# THE DEPARTMENT OF ENERGY'S ROLE IN ADVANCING THE NATIONAL, ECONOMIC, AND ENERGY SECURITY OF THE UNITED STATES

## HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY AND POWER

OF THE

COMMITTEE ON ENERGY AND COMMERCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED FOURTEENTH CONGRESS

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WITNESSES

# THE DEPARTMENT OF ENERGY'S ROLE IN ADVANCING THE NATIONAL, ECONOMIC, AND ENERGY SECURITY OF THE UNITED STATES

**THURSDAY, SEPTEMBER 15, 2016**

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY AND POWER,
COMMITTEE ON ENERGY AND COMMERCE,
*Washington, DC.*

The subcommittee met, pursuant to call, at 10:00 a.m., in room 2322 Rayburn House Office Building, Hon. Pete Olson presiding.

Members present: Representatives Olson, Barton, Latta, Harper, McKinley, Kinzinger, Griffith, Johnson, Flores, Mullin, Upton (ex officio), Rush, McNerney, Tonko, Engel, Green, Capps, Doyle, Castor, Sarbanes, Welch, Yarmuth, and Pallone (ex officio).

Staff present: Will Batson, Legislative Clerk, Energy & Power; Blair Ellis, Digital Coordinator/Press Secretary; Tom Hassenboehler, Chief Counsel, Energy & Power; Robert Ivanauskas, Detailee, Energy & Power; A.T. Johnston, Senior Policy Advisor; Ben Lieberman, Counsel, Energy & Power; Brandon Mooney, Professional Staff Member, Energy & Power; Mary Neumayr, Senior Energy Counsel; John Ohly, Professional Staff, Oversight & Investigations; Dan Schneider, Press Secretary; Peter Spencer, Professional Staff Member, Oversight; Andy Zach, Counsel, Energy & Environment; Jean Fruci, Minority Energy and Environment Policy Advisor; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; John Marshall, Minority Policy Coordinator; Dan Miller, Minority Staff Assistant; Alexander Ratner, Minority Policy Analyst; Tim Robinson, Minority Chief Counsel; Andrew Souvall, Minority Director of Communications, Outreach and Member Services; Tuley Wright, Minority Energy and Environment Policy Advisor; and C.J. Young, Minority Press Secretary.

## OPENING STATEMENT OF HON. PETE OLSON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF TEXAS

Mr. OLSON. This hearing will finally come to order. Obviously, four votes and members going home have put a time crunch on this committee.

I want every member to know, whether you're Republican or Democrat, ten terms or your first term, you will have a chance to ask our witness your questions.

But that means I'll be very aggressive with the gavel to ensure you stick to the 5-minute limit, and here's my example. I give myself 5 minutes for an opening statement.

America is back. We are an energy superpower. That statement would have sounded odd a handful of years ago and laughable in the 1970s.

But the fact is we are awash in energy. Today, we are the world's leading producer of oil and gas and we are less reliant upon foreign sources of energy.

Our resources are plentiful and affordable—so affordable that low prices have become a common complaint back home in Houston, Texas, except for my daughter in college who now has more money from her allowance. Instead of buying gasoline, she goes to Starbucks more often.

This subcommittee has been hard at work to bring energy policy into the 21st century and we are beginning to see positive effects. Since we have lifted the ban on crude exports last year, American oil is spreading all across the globe. We are undercutting OPEC and Russia, helping our allies and giving American workers an opportunity to compete. Natural gas imports are ramping up as well, a trend that's likely to continue if we get the permitting process right.

Unlike other energy commodities, you have to ask DOE for a permit to export natural gas. Unfortunately, these are applications that have been held up at DOE and sometimes for at least three years without a decision.

These delays are jeopardizing major construction projects and threatening American jobs. We have the opportunity for jobs and affordable energy right here at home and to our allies abroad.

But there is still much work to be done. It is hard to build infrastructure in this country. Yes, my own state of Texas has plenty of oil and gas to serve our homes and our businesses. But our friends in New England face gas shortages and price spikes because it is almost impossible to build a pipeline.

In other parts of the country people pay more than they should for electricity because of harmful EPA regulations. We are using our Energy Conference with the Senate to examine ways to improve infrastructure permitting plus a whole host of other topics such as grid and cybersecurity, energy efficiency and workforce development.

Likewise, we are in an era of abundance at home and must be vigilant concerning emergency preparedness. For example, the Nation's Strategic Petroleum Reserve—the SPR—is aging rapidly and the DOE's long-term strategic review, at least last week, raise very serious issues about the ability of the SPR to meet its mission.

According to the report, the SPR may only be able to effectively distribute about half as much of the oil it is designed to supply in an emergency—one half.

Congress has authorized $2 billion for SPR infrastructure modernization. But before that can be approved we need the department to be open and transparent about the condition of SPR and the funds required to rehabilitate it.

We want to make DOE a bigger part, a critical part, of our emergency response and that's why we used last year's FAST Act to

grant new emergency authorities and procedures to act in some specific cases.

However these limits—there are limits to this authority that we give DOE. Any new requests will be closely scrutinized.

Again, thank you for joining us today, Mr. Secretary. I am proud that this hearing, just like last week's, will mostly be bipartisan. Everybody on this dais wants the same thing—an energy economy that brings jobs and creates security at home with opportunities to advance our interests overseas.

[The prepared statement of Mr. Olson follows:]

## OPENING STATEMENT OF HON. PETE OLSON

America is an energy superpower. That statement would have sounded odd a handful of years ago, and laughable in the 1970s. But the fact is that we are awash in energy. Today, we are the world's leading producer of oil and gas and we're less reliant on foreign imports. Our resources are plentiful and affordable—so affordable that low oil prices have become a common complaint back in Houston.

This subcommittee has been hard at work to bring our energy policy into the 21st century, and we're beginning to see the positive effects. Since we've lifted the ban on crude oil exports last year, American oil is a spreading across the globe. We are undercutting OPEC and Russia, helping our allies, and giving American workers an opportunity to compete.

