and employs mentors, educational tools and essential support to pursue educational professional opportunities in STEM technical fields.
- Nuclear Workforce Initiative covers Georgia and South Carolina, with a mission to promote and expand nuclear workforce development capabilities by facilitating integrated partnerships between nuclear employers and educational and training entities that foster regional educational attainment, economic growth and job opportunities.
- Unions associated with the nuclear industry also drive training programs for the nuclear workforce, with a focus on nuclear power plant workers. They offer apprenticeship and training programs to ensure qualified individuals are on the job.
- Nuclear Human Resources Group provides a forum for nuclear industry human resources practitioners to exchange information on Human Resource management issues that uniquely affect nuclear power operations.
- International Atomic Energy Agency has a Technical Working Group on managing human resources in the field of nuclear energy.

The combined efforts of government, academia, and industry are expected to continue to provide sufficient scientists, engineers, and technicians to the nuclear energy workforce.

- Q42. **Grid Related Emergencies/FAST Act** - As part of the recently enacted Fixing America’s Surface Transportation (FAST) Act (P.L. 114-357), Congress provided the Department with the authority to address grid-related emergencies caused by cyber hacks or physical incidents. How does the Department plan to implement this new authority?

Also as part of the FAST Act, Congress directed FERC to establish criteria and procedures to designate information as CEII and prohibit the unauthorized disclosure of such information. Are you satisfied with the steps taken by the Commission to improve their handling of confidential information?

- A42. The Department is working to establish the Grid Security Emergency rule-making that will outline how the Department plans to implement this new authority by the requested June 1, 2016 date.

FERC has one year to implement the criteria for Critical Electric Infrastructure Information and the Department's team will continue to consult with FERC to encourage appropriate criteria and procedures that adequately address the handling of confidential information for the electricity subsector.

- Q43. **QER Meeting Findings** - The Department recently held its initial meeting on the second installment of the Quadrennial Energy Review. What were some of the Department's conclusions from this meeting and what initiatives should Congress reasonably expect to see coming out of this effort? What is the timetable for further work in this regard?

- A43. The first public stakeholder meeting for the second installment of the Quadrennial Energy Review (QER 1.2) occurred on February 4, 2016 in Washington, DC. This meeting was the first in a series of public meetings that the QER Task Force will hold through the spring of 2016 to conduct a thorough review of the electricity system, from generation, through transmission and distribution, to consumer end use, out to 2040 and beyond. The remaining meetings, to be held in Boston, Salt Lake City, Des Moines, Austin, Los Angeles, and Atlanta, seek to engage the broadest possible representation of stakeholders—to include the general public—to enhance the Task Force's current understanding of the issues and considerations facing the nation's electricity system. As part of this solicitation, inputs, advice, data, and relevant reports are collected during the stakeholder meetings. This information will be incorporated into the vast analytical work that is currently underway to arrive at eventual insights, trend analysis, data, policy options, and recommendations.

Experts who spoke on the two panels during the February meeting provided important insights and framed key issues. Initiatives and conclusions will be developed



subsequently in the context of the larger analysis efforts currently underway and towards the end of the process when policy recommendations are being formulated and the QER document is being written. It is imperative that conclusions or initiatives not be articulated prematurely as a result of these initial discussions. In the course of developing policy recommendations, the interagency QER Task Force, with the Department's Office of Energy Policy and Systems Analysis (EPSA) serving as Secretariat, will use the remaining six meetings to gather additional input. This includes panelists' statements and supporting materials; public comments offered at the meetings; comments and materials (independently produced reports and data sets, etc.) transmitted electronically by interested stakeholders at the Comments portal on the Department's website; the final reports of nearly a hundred EPSA analytical projects currently underway that are relevant to the scope of the second installment of the QER; and the insights, findings, and recommendations that might emerge from a roughly contemporaneous series of QER technical workshops.

Work on this effort has been underway for many months and will continue throughout the summer. EPSA has set a July 1st deadline for public comments, many of which are expected to be in the form of multi-volume scientific studies, which will be reviewed, analyzed, and synthesized in a process that will be careful, data-driven, and thorough. A simultaneous process will occur for EPSA's analytical products before the Department and other Federal agencies arrive at conclusions and final recommendations. It is the Task Force's intention to publish the second installment of the QER by January 2017.

- Q44. **Grid Reliability Interagency Cooperation** - The reliability of the nation's electric grids is critical. How is the Department working with FERC, NERC, and the ESSC to safeguard and maintain the grid's reliability? What are the principal accomplishments of this work thus far? What is the work plan and timeline for further work?
- A44. Electricity Subsector Coordinating Council (ESCC) meetings are held three times a year with 30 utility CEOs and senior government leadership, including the Deputy Secretary of Energy, FERC Chairman, and NERC President. Meeting action items and taskings are addressed between meetings by four working groups: Industry-Government

Coordination, Leveraging Infrastructure/Research and Development, Threat Information Sharing and Processes, and Cross-Sector Coordination.

Current action items and coordination activities include:

- Working with the NERC, the Electricity Information Sharing and Analysis Center (E-ISAC), and the ESCC to identify next steps and possible enhancements for the Cybersecurity Risk Information Sharing Program (CRISP).
- Holding classified briefings in conjunction with each meeting to share energy sector-relevant physical and cybersecurity threats with industry and government partners.
- Establishing a mechanism to bring together experts from the electricity subsector, information technology sector, DOE national laboratory enterprise, and the investment community to catalyze transformational innovation to substantially enhance electricity subsector resilience to physical and cyber threats.
- Conducting and participating in exercises such as Grid Ex III and Clear Path IV. As documented in NERC's after action report<sup>1</sup>, these activities improve coordination of effort across public and private resources to expedite restoration in the energy sector.
- Convening an Energy Sector Critical Manufacturing Working Group to identify and share best practices for addressing threats to the supply chain and include stakeholders from public and private sectors.
- Convening an Enhanced Background Investigation Screening (EBIS) Working Group with the ESCC and NERC to address insider threats by determining methods for improving background investigations into personnel holding sensitive positions.
- Addressing electromagnetic pulse (EMP) threats through a joint government and industry approach. In the short term, the partnership will convene government and industry stakeholders to identify available options for mitigating the consequences of

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<sup>1</sup><http://www.nerc.com/news/Pages/GridEx-III-Showcases-Steady-Improvements-on-Participation,-Coordination.aspx>

an EMP event. In the long term, the goal will be to identify additional measures that can be developed, tested, and deployed to address EMP threats.

- Engaging industry and interagency partners to identify potential enhancements to the Cybersecurity Capability Maturity Model (C2M2) and to collaboratively enhance sector cyber incident coordination procedures.

Q45. **North American Energy Cooperation** - You recently participated in the North American energy ministerial meeting in Winnipeg with Minister Carr from Canada and Secretary Coldwell from Mexico. I understand that this trilateral cooperation may result in a framework for North American information sharing. Is that accurate? If so, please elaborate. If not, what is accurate to report on this subject? What other initiatives are you working on with our Canadian and Mexican neighbors to ensure North America's energy security?

A45. Trilateral cooperation on energy information sharing is underway between the United States, Canada, and Mexico. The Energy Ministers from Canada, Mexico, and the United States signed a Memorandum of Understanding (MOU) in December 2014, creating a framework for trilateral consultation and sharing of publicly available energy information for the North American region.

At the North American Energy Ministers' Meeting in Winnipeg in February 2016, I, along with Secretary Joaquin Coldwell (Mexico) and Minister Carr (Canada), signed an updated MOU concerning climate change and energy collaboration and officially launched the North American Cooperation on Energy Information (NACEI) website ([www.nacei.org](http://www.nacei.org)). North American energy information available through this URL and on all three countries' websites includes: an initial suite of static and interactive North American energy infrastructure maps; an exchange of views and projections on cross-border energy flows; data tables and methodological guides to inform the comparison of energy trade data among the three countries; and a cross reference of terms and definitions in each country's official language(s).

This energy information platform is the result of the collaboration of at least 13 participating agencies among the three countries, including, for the United States: the U.S. DOE (EIA and the Office of Fossil Energy) and the U.S. Census Bureau; for

Canada: the Department of Natural Resources (NRCan), the National Energy Board, and Statistics Canada; and for Mexico: the Secretariat of Energy (Secretaría de Energía (SENER)), the National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía (INEGI)), the Energy Regulatory Commission (Comisión Reguladora de Energía), the National Hydrocarbons Commission (Comisión Nacional de Hidrocarburos), PEMEX (Petróleos Mexicanos), the Federal Electricity Commission (Comisión Federal de Electricidad), the National Natural Gas Control Center (Centro Nacional de Control de Gas Natural), and the National Energy Control Center (Centro Nacional de Control de Energía).

The achievements to date and the ongoing work on trilateral data sharing, including further development of a detailed process for comparison of definitional differences and a process for reconciling trade data, are creating a single continental body of knowledge and energy data that addresses previous gaps in information. This will serve to promote North America's integrated energy security and reliability, while also benefiting the individual partner countries, national industries, and the analytical community.

Beyond the sharing of energy information and data, DOE, NRCan, and SENER are advancing North American energy security through bilateral, trilateral, and multilateral initiatives (such as Mission Innovation and the Clean Energy Ministerial). We are working cooperatively through the existing framework provided by the North American Energy Ministers Meeting, and sharing technical information, research plans, and best practices in areas such as unconventional oil and gas development; reliable, resilient, and low-carbon electricity grids; carbon capture, use, and storage (CCUS); industrial energy efficiency; and meeting national, regional, and global climate goals. DOE expects Canada and Mexico to provide input for the second QER, which will focus on electricity. Bilaterally, DOE and NRCan work together under a MOU and engage in regional and multilateral fora to advance shared priorities, including global energy security. Bilaterally, DOE works with SENER under the U.S.-Mexico High-Level Economic Dialogue, and co-chairs with Mexico's Secretariat of the Environment a Task Force on Clean Energy and Climate Policy, which also involves SENER.

- Q46. **Disposal of Weapons Material** - I understand that DOE is considering shutting down the Mixed Oxide Fuel Fabrication Facility (MOX/MFFF) project in order to move forward with the Dilute and Dispose method to dispose of excess weapons plutonium by down-blending it and storing it in WIPP. Is this understanding accurate?
- A46. Yes, the President's FY 2017 budget request states that DOE will begin termination of the MOX project and will pursue the dilute and dispose approach as the path forward.
- Q46a. If so: Does WIPP have enough capacity to meet the new mission? When will WIPP be re-opened?
- A46a. Yes. Waste Isolation Pilot Plant (WIPP) is currently scheduled to resume waste emplacement operations in December 2016. The April 2015 Final Surplus Plutonium Disposition Supplemental Environmental Impact Statement analyzed the potential environmental impacts of alternatives for disposition of 13.1 metric tons of surplus weapons-usable plutonium for which a disposition path is not assigned under DOE/NNSA's prior decisions. In DOE/NNSA's Record of Decision (ROD) that appeared in the *Federal Register* on April 5, 2016, DOE/NNSA decided to prepare and package for disposal at WIPP a portion of this material - 6 metric tons of surplus weapons usable non-pit plutonium, meeting the waste acceptance criteria for contact-handled transuranic waste. Shipments of this 6 metric tons to WIPP, will be placed in the queue of waste to be shipped to WIPP. No decision has been made, and detailed analyses of the potential environmental impacts have not been performed for the potential disposal at WIPP of the 34 metric tons of surplus plutonium which DOE previously decided to fabricate into mixed plutonium-uranium oxide (MOX) fuel.
- Q46b. Is Congressional authorization needed for the Department to take such action? For example, are amendments to the Land Withdrawal Act necessary?
- A46b. The 6 metric tons of surplus non-pit surplus plutonium addressed in DOE/NNSA's April 2016 *Federal Register* ROD can be emplaced in WIPP without amending the WIPP Land Withdrawal Act.
- Q46c. Does shutting down the MOX/MFFF project have repercussions for the Plutonium Management and Disposition Agreement with Russia? If so, will the Department need to renegotiate that agreement? Will Congressional action be required for a renegotiation of the PDMA with Russia?

A46c. The Plutonium Management and Disposition Agreement (PMDA) provides for the disposition by irradiation or any other method — such as the dilute and dispose approach — as may be agreed to by the parties. In fact, in 2010 mechanisms established in the PMDA were used to accommodate Russia's change in strategy for disposing of its surplus plutonium. The Administration does not anticipate any need for Congressional action to begin consultations on the agreement with Russia on using the dilution and disposal method for plutonium disposition.

**Q47. U.S.-ISRAEL OIL SUPPLY AGREEMENT**

Q47a. Did the State Department and Energy Department work together to renew the U.S.-Israel oil supply agreement in 2015?

A47a. Yes.

Q47b. Has the agreement been formally renewed? If so, on what date? If not, why not?

A47b. Yes, the agreement was formally renewed on April 13, 2015.

Q47c. Please provide the text of the agreement. Was it signed? If so, by whom? If not, why not?

A47c. The text of the agreement, along with various diplomatic notes extending the agreement, are attached to these QFRs as attachment 1. The original agreement was signed by Herbert J. Housell, U.S. State Department official.

Q47d. Please describe any work, including travel that was required or otherwise occurred as part of the renewal process.

A47d. Renewal of the agreement included regular phone calls, meetings, and coordination between the State Department, DOE, and Embassy of Israel. No travel was conducted to renew the agreement.

Q47e. Do any outstanding issues remain with respect to this agreement?

A47e. The U.S. and Israel are discussing changes to the technical language of the agreement to reflect changed market conditions. Although the agreement has been renewed and will

not expire until November 25, 2024, the 1995 Implementing Arrangements need to be modified to reflect current conditions.

- Q48. **Umiat Field Oil Production** - In 2013, NETL completed a project related to producing oil from the Umiat field in NPR-Alaska. Is any future work expected in this area?
- A48. DOE is not currently conducting work in this area. In 2013, the study *Producing Light Oil from a Frozen Reservoir: Reservoir and Fluid Characterization of Umiat Field, National Petroleum Reserve, Alaska* identified resource, reserve and potential recovery rates for three reservoirs in the Umiat field. The study further identified development challenges including low reservoir energy, overlying permafrost and a reduction in the relative permeability and Umiat's distance from any transportation infrastructure (92 miles from the Trans Alaska Pipeline System).
- Q49. **Gas-to-Liquids R&D** - Is DOE conducting any R&D on gas-to-liquids technology (GTL), whether through ARPA-E, the National Laboratories, or elsewhere? What is your general view on the role GTL plants, such as those in Malaysia and Qatar, can play in global energy markets? Is GTL technology consistent with a broader shift towards natural gas?
- A49. The Department is not currently conducting R&D at NETL in the GTL area. There is limited activity at NETL in the coal and biomass to liquids area, based on technologies that produce synthetic gas, which can subsequently be converted to liquids.

However, Advanced Research Projects Agency-Energy (ARPA-E) has invested over \$39 million focused mostly on the biological conversion of natural gas. Announced in 2013, ARPA-E's REMOTE program, short for "Reducing Emissions using Metabotropic Organisms for Transportation Energy," seeks to enable highly efficient biological conversion of methane to liquid fuels for small-scale deployment. Specifically, 15 REMOTE projects focus on improving the energy efficiency and carbon yield of biological routes from methane to a useable form for fuel synthesis while also examining high-productivity methane conversion processes and bioreactor technologies. In addition, through ARPA-E's OPEN 2015 FOA, Oregon State University (OSU) will develop a small-scale bioreactor that can enable high-rate, low cost bioconversion of

methane to liquid fuel. Using an ultra-thin, stacked “Bio-Lamina-Plate” system OSU will attempt to improve the overall rate at which methane is transferred to the biocatalysts.

The GTL project in Qatar (Shell and Qatar Petroleum’s PEARL project) takes advantage of very low natural gas feedstock values, which enhance the project’s economics. The PEARL project, which produces 140,000 barrels per day of GTL products, suffered substantial cost overruns during construction. It should be noted that several other large-scale GTL projects that were envisioned in Qatar did not materialize, perhaps because of the PEARL cost overruns or changed expectations about the relative future prices of natural gas and liquids. Shell’s Bintulu project in Malaysia which started in 1993, produces a multitude of products including about 14,000 barrels per day of liquids, making it attractive in that region.

Between 1999 and 2004 DOE/NETL had an active GTL program including a project in Alaska to utilize spare capacity in the Trans Alaskan pipeline (TAPS) to transport converted gas from the North Slope. The theory at the time was to convert the associated gas on the North Slope, which has very low value, into liquids and transport those south along with North Slope crude oil.

A very low price for natural gas is necessary for GTL plants to be profitable in the lower-48 states, especially in light of current oil prices. With the abundant availability of shale gas and relatively low gas prices in the U.S., as well as advances in gas-to-liquids R&D by private companies, there may be some potential for deployment of GTL technologies, at least on a small scale (5,000-10,000 barrels per day range on a local basis) if one can assume liquids prices will rise in the future.

- Q50. **Alaska North Slope Crude** - On a chemical basis, is Alaska North Slope (ANS) crude well-suited for long-term storage? How many barrels of ANS have been stored in the Strategic Petroleum Reserve?
- A50. ANS oil has been part of the Strategic Petroleum Reserve (SPR) oil stock since 1980. There have been no observed long term storage issues with the ANS crude in the underground SPR salt storage caverns. The ANS oil, initially segregated and formerly stored in the Weeks Island Salt Mine as a medium gravity sour crude, was subsequently



relocated and commingled with other medium gravity sour crude oils at other SPR locations in the late 1990's. Inventory records indicate that the SPR received a total of 31,422,103 barrels of ANS crude for SPR use in the early 1980's.

Q51. **LNG Exports** - Do you believe there is a market in the Western Hemisphere for LNG exports from the United States?

A51. Yes.

Q51a. Has DOE authorized any natural gas exports for projects that would likely target customers in the Western Hemisphere?

A51a. Yes. There are several Liquefied Natural Gas (LNG) projects that have indicated they are targeting Western Hemisphere customers. In July 2015, Cheniere Energy Inc., announced that a Cheniere affiliate had entered into a long-term contract with a Chilean electricity utility that would purchase 0.6 million metric tons per year of LNG from the Corpus Christi LNG facility (equivalent to 0.08 billion cubic feet per day of natural gas) to be used in a proposed power plant in Chile. Additionally, several companies with headquarters or operations in the Western Europe portion of the Western Hemisphere hold long-term contracts for LNG supply from currently authorized U.S. export projects.

In February 2016, the first LNG tanker export of domestically produced lower-48-states LNG lifted from Cheniere's Sabine Pass LNG Terminal, was shipped to Brazil. Additionally, companies that hold long-term contracts for LNG supply from currently authorized U.S. LNG export projects are LNG marketing companies that could seek to export LNG to Western Hemisphere end-users.

Finally, DOE expects that all or nearly all micro-scale LNG exports via LNG containers are targeting end-users in the Western Hemisphere. To date, one micro-scale exporter approved for LNG exports has begun limited but ongoing exports of LNG to destinations in the Caribbean islands and expects to grow that business under their current LNG export authorization that allows exports up to the equivalent of 0.008 billion cubic feet per day of natural gas.

## QUESTIONS FROM RANKING MEMBER MARIA CANTWELL

- Q1. The Department of Energy's Clean Cities program has been extremely effective in deploying alternative fuel and electric vehicle charging infrastructure. In my state of Washington, the program helps save more than 18 million gallons of gasoline and helps avoid 96,000 tons of greenhouse gas emissions annually.

In the Omnibus last year, Congress increased funding for Clean Cities in fiscal year 2016 because it has been so effective in helping reduce our dependence on foreign oil and cutting greenhouse gases and other harmful air emissions.

For the fiscal year 2017 budget request, funding was cut by 32% below last year's enacted level.

How does the Department of Energy intend to use the additional funding for fiscal year 2016 to accelerate the deployment of electric vehicle and alternative fuel infrastructure?

Can you explain why funding was cut for fiscal year 2017?

- A1. In Fiscal Year (FY) 2016, the Department will initiate Alternative Fuel Vehicle Community Partner projects to accelerate widespread use of commercially available advanced and alternative fuel vehicle technologies to reduce U.S. dependence on petroleum, increase local fuel diversification, and enable sustainable transportation. The Vehicle Technologies Program will release an open and competitive funding opportunity for highly-leveraged, cost-shared, community-based projects involving local and/or regional partnerships of key stakeholders. The funding opportunity announcement will be "fuel neutral," with selected projects supporting one or more alternative fuels, such as electricity, natural gas, biofuels, and hydrogen, among others.

The Alternative Fuel Vehicle Community Partner projects are expected to provide new lessons learned regarding how local communities can leverage partnerships to significantly accelerate the introduction and adoption of alternative fuel and advanced vehicle technologies, as well as the necessary fueling infrastructure. The Department's FY 2017 Budget Request reflects plans to evaluate the success of the initial round of projects and collect lessons learned and community input before initiating another round of Community Partner projects. As such, the FY 2017 Budget Request does not request funding specifically for this program in FY 2017.

The Department's FY 2017 Budget Request does include support for Vehicle Technologies Deployment, which leverages the nationwide Clean Cities coalition network. Vehicle Technologies Deployment funding in FY 2016 will complement the Advanced Fuel Vehicle Community Partner program with tools and resources, technical assistance, and other competitively-awarded projects to overcome market barriers, facilitate infrastructure development, and accelerate market transformation.

- Q2. The Quadrennial Energy Review (QER) highlighted the ongoing need for bulk power system upgrades, including transmission build-out and upgrades. I understand that the next segment of the QER will focus further on grid modernization. Given the range of transmission-related authorizations included in the 2005 and 2007 energy bills, please provide a brief update on the steps the Department has taken in the past year to support strengthening the transmission system, in particular for high-voltage transmission (345kV and higher).
- A2. The Department has undertaken several recent activities that are relevant to this question: One of the QER recommendations called for a national review of transmission plans and an assessment of barriers to their implementation. The primary mechanism for planning to meet future transmission needs was established by the Federal Energy Regulatory Commission (FERC) through its Orders No. 890 and 1000. As input to QER 1.2, we are examining the planning processes developed to comply with these orders, the plans that have emerged to date, and the kinds of projects included in those plans. We are also examining a number of recently proposed transmission projects and possible barriers to their implementation.

The Midwestern Interconnection Seam Study, a Regional Partnership project in the Grid Modernization Laboratory Consortium portfolio, is a two-year collaborative effort among four national laboratories, industry, and academic experts to evaluate HVDC and AC transmission seams between the U.S. interconnections and propose upgrades that will reduce the cost of modernizing and operating the Nation's bulk power system. On February 2, 2016, DOE issued a Notice of Proposed Rulemaking to amend its regulations for the timely coordination of Federal authorizations for proposed interstate electric transmission facilities pursuant to section 216(h) of the Federal Power Act by

establishing an Integrated Interagency Pre-Application (IIP) process. The IIP is intended to provide a roadmap and encourage early coordination between electric grid transmission project proponents and permitting agencies on transmission projects. The IIP process, as proposed, is designed to improve interagency and intergovernmental coordination, to encourage early engagement with stakeholders, and to help ensure project proponents develop and submit accurate and complete information early in the project planning process.

The Transmission Infrastructure Program (TIP) manages the Western Area Power Administration's American Recovery and Reinvestment Act authority, which operates to provide development assistance and debt financing to eligible transmission and related projects which facilitate the delivery of clean energy. TIP recently supported the development of renewable source transmission projects and provided debt financing to its second project, the Electrical District 5 to Palo Verde Hub 230kV project, which is now operational and directly helps 18 communities and tribes in the State of Arizona. During FY 2016, TIP is working with advanced funding agreements to support development on multiple 230–500kV high voltage transmission projects currently in development in California, Wyoming, Utah, Nevada, New Mexico, and Arizona. Two of these projects, the TransWest Express and Southline, saw completion of final Environmental Impact Statements as part of the Federal National Environmental Policy Act (NEPA) component for the proposed transmission lines. TIP anticipates its active schedule to continue through FY 2017 and into the future.

On March 25, 2016, Secretary Moniz announced that the Department will participate in the development of the Plains and Eastern Clean Line project, through the authority granted by Congress under Section 1222 of the Energy Policy Act of 2005. The announcement follows the completion of two major elements: the National Environmental Policy Act (NEPA) review and the non-NEPA related review. The Record of Decision can be found at <http://energy.gov/sites/prod/files/2016/03/f30/Clean%20Line%20ROD%20FINAL%203-25-16.pdf>.

- Q3. Modernizing the Columbia River Treaty is of critical importance to Washington State, the Pacific Northwest, and the Country. Tribes, power companies, environmental interests, transportation and agriculture interests, the fishing industry, counties, and towns are all intently focused on how and when the treaty will be modernized, which is administered by the Bonneville Power Administration and the US Army Corps of Engineers.

I urged the Obama Administration to determine its negotiating position, and begin negotiating with Canada by the end of 2015. This did not happen, but I understand that there were Canadian elections in October of 2015, and it always takes time for a new administration to settle in. I was pleased to hear from the State Department that they have identified three areas for the draft US negotiating position, but I still have not received any indication as to when negotiations will commence, beyond the vague and not terribly helpful word “soon.”

How can the Department of Energy work more effectively to expedite the negotiations with Canada?

How can we ensure that the critical voice of the stakeholders in my state and region can remain in regular contact with the Administration during the negotiations?

- A3. The Department of Energy (DOE) agrees with the urgency of beginning formal negotiations. Secretary Moniz recently met with Department of State Secretary John Kerry and they both agreed on the importance of beginning negotiations quickly. The Department’s negotiator, Bonneville Power Administration (Bonneville), has been working diligently with the Department of State’s lead negotiator to help State conclude the approval process necessary to begin formal negotiations as soon as possible. DOE and Bonneville understand that State’s goal is to begin formal negotiations by mid-year.

The Department of State’s lead negotiator is committed to the Administration’s ongoing engagement with regional stakeholders, including with regional tribal governments. Engagement with regional stakeholders began soon after the negotiator was hired in August 2015 and has continued since then, including a government-to-government meeting in which Bonneville and DOE representatives participated with the fifteen-tribe Columbia Basin Tribes Coalition in February 2016. The Department of State’s lead negotiator plans to have a regular schedule of engagements with stakeholders and tribes through the preliminary and formal negotiation period. The Department will keep you informed on this important issue.

- Q4. Keeping America's energy networks secure from cyber intrusions is critical as new technologies and threats continue to emerge from transnational organized crime groups to hostile foreign governments. The smarter the power grid gets, the argument goes, the more connected it becomes, the more vulnerable it becomes.

I am sure you are familiar with the scale we are talking about. The Department of Homeland Security reported that 56 percent of cyber incidents against critical infrastructure in 2013 were directed at energy infrastructure, mostly on the electric grid. I've worked extensively to address this issue, and included several cyber provisions in the Energy Policy Act of 2016.

The bill provides the Secretary of Energy with the emergency authority to protect the bulk-power system from cybersecurity threats and designates the Department of Energy as the lead sector-specific agency for cybersecurity in the energy sector. The bill also directs the Secretary to carry out a research, development and demonstration program to develop advanced cybersecurity applications and technologies and to assess risk to the energy sector. Finally, and critically, the bill proposes to double the department's FY 15 investments in cyber-related R&D, supply chain security and public-private partnerships for information-sharing.

Our goal throughout has been to build a resilient and hardened infrastructure that can sustain attacks from people that are clearly trying to attack the electric grid.

The Department of Energy has been a leader in this work, but at first glance, I am concerned about the funding request for cyber programs. I note that cyber across the entire department is increased by about \$10 million dollars, to a total of approximately \$333 million. However, cutting edge research, development, and deployment is taking place in the Office of Electricity Delivery and Energy Reliability's Cyber office. The current enacted funding level is \$62 million, but the budget request for FY 17 decreases by \$16.5 million to only \$45.5 million.

This is a 27% decrease, and I am curious to know why at this critical moment in our country's mobilization on Cyber preparedness the Department has cut a critical office's ability to contribute?

- A4. Securing the Nation's power grid remains an urgent concern and a priority for the Department. The \$16.5 million decrease to Cybersecurity for Energy Delivery Systems (CEDS) results from the completion or transfer of several activities, without which the FY 2017 budget request would have been flat with the FY 2016 enacted level:
- A \$5 million reduction reflects the Wireless Testbed project at Idaho National Laboratory, for which development funding is completed in FY 2016.
  - The Virtual Energy Sector Advanced Digital Forensics Analysis Platform is a two-year project with a planned funding reduction from \$10 million in FY 2016 to \$5

million in FY 2017, when the platform will have completed implementation and will begin transitioning to the private sector.

- Incident coordination is moved to Infrastructure Security and Energy Restoration (ISER) in FY 2017, a \$1.5 million decrease. ISER will provide a comprehensive all-hazards response to incidents.
- A \$5 million reduction reflects the Advanced Control Concepts project, which is fully funded in FY 2016.

Q5. Secretary Moniz I am concerned with the decreases being proposed to the Defense Nuclear Nonproliferation account. While I understand and appreciate the need for adjustments due to carryover funds, my concern is why the R&D account decreased. In light of our current agreement with Iran and the ongoing situation in North Korea, can you explain the decrease in nuclear nonproliferation spending request given the need?

A5. The decrease in the FY 2017 budget request for Defense Nuclear Nonproliferation programs compared to FY 2016 enacted budget, is due to the following reasons:

- The availability of prior year carryover balances to execute our nonproliferation activities; and
- Termination of the Mixed-Oxide (MOX) Fuel Fabrication project and the Department's identification of a dilute and dispose approach as a faster, less expensive path to meeting U.S. commitment to dispose of excess weapons grade plutonium.

The FY 2017 reduction in planned activities for arms control-related research and development (R&D) relates to an internal DOE field demonstration of developed technologies applicable to warhead monitoring planned for 2017. After further study, we determined that the final integrated experiment was not necessary. However, there is \$80 million in the FY 2017 R&D budget to continue work on ground-based nuclear event monitoring that includes detection of low-yield and evasive nuclear tests, seismic and radionuclide detection, and exploitation of dynamic sensor network data.

Q6. A provision I'm very excited about in the Energy Bill is section 1014, the Smart Building Accelerator. This is something my home state is taking very seriously and Washington companies and organizations are paving the way to using innovative technologies to make buildings smarter and more energy efficient.

Some of the best examples are the Bullitt Center, the Brooks Corporate Headquarters on North Lake Union, and the Swedish Hospital in Issaquah, perhaps the most energy-efficient, modern hospital in the world. Another example, a deep retrofit of the iconic, 1930s Pacific Tower, demonstrates how these technologies can reduce energy use by two-thirds and increase power reliability. Retrofits and incorporating smart technologies into new construction has the potential to completely change energy requirements of buildings. It's estimated that if all high energy-use commercial buildings were improved to become low energy users, there would be a 42 percent reduction in energy use in this building sector, reducing costs and carbon and keeping the costs of doing business low. But we still have major obstacles to widespread adoption of smart building technologies due to cost and integration issues.

Secretary Moniz, I'm pleased to see a 44 percent increase in the Building Technologies Office. Does this budget proposal allow for evaluation of what's working in current smart buildings, both public and privately owned facilities?

- A6. Yes, the FY 2017 Budget does support the evaluation of best practices in the realm of smart buildings, both public and private. The emergence of smart buildings, led in part by the Northwest's leadership and investments, will help the Nation's businesses reduce their operating cost, increase productivity, and lower carbon emissions. The Department's Building Technologies Office (BTO) has been convening industry to discuss and resolve outstanding issues that impede widespread national adoption of smart building concepts, including:
- Interoperability – working with Pacific Northwest National Laboratory (PNNL), DOE has convened the smart building industry to increase device interoperability while decreasing cost to the consumer and manufacturers;
  - Cyber security – working with PNNL's cyber security expertise, DOE has adapted the Department of Homeland Security-sponsored Electricity Subsector - Cybersecurity Capability Maturity Model to help both private companies and federal agencies survey and protect connected, smart buildings; and
  - Evaluation – working through all national labs, competitive solicitations, and other mechanisms, DOE has undertaken research to assess the regional costs and benefits of energy management, information systems, and other components to help building owners make the business case for deploying smart buildings.

BTO is planning to launch an effort to encourage industry adoption of smart building technology this year. This effort will be in the mold of our previous highly successful



Lighting Energy Efficiency in Parking (LEEP) campaign and Advanced Roof-top Air Conditioner (RTU) campaign.

- Q7a. Over the past few years, I have been concerned about declining investments in our federal scientific facilities, since these investments play a major part in sustaining U.S. scientific leadership. I was encouraged to see the FY17 President's Request for the Office of Science includes a significant increase in funding for Science Laboratories Infrastructure—from \$113 to \$130 million—mainly to fund a few major facility construction projects at national laboratories around the country.

The proposed funding increase for science laboratory infrastructure is a major step in the right direction, but what is your vision for the future of science infrastructure?

- A7a. The Office of Science (SC) is the steward of 10 of the 17 DOE laboratories that together comprise the Department's Federal research system. This system develops unique and often multidisciplinary scientific capabilities beyond the scope of academic and industrial institutions that benefit our Nation's researchers and advance our national strategic priorities. The Science Laboratories Infrastructure (SLI) program mission is to provide and sustain mission-ready infrastructure that is necessary to support world leadership in science using world-class facilities, now and in the future.

The Department has invested over \$700 million to modernize the SC laboratory infrastructure complex since 2006, successfully completing seven new infrastructure projects and renovating seven inadequate laboratory facilities. The SLI program's vision is to capitalize on these investments and continue focusing on improving science infrastructure through the construction of new modern laboratory space, renovation of existing facilities, repair and upgrades to utilities, and the demolition of dilapidated and unsafe infrastructure.

- Q7b. How would you envision using science laboratory infrastructure or other vehicles to spur more investment to ensure our continued global leadership in science & technology?
- A7b. Providing and sustaining adequate, mission-ready infrastructure is essential to continued global leadership in science and technology. The SLI program has supported the construction or modernization of over 1.2 million square feet of space. As a result, an estimated 2,200 laboratory users and researchers now occupy newly constructed or

modernized buildings that better support scientific and technological innovation in a collaborative environment.

For example, the Interdisciplinary Science Building at Brookhaven National Laboratory, funded by the SLI program, combines basic and applied research programs and provides new cutting-edge laboratory space. The SLI program also funded the Energy Sciences Building which replaced some of the oldest and least effective research space at Argonne National Laboratory with new, environmentally stable, and specialized multi-disciplinary laboratory space. This new, state-of-the-art space integrates science research, enables multi-functionality and enhances capabilities of energy science research.

Continued improvements like these will spur more infrastructure investments to ensure our continued global leadership in science and technology. Modern, state-of-the-art, infrastructure will ensure that scientists and researchers are using the most cutting-edge technologies in the best facilities.

- Q8. Is DOE committed to continuing the U.S.-Israel Energy Cooperation Program, as supported by Congress? Are there areas within it for growth? In the last year, the Department of Energy has upgraded its bilateral dialogue with the Government of Israel. In what ways has the dialogue contributed to greater cooperation?
- A8. The DOE is fully committed to continuing a robust and expanding energy cooperation program with Israel. There are several recent and upcoming examples of bilateral energy cooperation that illustrate this commitment. Most recently, the DOE hosted the U.S.-Israel Energy Dialogue on October 19, 2015. During the event, U.S. officials and scientists shared expertise and best practices in the areas of: natural gas development; cybersecurity in the energy sector; the energy – water nexus, including desalination; and clean energy innovation. These exchanges continue regularly at the working level.

During the Energy Dialogue, the U.S. and Israeli sides agreed to explore expanding cooperation in several areas, including a flexible desalination design challenge, where U.S. and Israeli researchers would develop creative designs of integrated energy and desalination systems, as well as a proposed new post-doctorate exchange program in which leading energy scientists from Israel are selected to work with U.S. scientists and

conduct research at DOE laboratories. A proposed reciprocal exchange of U.S. scientists to Israeli institutes is also being explored.

On April 4-5, the Secretary of Energy traveled to Israel to build on the Department's ongoing work and commitment with this strategic partner. Along with the government to government discussions, Secretary Moniz plans to visit a U.S.-Israel Bi-national Industrial Research and Development (BIRD) Energy award-winning company. BIRD Energy supports joint research and development of clean energy technologies between American and Israeli companies. It is funded through annual contributions from the U.S. and Israel.