Natural gas exports are ramping up as well, a trend that is likely to continue if we get the permitting process right. Unlike other energy commodities, you have to ask DOE for a permit to export natural gas. Unfortunately, there are applications that have been held up at DOE for years without a decision. These delays are jeopardizing major construction projects and threatening American jobs.

We have the opportunity for jobs and affordable energy at home and aid to our allies abroad.

But there is still much work to be done——

It is too hard to build infrastructure in this country. Yes, Texas has plenty of oil and gas to serve our homes and businesses, but our friends in New England face gas shortages and price spikes because it's almost impossible to build a new pipeline. And in other parts of the country, people pay more than they should for electricity because of harmful EPA regulations.

We are using the energy conference to examine ways to improve infrastructure permitting, pl us a whole host of other topics such as grid and cyber-security, energy efficiency, and workforce development.

Likewise, while we are in an era of abundance at home, we must be vigilant in considering emergency preparedness. For example, the nation's Strategic Petroleum Reserve (SPR) is aging rapidly, and the DOE's Long-Term Strategic Review, released last week, raised very serious issues about the ability of the SPR to meet its mission.

According to the report, the SPR may only be able to effectively distribute about half as much oil as it is designed to supply in an emergency. Congress has already authorized $2 billion dollars for SPR infrastructure modernization. Before it can be appropriated, we need the Department to be open and transparent about the condition of the SPR and funds required to rehabilitate it.

We want to make sure DOE stays a critical part of emergency response. That is why we used last year's FAST Act to grant new emergency response procedures to the Department to act in some specific cases. However, there are limits to the authority we will give to the DOE. Any new request will be closely scrutinized.

Again, thank you for joining us today Mr. Secretary. I am proud that this hearing—just like last week's—is relatively bipartisan. Everyone on this dais wants the same thing: an energy economy that brings economic and security benefits at home and opportunities to advance our interests abroad.

Mr. OLSON. And I yield back the balance of my time and recognize the ranking member of the full committee, Mr. Pallone, for an opening statement for 5 minutes.

**OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY**

Mr. PALLONE. Thank you. Thank you, Chairman, for holding today's hearing evaluating the Department of Energy's work on energy security here in the United States and I'd like to welcome Secretary Moniz back and thank him for his efforts to provide us all with a more secure energy future.

This is an important topic but the realities of energy security are changing as our energy mix changes. We can no longer simply look at oil supply when we think about energy security.

Our country must take a broader approach that encompasses cleaner energy technologies including renewable energy technologies, which are becoming more affordable.

And beyond the realities of our energy mix we must recognize the impacts climate change is having on energy security here in the United States and abroad.

Our nation is not alone in this. The G7 Energy Initiative for Energy Security states "that reducing emissions from fossil fuels is necessary to tackle climate change and can enhance our energy security."

Simply put, an energy future that reduces our carbon emissions and our reliance on fossil fuels is a more secure energy future. But simply recognizing and identifying issues affecting our energy security is not enough. We must take real action to enhance and protect our energy infrastructure. I have championed two critical proposals borne out of DOE's quadrennial energy review—one to support state efforts to modernize and harden the electricity grid and the other to encourage investment in the repair of old leaking natural gas pipeline infrastructure in major metropolitan regions.

And to make our energy future more secure, we must make serious investments in our aging and often outdated energy infrastructure.

I would be remiss if I did not also mention the energy bill conference. Along with my colleagues who sit on the conference committee, we have started the difficult process of merging two very different bills, and while some progress has been made there are still many contentious issues to be resolved and I have made it clear that one of my top priorities in any final energy conference report is providing investments in our energy infrastructure to address some of the needs outlined in the QER such as grid modernization.

Mr. Chairman, the energy sector in 2016 looks vastly different than it did the last time we passed major energy legislation. Changes in energy markets, new technologies, improved efficiency and shifting consumer demand are all transforming how we think about energy security.

Secretary Moniz, I want to thank you for bringing this conversation to the forefront and for your work to bolster our energy and overall national security and I look forward to your testimony.

And I would like to yield the remainder of my time to Mr. McNerney.

Mr. MCNERNEY. Well, first of all, I want to thank the chairman for holding this hearing. Energy is an issue I care deeply about. I am glad to have a chance to hear from Secretary Moniz.

Mr. Secretary, I am always happy to have you in front of our committee to give us the latest information on what's happening at the DOE and around the country in the energy sector.

I doubt if anyone in our country is more knowledgeable than you are and you have the gift of being able to traverse the political landscape without too many scars to show. So congratulations.

Our nation's energy system works reasonably well most of the time, providing electricity, natural gas, oil and coal reliably and at an affordable cost.

This has been one of the foundations of our nation's economy and security. Because of this, most people take our energy system for granted until the disruption takes place such as an oil shortage or oil price spikes, large power failures or climate-caused disasters.

It is our and your responsibility, Mr. Secretary, to make sure that the energy systems continue to operate smoothly and reliably. This means the proper regulatory framework be in place to encourage the investments needed to keep our energy systems operating and up to date with the challenges we face of new technology, changing demand, a changing generation—new sources of oil and gas—retiring nuclear plants and the different threats to our energy systems.

The quadrennial energy review along with other statutes such as the FAST Act and the pending North America Energy Security and Investment Act are designed to make sure that we succeed in keeping our energy system in good condition.

And that brings us to today's hearing. Mr. Secretary, I look forward to your testimony and to the back and forth that will follow to help me increase my understanding of our successes and of the challenges that remain.

Mr. Chairman, I yield back.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

Thank you Chairman Olson and Ranking Member Rush for holding today's hearing evaluating the Department of Energy's work on energy security here in the United States. I would like to welcome Secretary Moniz back and thank him for his efforts to provide us all with a more secure energy future.

This is an important topic—but the realities of energy security are changing as our energy mix changes. We can no longer simply look at oil supply when we think about energy security; our country must take a broader approach that encompasses cleaner energy technologies, including renewable energy technologies, which are becoming more affordable. And, beyond the realities of our energy mix, we must recognize the impacts climate change is having on energy security here in the U.S. and abroad. Our nation is not alone in this: the G7 Energy Initiative for Energy Security states that "reducing emissions from fossil fuels is necessary to tackle climate change and can enhance our energy security." Simply put, an energy future that reduces our carbon emissions and our reliance on fossil fuels is a more secure energy future.

But simply recognizing and identifying issues affecting our energy security is not enough—we must take real action to enhance and protect our energy infrastructure. I have championed two critical proposals—born out of DOE's Quadrennial Energy Review (QER)—one to support state efforts to modernize and harden the electricity grid, and the other to encourage investment in the repair of old, leaking natural gas pipeline infrastructure in major metropolitan regions. To make our energy future

more secure, we must make serious investments in our aging and often outdated energy infrastructure.

I would be remiss if I did not also mention the ongoing energy bill conference. Along with my colleagues who sit on the conference committee, we have started the difficult process of merging two very different bills. And while some progress has been made, there are still many contentious issues to be resolved. I have made it clear that one of my top priorities in any final energy conference report is providing investments in our energy infrastructure to address some of the needs outlined in the QER, such as grid modernization.

The energy sector in 2016 looks vastly different than it did the last time we passed major energy legislation. Changes in energy markets, new technologies, improved efficiency and shifting consumer demand are all transforming how we think about energy security. Secretary Moniz, I thank you for bringing this conversation to the forefront and for your work to bolster our energy and overall national security. I look forward to your testimony.

Mr. OLSON. Gentleman yields back and right now it is time our distinguished witness to speak for 5 minutes. Mr. Moniz—he is our secretary of energy, a regular here at the committee.

You have an invitation in December to come to Thompsons, Texas and see the energy at Petra Nova project. As you know, my friend, that's the first viable carbon capture enhanced oil recovery situation in the whole country. So invitation and 5 minutes for your opening statement.

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

Secretary MONIZ. Thank you, Vice Chairman Olson and Ranking Member Pallone and members of the subcommittee.

I am very pleased to be here to discuss our role in energy security. U.S. energy security must be considered in the context of the changing U.S. energy profile, the evolving threat environment and the global security challenges facing our country and our allies in various regional settings.

The U.S. is now the number-one producer of liquid fuels and of natural gas in the world but remains a major importer of crude oil. The unconventional production locations of the new supply creates infrastructure challenges and the spread between U.S. and European and Asian natural gas prices has been reduced considerably.

Renewable energy technology deployment is rising rapidly as costs continue to fall. Energy efficiency policies and technologies are contributing to slow growth in demand for electricity and flat or declining demand for oil even as our economy grows.

Natural gas has replaced coal as the largest fuel source for power generation. This dramatically changed and changing energy landscape faces an evolving set of threats as well and the structure and nature of our energy emergency responses must keep pace with reality.

We know that adversaries and homegrown actors are interested in the vulnerabilities of our critical infrastructures. Threats to our infrastructure includes severe weather, storm surges, exacerbated by rising and warming seas, earthquakes, wildfires, EMP, aging infrastructure, cyber threats, kinetic attacks, and growing infrastructure interdependencies.

In response, there are now a range of laws, actions, and presidential directives and orders designed to protect our citizens, the

economy and critical infrastructures from those with malevolent intent and from the effects of natural disaster.

Challenges like these underscore the need to rethink energy security in light of modern, domestic and global energy markets—the subject of this hearing.

In June 2014, the G–7 and the EU endorsed a set of seven modern energy security principles. These principles are premised on the recognition of energy security as a collective responsibility among allies and friends. The first two principles deal with market structures, flexible, transparent and competitive energy markets, diversification of fuels, sources and routes, including indigenous sources.

The next three principles highlight the transition to a low-carbon economy through clean energy and efficiency, innovation, and deployment as key to enduring energy security.

And the last two principles deal with the need for energy infrastructure resilience and effective response to disruptions of all types including the need for strategic reserves.

We have appreciated working with this committee and with Congress more broadly in responding to some of the resilience and response challenges and, as called for in the FAST Act, are working with the Department of State on an energy security evaluation study.

In the remainder of this opening statement, I am just going to highlight a few points in my written submission to the committee.

On oil, first, even with strong domestic production the U.S. remains directly tied to global oil markets, price volatility, and potential market disruptions.

Second, the Strategic Petroleum Reserve remains essential to ensuring the U.S. economy can withstand serious oil supply disruptions and associated spikes in petroleum prices.

The administration recommended in the QER and Congress authorized through the bipartisan Balanced Budget Act an investment of up to $2 billion in SPRO facilities and marine terminal infrastructure modernization.

The long-term strategic review of the SPRO required by that act was submitted to Congress in August.

The key issue on natural gas in energy security is the progress toward global natural gas markets principally through LNG developments. Increased U.S. natural gas production has contributed to a more financially liquid and competitive international and natural gas market which has improved global energy security for the U.S., our neighbors, partners, and allies.

Physical exports of LNG from the lower 48 started in February of this year. Four more facilities are under construction. The U.S. entry into world LNG markets will also put downward pressure on European gas prices and could constrain the noncompetitive practices of Russia.

The widening of the Panama Canal is coincident with growing U.S. LNG exports, thereby lowering supply chain costs from the Gulf to the Pacific Basin.

The grid faces a lot of new demands based on new technologies for both generation and distribution and the need to address a new

set of vulnerabilities, institutional inertia, a complex jurisdictional environment, and a mix of delivery service models.

The second installment of the QER, due later this year, will examine the issues confronting the nation's electricity system. It'll make policy recommendations on a range of issues including the changing generation mix, low load growth, increased vulnerabilities, severe weather and climate change, new technologies emerging, physical threats as well as cyber, aging infrastructure and workforce, jurisdictional issues, value creation and the need for an integrated North American electricity market.