- Q9. Israel is a world leader in technological research and development, with expertise in areas such as clean-tech, water resource management and cyber protection technologies that may be applicable to our critical infrastructure. Moreover, many of its energy priorities align with our own. As DOE increases its investments in R&D, does the Department have plans to expand its current programs with Israel?
- A9. Yes, the DOE is actively working to expand cooperation with Israel in the areas of energy cyber, energy-water nexus, and renewable energy research. At the October 2015 U.S.-Israel Energy Dialogue, U.S. and Israeli energy cyber teams agreed to expand cooperation, to include contributions from agencies such as the Department of Homeland Security (DHS) and the Federal Energy Regulatory Commission (FERC). With regard to energy-water nexus and water resource management, under the umbrella of the DOE and Israel's Ministry of National Infrastructures, Energy, and Water Resources (MIEW), several laboratories have conducted significant bilateral cooperation. Argonne National Laboratory, the University of Chicago, and Ben-Gurion University have been working on joint water/energy nexus projects, including in the areas of: smart membranes (including membranes that will facilitate more energy-efficient treatment of water); ground water transport patterns and pollution levels; and approaches to remediate pollutants by wet oxidation. The Department is currently exploring an energy-water nexus design challenge, where U.S. and Israeli researchers would develop creative designs of integrated energy and water systems to make a real difference to countries like Israel that face water issues.

With regard to clean energy research, the Secretary of Energy, during his April 4-5, 2016 travel to Israel, signed a new amendment expanding energy research cooperation between the U.S. and Israel as well as meet with a U.S.-Israel BIRD Energy award-winning company. The Department continues to support joint research and development between American and Israeli companies through BIRD Energy, a program funded through annual contributions from the U.S. and Israeli in support of clean energy technologies. Concurrently, the two countries are discussing ways to expand clean energy efforts, including increased funding and cooperative opportunities.

- Q10. The U.S.-Israel Strategic Partnership Act authorized a first-of-its-kind Center of Excellence to provide a platform for the United States and Israel to collaborate on energy and water issues. Designed as a binational accelerator, the Center is designed to bring together American and Israeli researchers, academics, companies and the governments in the pursuit of joint research initiatives, technology development and policy collaboration.

This Center, when stood-up, can represent a new chapter in the bilateral relationship between the U.S. and Israel and serve as a hub for the development of critical technologies and synergies that will aid both countries. Beyond authorizing this Center into law through the U.S.-Israel Strategic Partnership Act, Congress has pressed for its creation.

Is there a reason the Department of Energy has not yet formally designated the U.S.-Israel Center of Excellence as called for in the legislation? When does the Department plan to do so?

- A10. The activities and cooperation between Israel and the DOE form an important partnership that provides benefits to both countries. DOE continually evaluates the most effective means of engagement with its international partners. Without appropriated funding available, the Department has not established a center of excellence; however, it remains committed to expanding cooperation in energy research with Israel. The DOE is leveraging its relationship with Israel's Ministry of National Infrastructures, Energy, and Water Resources (MIEW) to encourage bilateral energy-water nexus research between Argonne National Laboratory, the University of Chicago, and Ben-Gurion University.

Additionally, on April 5, 2016, the Secretary of Energy announced enhanced scientist-to-scientist exchanges between the U.S. DOE-funded research programs and Israeli scientists in energy related topics of mutual interest. These exchanges may include post-

doctorate fellow exchanges from leading Israeli universities and the Department's Energy Frontier Research Centers. These exchanges hopes to advance nascent collaborations, establish new connections, and encourage collaborations leading to a cleaner energy future.

## QUESTIONS FROM SENATOR JOHN BARRASSO

- Q1. In your testimony, you discuss the Department's FY 2017 budget request for decommissioning the gaseous diffusion plant in Portsmouth, Ohio. You explain that: "The Request... is supplemented by continuing transfers of uranium." Do you plan to issue a new Secretarial Determination, authorizing additional transfers of uranium, before the end of the Administration?
- A1. The May 1, 2015, Secretarial Determination is effective for two years after issuance. The Department does not plan to issue a new Secretarial Determination authorizing additional transfers of uranium to fund Portsmouth decontamination and decommissioning activities before the end of this Administration.
- Q2. Please provide the total value of services that the Department received for each set of uranium transfers authorized by the following Secretarial Determinations:
- A. Secretarial Determination, executed by Secretary Chu on November 10, 2009: \$ \_\_\_\_.
  - B. Secretarial Determination, executed by Secretary Chu on March 1, 2011: \$ \_\_\_\_.
  - C. Secretarial Determination, executed by Secretary Chu on May 15, 2012: \$ \_\_\_\_.
  - D. Secretarial Determination, executed by Secretary Chu on March 15, 2013: \$ \_\_\_\_.
  - E. Secretarial Determination, executed by Secretary Moniz on May 15, 2014: \$ \_\_\_\_.
  - F. Secretarial Determination, executed by Secretary Moniz on May 1, 2015: \$ \_\_\_\_.
- A2. The Department received the following total value of services for the natural or low enriched uranium transfers under each Secretarial Determination as listed below.
- A. Secretarial Determination, November 10, 2009: approximately \$131,995,000
  - B. Secretarial Determination, March 1, 2011: approximately \$246,714,000
  - C. Secretarial Determination, May 15, 2012: approximately \$675,400,000
  - D. Secretarial Determination, March 15, 2013: The March 15, 2013 Secretarial Determination covered the transfer of approximately 47 metric tons of low enriched uranium to the USEC Corporation with the natural uranium feed component equivalent returned to DOE and the value of the 299,000 separative work units (SWU) credited as the Department's contributions to a specific funding phase under a cost-shared, multi-year research, development and demonstration program. While the Department did not receive services for this uranium transfer, the transfer equated to approximately \$44 million toward the Department's cost share for this program.

- E. Secretarial Determination, May 15, 2014: approximately \$321,370,000
- F. Secretarial Determination, May 1, 2015: approximately \$347,791,000

## QUESTIONS FROM SENATOR RON WYDEN

- Q1. As you and I discussed from the very beginning of your confirmation process, the problems at Hanford are complex, and require sustained funding and commitment. That said, just throwing money at the problems is not going to fix them. The Inspector General just came out with yet another report documenting the fact the corrective action plan to correct known problems at the Waste Treatment Plant needs its own corrective action because it's not working (Audit Report: Corrective Action Program at the Waste Treatment and Immobilization Plant, OAI-M-16-06, February 2016). What assurance can you give me that the Department is going to live up to its obligations to clean-up Hanford and fix the management and technical problems with the Waste Treatment Plant?
- A1. The Department remains committed to safely storing the nuclear waste in Hanford's 177 underground tanks, building the Waste Treatment and Immobilization Plant Project (WTP) and treating the waste in the WTP for final disposition. Key actions that the Department is taking to improve and oversee the performance and culture at the Hanford Site include the following:
- In September 2015, the Department selected Parsons Government Services, Inc. as the Owner's Representative in assisting with the oversight of the WTP project. Parsons' assistance includes, but is not limited to, support for procurement and acquisition, risk management, configuration management, project planning, design-engineering, nuclear safety, construction, and startup, testing and commissioning. Parsons has provided several personnel, who are already on-site assisting the WTP team.
  - Contract incentives have been realigned to focus on specific areas that warranted improvement, e.g., quality assurance, and issue identification.
  - Significant improvements have been made in contractor assurance and accountability.
  - Additional Federal resources both at Headquarters and at the Office of River Protection have been targeted to address areas that require improvement, such as nuclear safety.
- Q2. The DOE Bioenergy Technologies Office does some work to support woody biomass energy, including funding for studies, logistics research, and demonstration projects, but I see a need for further support of woody biomass energy particularly in heat and power applications. There is great potential for this industry nationwide. For example, in my home state of Oregon millions of tons of dry biomass could be harvested on a sustainable basis from forest lands, providing a steady source of renewable low-carbon feedstock to power and heat our homes and businesses. Further investment from the Department of



Energy is needed to develop the markets and technologies to use woody materials economically and sustainably, and in an environmentally responsible way consistent with our climate protection goals. How can DOE expand needed support for cutting-edge woody bioenergy applications? Will the Department work with the US Forest Service on these efforts?

- A2. Woody biomass is a significant source of biomass and the Department of Energy's (DOE) Bioenergy Technologies Office (BETO) is supporting various efforts to accelerate its development and commercialization. BETO recognizes that woody biomass is a promising source of biomass because it can provide large volumes of materials, has widespread availability, and is an economically attractive source of energy.

BETO is supporting the early adopter market of biopower through the innovative reduction of feedstock costs at volume and of suitable quality to support power plants. In coordination with stakeholder input, BETO developed the concept of Advanced Feedstock Supply Systems, designed to provide strategies and mechanisms for reliably and sustainably supplying biorefineries with affordable feedstock. In Fiscal Year (FY) 2017, BETO plans to pursue opportunities for advanced feedstock supply systems to transform an array of biomass from a highly variable, aerobically unstable, low density form into a uniform, stable, high density aggregable commodity. As part of this effort, BETO will focus on developing several underutilized woody biomass resources and new dedicated woody energy crops, including whole-tree biomass and short rotation woody crops. The technology for converting woody biomass for heat and power production is largely commercially available as evidenced by the 8.4 gigawatt (electrical) of installed generating capacity<sup>2</sup> based on wood fuels and the 42 terawatt-hours of electricity generated from wood in 2014.<sup>3</sup>

BETO works closely with the U.S. Forest Service in assessing woody biomass potential in the United States, improving logistical systems, and advancing the role of short-rotation woody crops. This collaboration supports the use of woody biomass for heat and power, biofuels, and bioproducts.

<sup>2</sup> [http://www.eia.gov/electricity/annual/html/cpa\\_04\\_03.html](http://www.eia.gov/electricity/annual/html/cpa_04_03.html)

<sup>3</sup> [http://www.eia.gov/electricity/annual/html/cpa\\_03\\_01\\_b.html](http://www.eia.gov/electricity/annual/html/cpa_03_01_b.html)

- Q3. The FY17 budget appears to request \$20 million for funding for an “open water, fully energetic, grid-connected wave energy test facility,” although that is not explicit in the request. The cost-share requirements for matching funds for this facility are also not described. For example, a very similar project, the DOE FORGE lab, allowed for a zero cost share in Phase I and will require a maximum of a 20% cost-share--or even a zero cost-share for academic institutions--in Phases II and III. How much funding is the Department actually requesting for this open water wave energy test facility? What is the basis for this cost estimate? And what is the Department’s intended cost-share requirement for the facility?
- A3. The Open Water Test Facility would be funded under a phased approach. DOE’s planned commitment of federal funds for the Open Water Test Facility is \$25 million, including \$5 million appropriated in FY 2016 for complete front-end engineering and design (FEED), and \$20 million planned investment requested in FY 2017 for procurement for and construction of the critical infrastructure for the facility. The \$25 million request is based on cost estimates from preliminary designs being conducted at potential U.S. test site locations. The extent of testing capabilities provided by the \$25 million investment depends on factors such as applicant cost share, existing infrastructure, and number of test berths.

The first \$5 million phase involving complete FEED activities would include a non-federal cost-share of 20%. The second \$20 million phase, including procurement for and construction of the facility, falls within demonstration and commercial application activities under Section 988 of the Energy Policy Act of 2005 and would carry a non-federal cost-share of 50%. This cost-share can be waived by DOE if the statutory standard for waiver is met.

Historically, DOE has supported many different types of test facilities, and some of these have carried a non-federal cost-share of 50%. Examples of the 50% demonstration cost-share requirement include the existing National Marine Renewable Energy Centers (NMRECs), including the Northwest NMREC, whose construction activities were funded under a 50% federal / non-federal cost-share.

As DOE finalizes a solicitation for a wave testing facility, the Department is committed to working with Congress and various stakeholders to determine the optimal cost share requirement that makes sense for this facility and the industry.

With regard to maintenance and operation, the facility will develop a plan for achieving long-term sustainable funding without direct support from DOE. It is expected that as the industry matures, this funding will be available through testing fees and related research and development (R&D) projects.

- Q4. DOE's Small Modular Reactor (SMR) program is supporting a \$226 million grant to an SMR vendor, NuScale Power. The company is on track to submit a Design Certification Application (DCA) to the NRC in the second half of 2016. I am concerned, however, that the FY17 budget does not reflect the full scope of activities required to move this project forward. Specifically, in FY 2016, the Energy and Water Appropriations Subcommittee included report language clarifying that DOE should incorporate standard plant design costs into the program in future budget requests. This report language does not appear to be reflected in the President's \$89.6 million request. Please explain why the budget request does not reflect this appropriations direction.
- A4. The SMR Licensing Technical Support program was established to share costs and reduce the financial risks to industry for the early design and development of innovative SMR designs. The program to date has set NuScale Power on a path to the submittal of their design certification application to the Nuclear Regulatory Commission. The program did provide Government cost share for design development, but the program was never expected to support the completion of the design to the point that it was available for commercialization. However, DOE is confident that the funding provided to date has provided adequate incentive for the vendor organization, as well as the potential utility customers, to complete their licensing activities and proceed to the next steps of commercialization.
- Q5. Energy Storage is the missing link in the electricity delivery chain. The lack of storage capacity prevents us from taking full advantage of intermittent renewable energy sources like wind and solar. Storage would allow those renewable kilowatts to be held for when they are most needed. Storage would also reduce the overall cost of electricity to American homes and businesses by allowing low-cost energy produced at night from any source to be stored and then later used to meet peak demand during the day when less

efficient, more expensive generation sources rise to the top of the dispatch stack. What more can be done to fully implement the research plan included in the 2013 DOE Strategic Plan for Grid Energy Storage? What more can be done to assist in the development of pumped hydro energy storage infrastructure in the United States?

- A5. The 2013 DOE Strategic Plan for Grid Energy Storage outlined four major development areas for the improved deployment and integration of energy storage: cost competitive technologies, safety and reliability, industrial acceptance, and an equitable regulatory environment. While the Office of Electricity Delivery and Energy Reliability (OE) Energy Storage program continues a strong research emphasis in energy storage materials and storage safety, the program is currently increasing support to independent system operators, state regulators, energy agencies, and utilities to fully understand the complete value proposition energy storage provides.

The Energy Storage program provided technical assistance through Pacific Northwest National Laboratory to regulators in Oregon to support Oregon House Bill 2193, which calls for jurisdictional utilities to procure five megawatt hours of energy storage by 2020. The Energy Storage program also supported, through a joint solicitation with Oregon DOE, an initiative with Oregon's Eugene Water and Electric Board to deploy distributed storage and photovoltaics.

In both Oregon and Washington, the program is working with regulators to develop high fidelity valuation models that reflect the benefits energy storage provides, both to the utility and to the ratepayer.

Under the Grid Modernization Laboratory Consortium (GMLC), the Energy Storage program is supporting optimization and valuation efforts for 11 megawatts/13.5 megawatt-hours of energy storage deployments in Oregon, Vermont, New Mexico, and Tennessee. This foundational analysis will be the groundwork for a nationwide valuation model that can be used by regulators, utilities, and developers alike.

The FY 2017 Budget Request supports an expansion of state demonstration projects and an increased emphasis on storage reliability. Strategically located demonstrations will further elucidate the economics of storage and provide validation of newly developed

models. The development of accelerated testing methodologies for energy storage to accurately predict functional lifetimes will be critical for future industrial acceptance of the technology.

- Q6. With solar energy at nearly 2 percent of the Nation's electricity generating capacity and projected to grow to about 5 percent by 2030 according to the National Renewable Energy Laboratory, we can see that solar is playing an increasingly important role in the 21st Century energy system. The Department's own analysis, however, suggests that many of the promising reductions in solar energy costs are starting to hit a plateau. Furthermore, we are seeing increasingly aggressive competition from other countries that have heavily subsidized their solar industries. What plans does the Department have to ensure that domestic photovoltaic and solar thermal manufacturers stay competitive in the global marketplace?
- A6. While certain portions of the overall cost of a PV system installation, such as module costs, are reaching the point where continued cost decreases in these system components are having smaller overall impacts in reducing total PV system cost, the Department's own analyses continue to show considerable continued decreases in the cost of PV systems. According to the National Renewable Energy Laboratory analysis, *Photovoltaic System Pricing Trends, 2015 Edition* ([https://emp.lbl.gov/sites/all/files/pv\\_system\\_pricing\\_trends\\_presentation\\_0.pdf](https://emp.lbl.gov/sites/all/files/pv_system_pricing_trends_presentation_0.pdf)) and Lawrence Berkley National Laboratory's *Tracking the Sun VIII* report ([https://emp.lbl.gov/sites/all/files/lbnl-188238\\_1.pdf](https://emp.lbl.gov/sites/all/files/lbnl-188238_1.pdf)), in 2015, PV system cost was reduced by 17% as compared to 2014. Nevertheless, the Department's Solar Energy Technologies Office's SunShot Initiative recognizes the need to continue to aggressively target cost reductions for all solar technologies in order to achieve ubiquitous deployment of these technologies across the U.S. Therefore, SunShot has begun to undertake a rigorous exercise of planning out a more aggressive 2030 goal for solar technologies cost reduction. SunShot is in the process of engaging industry, university, and national laboratory stakeholders in this endeavor and will be holding a workshop in late spring of 2016 to receive feedback and finalize the targets for this "Beyond SunShot" goal.

The Department's goal, with respect to U.S.-based solar manufacturing is to reverse the trend of offshoring solar technology component manufacturing and assembly through technology and process innovations that can enable U.S. companies to manufacture and

deploy solar technologies competitively. The SunShot Initiative has a well-developed and integrated technology-to-market strategy that supports U.S.-based business along a spectrum of development activities. In 2014-2015, the U.S. solar manufacturing industry expanded for the second year in a row, a significant achievement. Several new manufacturing facilities, including what will be the largest solar manufacturing facility in the western hemisphere, have direct DOE technology development linkage and have begun construction to address U.S., as well as growing global, markets. DOE's strategy is to invest in manufacturing technology innovation, which includes investigating and identifying segments of the value chain where the U.S. has long-term competitive advantages involving high performance and high value products in a global marketplace. By involving industry, academia and the National Laboratories, this also strengthens the U.S. innovation ecosystem.