DOE's grid modernization initiative complements the QER analysis by providing technology and system solutions. The majority of our national labs are directly involved in this.

A key dimension of our efforts is our engagement with industry, especially through the Electricity Subsector Coordinating Council that bring together key federal agencies and electricity sector leaders around resilience and emergency response issues.

Finally, the question of emergency authorities—with the FAST Act of last year, Congress provided DOE with a new authority to protect and restore critical infrastructure when the president declares a grid security emergency, enabling DOE to support preparation for and response to cyber, EMP, geomagnetic disturbance, and physical attack threats. The FAST Act also noted the critical nature of large power transformers and required a feasibility study of a strategic transformer reserve which we will complete by the end of the year.

President Policy Directive 21 identifies DOE as the sector-specific agency for energy infrastructure. As that, we serve as the day-to-day federal interface for the prioritization and coordination of activities to strengthen the security and resilience of critical energy infrastructure.

In addition, we serve as the lead agency for Emergency Support Function 12 under the national preparedness systems, the national response framework. So we are responsible for facilitating recovery from disruptions to the energy infrastructure.

We look forward to working with Congress now on the alignment of authorities, responsibilities, resources and organization.

In conclusion, it is clear that energy security has many dimensions, from global market structures to the low-carbon energy system, transformation to resilient infrastructure and response to a changing threat environment.

Chairman Olson, Ranking Member Rush, Ranking Member Pallone, members of the committee, I look forward to continuing to work with the committee and setting the stage for the next administration and beyond. I look forward to our discussion.

Thank you, sir.

[The prepared statement of the Honorable Ernest Moniz follows:]

**Testimony of Secretary of Energy Ernest Moniz**
**U.S. Department of Energy**
**Before the Committee on Energy & Commerce**
**Subcommittee on Energy & Power**

**"U.S. Energy Security"**
**September 15, 2016**

Thank you Chairman Upton, Vice Chairman Olson, Ranking Member Pallone, Ranking Member Rush, and members of the Subcommittee for holding this hearing concerning the Department of Energy's role in energy security.

## I. Rapidly Changing Energy Systems and Threat Environment

U.S. energy security must be placed in the context of the changing U.S. energy profile, the evolving threat environment, and the global security challenges facing both our country and our allies, partners and friends in various regional settings.

The U.S. is now the number one producer of liquid fuels in the world, although we remain a major importer of crude oil. However, net imports of oil and oil products have been reduced significantly and since 2014. Thus, by the traditional measure of energy security, namely oil imports, we are in a stronger position than we have been for decades.

Importantly, unconventional oil and gas are also being produced in unconventional locations with important implications for the transportation infrastructure to move these supplies to market, such as congestion and accidents on railroads, inland waterways and ports in recent years. The April 2015 Quadrennial Energy Review (QER) concluded that in key areas, the country's energy and related infrastructures have not kept pace with changes in the volume and geography of oil and gas production. U.S. companies are also beginning to export crude oil and LNG, impacting global supply chains. This highlights our continuing linkages to global energy markets and exposure to global oil price volatility.

Renewable energy technology deployment is rising rapidly, as costs of wind and solar energy continue to fall. Energy efficiency policies and technologies are contributing to projected slow growth in demand for electricityand for oil. Natural gas recently replaced coal as the largest fuel source for power generation. These are among the factors challenging incumbent business models in the energy sector.

We face a very different set of threats to our energy systems that guide both the structure and nature of our energy emergency responses. Energy infrastructure is extending across state and international boundaries; for example, integrated North American electricity grids and energy markets have increased the need for joint grid security strategies.

We are also now operating in a post-9/11 threat environment that provides a new context and framework for what we as a Department are responsible for and do in emergency response. We know that adversaries and homegrown actors are interested in the vulnerabilities of our critical infrastructures. Threats include natural and manmade events such as severe weather, storm surges exacerbated by rising and warmer seas, natural disasters such as earthquakes and wildfires, electromagnetic pulses (EMPs), aging infrastructure, cyber threats, kinetic attacks on electricity substations, and growing infrastructure interdependencies. According to the QER, billion dollar weather events, especially severe storms, have risen dramatically in the last 15 years and are indicators of the vulnerabilities of our energy systems to climate change and costly disruptions. There are now a range of laws, actions, and Presidential directives and orders designed to protect our citizens, economy and critical infrastructuresfrom those with malevolent intent.

With greater deployment of information and communication technologies to enhance the operational efficiency of our energy infrastructure, we are also witnessing a rise in intentional, malicious challenges to our energy systems. We are seeing threats continually increase in numbers and sophistication. This evolution has profound impacts on the security and resilience of the energy sector, so cybersecurity is and is likely to remain one of our highest priorities at DOE and in the energy industry.

Recent DOE analysis examining the effects of climate change on energy infrastructure exposure to storm surge and sea-level rise found that vulnerabilities are likely to increase for many energy sector assets, including electricity. Under the highest sea-level rise scenario, by 2030 the number of electricity substations in the Gulf of Mexico exposed to storm surge from Category 1 hurricanes could increase from 255 to 337; by 2050 the number would rise to roughly 400.

Further, our energy infrastructures are increasingly interdependent and all are dependent on electricity. Hurricanes Katrina and Rita, for example, downed 85,000 utility poles, 800 distribution substations, and thousands of miles of transmission lines. On the worst day of these sequential events, the Nation also lost almost 30 percent of its refining capacity. Three weeks after Rita hit, oil markets were still short around two million barrels a day. Hurricane Sandy knocked out power to 8.66 million customers. More than nine days after the storm, product deliveries from terminals in New York Harbor had returned to only 61 percent of pre-storm levels, forcing industry to seek work-arounds to resume supplies. Also during Sandy, power outages shut down gasoline pumps, demonstrating the interdependencies of energy infrastructures and our growing reliance on electricity.