The SunShot Initiative has implemented a number of processes to ensure the programs and projects it funds result in the development of new solar technologies that lead the market in terms of innovation and technologies, and that are manufactured in the U.S. Projects and technologies funded by the Program undergo a rigorous independent merit review process in the selection of an award, whereby the experience and expertise of leaders in the field is solicited, with an emphasis on receiving feedback about the ability of the proposed technology to be market leading. In addition, SunShot implements a thorough Active Project Management process during the execution of the work it funds, where Program staff work with awardees to both develop their technology and their business plan to successfully bring it to market and review awardee progress against both technical and market goals, with the ability to stop an award if the technology is not meeting technical goals or if business conditions have changed and the technology is no longer leading the field.

- Q7. As we move to an energy system that relies increasingly on clean renewable energy, we will need to build the most nimble electricity system possible. One of the least cost ways of making progress on grid flexibility is Demand Response--the coordinated ability of energy customers to reduce or shift their energy use during peak periods, in response to time-based rates or other forms of financial incentives. The Pacific Northwest has been a long-time champion of Demand Response, and we have seen that it is a highly cost-

effective way of managing the grid. Please explain the ways in which your budget will support further advancement in Demand Response.

- A7. In FY 2016, the Department's Smart Grid R&D Program launched a new focus area, Market-based Controls, to further advance demand response. The objective of the focus area is to support customer control of their electricity usage in response to pricing changes, while enabling utilities to balance supply and demand using market forces through demand-side resource prices and incentives. Coupling the competitive market forces, which serve as control signals, with electric distribution operations will result in increased flexibility and reliability, as well as lowering the carbon footprint.

The initial test cases used for developing simulation tools for market-based controls include those demand-response programs employed by the Pacific Northwest Demonstration project. The Department will continue developing the Market-based Controls, as included in the FY 2017 Budget Request, to refine controllability, stability limits, and efficacy of operating distributed assets (end-use devices, distributed generation, batteries, PV solar systems, inverters, EV chargers, etc.) and networked communication systems.

- Q8. The Department's 2017 budget proposes to deobligate \$240 million that has already been appropriated to support commercial demonstration of carbon capture and storage technologies for projects that have not yet reached financial close. Please identify each of the pending projects that would be affected by this deobligation of funds and describe the current status of each of the projects and their ability to reach financial close prior to fiscal year 2017 when the deobligation would go into effect.
- A8. The Fossil Energy (FE) budget request for FY 2017 proposes \$600 million for FE R&D activities, of which \$240 million would come from prior year unobligated balances. It is important to demonstrate that electric generation technology with carbon capture and storage (CCS) can be deployed at commercial scale while maintaining reliable, predictable and safe operations. Therefore, the Fossil Energy research and development (FER&D) portfolio includes several major integrated CCS demonstration projects encompassing different technological approaches and applications of CCS. While there are successful CCS demonstration projects underway, there are several Clean Coal Power Initiative (CCPI) projects have not reached financial close after six years. DOE intends

to suspend further funding for these projects under the CCPI program due to: (1) their lack of progress in obtaining construction financing and regulatory approvals; (2) the loss of federal funds pursuant to section 313 of the Consolidated Appropriations Act, 2016; and (3) regulatory deadlines for project completion imposed by the Energy Policy Act of 2005 and by the conditions in the tax credits allocated to these projects. This will allow DOE to deobligate \$240 million from these projects for use in FY 2017.

- Q9. The Department's Office of Inspector General (OIG) recently released a report on contractor fines, penalties and legal costs (Audit Report: Follow-up Audit of the Department of Energy's Management of Contractor Fines, Penalties, and Legal Costs, DOE-OIG-16-06; February 2016). The audit found that Department contracting officers were not always performing documented settlement reviews for complaints against contractors. The audit identified three settlements related to whistleblower complaints where reviews had not been conducted, all at one field office, including a case where there had been a formal judgment against contractor for retaliation. As discussed with the Department's General Counsel during his confirmation, I have long been concerned that the Department's practices concerning reimbursement of contractors for the legal fees tips the scale against whistleblowers. What steps is the Department taking to address the issues raised in the OIG audit? In addition to guidance issued last year concerning protection of Federal whistleblowers under the Whistleblower Protection Act, what other steps is the Department taking to ensure that both Federal and contractor whistleblowers are protected and when will they be implemented?
- A9. The Department is taking action to address the issues raised in DOE IG Report DOE-OIG-16-06, Followup Audit of the Department of Energy's Management of Contractor Fines, Penalties, and Legal Costs (February, 2016). As provided in the OIG Report, "Management concurred with each of the report's recommendations and indicated that corrective actions were planned to address the identified issues." In addition, "management indicated that procedures for performing reviews for settlements related to matters other than discrimination and whistleblowers would be developed." Finally, the OIG Report provided that, "management stated that procedures would be developed for when a postsettlement review should be performed." The Department is currently taking these steps to address the issues raised in the OIG audit.

The Department is committed to a workplace where both Federal and contractor employees feel free to raise concerns without fear of retaliation. In addition, DOE provides multiple avenues for both federal and contractor employees to raise not only



substantive safety concerns, but also concerns about potential retaliation. Recent steps the Department has taken with respect to whistleblower-related issues include the following: While DOE's Project Management Risk Committee (PMRC) does not adjudicate whistleblower actions, the PMRC is now considering technical, health, or safety concerns raised in conjunction with whistleblower actions during ongoing construction project reviews; the General Counsel issued an official communication to all employees concerning The Whistleblower Protection Enhancement Act (WPEA) that also renders all individual non-disclosure agreements and acknowledgments in conformance with WPEA; and, the Department is preparing additional detailed guidance to its contracting staff, clarifying the Department's standard for allowability of costs of settling whistleblower cases.

## QUESTIONS FROM SENATOR DEBBIE STABENOW

- Q1. In last year's omnibus, Congress approved a \$10 million increase for the Clean Cities program. However, this year's budget request for Clean Cities was \$11 million less than Congress just enacted.

The Clean Cities program can play a critical role in fostering the deployment of alternative and electric refueling infrastructure. Could you tell me how the Department intends to use the additional funding in FY2016 to accelerate the deployment of electric and alternative refueling infrastructure?

I would also be interested in hearing your perspective on DOE's projections for increased market penetration of electric vehicles in the coming year, particularly as a result of the price of batteries continuing to drop.

- A1. In Fiscal Year (FY) 2016, the Department will initiate Alternative Fuel Vehicle Community Partner projects to accelerate widespread use of commercially available advanced and alternative fuel vehicle technologies to reduce U.S. dependence on petroleum, increase local fuel diversification, and enable sustainable transportation. The Vehicle Technologies Program will release an open and competitive funding opportunity for highly-leveraged, cost-shared, community-based projects involving local and/or regional partnerships of key stakeholders. The funding opportunity announcement will be "fuel neutral," with selected projects supporting one or more alternative fuels, such as electricity, natural gas, biofuels, and hydrogen, among others.

The Alternative Fuel Vehicle Community Partner projects are expected to provide new lessons learned regarding how local communities can leverage partnerships to significantly accelerate the introduction and adoption of alternative fuel and advanced vehicle technologies, as well as the necessary fueling infrastructure. The Department's FY 2017 Budget Request reflects plans to evaluate the success of the initial round of projects and collect lessons learned and community input before initiating another round of Community Partner projects. As such, the FY 2017 Budget Request does not request funding specifically for this program in FY 2017.

The Department's FY 2017 Budget Request does include support for Vehicle Technologies Deployment, which leverages the nationwide Clean Cities coalition

network. Vehicle Technologies Deployment funding in FY 2016 will complement the Advanced Fuel Vehicle Community Partner program with tools and resources, technical assistance, and other competitively-awarded projects to overcome market barriers, facilitate infrastructure development, and accelerate market transformation.

The Department's official projections of future energy scenarios, including market penetration of electric vehicles, are published by the Energy Information Administration (EIA) in the Annual Energy Outlook (AEO). The most recent projections may be found here: [http://www.eia.gov/forecasts/aeo/pdf/0383\(2015\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf). Historically, AEO has not incorporated electric vehicle battery price improvements in every annual edition, though, in 2012, EIA did conduct a battery "breakthrough" side case. The analysis hypothesized a scenario wherein electric vehicle battery costs were reduced by half (to a level considered a "breakthrough" then, though now known to be higher than Department of Energy's current targets) compared to a reference case, and market penetrations of electric vehicles increased by as much as four times, as a result ([http://www.eia.gov/forecasts/aeo/pdf/0383\(2012\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2012).pdf)).

- Q2. Mr. Secretary, I believe through the right policy choices and investments, that we can reduce carbon emissions while revitalizing the nation's economy and creating jobs. We need to invest in clean energy technologies, and we have to make them here in the United States. For example, a wind turbine is made of over 8,000 individual parts, all of which can be made in my home state of Michigan.

I was pleased that the budget provides support that puts the country on a path towards doubling our clean energy research and development over the next five years. In addition, the funding increase requested for Vehicle Technologies Program will promote R&D that reduces petroleum consumption and greenhouse gas emissions from light- and heavy-duty vehicles.

Secretary Moniz, can you talk about how investing in clean energy will help our manufacturing sector, while protecting the environment?

- A2. The Department-wide Clean Energy Manufacturing Initiative (CEMI) is a comprehensive approach to enhancing U.S. competitiveness in clean energy manufacturing while advancing progress toward the Nation's energy goals. CEMI aligns resources across Department of Energy (DOE) to increase the impact of investments in advanced

manufacturing-related technology research, development, and demonstration (RD&D), developing advanced manufacturing approaches and technologies applicable to multiple energy sectors. For example, multiple activities in the Vehicle Technologies Office support CEMI, including R&D to enable scale-up of manufacturing technologies needed to enable market entry of next-generation battery materials and cell components, among other areas. CEMI efforts also target market barriers and assist manufacturers in leveraging energy efficiency measures that increase their energy productivity, helping them competitively manufacture clean energy technology products in the United States. Investing in clean energy manufacturing innovation will support U.S. manufacturers in capturing a large and growing share of the global markets for clean energy products while increasing U.S. competitiveness and reducing environmental impact through increased energy productivity.

- Q3. Mr. Secretary - You're well aware of my concerns regarding LNG exports, and the recent unanticipated drop in crude oil prices makes clear the great uncertainties of economic modeling. For that reason alone, I believe sound public policy requires us to address LNG exports in a risk adverse manner – in favor of the domestic consumer and manufacturers.

DOE has approved applications for shipment to non-free trade countries to levels around 10 billion cubic feet/day, or 13.6% of today's demand. And, pipeline exports to Mexico are surging.

Before more applications are approved, wouldn't it be prudent to wait until existing approved terminals begin to ship and see if the natural gas industry can not only increase production, but sustain higher levels of production without increasing domestic prices... particularly when DOE approval of an export terminal is for 20 years or more? Once approved, it seems there is no way to put the genie back in the bottle.

- A3. The Department examines and acts upon applications to import or export natural gas pursuant to Natural Gas Act (NGA). Section 3(a) of the NGA requires DOE to conduct a public interest review of liquefied natural gas (LNG) export applications to non-free trade agreement (non-FTA) countries and to grant the applications unless DOE finds that the proposed exports will not be consistent with the public interest.

In making a public interest determination, DOE reviews a number of factors, including the impact on domestic natural gas supplies and prices, and a range of macroeconomic

impacts of the proposed export. No final decision will be made on applications to export LNG to non-FTA countries until DOE has met all of its responsibilities.

To evaluate the economic impact of LNG exports at varying levels, DOE undertook analyses that evaluated the economic impact of LNG exports in the range of up to 12 billion cubic feet per day (Bcf/d) of natural gas. In addition, DOE undertook additional analyses that evaluated the economic impact of LNG exports in the range of 12 to 20 Bcf/d. These studies were released for a public comment period that ended in February 2016. The first study, performed by the U.S. EIA and originally published in October 2014, assessed how specified scenarios of increased natural gas exports could affect domestic energy markets. At DOE's request, this study was an update of EIA's January 2012 study of LNG export scenarios using baseline cases from EIA's 2014 AEO. The second study was performed by the Center for Energy Studies at Rice University's Baker Institute and Oxford Economics, under contract to DOE (2015 LNG Export Study). The 2015 LNG Export Study is a scenario-based assessment of the macroeconomic impact of levels of U.S. LNG exports sourced from the lower-48 states in volumes ranging from 12 to 20 Bcf/d of natural gas under a range of assumptions. Both studies found that LNG exports up to the equivalent of Bcf/d of natural gas provided economic benefits to the United States.

DOE will use these studies, plus public comments, as part of the record in making future public interest findings of pending applications to export LNG to non-FTA countries. If at any future time the cumulative export authorizations approach the high end of export cases examined, the Department will conduct additional studies as needed to understand the impact of higher export ranges.

Finally, all long-term authorizations granted by DOE have a requirement that exports must commence within seven years after the export authorization is granted. It is anticipated that the Department will evaluate any authorization that has not initiated exports after seven years and make appropriate decisions on a path forward in the proceeding at that time.

## QUESTIONS FROM SENATOR JEFF FLAKE

- Q1. In November 2015, I sent a letter along with the Chair of this Committee, Senator Murkowski, Committee members, Senator Barrasso and Lee, as well as five other colleagues to Secretary Lew seeking answers about fraud within the 1603 cash grant program and the valuation of the cost basis for claiming the investment tax credit or ITC. Specifically, we asked for a follow up to statements made by two separate Inspectors General that ITC recipients were overstating the value of their property in order to claim a larger tax credit and, in some cases double dipping by claiming both the tax credit and the cash grant. Despite these problematic reports, no federal agencies or IGs have provided a detailed analysis about fraud in the programs. In July 2015, you responded to a question for the record about the Department's Quadrennial Energy Review about the ITC by noting that DOE has worked to "create[] standard solar Power Purchase Agreement (PPA) contracts and develop[] pricing and valuation tools to help protect consumers and improve transparency in the market." Please explain how those tools that increase transparency could be used by the IRS, Treasury, and DOJ to identify and eliminate fraud in the ITC and relate 1063 program.
- A1. The Department of Energy (DOE) administers grant and loan programs for renewable energy projects, but does not manage tax incentives, such as the section 1603 cash grant program or the investment tax credit. As such, the Department respectfully defers to the Department of Treasury and the Department of Justice.
- Q2. As a result of the years-long drought in the Colorado River basin, there has been a significant reduction in hydropower generation. For example, I understand that Hoover Dam has seen an approximate 25% reduction in power generating capacity since 2000, falling from 2,074 MW to 1,550 MW. Such reductions clearly have implications for power users and the Power Marketing Administrations, as hydropower dams, like Hoover, are not only an important generation resource, but they often provide critical load balancing functions. Could you elaborate on the relationship between reservoir elevations and power production and describe how DOE's Budget Request would address those drought-driven challenges?
- A2. Hydropower generation is an important authorized purpose of the Hoover Dam project, which is operated by the Bureau of Reclamation, and produces power marketed by the Western Area Power Administration to its customers. Other authorized purposes of the Hoover Dam project are to control water for irrigation, flood control, navigation, and public supply. The relationship between reservoir elevations and hydropower generation is therefore complex, and depends on operational requirements to balance hydropower generation with other non-hydropower functions. From a technical perspective,

decreased reservoir elevation corresponds to reduced hydraulic head at the hydropower plant. This reduces the available hydropower generating capacity and in some cases can constrain hydropower generation.

The Energy-Water Nexus crosscut within the Fiscal Year (FY) 2017 Budget Request addresses drought-related challenges for hydropower. In FY 2017, the Water Power Program plans to build on its work in FY 2016 to improve accurate representation of hydropower systems in integrated energy assessment models, with the aim of identifying any significant future water and energy systems-level risks, particularly as precipitation, runoff, and temperature patterns change. This work will be closely coordinated with investments initiated by the Office of Science in FY 2016 and are proposed to expand in FY 2017 to support examination of both changing baseline conditions and extreme events (e.g., droughts, floods, heat waves) in integrated assessment and vulnerability models and underlying data. In addition, the Office of Energy Policy and Systems Analysis will continue to analyze approaches to achieve operational flexibility in electricity generation under changing water resource availability and evolving electricity generation portfolios.

- Q3. In October 2015, GAO issued a report on unobligated balances,<sup>4</sup> analyzing whether they exist within certain agencies, the size of the balances, and opportunities for savings. Among its findings, GAO noted that unobligated “carryover” balances at the Western Area Power Administration or WAPA “exceeded the level officials said was necessary to maintain certain activities and manage risk for those activities.” In 2014, for example, the unobligated balance “was \$92 million, or \$40 million more than officials deemed necessary to avoid risk.” GAO further noted that, “[a]s of October 2015, WAPA had not finalized or fully implemented a strategy to reduce unobligated balances.” Please explain how the carryover of those unobligated balances is addressed in the Budget Request and provide a timeline for when WAPA will finalize and fully implement its strategy to reduce such balances and limit them going forward.
- A3. As you may know, nearly 94 percent of Western’s \$1.2 billion budget is derived from operating revenue, and not from an appropriation. Therefore, Western’s unobligated carryover balances are predominantly offsetting collections and alternative financing designated for various customer projects and for purchase power and wheeling costs. Western retains some unobligated carryover balances for contingency purposes.

<sup>4</sup> GAO, *2013 Sequestration and Shutdown: Selected Agencies Generally Managed Unobligated Balances in Reviewed Accounts, but Balances Exceeded Target Levels in Two Accounts* (Oct. 2015).

Western's unobligated balance is reflected by fiscal year in the President's Budget Appendix. Western is in the process of finalizing its unobligated balance strategy in coordination with customers to be implemented by the end of calendar year 2016, and will continue to review its strategy and balances annually.