Sea level rise, severe weather and storm surge are not, however, only about electricity. The Gulf Coast region is home to nearly 50 percent of the Nation's refining capacity, so damage to liquid fuels infrastructure in this region can lead to significant impacts on much of the rest of the country, as the Gulf supplies oil products to the Northeast, Midwest, Mid-Atlantic, and South Atlantic regions. Land subsidence also is a widespread issue throughout the Gulf Coast (and Mid-Atlantic coastal areas). During the past century, global sea-level rise has averaged about 1.7 mm/yr, though the rate in the Gulf has been faster (at 5–10 mm/yr, in part due to subsidence).

Between now and 2030, the average global sea-level rise could accelerate to as much as 18 mm/yr in worst-case scenarios.

Relatedly, aging energy infrastructure presents challenges to citizen safety as well as reliable supply of power. The recent Southern California Aliso Canyon gas leaks are a prominent example of the challenges the U.S. faces in managing a system that was built decades ago and that has not been upgraded. Another important example is our Strategic Petroleum Reserve (SPR), which remains an essential tool of energy emergency response as the United States is still a significant oil importer. Its value however – and how that value gets translated into its use and operations – is dramatically different than when it was created in the 1970s. U.S. dependence on this infrastructure is high, and public and private investment in it should match its benefits in order to ensure the resilience and responsiveness of our energy grid of the future. Later in this testimony I will describe progress that we have achieved, working closely with this Committee and other Congressional partners, in advancing the maintenance and modernization of the SPR.

These events, trends and vulnerabilities have regional and at times national-scale impacts on our energy infrastructures. They have stressed our response capabilities and resources and underscored the interdependence of our critical infrastructures. As a result, public consciousness has been elevated about the need for the U.S.to substantially raise its game in addressing those vulnerabilities and highlight the need for comprehensive and coordinated emergency responses.

These issues also underscore the need for a re-thinking of energy security that reflects modern domestic and global energy markets and the collective needs of our allies. Within this new framework, the modernization of our energy infrastructures to enhance resilience, reliability, flexibility, and efficiency directly contribute to energy security. The challenge is to develop the appropriate measures to appropriately value such contributions.

## II. Energy Security Principles

Changing oil and natural gas markets, the evolving threat environment, and geopolitical factors such as the Russian aggression in Ukraine combined with European dependence on Russian gas have underscored the need for a modern approach to energy security to help guide U.S. domestic and foreign policy. In June 2014, the G-7 leaders and the EU noted that "energy security is not only domestic — it is dependent on interaction in the global interconnected market." The focus on energy security as a collective responsibility is very relevant for the United States even though our domestic oil and gas production has increased dramatically: energy insecurity of our allies and friends can raise national security challenges for us. In an effort to articulate "a modern and collective definition of energy security," the leaders endorsed a set of seven energy security principles put forward by their energy ministers, summarized as follows:

1) Develop flexible, transparent and competitive energy markets, including gas markets;
2) Diversify energy fuels, sources and routes, and encouragement of indigenous sources of energy supply;
3) Reduce greenhouse gas emissions, and accelerating the transition to a low carbon economy, as a key contribution to enduring energy security;

4) Enhance energy efficiency in demand and supply, and demand response management;
5) Promote deployment of clean and sustainable energy technologies and continued investment in research and innovation;
6) Improve energy system resilience by promoting infrastructure modernization and supply and demand policies that help withstand systemic shocks; and
7) Put in place emergency response systems, including reserves and fuel substitution for importing countries, in case of major energy disruptions.

These principles, with their focus on well-functioning and competitive energy markets, diverse sources and routes of energy supply, environmental protection, efficiency and infrastructure improvements, energy innovation, emergency response, and resilience are guiding the work currently being done by the Department of Energy and our interagency partners. For instance, DOE, in cooperation with the Department of State, is implementing the language in the FAST Act (PL 114-94), which calls for DOE and State to evaluate energy security of the U.S. and its allies with the intent of ensuring that government review of actions that affect energy security accurately capture their full benefits and costs.

DOE's energy technology programs have very direct roles in principles 3, 4, and 5. Moreover, certain DOE R&D activities that fall under Mission Inovation -- the global initiative aimed at accelerating clean energy innovation -- support principles 3, 4, and 5. For the purposes of this hearing, however, discussion in this testimony will focus primarily on the domestic and global dynamics relevant to principles 1, 2, 6 and 7, and the efforts by the public and private sectors in advancing these shared objectives.

## III. Oil

The US is now the number one producer of liquid fuels in the world and within the last two years began producing more oil than it imports for the first time in decades. Crude oil production in the U.S. rose from an average of 5.1 million barrels per day in 2008 to 9.4 million barrels per day in 2015; these production increases and relatively flat consumption have resulted in the lowering of imports of oil by 3.5 million barrels per day (or about 30 percent).

Importantly, however, the U.S. still remains a large oil consumer and is a large oil product exporter; this directly ties us to global oil markets and oil price volatility. Energy security is a broad and collective responsibility, especially in light of America's unique global security posture. The energy situation in the U.S. enhances our energy security, as the global market is experiencing continued uncertainty generated by events in Africa, the Middle East, and Russia, raising the possibility of global oil price shocks. There is also reduced spare capacity in the world. Further, former Saudi oil minister Al Naimi recently indicated that it would take 90 days for the Kingdom to bring spare capacity fully online; during this interval, in combination with private inventories, and conservation incented by price signals, government-controlled strategic stocks could be essential for dampening oil price shocks.

Our security exposure goes beyond just volatility, but also to oil prices more broadly and the potential impacts of a major market disruption. DOE has held multiple workshops to examine oil market disruption scenarios. In August 2015, DOE convened a group of experts on the oil market for a discussion to analyze the potential origin and duration of large-scale supply disruptions that may necessitate an IEA coordinated emergency response, potentially in concert with the release

of strategic supplies from non-IEA partners. The group concluded that oil infrastructure is an attractive target for state and non-state adversaries, including terrorist organizations, as demonstrated by the 2013 attack against a gas facility near In Amenas, Algeria, and recent Islamic State operations targeting infrastructure in Syria, Iraq, and Libya.