- Q4. In the Power Marketing Administration or PMA portion of the Budget Request, WAPA is seeking 51 new FTEs to, among other things, address cyber and physical security issues and NERC requirements. Notably, the Southeastern and Southwestern Power Administrations, which presumably must meet the same security and reliability requirements, do not seek any increases in FTEs as part of the budget. This feeds into a larger issue I have heard from some of WAPA's customers: a lack of transparency and meaningful accountability in WAPA's budget process, including its expansion of FTEs. What can be done to ensure more transparency and meaningful accountability for those customers? Please also explain why WAPA believes it needs an increase of 51 FTEs. Does the Budget Request rely on the aforementioned unobligated balances to increase the number of FTEs while simultaneously lowering its overall FTE funding request?
- A4. As you may know, Western is committed to fostering transparency, and has introduced a new website for its customers, entitled The Source. Activated March 17th, this website provides quick and easy access to information to keep customers and the public informed about operational data and financial data. Making these data publicly available promotes transparency and builds trust with customers and the community. Regarding Western's annual budget process, each year Western's work plan and budget undergoes extensive vetting by customers, DOE, Office of Management and Budget, and Congress before its enactment. To further transparency in the budget process, Western is modifying its budget formulation schedule specifically to accommodate substantive customer input earlier during the work plan phase. This will be an opportunity to partner with customers and share insights on all aspects of Western's budget including cost drivers and cost containment efforts. We are cognizant of how changes and expenses at Western affect our customers and their ability to serve American homes and businesses. The highest goal is to continue safely and securely delivering on the mission, which proposes an increase for the Construction, Rehabilitation, Operations and Maintenance account of 51 FTEs in FY 2017. The primary drivers of this increase are: 1) North American Electric Reliability Corporation (NERC's) revision of



transmission operator reliability standards to improve situational awareness of transmission providers and reliability coordinators across the country. The revised standard requires transmission operators and reliability coordinators to conduct real-time assessments of the system every 30 minutes—a dramatic increase over the current-day, day-ahead and seasonal contingency analyses provided today; and 2) new cyber and physical security mandates requiring additional IT specialists (cyber) to enforce NERC CIP v5 and physical security specialists to enforce NERC CIP 014. Increasing security threats, compliance requirements, and emerging complexities require our immediate attention to match the growing workload. The Budget Request does not rely upon the unobligated balances to fund the FY 2017 FTEs request. Rather, where there is recurring reimbursable work FTEs are funded through the reimbursable agreements, attributing to the decline in the request for program direction funding.

- Q5. Last month, a coalition of organizations including the National Black Caucus of State Legislators, the World Conference of Mayors, and the U.S. Hispanic Chamber of Commerce, among others, sent a letter to the Senate noting that some net metering policies “unfairly harm those in historically low-income and minority communities,” because those policies require “customers without distributed generation systems [to] unfairly absorb [the fixed costs of the grid] through higher utility bills.” Later, the U.S. Hispanic Chamber of Commerce issued a statement of support for legislation (S.2384) I introduced to examine the harm caused by unfair cross-subsidization policies. What, if anything, is DOE doing to examine cross-subsidization issues?
- A5. The Department has been tracking cross-subsidization for some time as an important concern in the broader dialogue about the rising deployment of distributed energy resources (DERs). For example, it was discussed (among other concerns) in a workshop we sponsored by the Department in September 2014 titled *Estimating the Benefits and Costs of Distributed Energy Technologies*. More recently, the Office of Electricity Delivery and Energy Reliability (OE) funded a study at Lawrence Berkeley National Laboratory that will estimate the impacts of DER deployment on utility earnings and the bills of participating and non-participating customers, for two hypothetical utilities, one in the Northeast and one in the Southwest. Draft results from this study will start to become available by early summer, and the study will be completed by December.

- Q6. The recently enacted FAST Act (P.L. 114-94, Sec. 61004) requires DOE to develop a plan to establish a strategic transformer reserve. Specifically, it requires DOE to promulgate a plan within one year in consultation with FERC, NERC, and the owners/operators of the grid. Please explain how DOE intends to begin consulting with the necessary agencies and industry in crafting the plan. Does DOE have a timeline for initiating and completing that process?
- A6. The Oak Ridge National Laboratory (ORNL) began work on the project in January 2016. OE is establishing a technical panel of representatives from the organizations mentioned in the Act to be consulted. This panel will meet during the summer to review the interim work product and provide feedback to the ORNL team. The ORNL team's analysis of the size, scale, and scope of a reserve is due September 2016. The study will inform Administration decisions regarding the Strategic Transformer Plan.
- Q7. The electric generation fleet is changing with natural gas becoming a more predominate fuel source. As this occurs, I understand there are concerns about the reliability of the grid. New intermittent sources of generation such as solar and wind do not provide the same type of reliability support as the types of generation they are replacing—a point noted by Bill Gates in his annual letter, when he noted, “people still need dependable energy on cloudy days, at nighttime, and when the air is still.” FERC recently announced that it was beginning a process to examine loss of reliability services provided by baseload generators and how to replace those services. Does DOE share this concern? If so, how does the Department intend to address reliability challenges?
- A7. Historically, the electric utility sector has a strong track record of protecting the reliability of the Nation's electric grid. Working collaboratively with federal and state governments, regulators, utilities, vendors, and other stakeholders have developed technologies, tools, processes, and procedures that protect the Nation's critical infrastructure. Within the Department, the Office of OE leads DOE's efforts to ensure a resilient, reliable, and flexible electricity system. OE accomplishes this mission through research, partnerships, facilitation, modeling and analytics, and emergency preparedness activities.

Recognizing the importance of maintaining reliability, and as part of the Grid Modernization Initiative FY 2017 Budget Request, DOE proposes to fund a set of regional projects that will demonstrate co-optimization of reliability, affordability, and other key grid attributes in (1) a transmission and distribution system operating reliably on a lean reserve margin; (2) resilient distribution feeders with high percentages of

distributed energy resources; and (3) an advanced modern grid planning and analytics platform.

The Federal Energy Regulatory Commission (FERC), together with the NERC, is extensively engaged in monitoring changes in generation and their interaction with the grid. FERC is planning a Technical Conference on Electricity Reliability on June 1, 2016, specifically to address the reliability of the bulk power system. DOE is committed to working with FERC and other stakeholders to maintain grid reliability.

Finally, DOE offers a number of technical assistance resources to help states and tribes as they think through topics including grid reliability. Specific technical assistance resource opportunities vary across the Department and may include: funding opportunity announcements, reports, peer-to-peer exchange, access to Department and lab technical experts, workshops, and webinars. DOE provides more details and contact information on specific technical assistance opportunities currently available by DOE on its website ([www.energy.gov/technicalassistance](http://www.energy.gov/technicalassistance)).

## QUESTIONS FROM SENATOR AL FRANKEN

Q1. During the Paris climate negotiations last December, President Obama and the leaders of 19 other countries committed to doubling clean energy R&D investment. To accomplish this goal, the Administration launched Mission Innovation, helping support research for new breakthrough technologies to fight climate change and promote a cleaner energy future. Much of the R&D funding will go towards the Department of Energy (DOE) priorities like the Office of Energy Efficiency and Renewable Energy. Can you describe the significance of Mission Innovation in addressing climate change and achieving our national emission reduction commitments set forth in Paris?

A1. The Mission Innovation-related areas of the Fiscal Year (FY) 2017 Budget Request support clean energy activities that span the innovation spectrum from use-inspired basic research to demonstration, and encompass all clean energy technologies, including basic energy research, renewable energy, energy efficiency, sustainable transportation, nuclear energy, fossil energy, and the electricity grid of the future. Innovation is essential for economic growth by providing affordable and reliable energy for everyone. It is also critical for energy security, a means to enhance U.S. competitiveness, and the key to a transition to a clean energy future. While important progress has been made in cost reduction and deployment of clean energy technologies, the pace of innovation and the scale of transformation and dissemination remains significantly short of what is needed to address global climate change. As part of Mission Innovation, DOE is undertaking an all-of-the-above innovation strategy to lower costs, reduce risks, and provide new solutions across all sectors to help achieve our clean energy goals.

The FY 2017 Budget Request takes the first step in fulfilling the U.S. Government's pledge to Mission Innovation, an unprecedented global initiative across 20 nations to double public clean energy research and development (R&D) over five years. While each country will determine its own doubling plan and portfolio, the collection of countries will provide new opportunities for synergies and collaboration. Following COP-21, these investments will be a critical next step in enabling the transition to a low carbon energy future through innovation and cost reduction.

Mission Innovation investments will be leveraged by private capital that drives innovation and clean energy deployment. The initiative is complemented by a separate private sector-led effort, the Breakthrough Energy Coalition (Coalition), as increased

government investment, while necessary, is insufficient by itself. This parallel initiative includes over 28 investors from 10 countries and will supplement the large and growing private sector investment in commercialization of clean energy technologies by targeting new investments at an earlier stage of the innovation cycle and managing these investments through the completion of the innovation process, including the formation of new companies and the commercial introduction of new products and processes. The Coalition—as well as other private sector entities and organizations—will be investing in technologies and projects originating in the Mission Innovation participating countries.

- Q2. As our grid continues to evolve, new energy storage technologies will be essential for providing enhanced grid stability, and enabling intermittent renewable energy sources to meet continuous electricity demand. DOE has a very important role to play in this effort, from finding transformative solutions for a wide range of energy technologies, to working with private industry and other stakeholders to determine the most effective ways to integrate these new storage systems into our grid. Could you please outline the programs that the DOE has in place, or is rolling out this year, to accelerate the development, planning, and deployment of advanced energy storage systems?
- A2. The 2013 DOE Strategic Plan for Grid Energy Storage outlined four major development areas for the improved deployment and integration of energy storage: cost competitive technologies, safety and reliability, industrial acceptance, and an equitable regulatory environment. All four of these areas are critical to accelerate the development, planning, and deployment of energy storage systems. New technologies, such as mixed acid vanadium redox flow batteries, have been developed that offer five times the performance at half the cost of conventional systems. This technology has been commercialized by several companies, including UniEnergy Technologies, which recently commissioned the largest flow battery system in North America—a one megawatt/four megawatt-hour system in Pullman, WA. Planned research will focus on replacing vanadium with an aqueous soluble organic species that could further reduce the costs by half.

In regards to safety, the Office of Electricity Delivery and Energy Reliability (OE) Energy Storage program has initiated a comprehensive program focused on the development of codes and standards for deployed energy storage systems, education and

training of first responders, and furthering our understanding of the science governing safety. Future efforts will target testing methodologies that can help determine the reliability of energy storage systems under real world conditions.

The OE Energy Storage program has facilitated greater industrial acceptance of energy storage both through targeted demonstrations in Vermont, Washington, Oregon, Massachusetts, and Alaska and through deployment activities initiated under Recovery Act grant programs. Grant recipients such as Aquion, Amber Kinetics, and Primus Power have advanced past the original Recovery Act funding and are finding greater acceptance in the market today.

Ensuring an equitable regulatory environment for energy storage has been a recent focus of the program. In 2015, the OE Energy Storage program led a workshop for regulators in Washington, Oregon, Idaho, and Montana to understand the policy and economic barriers limiting increased adoption of energy storage. Future workshops will be implemented in the southwest and other regions with the ultimate goal of developing a comprehensive modeling platform that accurately reflects the technical and economic benefits storage can provide.

Western Area Power Administration's (Western) Transmission Infrastructure Program (TIP) is an American Recovery and Reinvestment Act authority which operates to provide development assistance and support investment to eligible transmission and related projects which facilitate the delivery of renewable energy. TIP has received development assistance applications for utility-scale energy storage projects and expects further requests for assistance and financing as utility energy storage solicitations ramp up in the West. As a unique public/private partnership, TIP can support commercially demonstrated energy storage projects by creditworthy entities that are located within Western's 15-state territory, including potential pumped-hydropower projects.

- Q3. Over the past decade, studies by various entities in collaboration with regional transmission organizations, government laboratories, and the DOE demonstrate the need for new electricity transmission infrastructure to modernize the electric grid and support renewable energy development. This includes the Eastern Interconnection Planning Collaborative (EIPC), led by the DOE and several regional transmission

organizations. Does the DOE still believe that new transmission is necessary to support renewable energy development? If so, what steps is the Department taking this year to support the deployment of high voltage or extra-high voltage transmission proposals? What steps is the Department taking to support additional studies to identify new transmission needs?

- A3. For the foreseeable future, existing transmission lines will need to be upgraded or new lines built in some areas, due to factors such as aging facilities, changing patterns of demand, and changes in the generation fleet, particularly increasing reliance on renewable generation sources located in areas where existing transmission is limited. The Department is reviewing the transmission plans and planning processes established under the Federal Energy Regulatory Commission's Orders No. 890 and 1000, and we will monitor the progress of major projects that are included in those plans.

In addition, DOE is initiating a Midwestern Interconnection Seam Study as one of the Regional Partnership projects in the Grid Modernization Laboratory Consortium portfolio. This will be a two-year collaborative effort among four national laboratories, industry, and academic experts to evaluate HVDC and AC transmission seams between the U.S. interconnections and propose upgrades that will reduce the cost of modernizing and operating the nation's bulk power system.

## QUESTIONS FROM SENATOR STEVE DAINES

- Q1. Since 2005, what is the total amount of grant funding provided by the Office of Indian Energy to tribes and what activities have they helped tribes undertake?
- A1. Prior to Fiscal Year (FY) 2015, Department of Energy's (DOE) funding for tribes and Alaska Natives was provided principally within the Office of Energy Efficiency and Renewable Energy (EERE). Beginning in FY 2015, these programs have been funded within the Office of Indian Energy Policy and Programs (IE).

Excluding projects where expenditures were specifically directed by Congress, EERE funded 151 clean energy projects with tribes and Alaska Natives since 2005. Those projects, valued at \$87.5 million, represent a DOE investment of over \$43 million. The types of activities funded by these grants include 51 planning grants, 59 feasibility studies, 7 development grants, and 34 deployment or installation grants. Summaries of these projects can be found at <http://energy.gov/indianenergy/maps/tribal-energy-projects-map>, and success stories at <http://energy.gov/indianenergy/listings/indian-energy-blog>.

On March 16, 2015, the U.S. DOE selected 11 tribal communities to receive nearly \$6 million in funding to implement clean energy and energy efficiency retrofit projects for tribal buildings and deploy clean energy systems on a community scale on Indian lands. The Department's funding is expected to be leveraged by nearly \$7.5 million in tribal cost share. The 11 projects announced by the Department were competitively selected under the FY 2015 Deployment of Clean Energy and Energy Efficiency on Indian Lands (DE-FOA-0001021) funding opportunity announcement (FOA).

On March 22, 2016, the Office of IE announced 16 projects benefiting 24 native communities as a result of its most recent Announcement Number DE-FOA-0001390, Deployment of Clean Energy and Energy Efficiency Projects on Indian Lands-2015, which represents an additional DOE investment of more than \$9 million in FY16. The press release can be found here <http://energy.gov/articles/energy-department-announces-over-9-million-funding-16-indian-and-alaska-native-community>.



Q2. Please provide examples of grants leading to:

- a. clean coal research and development projects benefiting Indian Tribes?
- b. the tribe acquiring energy supplies or electricity that they in turn provided to homes and business on Indian land?
- c. projects allowing energy producing Tribes to compete on the global market such as energy exports?
- d. construction and operation of tribal electrical generation, transmission and distribution facilities on Indian land?
- e. construction and interconnection of electric power transmission facilities on Indian land with other electric transmission facilities?
- f. renewable energy production on Indian land?

A2. Prior to FY 2015, DOE's funding for tribes and Alaska Natives was provided principally within the Office of EERE. As a result, examples of DOE grants to tribes and Alaska Natives are heavily weighted toward renewable energy production on Indian land. Beginning in FY 2015, these programs have been funded within the Office of IE, which provides programs and services on a fuel neutral basis for both renewable and non-renewable energy projects.

A few examples include:

- a. The Nez Perce Tribe (ID) installed windows, insulation, and efficient lighting in five tribal buildings (54,312 square feet total). These retrofits, besides increasing the comfort of the buildings are estimated to reduce energy use by 35% and save \$13,800 per year.
- b. The Forest County Potawatomi Community of Milwaukee, Wisconsin (WI) established "Project Greenfire" with the ultimate goal of eliminating the Tribe's carbon footprint, being energy self-sufficient, and a provider of carbon-free energy to others. DOE funding has allowed four projects which support "Project Greenfire" to proceed, including:
  - 1. The replacement of inefficient lights in their parking garage facility with energy efficiency lighting, which reduced energy consumption by 47.3%.
  - 2. The renovation of a historical building, Wunder Hall on the old Concordia Campus. These renovations not only are saving over 50% in electricity and natural gas, but contribute to the revitalization of the neighborhood and preservation of this historically significant building.

3. Conducting an energy efficiency feasibility study at Potawatomi Carter Casino Hotel in Northern Wisconsin. The tribe expects detailed reports and actionable recommendations to yield at least a 30% reduction in overall energy use, once implemented.
  4. Installation of 875 kilowatts (kW) of solar photovoltaic (PV) systems at a minimum of eight tribal facilities in Milwaukee and Forest Counties.
- c. The Eastern Band of Cherokee in North Carolina (NC) reduced the energy consumption of 9 buildings for a savings of over \$64,000 a year.
  - d. The Chickasaw Nation in Oklahoma (OK) completed lighting upgrades in 17 of their buildings and saw a reduction of over 30% in energy use and a savings of up to \$180,000 per year.
  - e. In Alaska, the Chaninik Wind Group (AK) has reduced the consumption of fossil fuel by 40% in four Lower Kuskokwim Alaska villages, displacing 200,000 gallons of diesel fuel by tapping wind resources, with 65% being captured and stored for use as heat in these remote villages.

Summaries of these projects can be found at <http://energy.gov/indianenergy/maps/tribal-energy-projects-map>. See success stories at <http://energy.gov/indianenergy/listings/indian-energy-blog>.

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<http://energy.gov/articles/energy-department-announces-over-9-million-funding-16-indian-and-alaska-native-community>.

Other DOE offices also fund projects on tribal lands, such as the Office of Fossil Energy's award of \$1.5 million to the Crow Tribe of Indians of the Crow Reservation, for the Montana Integrated Carbon to Liquids (ICTL) Demonstration Program project. This award is an example of clean coal research and development projects benefiting Indian Tribes, and projects allowing energy producing Tribes to compete on the global market such as energy exports. A copy of the Final Technical Report prepared for the ICTL can be found at <http://www.osti.gov/scitech/servlets/purl/1121739>.

- Q3. I have heard one role of the Indian Energy Program is to communicate with Tribes regarding other federal agencies' federal rules impacting Indian Energy development. The Office facilitated educational webinars between the EPA and Indian Tribes for the Clean Power Plan. Can you expand on the role of the Office of Indian Energy Program as it pertains to other federal agency actions like the Clean Power Plan?
- A3. The Energy Policy Act of 2005 established the Office of IE to promote Indian tribal energy development, efficiency and use; reduce or stabilize energy costs; enhance and strengthen Indian tribal energy and economic infrastructure relating to natural resource development and electrification; and to bring electrical power and service to Indian land and homes.