DOE also convened a workshop in September 2015 which evaluated the likelihood of one or more foreign oil disruptions over the next 10 years. The risk assessment was conducted by leading geopolitical, military, and oil market experts who provided their expertise on the probability of different events occurring, and the corresponding implications for major disruptions in key oil market regions. The study concluded that over a 10-year timeframe (2016–2025):

- The probability of a net disruption of 2 MMbbl/d or more lasting at least one month is approximately 80%.
- The probability of a net disruption of 2 MMbbl/d or more lasting at least six months is approximately 63%.
- The probability of a net disruption of 2 MMbbl/d or more lasting at least 18 months is approximately 37%.
- The probability of a net disruption of 3 MMbbl/d or more lasting at least one month is 67%.
- The probability of a net disruption of 5 MMbbl/d or more lasting at least one month is 42%.

These expert assessments, which are substantively similar to those developed in the 2005 study on the same topic, suggest continued risk in the global market, notwithstanding supply-demand conditions at the time of writing or expanding North American oil production.

The Strategic Petroleum Reserve is an important insurance policy for the U.S. economy in the event of serious oil supply disruptions and the associated spike in petroleum product prices. In spite of the changes in the U.S. oil production profile, the U.S. economy will remain vulnerable to significant international oil supply disruptions in the future, and the SPR will remain an important aspect of our energy security strategy. At the same time, changes in the U.S. oil production profile have reduced the ability of the SPR to respond to a future disruption. The changing geography of U.S. oil production has led to major changes in the domestic oil pipeline system. Those new patterns of oil supply and demand among U.S. oil producers and refineries, along with associated changes in the U.S. midstream infrastructure, have significantly reduced the ability of the SPR to distribute incremental volumes of oil during oil supply interruptions.

In response to these changes, the Administration recommended and Congress authorized through the Bipartisan Balanced Budget Act of 2015 an investment of up to $2 billion in SPR facilities and marine terminal infrastructure as part of a SPR modernization program to ensure that incremental oil from the SPR can enter the global market in sufficient volumes to minimize the economic harm associated with disruption-related price spikes.

We are moving forward on the SPR modernization efforts. DOE has identified two specific projects that will make up the SPR modernization program:

- *Life Extension Phase II*–The aging SPR infrastructure is further strained with a challenging budget environment that has resulted in an extensive, growing backlog in the SPR's major maintenance project account. As a result, unanticipated SPR-related equipment failures are occurring and impacting the Reserve's operational readiness capability. The new life extension project will modernize aging SPR infrastructure through systems upgrades and associated equipment replacement to ensure that the Reserve is able to meet its mission requirements and maintain operational readiness for the next several decades. On October 30, 2015, DOE approved the mission need (Critical Decision 0), the first step in DOE's project management process, for the Strategic Petroleum Reserve, Life Extension Phase II Project.
- *Marine Terminal Distribution Capability Enhancements*—The SPR's effective distribution capability—the reserve's ability to deliver SPR oil to domestic consumers without displacing commercial oil shipments—is compromised by new patterns of oil supply and demand among U.S. oil producers and refineries and associated changes in the U.S. midstream, including overall capacity. This has reduced the ability of the U.S. to distribute incremental volumes of reserve oil to the domestic market during certain future oil supply disruption scenarios. The purpose of this project is to increase the effective distribution capacity of the SPR through the addition of dedicated marine capacity. DOE has approved Critical Decision-0, Mission Need and we anticipate being able to commence work on the National Environmental Policy Act analysis in January 2017, pending receipt of a congressional appropriation to commence crude oil sales in the near term.

The Bipartisan Budget Act of 2015 also required DOE to complete a long-term strategic review of the SPR and develop and submit to Congress a proposed action plan, including a proposed implementation schedule. DOE carried out the review required by the Act starting in May 2015 with completion and submission to Congress in August 2016.

This Long-Term Strategic Review (LTSR) provides an overview of the SPR and addresses key challenges that will impact the SPR's ability to carry out its energy security mission. Major topics examined in this report include the state of the SPR's surface and subsurface infrastructure, bottlenecks in the North American midstream infrastructure that impact the SPR's ability to move oil to the market, a discussion of some of the costs and benefits of various SPR sizes and other options, SPR modernization requirements for infrastructure life extension and the addition of dedicated marine terminals, and considerations associated with the SPR's authorizing legislation, the Energy Policy and Conservation Act (EPCA).

To address the myriad topics relevant to the SPR strategy, DOE sponsored studies by outside experts in fields including engineering, geology, petroleum logistics, economics, and geopolitics, among others. This review synthesizes these input projects and presents conclusions that will help inform decisions about the SPR going forward.

## IV. Natural Gas

The increased production of natural gas in the U.S. has contributed in several ways to a more financially liquid and competitive international natural gas market, which has improved global energy security for U.S. neighbors, partners, and allies. The U.S. is also now the number one producer of natural gas in the world. According to the U.S. Energy Information Administration (EIA), the production of natural gas climbed from 20 Tcf in 2008 to 27 Tcf in 2015, which represents more than 98 percent of domestic consumption. The U.S. became a net exporter of liquefied natural gas (LNG) in February of this year and according to EIA, the U.S. will become a net exporter of all forms of natural gas by mid- 2017.

Abundant natural gas resources and large production increases have created significant global, regional and domestic natural gas market opportunities for U.S. producers. Indeed, U.S. exports of LNG can make a major contribution to the evolution of world gas markets. Historically there have been three regional natural gas markets: North America, Europe, and Asia. But increased production in the U.S. and the Middle East and significant investment in LNG facilities in Australia and the U.S. are re-shaping the regional nature of gas markets, creating the potential for their globalization. The share of LNG traded through shorter-term contracts, an indicator of a more competitive liquid gas market, increased from 18% in 2008 to 28% in 2015, according to EIA. Also, oil-linked natural gas prices in Asia fell significantly in 2015 and some LNG importers were able to successfully renegotiate their contracts with sellers—adding more flexibility to the market.

Significant investment in LNG facilities in Australia and the United States is also re-shaping the traditionally regional nature of gas markets. The International Energy Agency forecasts that between 2015 and 2021, global liquefaction capacity will increase by 33%, mostly from the United States and Australia. By 2020, the United States is projected to have the third-largest LNG export capacity in the world (after Qatar and Australia). This fundamental shift in the diversity of LNG supply sources along with increased liquidity in global LNG markets will place significant competitive pressures on other new sources of LNG.

While Europe is a particularly attractive market for new LNG supplies due to the flexibility of its gas system and well-developed spot markets, continued flat to soft European demand for natural gas suggests intense competition will develop among producers to retain or gain access to European customers.

In the Eastern Mediterranean region, there are competing proposals to develop pipeline and LNG infrastructure to support regional natural gas demand -- each with a unique set of challenges and each confronted by an increasingly competitive global supply for LNG. At present, the focus appears to be on developing regional gas pipelines.

Finally, it should be noted that the widening of the Panama Canal is taking place coincident to the growth of LNG exports from the U.S. This multi-billion dollar infrastructure improvement could help facilitate and lower transportation costs for the U.S LNG trade with Asia and possibly to destinations on the west coast of South America. We note that this has already been extremely helpful for U.S. LNG exports to Chile which is working with Cheniere to supply LNG to a Chilean offshore floating storage regasification unit. Also, the Panama Canal Authority (ACP) is interested in ways that U.S. LNG trade can provide energy to the region. Last year, the U.S.

Trade and Development Agency awarded a grant to the ACP that supports planning for a possible LNG import terminal and increased natural gas utilization in the area. This holds promise for additional markets for U.S. LNG in Panama and other countries in Central America.

As you know, the Natural Gas Act of 1938 (NGA) assigns DOE regulatory responsibility for the import and export of natural gas to or from a foreign country. The NGA, as amended, requires that any company that wishes to export LNG to any foreign country must first obtain authorization from DOE. For companies seeking authorization to export to non-free trade agreement (FTA) countries, DOE considers the economic, energy security, and environmental impacts of the proposed LNG exports, among other factors in order to make a public interest determination. As of June 2016, DOE has approved 19 LNG export applications for projects to export to non-FTA countries. By law, applications to export to FTA countries must be approved without modification or delay. According to EIA, five projects (with authorization to export 9.2 Bcf/d to non-FTA countries) are currently under construction or operational in the lower 48 states. As of September of this year, US LNG producers had exported 100 Bcf of LNG to 11 countries. More than 50% of the U.S. LNG exports thus far went to South America (Brazil, Argentina, Chile), followed by Asia (India and China), and the Middle East (United Arab Emirates, Kuwait, and Jordan), Dominican Republic, and a small volume to Europe (Portugal and Spain).

DOE's review of applications to export LNG to non-FTA countries is conducted through a public and transparent process. Upon receipt of an application, DOE issues a notice of the application in the Federal Register, posts the application and all subsequent pleadings and orders in the proceeding on its website, and invites interested persons to participate in the proceeding by intervening and/or filing comments or protests. Applicants are typically given an opportunity to respond to any such comments or protests and, after consideration of the evidence that has been introduced into the record, DOE issues an order either granting the application as requested, granting with additional terms or conditions, or denying the application.

Under the Natural Gas Act, DOE's orders are subject to a rehearing process that can be initiated by any party to a proceeding seeking to challenge DOE's determinations. Court review is available as well after the rehearing process is exhausted.

For applications requesting authority to export LNG to countries that do not have free trade agreements requiring national treatment for trade in natural gas, DOE conducts a full public interest review. While the NGA establishes a broad public interest standard and a presumption favoring export authorizations, the statute neither defines "public interest" nor identifies criteria that must be considered. In prior decisions, however, DOE's Office of Fossil Energy (DOE/FE) has identified a range of factors that it evaluates when reviewing an application for export authorization. These factors include economic impacts, international impacts, security of natural gas supply, and environmental impacts, among others. To conduct its review, DOE/FE looks to record evidence developed in the application proceeding. Applicants and interveners are free to raise new issues or concerns relevant to the public interest that may not have been addressed in prior cases.

Under current law and the procedures I have previously described, an LNG export application is ready for final action when DOE has (1) completed the pertinent National Environmental Policy Act review, and (2) sufficient information on which to base a public interest determination.

DOE's current process is to promptly conduct reviews of final authorizations once FERC has completed its regulatory process. The Department has clearly demonstrated a commitment to act expeditiously in its regulatory responsibilities and will continue to do so.

U.S. LNG producers are currently using innovative long-term contracts that increase the liquidity and competitiveness of the spot market. Specifically, U.S. contracts are structured to give buyers of LNG the option of paying only the liquefaction tolling fee if they determine, based on market conditions that they do not need to actually take delivery of the natural gas. This differs from many traditional long-term contracts for LNG on world markets that do not offer this level of flexibility for buyers or sellers. The design of the U.S. contract provides greater protection for buyers from falling natural gas prices, reduces transaction costs of reselling unneeded LNG, and enables a more active spot market. In addition, U.S. LNG contracts are supplied at Henry Hub prices, the most competitive in the world.

Physical exports of U.S. LNG started in February of this year after completion of Train One at Sabine Pass in Louisiana; four more facilities are currently under construction. In the context of today's hearing, it is worth noting that the first cargoes moving from Sabine Pass were purchased by Brazil's Petrobras. The U.S. entry into world LNG markets in a significant way (volumes are only exceeded by those of Qatar and Australia), will also put downward pressure on European gas prices, and the competition for customers could constrain the non-competitive practices of Russia. The U.S. entry into world LNG markets is consistent with the G7 principles for increased energy security.