The Office of IE disseminates information on federal agency actions, such as the Clean Power Plan, through its extensive email newsletter subscription at <http://apps1.eere.energy.gov/tribalenergy/>. Also, when tribes contact the Office of IE directly and request information on federal agency actions such as the Clean Power Plan, IE refers the tribes to contacts in the appropriate agency.

For example, when DOE's Indian Country Energy and Infrastructure Working Group (ICEIWG) recently requested that IE provide information to Indian Country on EPA's Clean Power Plan, IE included the topic in its regularly scheduled nationwide webinar series and included speakers from EPA and interested tribes. Also, IE invited EPA to present on the Clean Power Plan to ICEIWG at their January 2016 meeting.

The IE Webinar Series can be found at <http://energy.gov/indianenergy/webinars#series>

- Q4. Under the Clean Power Plan, consumers of Indian coal are pressured to shutter their coal producing units to meet the Plan's emissions targets. How is the Office of Indian Energy communicating to other federal agencies regarding the challenges the Plan presents for tribes that rely on Indian coal production for good-paying jobs and revenue for its tribal government and essential services?
- A4. In general, the Office of IE does not respond to other federal agency actions or proposals by contacting the federal agency directly. When tribes contact the Office of IE on federal agency actions such as the Clean Power Plan, IE refers the tribes to contacts in the appropriate agency to share such information directly.

## QUESTIONS FROM SENATOR JOE MANCHIN III

- Q1. Your agency's Energy Information Administration (EIA) predicts that the United States will continue to rely on fossil fuels to produce a large share of the nation's electricity through 2040. In fact, EIA predicts, in its 2015 Annual Energy Outlook Reference Case coal remains more than a third of total electricity generation in 2040.

A stated goal of the Department of Energy is to see carbon capture, utilization and storage (CCUS) technology across the finish line. The proposed FY 2017 budget for Fossil Energy remains an average of 40% below FY 2016 levels for 10 years, through 2026. In comparison, this budget request includes \$4.2 billion for Energy Efficiency and Renewable Energy (EERE) and only \$600 million for Fossil Energy Research and Development (FE R&D) which, if not for a proposed \$240 million in de-obligated and re-directed funds, would represent a 43% reduction from FY 2016. This year's energy efficiency and renewable energy budget is nearly seven times that of the fossil budget and nearly twelve times when accounting for the de-obligated funds.

If we are going to be serious about moving forward with reducing carbon emissions, we have to be serious about CCUS technology. The proposed reductions to the Fossil Energy program don't reflect that sentiment.

In your opinion, does the proposed budget for the Fossil Energy technology program track the Department's goal of commercially available deployment of CCUS?

- A1. Yes. The Office of Fossil Energy's (FE) budget request provides a substantial amount of funding for research and development (R&D) activities that seek to lower the cost of second generation and transformational carbon capture and storage (CCS) technology. FE funds R&D into all parts of the CCS process including advanced energy systems, capture technologies, storage site characterization, and the monitoring, verification, and accounting technologies needed to ensure long-term storage of carbon dioxide. Lowering the cost of the individual technology components and focusing on system integration and modularization will accelerate CCS deployment to market. In addition to funding new CCS component technologies, the Fiscal Year (FY) 2017 Budget Request allocates funding for several large-scale, carbon capture pilot projects, advancing these promising technologies closer to commercial deployment. Beyond the CCS systems being deployed today, a broad portfolio of second generation technologies is being funded to be ready for demonstration and deployment in the 2020 to 2025 timeframe.

- Q2. I am concerned that the President recommends de-obligating \$240 million from the Texas Clean Energy Project (TCEP) – also known as the “Summit Project” – of the Clean Coal Power Initiative to pay for research and development when the Congressional intent for these funds was to take projects out of the lab and into reality.

The Clean Coal Power Initiative is intended to provide funding for demonstration of coal-based technologies, but DOE is proposing to redirect these funds to the general Fossil Energy R&D program.

It is my understanding that the federal government is proposing to use these funds to pay for other parts of the program budget.

Does this de-obligation represent a withdrawal of a commitment to a project that is under contract for DOE support? Can you explain why this decision was made?

- A2. The FY 2017 Budget Request proposes \$600 million for fossil energy research and development (FER&D) activities, of which \$240 million would come from prior year unobligated balances. It is important to demonstrate that electric generation technology with CCS can be deployed at commercial scale while maintaining reliable, predictable and safe operations. Therefore, the FER&D portfolio includes several major integrated CCS demonstration projects encompassing different technological approaches and applications of CCS. While there are successful CCS demonstration projects underway, there are several Clean Coal Power Initiative (CCPI) projects have not reached financial close after six years. Department of Energy (DOE) intends to suspend further funding for these projects under the CCPI program due to: (1) their lack of progress in obtaining construction financing and regulatory approvals; (2) the loss of federal funds pursuant to section 313 of the Consolidated Appropriations Act, 2016; and (3) regulatory deadlines for project completion imposed by the Energy Policy Act of 2005 and by the conditions in the tax credits allocated to these projects. This will allow DOE to deobligate \$240 million from these projects for use in FY 2017.

- Q3. As you know, I have serious concerns about the Environmental Protection Agency (EPA)’s new source performance standard (NSPS) for new and modified power plants.

The Clean Air Act Section 111(b) requires EPA to use a standard that “reflects the degree of emissions limitation achievable through the application of the best system of emissions reductions which the Administrator determines has been adequately demonstrated.”

In that regulation, the EPA requires new coal power plants to emit no more than 1,400 pounds of carbon dioxide per megawatt hour. That requires the use of at least partial **carbon capture and storage (CCS)** technology. But, as things stand today, the commercial availability for large-scale deployment is still in question.

Is CCS as it stands today commercially viable? If not, isn't now the time to double down on our commitment to Fossil Energy R&D?

- A3. Yes, CCS is commercially viable today. A number of large-scale CCS projects are currently online, or will be completed in the near future. In the United States, the NRG-Petra Nova project is expected to complete construction later this year, demonstrating a post-combustion capture unit with an associated Enhanced Oil Recovery field, and the Kemper Project is expected to begin operations on coal in the near future. The CO<sub>2</sub> emission rates required by the New Source Performance Standard are achievable with today's technologies, and the ongoing research conducted by DOE will further reduce both the energy penalty and cost associated with those technologies.

- Q4. Ensuring reliable electricity is a top priority for me. I assume it continues to be for DOE as well. I believe that the reliability of our generation assets and our electric grid is, at times, a life and death matter.

I am concerned that the regulatory agenda of the EPA combined with market dynamics are forcing the transition of our bulk power system (electricity generation, pipelines and transmission) more rapidly than it can adapt.

We have already witnessed the premature closure of numerous large baseload coal and even nuclear power plants. Furthermore, EIA predicts another 26 gigawatts of coal-plant retirements by 2020 in its AEO'15 Reference case and EPA predicts 73 gigawatts of retirements by 2020 in their Clean Power Plan base case. These plants provide critical services to the grid that allow it to operate reliably.

As you know, West Virginia sits within the PJM Interconnection, which has recently taken steps to enhance its recognition of the value that these plants provide, like reliable access to long-term fuel storage. But EPA regulations still present overwhelming difficulties.

Are you confident that the rapid shift away from baseload power will not jeopardize reliability of the grid?

- A4. Historically, the electric utility sector has a strong track record of protecting the reliability of the Nation's electric grid. Working collaboratively with federal and state

governments, regulators, utilities, vendors, and other stakeholders have developed technologies, tools, processes, and procedures that protect the Nation's critical infrastructure. Within DOE, the Office of Electricity Delivery and Energy Reliability leads the Department's efforts to ensure a resilient, reliable, and flexible electricity system.

Recognizing the importance of maintaining reliability, and as part of the Grid Modernization Initiative FY 2017 Budget Request, DOE proposes to fund a set of regional projects that will demonstrate co-optimization of reliability, affordability, and other key grid attributes in (1) a transmission and distribution system operating reliably on a lean reserve margin; (2) resilient distribution feeders with high percentages of distributed energy resources; and (3) an advanced modern grid planning and analytics platform.

The Federal Energy Regulatory Commission (FERC), together with the North American Electric Reliability Corporation, is extensively engaged in monitoring changes in generation and their interaction with the grid. FERC is planning a Technical Conference on Electricity Reliability on June 1, 2016, specifically to address the reliability of the bulk power system.

DOE is committed to working with FERC, the Environmental Protection Agency (EPA), and other stakeholders to successfully implement EPA's regulations and maintain grid reliability.



## QUESTIONS FROM SENATOR MARTIN HEINRICH

- Q1. With regard to fusion energy sciences, we've recently seen some very exciting new developments out of MIT on high-field superconducting magnets. Why isn't the recent progress on domestic fusion research reflected in what seems to be an otherwise progressive budget with respect to energy research?
- A1. The Fiscal Year (FY) 2017 Budget Request supports investments in key areas that will enable continued U.S. leadership in research to overcome the scientific challenges to achieving fusion energy. The Request will enable maximum usage of our largest domestic fusion facilities to address a wide range of high-priority scientific challenges in fusion. Research based at the Massachusetts Institute of Technology is a vibrant part of this mix and includes the study of high temperature superconducting magnets. The FY 2017 Budget Request will advance first-of-a-kind research in fusion materials science, strengthen our computing effort targeting whole fusion device modeling that ultimately will require exascale computing capability, advance world-leading capabilities in high energy density physics and research in discovery plasma science, and leverage new facility developments overseas through smart partnerships.
- Q2. With respect to the 34 MT of surplus plutonium and the MOX project, going forward, what generally are the key milestones and approvals, including permits, NEPA, and local input, which would be required before any diluted plutonium could be permanently disposed of? What is the approximate timeline for completing these requirements and implementing the dilute and dispose option?
- A2. The explanatory statement accompanying the Consolidated Appropriations Act, 2016 requested that Department of Energy/National Nuclear Security Administration use up to \$5 million to initiate a lifecycle baseline estimate outlining the cost and schedule for the dilute and dispose approach and initiate pre-conceptual design for the proposed project activities at the Savannah River Site in Aiken, South Carolina. This process has recently begun and will outline the additional steps needed to execute this approach.
- Q3. I believe expanding the nation's transmission grid is critical to the continued deployment of wind and solar generation in New Mexico and western states. To that end, I understand the Plains and Eastern Clean Line transmission project has a pending application under DOE's Section 1222. The proposed Plains & Eastern Clean Line is an approximately 700-mile overhead, direct current electric transmission project that

will deliver low-cost, wind energy from the Oklahoma Panhandle region to utilities in Arkansas, Tennessee, and other markets in the Mid-South and Southeast. One hundred percent of this project is privately financed by Clean Line Energy. What is the status and timeline for DOE to complete the NEPA process and issue a ROD for this project?

- A3. On March 25, 2016, Secretary Moniz announced that the Department will participate in the development of the Plains and Eastern Clean Line project, through the authority granted by Congress under Section 1222 of the Energy Policy Act of 2005. The announcement follows the completion of two major elements: the National Environmental Policy Act (NEPA) review and the non-NEPA related review. The Record of Decision can be found at <http://energy.gov/sites/prod/files/2016/03/f30/Clean%20Line%20ROD%20FINAL%203-25-16.pdf>.

## QUESTIONS FROM SENATOR MAZIE E. HIRONO

- Q1. There are 28 electric grid energy storage projects in operation or under development in Hawaii. Such projects can complement new solar and other renewable energy sources to use the power throughout the day and night. Businesses and families are exploring the advantages of having their own energy storage systems. Advances in battery technologies will have obvious benefits to families and businesses looking for vehicles that are independent of volatile global oil prices when it comes to paying their bills. Could you elaborate on the objectives this budget sets for energy storage and how wider use of energy storage could ultimately help make power more affordable and reliable for people in Hawaii and elsewhere?
- A1. The Office of Electricity Delivery and Energy Reliability (OE) Energy Storage program has multiple ongoing projects in Hawaii. These projects, in partnership with the Natural Energy Laboratory of Hawaii Authority (NELHA), Hawaiian Electric (HECO); and Hawaii Electric Light Company (HELCO), are focused on enabling higher levels of renewable integration, deployment of microgrids, and integration of energy storage to improve the resiliency of the grid. Sandia National Laboratories is providing technical consulting, system and grid evaluation, performance modeling, and project engineering and commissioning support for several projects including HECO's 90 megawatt/45 megawatt-hour energy storage system on the Oahu grid and HELCO's proposed 16 megawatt/8 megawatt-hour battery system on the Island of Hawaii.

Sandia National Laboratories has partnered with NEHLA to develop an energy storage test and analysis site at the Hawaii Ocean Science and Technology (HOST) Park. This facility will enable rapid implementation of new energy storage technologies in renewable energy projects in the state. Increased deployment of storage will decrease the amount of expensive diesel generation by allowing more renewables on the grid. Currently, renewable integration in Hawaii is facing serious issues in meeting rapid ramping of variable renewables. In addition, storage can provide spinning reserves to avoid costly outages in case of disruptions of existing fossil generation. Ongoing and future projects during Fiscal Year (FY) 2017 will contribute to optimal deployment of storage to make the island grid more resilient and cost-effective.

- Q2. The 2015 Quadrennial Energy Review (QER) forecast that 1.5 million new jobs could be created in the fields of energy transmission, distribution, and storage by 2030. What does the budget proposal recommend to make sure that we are training people to have the skills necessary to get those jobs, and what in particular can we do to help veterans transition into the clean energy sector?
- A2. The Department of Energy (DOE) supports a variety of specific workforce activities within its program offices to prepare the next generation of workers in a range of new energy technologies. These include, for instance, our Industrial Assessment Centers (IACs), run out of the Office of Energy Efficiency and Renewable Energy (EERE), which provides 25 university centers with funding to perform energy assessments at small and medium-sized manufacturers around the country. The IAC's utilize graduate engineering students to provide these assessments under the guidance of university faculty. Thus, the IAC's provide both a useful energy assessment on ways for manufacturers to save energy, and also provide workforce training to the next generation of manufacturing electrical engineers. These graduate students are some of the most sought-after electrical engineers in their field. The FY 2017 Budget Request includes \$10M per year for the IACs in total, which includes not just the centers, but the Field Manager and any other program support activities, at an approximate cost of \$1.2M annually. The existing IAC solicitation for the centers themselves (\$7M per year target) assumes a consistent number of centers and funding levels. Any budget increase (i.e., above the ~\$8M and towards \$10M) would enable us to increase the number of university sites and/or per center funding.

DOE runs similar programs in grid engineering. In the solar energy field, DOE's SunShot Initiative funded the Solar Instructors Training Network (SITN). Across a five-year span, the SITN's Regional Training Providers offered training to more than 1,000 instructor trainees and partnered with nearly 500 institutions/organizations. This cohesive Network provided training to more than 30,000 students.

DOE's SunShot Initiative also manages the Department's Solar Ready Vets Program. During the pilot, Solar Ready Vets trained 9 cohorts in solar skills on military bases around the country, graduating over 202 exiting service members. Instruction is provided on base by teachers from adjacent community colleges. Active duty service members are

able to receive training just before exiting to Veteran status under the Department of Defense Skill Bridge authority. Virtually every graduating service member has received a job offer from a solar company upon completion of the program and 30% of graduates have accepted offers of employment and are already working in the solar industry. Graduates declining job offers opted instead to return to school, are still active duty, or were unwilling to accept a job that requires them to move away from the military base community or their hometown in a non-solar state to a more robust solar market, or have taken employment with a non-solar company.

The Department also leads a number of workforce initiatives to help prepare individuals to join the energy workforce. One of these initiatives is the Administration's current Utility Industry Workforce Initiative (UIWI) which focuses on hiring veterans in the utility industry. The UIWI is composed of four federal agencies led by DOE and including the Departments of Labor, Defense, and Veteran's Affairs), six major utility trade associations, and two unions. Together this consortium develops activities for outreach to exiting military service members, streamline training opportunities, and provide centralized listings of both utility job opportunities and veterans' resumes.

Finally, DOE's FY 2017 budget proposes \$3.7 million to establish a new office for Energy Jobs Development. This office will consolidate ongoing activities within different DOE Program offices and focus on three areas:

1. Managing the collection of annual energy jobs growth data and issuing an annual U.S. Energy and Employment Report;
  2. Coordinating the ongoing energy job training activities within the program offices and laboratories and managing external partnerships with other federal agencies on energy workforce; and
  3. Providing energy job development technical services to states, municipalities, and tribal governments.
- Q3. In Hawaii, over twelve percent of homes have rooftop solar energy systems, and many residents are eager to add more. Part of the reason I introduced my Next Generation Electric Systems Act, S. 1207, is to spur innovation in the electric system so that it can accommodate high levels of renewable energy and energy storage. In January, the DOE announced two grants to support Hawaii's largest utility in adding more solar

energy and energy storage onto the electric grid. The awards will help Hawaii towards its goal of 100 percent renewable energy by 2045. What lessons has DOE taken from its past grid projects in shaping the grid modernization plan represented in the budget?

- A3. The Department's past efforts in Hawaii played a strong role in the development of the Multi-Year Program Plan and informed our program research and development efforts as well as the integrated systems approach to Hawaii's energy needs. Projects with Hawaii include storage, hydrogen fuels, cybersecurity, microgrids, and every form of renewable energy. DOE has worked with utilities, the Public Utilities Commission, the Department of Defense, and the private sector in working to advance to a clean energy future. Several of DOE's national laboratories have made significant contributions to meeting Hawaii's energy goals.

There are many other examples of DOE working with states, national laboratories, industry and others on grid modernization, many of which are available on DOE program and industry partner websites. Partnerships like the Hawaii Clean Energy Initiative have provided many lessons learned for other states and users. DOE formed the Grid Modernization Initiative to coordinate work across DOE and national laboratory activities and is working to make results from projects like the Hawaii projects visible to all users. The Department is also working to facilitate state to state discussion on topics of mutual interest like activities around needs for advanced distribution controls for widespread use of solar, storage and other technologies. DOE also has published data and reports on [www.smartgrid.gov](http://www.smartgrid.gov) from the \$4.5 billion spent on Recovery Act Smart Grid awards that is helping utilities and states craft Smart Grid use.

- Q4. I support the budget's plan to expand its Energy Transition Initiative efforts to the U.S. Pacific territories and freely associated states, while continuing to assist Hawaii, the Caribbean, and Alaska with the unique challenges of isolated energy systems. Guam, for instance, is an important hub in the Pacific for our strategic rebalance in Asia. Over the next decade, the Department of Defense plans to expand the military's presence in Guam and add 5,000 Marines. Having a reliable and secure energy system in Guam and other territories that are currently dependent on oil from the Middle East and Asia serves our broader national interest. How will the Energy Transition Initiative help the Pacific territories move to cleaner, reliable, and more affordable energy options?

- A4. Through the Energy Transition Initiative (ETI), the U.S. DOE works with local government entities and community stakeholders to help them accelerate the transition to a clean energy economy through the adoption of appropriate policies and technologies. ETI's approach has been developed based on DOE investments in Hawaii, the U.S. Virgin Islands, and other locations. For example, the ETI Energy Scenario Tool, which is derived from the Hawaii Clean Energy Initiative Scenario Analysis from 2008-2010, can be used to model the levelized cost of electricity for custom, user-defined scenarios of supply and demand and whether those fuel portfolios meet a given energy transition goal. With the intention of working with other Federal agencies, in particular the Department of Interior and the Department of State, the FY 2017 Budget Request would support the delivery of ETI resources to the Pacific, helping those communities identify sustainable and reliable alternatives to costly fuel imports using advanced energy technologies, local renewable resources, and energy efficiency solutions.
- Q5. Last year, the Department of Energy established the Office of Technology Transitions to speed commercialization of new energy technologies by the private sector, including small businesses. What are the results of establishing the new office, and how will the budget support the department's efforts to expand its engagement with small businesses?
- A5. DOE is one of the largest supporters of technology transfer within the federal government, and in February 2015, the Office of Technology Transitions (OTT) was created to expand the commercial impact of the Department's portfolio of research, development, demonstration and deployment (RDD&D) activities over the short, medium, and long term. OTT's work includes implementing the key responsibilities and duties assigned to the statutorily-created Technology Transfer Coordinator, developing the statutory Technology Transfer Execution Plan and Annual Technology Transfer Report — both of which are expected to be sent to Congress later in 2016 — and implementing the Clean Energy Investment Center (CEIC).
- OTT conducts activities in three primary areas: stakeholder engagement, data management and analysis, and evidence-based impact evaluations.
- Engagement: OTT conducts roundtables and other meetings across the country to exchange information. The office also engages with and connects DOE laboratories

and stakeholders to promote technology transfer to the private sector. In 2015, OTT held four workshops at DOE's national labs, roundtables on regional-state technology transition opportunities in Colorado, Virginia and Nevada and sent out a Request for Information (RFI) which received 55 submissions. This year, OTT is building on those efforts by engaging with its wide and diverse stakeholder community including DOE's national laboratories, investors, entrepreneurs, policymakers, universities and even members of the Maker community.

- Data Collection and Analysis: DOE collects more than 70 technology transfer-related data points from across the DOE enterprise to evaluate and improve the delivery of DOE's missions. Annually, OTT develops two statutorily-mandated technology transfer-related reports to Congress based largely on this data.
- Evidence-based Evaluations and Impact Studies: OTT assesses the effectiveness of technology transition pilot programs through rigorous, peer-reviewed, evidence-based reports. The office also examines and disseminates best practices, and communicates the broad impact of DOE-funded technology.

In February 2016, OTT launched DOE's Technology Commercialization Fund (TCF). The TCF was authorized in the Energy Policy Act of 2005 and is focused on commercializing energy technologies from DOE national laboratories. Through TCF awards totaling approximately \$20M this year, the national laboratories will be funded to further mature existing lab developed technologies to the point where a private company can be engaged to work towards commercialization. They will also be funded to support commercialization activities in concert with private companies. The TCF fills a critical gap between basic research, such as that funded by the Office of Science or LDRD projects, and the larger field scale demonstrations that the applied programs push to support. TCF projects will support activities such as material qualification, systems integration, scaling the technology towards a large field prototype. The funds provided by DOE must be matched by funds from non-federal sources. Awards are expected to be announced later in 2016.



OTT formally launched the CEIC in January 2016 to enable private, mission-oriented investment in clean energy technologies that address the present gap in U.S. cleantech investment. Specifically, the CEIC is working to create pathways that enable expanded access to the unique technical expertise and capabilities within DOE's programs, sites, and national laboratories located across the country. Currently, the CEIC is focused on developing a "Laboratory Partnering Service." This web-based tool is designed to accept inquiries and connect the requestor to appropriate subject matter experts within the Department's programs or national laboratories. Through this service, public information on current technological research that may be hard to access will be made transparent and more accessible to the public, including the investor and business community e.g. small businesses.

In addition to those specific activities, OTT is also committed to working with its Departmental partners who are also engaging with small businesses. That includes efforts like the Office of EERE's Small Business Vouchers (SBV) pilot, which in March 2016 invested nearly \$6.7 million in 33 national laboratory projects aimed at assisting U.S. small businesses from around the country that were selected to work directly with DOE national labs to put the labs' sophisticated tools and facilities in the hands of small businesses with big ideas but limited resources. The SBV pilot is funded directly by EERE Technology Offices, with appropriated funds, to support lab projects in their respective technology areas. This pilot program does not shift or redirect appropriated funds from one area to another. Rather, the SBV pilot creates a mechanism and organized structure for EERE Technology Offices to develop mission-focused lab projects in partnership with small businesses in their sectors that are working towards EERE's mission as well. In March 2016, the Department announced it is accepting applications for Round 2 of the SBV pilot. A third round of SBV applications, and awards, is expected to follow the second later this summer, and an expanded, technology-neutral Small Business Partnerships program modeled on the SBV pilot is included as a line item in the Department's FY 2017 request.

Through all these efforts, and many others, OTT is committed to nurturing the nation's innovation ecosystem and strengthening U.S. economic competitiveness.

- Q6. I am glad that the budget supports the President's commitment to the Mission Innovation effort among 20 nations to double clean energy research and development funding over the next five years. How will the department ensure that Mission Innovation research and development investments also promote the transfer to small businesses of the resulting clean energy technologies?
- A6. As part of Mission Innovation, DOE is establishing a new Crosscutting Innovation Initiatives program in FY 2017. One activity within the Crosscutting Innovation Initiatives Program supported in the FY 2017 Request is the Small Business Partnerships (SBP) subprogram, through which DOE's world-class National Laboratories will partner with companies around the country on clean energy research, development and demonstration (RD&D). While large industry partners often have better abilities to successfully engage with the National Laboratories, small businesses – the backbone of the nation's economy – often face knowledge, financial, and institutional barriers to accessing the capabilities and resources of DOE National Laboratories. The goal of the SBP subprogram is to increase the interaction of small businesses with the National Laboratories through RD&D by: (1) assisting small businesses to bring next-generation clean energy technologies to the market faster by enabling them to access lab expertise and infrastructure quickly, easily, and affordably; and (2) increasing the interaction of National Labs with partners working on the most pressing and market-relevant RD&D challenges facing the industry to make them better informed and more capable moving forward.

The Department will competitively award clean energy RD&D funding at National Laboratories to partner with small businesses to address their critical clean energy RD&D challenges and opportunities, with an emphasis on small business partners who have not worked with the National Laboratories before. The National Laboratories will conduct competitive evaluation and selection of small business participants under the supervision of EERE and in coordination with the OTT.

## QUESTION FROM SENATOR ROB PORTMAN

Q1. I fully understand that you are going to continue to support the AC100 technology in Oak Ridge through continued R&D, but we are losing the infrastructure and assets that are already in place and paid for in Piketon. The government's most pressing need is for tritium, a critical component for a nuclear deterrent. DOE has identified sources of unobligated fuel that meet the requirements for tritium production for the next 10 years. You say that you have identified options that COULD extend this timeline until 2038. Last October the Department released a report that details five options for meeting the tritium need after the unobligated fuel is used up - all of which, according to your own report, carry significant costs and risk. The report from October even shows that the cost of one option is over \$770m over the seven year window that the report considered. What happens if your five options do not pan out?

A1. As you noted, the Department of Energy (DOE) provided a report to Congress outlining five options for obtaining unobligated low enriched uranium (LEU) fuel for tritium production from existing sources. Each of those options carries different estimated costs and degrees of risk. All of the options outlined either preserve the unobligated status of the existing LEU until it is ready to be used, down-blend highly-enriched uranium from the Department's inventory, or do both.

Already the Department has implemented Options 1 and 2, which have the lowest cost and risk to the government. Combined, these two options will extend the need date for unobligated fuel for tritium production until approximately 2033. There is a moderate risk associated with implementing Option 3 since it would require appropriations on the order of approximately \$770 million over seven years beginning in FY 2019. Option 3 would extend the need date from 2033 to approximately 2038-2041 (depending on how the Department is able to preserve the unobligated status of the down-blended material). Options 4 and 5 have significantly higher (currently unknown) costs and risks.

The report to Congress also identified and compared six different technology options that could provide a new source of unobligated enriched uranium. DOE/National Nuclear Security Administration intends to issue a Request for Information to obtain input from industry regarding technical and possible contractual options that could be used to supply

new LEU fuel for tritium production by 2038-2041. Consistent with the Department's procurement process, all options will be analyzed and considered carefully.

As current commercial industry relies on uranium enriched by centrifuge technology, the Department is confident that a technical solution is achievable within the timeframe by using the first three uranium options outlined above.

Source: Tritium and Enriched Uranium Management Plan Through 2060. Report to Congress, October, 2015.

- Q2. Does Congress need to pass authorization legislation to permit amounts in the USEC Fund to be spent on environmental cleanup at Portsmouth, Paducah, and Oak Ridge? Please provide a statement of legal authority for Congress to use money for those purposes.
- A2. Yes. Through a mandatory spending proposal, the FY 2017 Budget Request would make progress on DOE's cleanup missions at Paducah, Portsmouth, and Oak Ridge, and the Title X Uranium/Thorium Reimbursement Program by harnessing the funds remaining in the United States Enrichment Corporation Fund.
- Q3. With respect to the mandatory spending nature of the request, does the Department propose any specific offset? If so, please provide legislative language to implement that offset. If not, why not?
- A3. Through the Energy Policy Act of 1992, Congress authorized annual deposits to the Uranium Enrichment Decontamination and Decommissioning Fund from an assessment on nuclear utilities from fiscal years 1993 through 2007. The FY 2017 Budget Request proposes to reinstate these fees to offset proposed new mandatory spending for uranium enrichment cleanup. We will continue to work with Congress on any needed legislative language.

## QUESTIONS FROM SENATOR ANGUS S. KING, JR.

- Q1. Biomass heating and electric technology has the potential to grow and fill the need in rural markets to reduce dependence on fossil fuels and lift up hurting communities. Can the Secretary commit to seeing that R&D in the biomass program looks beyond biomass fuel and dedicates resources to developing biomass heating and thermal technology?
- A1. The Billion Ton studies in 2005 and 2011 estimate the potential of over a billion dry tons of biomass available annually. The estimate includes agricultural and forestry residues, several categories of waste materials, and purpose-grown energy crops. There are opportunities to expand the bioeconomy based on the production, collection and harvest, and use of biomass to produce energy and bioproducts. New biomass markets and the associated infrastructure provide jobs, additional income for farmers and forest landowners, and opportunities for environmental enhancements such as helping reduce forest fire and pest risk, using biomass crops to stabilize agricultural soils and provide field buffers, and reduce greenhouse gas emissions. Though the nation will reap the benefits of a more active and mature bioeconomy, rural communities will especially see these benefits firsthand through an addition of jobs and infrastructure.

Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) supports the use of biomass to reduce our dependency on imported oil, enhance environmental quality, and to support rural communities. Ongoing research and demonstration efforts are bringing new technologies to reduce biomass logistical and conversion costs, and to ensure sustainability along the entire supply chain. Such efforts are applicable to and support the use of biomass for biofuels, biopower and heat, and bioproducts to the extent that they are byproducts from biofuels production. These include harvest and preprocessing technologies to access feedstocks and gasification, and pyrolysis technologies to convert biomass to usable intermediates.

EERE's Bioenergy Technologies Office (BETO) mission is focused on reducing oil imports which have been economically taxing to our economy. EERE is committed to supporting the use of biomass as a clean and renewable energy source, as well as

supporting the various opportunities for economic growth and enhancing environmental quality.

BETO indirectly supports heating markets through the innovative reduction of feedstock costs at volume and of suitable quality while ensuring the biomass is sustainable, which helps reduce biofuels costs. Advanced feedstock supply systems will be required to transform the variable, distributed biomass to a uniform high density, stable commodity to enable competition with low oil and gas prices and increasingly economical wind and solar power for heating and power.

- Q2. I have had first-hand experience of how important and valuable the Islanded Grid Resource Center program is, both from the perspective of Maine's island communities and from the Alaska remote community perspective recently. Can you commit to continuing to fund the Islanded Grid Resource Center and its important work?
- A2. The Department has been and continues to be very supportive of the Islanded Grid Resource Center and the other five Regional Wind Resource Centers. The Regional Resource Centers (RRCs), which are supported by the Wind and Water Power Technologies Office's WINDEXchange program, provide accurate and unbiased information about wind energy to regional stakeholders and decision-makers, including information on supply chains, workforce, wind resources, geography, wildlife, electricity infrastructure, and project costs. RRCs provide information about various sizes of wind energy systems, such as utility-scale, distributed wind, and offshore wind, based on various factors within a region of the United States, such as wind resource, energy options, electricity costs, and other considerations.

As indicated in the original 2013 Request for Proposals (RFPs) and agreed to by subcontractors, RRCs are partially funded by competitive awards from the Department and partially by participant cost share. In addition, the RFPs also indicated that awards would run an anticipated 36 months at maximum, and subcontractor cost share would increase annually over that time.

The Fiscal Year (FY) 2017 budget includes sufficient funds to meet the federal cost share for the RRCs through the end of their final contract year, which ends during FY 2017. After that time, the Department will evaluate the RRC performance to measure the success of the three-year effort and inform the future direction of the program's education and outreach.

- Q3. I thank you for the continued support of the University of Maine Deepwater Offshore Wind Project. The question is, will the Department of Energy guarantee that it will hold to its commitment to make a decision by May of this year to select the most viable offshore wind projects that will continue on to the final stages of the Offshore Wind Advanced Technology Demonstration program?
- A3. Yes, after evaluating the status of all five projects in the Offshore Wind Advanced Technology Demonstration program, consisting of the three demonstration projects and two alternate projects, the Department will decide in May 2016 whether DOE funding of any of the demo projects will be discontinued and whether, as a result, one or both alternates may be on-boarded into the demo program.

OIL SUPPLY ARRANGEMENT

Memoranda of Agreement  
Between the  
UNITED STATES OF AMERICA  
and ISRAEL

Signed at Washington March 26, 1979

and

Signed at Washington June 22, 1979

with

Related Understanding





NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 80-497, approved July 8, 1958 (50 Stat. 271; 1 USC 119):—

"... the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence... of the treaties, international agreements, and international conventions entered into or concluded by the President of such treaties and international agreements other than treaties, as the same may be, therein contained, in all the courts of law and equity, and in all the executive, legislative, judicial, and public offices of the United States and of the several States, without any further proof or authentication thereof."

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. Single Subscriptions Price \$12.50 per year in advance. Single copies 50¢ each. For foreign mailing, Single copies vary in price. This issue \$1.25.



ISRAEL

Oil Supply Arrangement

*Memoranda of agreement signed at Washington March 26, 1979;  
Entered into force March 26, 1979;  
And signed at Washington June 22, 1979;  
Entered into force November 25, 1979.  
With related understanding.*

95-446 0

(1)

TIAS 9533

March 16, 1979

MEMORANDUM OF AGREEMENT  
BETWEEN THE GOVERNMENT OF  
THE UNITED STATES AND ISRAEL

The oil supply arrangement of September 1, 1975, between the Governments of the United States and Israel, annexed hereto, remains in effect. A memorandum of agreement shall be agreed upon and concluded to provide an oil supply arrangement for a total of 15 years, including the 5 years provided in the September 1, 1975 arrangement.

The memorandum of agreement, including the commencement of this arrangement and pricing provisions, will be mutually agreed upon by the parties within sixty days following the entry into force of the Treaty of Peace between Egypt and Israel.

It is the intention of the parties that prices paid by Israel for oil provided by the United States hereunder shall be comparable to world market prices current at the time of transfer, and that in any event the United States will be reimbursed by Israel for the costs incurred by the United States in providing oil to Israel hereunder.

3

Experts provided for in the September 1, 1975, arrangement will meet on request to discuss matters arising under this relationship.

The United States administration undertakes to seek promptly additional statutory authorization that may be necessary for full implementation of this arrangement.

*M. Dayan*  
For the Government of  
Israel

*Q. R. [?]*  
For the Government of the  
United States

*M. Dayan*  
Cyrus R. Vance

TIAS 9033

TIAS 9033

## ANNEX

Israel will make its own independent arrangements for oil supply to meet its requirements through normal procedures. In the event Israel is unable to secure its needs in this way, the United States Government, upon notification of this fact by the Government of Israel, will act as follows for five years, at the end of which period either side can terminate this arrangement on one-year's notice.

(a) If the oil Israel needs to meet all its normal requirements for domestic consumption is unavailable for purchase in circumstances where no quantitative restrictions exist on the ability of the United States to procure oil to meet its normal requirements, the United States Government will promptly make oil available for purchase by Israel to meet all of the aforementioned normal requirements of Israel. If Israel is unable to secure the necessary means to transport such oil to Israel, the United States Government will make every effort to help Israel secure the necessary means of transport.

(b) If the oil Israel needs to meet all of its normal requirements for domestic consumption is unavailable for purchase in circumstances where quantitative restrictions through embargo or otherwise also prevent the United States from procuring oil to meet its normal requirements, the United States Government will promptly make oil available for purchase by Israel in accordance with the International Energy Agency conservation and allocation formula, as applied by the United States Government, in order to meet Israel's essential requirements. If Israel is unable to secure the necessary means to transport such oil to Israel, the United States Government will make every effort to help Israel secure the necessary means of transport.

Israeli and United States experts will meet annually or more frequently at the request of either party, to review Israel's continuing oil requirement.

June 22, 1979

MEMORANDUM OF AGREEMENT  
BETWEEN THE GOVERNMENTS OF ISRAEL AND  
THE UNITED STATES

Pursuant to the Memorandum of Agreement between the Governments of the United States and Israel signed March 26, 1979, Israel and the United States have entered into the Oil Supply Arrangement set forth herein as follows:

1. Israel will make its own independent arrangements for oil supply to meet its requirements through normal procedures. In the event Israel is unable to secure its needs in this way, the United States Government, upon notification of this fact by the Government of Israel will act as follows:

(a) If the oil Israel needs to meet all its normal domestic requirements is unavailable for purchase in circumstances where no quantitative restrictions exist on the ability of the United States to procure oil to meet its normal requirements, the United States Government will promptly make oil available for purchase by Israel to meet the shortfall in the aforementioned normal requirements of Israel. Oil will be made available to Israel as soon as practicable after notification; the United States will make every effort to ensure this period is less than 60 days.

(b) If the oil Israel needs to meet all of its normal requirements for domestic consumption is unavailable for purchase in circumstances where quantitative restrictions through embargo or otherwise also prevent the United States from procuring oil to meet its normal requirements, the United States Government will promptly make oil available for purchase by Israel in accordance with the International Energy Agency conservation and allocation formula as applied by the United States Government, in order to meet the shortfall in Israel's essential requirements. Oil will be made available to Israel as soon as practicable after notification; the United States will make every effort to ensure this period is less than 60 days.

(c) If Israel is unable to secure the necessary means to transport to Israel oil made available pursuant to this Agreement, the United States Government will make every effort to help Israel secure the necessary means of transport.

Attachment 1 DOE OFR 2016

2. Prices paid by Israel for oil provided by the United States hereunder shall be comparable to world market prices current at the time of transfer. Israel will, in any event, reimburse the United States for the costs incurred by the United States in providing oil to Israel hereunder.

3. Israeli and United States experts will meet annually or more frequently at the request of either party, to review Israel's continuing oil requirement and to develop and review any necessary contingency implementing arrangements.

4. This Memorandum of Agreement is subject to applicable United States law. The United States administration may seek additional statutory authorization that may be necessary for full implementation of this Memorandum of Agreement.

5. This Memorandum of Agreement shall enter into force on November 25, 1979 and shall terminate on November 25, 1994. The oil supply arrangement of September 1, 1975 between the Governments of Israel and the United States shall be in force during the period from the date of this Memorandum of Agreement to November 25, 1994 and shall be performed and implemented in accordance with the provisions of this Memorandum of Agreement.

*Richard J. Russell*  
For the Government of  
the United States

*Abba Eban*  
For the Government of  
Israel

Richard J. Russell  
Yasur Nechumim

TIAS 9038

9

[RELATED UNDERSTANDING]

June 22, 1979

In connection with the Memorandum of Agreement being entered into on this date between the Government of Israel and the Government of the United States, Israel and the United States understand that:

Because of the unique security situation of Israel its oil reserves are and should be at the level equal to six months of Israel's oil consumption; and in this connection U.S. oil supplies should be at such levels that U.S. ability to meet its oil requirements will not be adversely affected.

For the Government of  
the United States

*Richard J. Russell*

For the Government of  
Israel

*Abba Eban*

TIAS 9038

U.S. GOVERNMENT PRINTING OFFICE : 1980 O-30-446

## ENERGY

Agreement Between the  
UNITED STATES OF AMERICA  
and ISRAEL

Amending and Extending the  
Memorandum of Agreement of  
June 22, 1979

Effectuated by Exchange of Notes  
Dated at Tel Aviv and Jerusalem  
October 19 and November 13, 1994



NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89-497, approved July 8, 1966 (80 Stat. 271; 1 U.S.C. 113)—

"... the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence . . . of the treaties, international agreements other than treaties, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, therein contained, in all the courts of law and equity and of maritime jurisdiction, and in all the tribunals and public offices of the United States, and of the several States, without any further proof or authentication thereof."

ISRAEL

Energy

*Agreement amending and extending the memorandum of agreement of June 22, 1979,  
Effectuated by exchange of notes*

*Dated at Tel Aviv and Jerusalem October 19 and*

*November 13, 1994;*

*Entered into force November 13, 1994.*

No. 103

The Embassy of the United States of America presents its compliments to the Ministry of Foreign Affairs of the State of Israel and has the honor to inform the Ministry that the Government of the United States proposes an extension, for an additional year, of the Memorandum of Agreement between the United States and Israel signed at Washington June 24, 1979.<sup>1</sup> For this purpose, the United States proposes that paragraph 5 of the Memorandum of Agreement be amended to read in its entirety as follows:

5. This Memorandum of Agreement shall enter into force on November 25, 1979 and shall terminate on November 25, 2004.

If this proposal is acceptable to the Government of Israel, the United States further proposes that this note and the Government of Israel's reply shall constitute an agreement between our two governments and that the amendment shall enter into force on the date of the Government of Israel's reply. It is further the understanding of the United States that the October 17, 1980 contingency implementing arrangements related to the Memorandum of Agreement will as a consequence of this extension also remain in force in accordance with paragraph 20 of these arrangements.

The Government of the United States of America avails itself of this opportunity to renew to the Government of the State of Israel the assurances of its highest consideration.

Embassy of the United States of America,  
Tel Aviv, October 19, 1994.

<sup>1</sup> TIAS 5933, 30 UST 5994.

TIAS 12490

MINISTRY OF FOREIGN AFFAIRS  
JERUSALEM  
65560

מסד החוץ  
ירושלים

The Ministries of Energy and of Foreign Affairs of the State of Israel present their compliments to the Embassy of the United States of America and have the honor to inform the Embassy that the Government of Israel accepts the proposal contained in the Embassy's Note No. 103 of 19 October 1994, concerning the extension of the Memorandum of Agreement of 22 June 1979, for an additional period of 10 years.

The Ministries confirm that the Government of Israel shares the understanding that the October 17, 1980 contingency implementing arrangements remain in force, subject to future revisions under the terms of the arrangements.

The Ministries of Energy and of Foreign Affairs of the State of Israel avail themselves of this opportunity to renew to the Embassy of the United States of America the assurances of their highest consideration.

Jerusalem, 13 November 1994

Embassy of the  
United States of America  
in Israel

TIAS 12590



ENERGY

Agreement Between the  
UNITED STATES OF AMERICA  
and ISRAEL

Amending the Contingency Implementing  
Arrangements of October 17, 1980

Effectuated by Exchange of Notes  
Dated at Tel Aviv and Jerusalem  
June 21 and 27, 1985



NOTE BY THE DEPARTMENT OF STATE

Pursuant to Public Law 89-497, approved July 8, 1966 (80 Stat. 271; 1 U.S.C. 113)—

"... the Treaties and Other International Acts Series issued under the authority of the Secretary of State shall be competent evidence in the courts of the United States of the existence, content, and proclamations by the President of such treaties and international agreements other than treaties, as the case may be, heretofore contained, in all the courts of law and equity and of the United States, and of the treaties and public officers of the United States, and of the laws, decrees, and other acts of the United States, and of the laws, decrees, and other acts of the United States, without any further proof or authentication thereof."

ISRAEL

Energy

*Agreement amending the contingency implementing arrangements of October 17, 1980. Effected by exchange of notes. Dated at Tel Aviv and Jerusalem June 21 and 27, 1995; Entered into force June 27, 1995.*

(1)

TJAS 12570

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The American Embassy to the Ministry of Foreign Affairs of Israel

EMBASSY OF THE  
UNITED STATES OF AMERICA

No. 15495

The Embassy of the United States of America presents its compliments to the Ministry of Foreign Affairs of the State of Israel and has the honor to refer to the 1980 contingency implementing arrangements relating to the Memorandum of Agreement of June 22, 1979 (hereinafter "the contingency implementing arrangements"). Pursuant to recent correspondence between our two governments relating to modifications of these arrangements, the United States proposes the following amendments to the contingency implementing arrangements:

A. Paragraph 3 is replaced with the following: "3. Absent a shortfall in the amount of oil physically available to Israel on the world market, the MOA could be activated when Israel is paying for its major import basket, as defined hereinafter, an average price that is 20 percent or more above the average price of such crude oils as published in Platt's Crude Oil Assessment. For the purpose of this paragraph, Israel's 'major import basket' shall be defined as the following crude oils or their equivalents, measured in equal proportion: Brent, Oseberg, Uthmaniyah, Cushing, and others. The time period for measurement of these factors would be the 60 days preceding notification. In the event the percentage of total Israeli oil imports represented by its major import basket falls below 50 percent, the parties agree to renegotiate the definition of the basket for the purposes of this paragraph to better represent in the future Israel's actual imports."

B. The first sentence of paragraph 4 is replaced with the following: "4. If Israel were to lose its existing sole source of long-term supply (or a replacement source providing 22 percent or more of Israel's oil imports), notwithstanding Israel's reasonable efforts to obtain said sources of supply, without immediately replacing it with an equivalent source, the MOA could be activated immediately." The remainder of the paragraph is unchanged.

C. Paragraph 17 is replaced with the following: "17. At the request of the United States, Israel shall inform the United States of the quantity, quality, price and other relevant conditions of oil imports into Israel, Israel's requirement for

<sup>1</sup>TIAS 9048, 9531; 50 U.S.T. 3697, 30 I.O.T. 3594.

TIAS 12670

the preceding 3-month period and its forecast for imports and requirements for the next 6-month period."

D. Paragraph 18 is replaced with the following: "18. At the request of either party, United States and Israeli experts will meet to review Israel's oil situation in light of prevailing market conditions and to review and, if necessary, further develop or modify these contingency implementing arrangements by mutual agreement."

E. Paragraph 20 is replaced with the following: "20. These arrangements shall apply as long as the MOA is in force, unless suspended by either party upon 6-months written notice. Suspension of these arrangements shall in no way affect the continued validity of the MOA. In the event of suspension, both parties will make every effort to reach renewed agreement on contingency implementing arrangements."

If these amendments are acceptable to the Government of Israel, the United States proposes that this note and the Government of Israel's reply shall constitute an agreement between our two governments and that the amendments to the arrangements shall enter into force on the date of the Government of Israel's reply.

The Embassy avails itself of this opportunity to renew to the Ministry of Foreign Affairs the assurances of its highest consideration.

Embassy of the United States of America  
Tel Aviv, 21 June 1995

TIAS 12670

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*The Ministry of Foreign Affairs of Israel to the American Embassy*

MINISTRY OF FOREIGN AFFAIRS  
JERUSALEM

85102.

The Ministry of Foreign Affairs presents its compliments to the Embassy of The United States of America and referring to the Embassy's Note No.13895 dated June 21, 1995, concerning amendments to the 1980 contingency implementing arrangements relating to the Memorandum of Agreement of June 22, 1979, has the honor to accept the proposed amendments, as follows:

[For text of the U.S. note, see pp. 2-3.]

The Ministry of Foreign Affairs avails itself of this opportunity to renew to the Embassy of the United States of America the assurances of its highest consideration.

Jerusalem, June 27, 1995

ISRAEL  
Oil Supply Arrangement  
Contingency implementing arrangements relating to the memorandum of agreement of June 22, 1979,  
Signed at Washington October 17, 1980,  
Referred into force October 17, 1980.  
With related items.

(3857)  
TIAS 8908

CONTINGENCY IMPROVING ARRANGEMENTS  
FOR THE  
MEMORANDUM OF AGREEMENT OF JUNE 22, 1978  
UNITED STATES AND ISRAEL

1. This agreement is to specify the conditions for the activation of the Emergency Reserve under the Agreement (MOA) between the United States and Israel on oil supply and the means by which the MOA would be implemented.

2. Pursuant to paragraph 1 of the MOA, Israel may give notification to the United States, the State Department, the State Bureau of Near Eastern and South Asian Affairs, the Department of Energy, and the Department of Defense, that it is unable to secure its needs, or some part thereof, on a continuing basis. The notification must be substantiated by evidence to be provided on request. Consultations between the United States and Israel would then take place as soon as possible after receipt of the notification. Upon the receipt of the notification, the United States would be required to make every effort to ensure that the period of time that Israel is unable to secure its needs is less than 90 days.

3. Absent a shortfall in the amount of oil physically available to Israel in the world market, the MOA could be activated when Israel:

- (a) is paying for all its imported oil an average price higher than the average cost of the oil imported into the United States; and
- (b) has to buy at least 50% of its oil through short-term, indirect purchases.

The time period for measurement of these factors would be the 90 days preceding notification.

4. If Israel were to lose one of its two existing main sources of long-term supply (or a replacement source providing Israel's reasonable efforts to obtain said source failed), the United States would make every effort to ensure that Israel's needs are met, without immediately replacing it.

After entering United States and Israeli experts would meet every three months or more often on request, to review Israel's oil supply situation and its attempts to obtain oil and to adjust Israel's allocation accordingly. Israel's allocation right would be adjusted to the extent of its vulnerability to lack of oil. The United States would make the necessary "best efforts" to secure oil independently in such manner as to reduce or eliminate its dependency on oil made available by the United States through the OPEC. When Israel's allocation right under the OPEC is exhausted, the United States would be obligated to attempt to adjust its own oil supply and its arrangements for oil supply to Israel in an orderly fashion.

(a) The United States would first try to use its good offices with other nations and with private companies to arrange for alternative foreign sources of supply for sales to Israel. Price and other terms would be worked out between the supplier and Israel.

(c) If there is no other more suitable alternative, the United States currently possesses fulfilling its obligation under the MOA by making oil available to Israel through swaps or direct sale of domestically produced oil.

10. In any of these arrangements the United States will, to the extent possible, take into account the

11. Under the terms of the MOA, the price paid for oil supplied by the United States shall be comparable to world market prices current at the time of transfer. Israel will, in any event, reimburse the United States for the costs incurred by the United States in providing oil to Israel hereunder.

12. The U.S. Government would make all necessary arrangements with appropriate U.S. agencies and relevant suppliers to implement fully the U.S. commitment to make oil available for purchase by Israel.

14. Arrangements would be made for appropriate participation of United States flag carriers in the transportation of oil from the United States under paragraph 9(c) above. If Israel is unable to secure the necessary means to transport to Israel oil made available pursuant to the MOU, the United States Government would make every effort to help Israel secure the necessary means of transport.

15. In the event of war or damage to Israel's refining capacity or storage installations, to adjust for variations of API gravity crude oil, or for other reasons, Israel may require refined petroleum products. In that event, the United States and Israeli Governments would promptly consult as to the means by which Israel might acquire and transport such products.





No. 103-04

The Embassy of the United States of America presents its compliments to the Ministry of Foreign Affairs of the State of Israel and has the honor to inform the Ministry that the Government of the United States proposes an extension, for ten additional years, of the Memorandum of Agreement between the Governments of the United States and Israel signed at Washington June 22, 1979, as amended by exchange of notes October 19 and November 13, 1994. For this purpose, the United States proposes that paragraph 5 of the Memorandum of Agreement be amended to read in its entirety as follows:

"5. This Memorandum of Agreement shall enter into force on November 25, 1979 and shall terminate on November 25, 2014."

If this proposal is acceptable to the Government of Israel, the United States further proposes that this note and the Government of Israel's reply shall constitute an agreement between our two Governments, which shall enter

DIPLOMATIC NOTE

into force on the date of the Government of Israel's reply. It is further the understanding of the United States that the October 17, 1980 contingency implementing arrangements, as amended by exchange of notes June 21 and 27, 1995, related to the Memorandum of Agreement will as a consequence of this extension also remain in force in accordance with paragraph 20 of the arrangements.

The Government of the United States of America avails itself of this opportunity to renew to the Government of the State of Israel the assurances of its highest consideration.



Embassy of the United States of America,

Tel Aviv, November 23, 2004.

MINISTRY OF FOREIGN AFFAIRS  
JERUSALEM



משרד החוץ  
ירושלים

Note No. 882/04

The Ministry of Foreign Affairs presents its compliments to the Embassy of the United States of America and referring to the Embassy's note no. 103-04 of November 23, 2004, which proposes an extension, for ten additional years, of the Memorandum of Agreement between the Governments of the State of Israel and of the United States signed at Washington on June 22, 1979, as amended by an exchange of notes of October 19 and November 13, 1994, has the honour to accept the proposed extension.

For this purpose paragraph 5 of the Memorandum of Agreement will read in its entirety as follows:

"5. This Memorandum of Agreement shall enter into force on November 25, 1979 and shall terminate on November 25, 2014."

The Government of the State of Israel further accepts the proposal of the Government of the United States that its note and the present Israeli note of reply shall constitute an agreement between both governments, which shall enter into force on the date of this Israeli note of reply.

Israel shares the understanding of the United States that the October 17, 1980 Contingency Implementation Arrangements, as amended by exchange of notes of June 21 and 27, 1995, related to the Memorandum of Agreement will as a consequence of this extension also remain in force in accordance with paragraph 20 of the arrangements.

The Government of the State of Israel avails itself of this opportunity to renew to the Government of the United States of America the assurances of its highest consideration.

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Jerusalem, November 23, 2004.

Embassy of the  
United States of America  
In Israel



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The Ministry of Foreign Affairs of the State of Israel presents its compliments to the Embassy of the United States of America and referring to the Embassy's note no. 29/15 of March 2015, which proposes an extension for ten additional years, of the Memorandum of Agreement between the Government of the State of Israel and of the United States signed in Washington on June 22, 1979, as amended by an exchange of notes on October 19 and November 13, 1994, and November 23, 2004, has the honor to accept the proposed extension.

For this purpose paragraph 5 of the Memorandum of Agreement will read in its entirety as follows:

“5. This Memorandum of Agreement shall enter into force on November 25, 1979 and shall terminate on November 25, 2024.”

The Government of the State of Israel further accepts the proposal of the Government of the United States that its note and the present Israeli note of reply shall constitute an Agreement between both Governments, which shall enter into force on the date of this Israeli note of reply.

Israel shares the understanding of the United States that the October 17, 1980 Contingency Implementation Arrangement, as amended by exchange of notes of June 21 and 27, 1995, related to the Memorandum of Agreement will as consequence of this extension also remain in force in accordance with paragraph 20 of the Arrangement.

**DIPLOMATIC NOTE**

Attachment 1 DOE QFRs 2016

The Government of the State of Israel avails itself of this opportunity to renew to the Government of the United States of America the assurances of its highest consideration.

The Ministry of Foreign Affairs

Jerusalem, April 13, 2015