## V. Electricity

Today's U.S. power grid – the world's "largest machine" – is vast, complex and interconnected. It is comprised of around 7,700 operating power plants that generate electricity from a variety of primary energy sources; 200,000 miles of high voltage transmission lines; 55,000 substations; 5.5 million miles of local distribution lines; and 3,300 providers delivering electricity to 135 million customers. The value of the electricity supply chain (from fuel to generation to transmission to distribution) is about $1 trillion.

Today's electricity system is built on a century-old foundation of continuous reliable electricity service. It is, however, being pulled by new demands on the consumer side of the electricity supply chain, pushed by new technologies for both generation and distribution, and the need to address a new set of vulnerabilities. At the same time, the electricity sector must deal with high institutional inertia, a very complex jurisdictional environment, a mix of delivery service models (investor owned utility (IOU), public, international organization for standardization (ISO)/regional transmission organization (RTO)) with numerous forms of wholesale electricity organized markets, and increasingly complex grid operations to accommodate variable renewables, distributed energy resources and demand-side management.

**The Quadrennial Energy Review: Electricity from Generation to End Use.**
The second installment of the Quadrennial Energy Review (QER 1.2) will examine these trends and issues confronting the Nation's electricity system. This in-depth focus on electricity – from generation to end use – follows up on recommendations in the first installment of the QER (QER 1.1), which looked at electricity in the context of a broader examination of energy transmission, distribution and storage infrastructures. QER 1.2 will analyze key trends and make policy

recommendations on a range of electricity issues including: the changing generation mix; low load growth; increasing vulnerabilities to severe weather/climate change; the proliferation of new technologies, services and market entrants; emerging cyber/physical threats; aging infrastructure and workforce; the growing overlap between jurisdictions; value creation; and the growing need for an integrated North American electricity market.

An example of an area of analysis in QER 1.2 is the changing generation mix in the U.S. In 2016, natural gas is projected to surpass coal as the most-used fuel for U.S. power generation on an annual basis. Between 2005 and 2015, net generation from natural gas increased by 75 percent, while coal generation fell by 33 percent. Recent generation capacity additions have been dominated by natural gas and renewables. Natural gas net generation has increased from 19 percent in 2005 to 33 percent in 2015. As a percentage of net generation, wind increased roughly tenfold since 2005 to 4.7 percent of net generation in 2015. Non hydro renewables grew from 2 percent in 2005 to 7 percent in 2015, surpassing hydropower for the first time. Wind generation increases have been driven by improved turbine technologies, reduced cost of electricity production, and government policies that encouraged the development of renewable energy sources.

Also, geography and physics are inherent limitations in electricity markets. As such, the Administration has focused on the benefits of the integration of U.S., Canadian and Mexican electricity systems.

The U.S. is a major hub for technology development. The Department of Energy is the single largest supporter of civilian physical science R&D in the country, and our system of 17 National Laboratories is an energy innovation powerhouse. The work of our labs and programs, including those that support many partnerships, has helped develop technologies that: lower electricity bills; enable and enhance a modern economy that heavily relies on electricity; reduce electricity demand and decrease carbon emissions from power generation. Our technology programs support renewable and nuclear power generation and programs to decrease the costs of carbon capture technologies from coal and gas-fired power plants. Finally, an important issue for this hearing as well as the QER is the growing reliance of all of our critical infrastructures on electricity. As the nation reinvests and modernizes its infrastructure systems, the critical lifeline infrastructures, generally thought of as the energy, water, telecommunications, and transportation infrastructures, are all essential to the national defense, economic prosperity, and general well-being of the nation. From the electricity and energy perspectives, we are increasingly electrifying aspects of our economy, such as transportation, while also becoming more dependent on electricity through, for example, telecommunications. The benefits of this convergence are expected to include lower emissions, greater efficiency, and increased productivity. However, if not properly managed, such convergence has the potential to escalate societal risks as these formerly separable systems become more tightly linked.

Let me provide a few examples of the relationships among these sectors, and illustrate why these considerations are so important.

- As our nation enjoys the benefits of the increased shale gas production, the increased use of this gas for power generation introduces the potential for complications and

disruptions. These complications arise because just as the power sector is reliant on natural gas for the fuel to produce electricity, and the gas sector relies on electricity in segments of the production chain including for field gathering pumps, selected transmission pipelines, and gas processing stations. These interdependencies were illustrated in New Mexico in 2011 when gas shortages from cold weather and high demand produced power outages, which then further reduced gas production as field gathering pumps lost power (cite, QER, 2011 report).

- After Hurricane Sandy in 2012, utilities and the public were faced with massive outages and disruptions across their systems. As crews worked to get the systems back in order, they were hampered by difficulties communicating due to failures within the communications systems. Modern communications systems are almost entirely dependent on electricity, and as a result maintain varying degrees of backup within the system (generally 72 – 96 hours battery backup). However during Hurricane Sandy, the damage was so extensive and long-lasting that some of these backups began to fail.
- Among the critical infrastructures, water is not always thought of as a major component or point of vulnerability. However, water purification, movement, and treatment currently consumes roughly 2% of national electricity generation. In some regions, such as California this amount can be up to 10% of electricity generation. The key concern here is that not only do many water facilities lack sufficient power backup capabilities, they serve as critical elements necessary to supply cooling water to generation facilities.

These are just a few examples of the many interdependencies among our national critical infrastructures. To these examples, I'd like to add an additional thought to inform the larger discussion. One area of increasing concern relates to the interdependence among the electricity and telecommunications sectors, and computational data centers specifically. Such data centers consume roughly 2% of electricity nationally. The concern arises when, as expected with the evolving smart grid, increasing amounts of electricity generation becomes dependent on public communications networks and data storage in order to properly function. So far this has not amounted to a significant vulnerability, but it is an area for attention and focus.

In addition to the QER, the DOE's Grid Modernization Initiative (GMI) represents a comprehensive effort to help shape the future of our nation's grid by coordinating a portfolio of activities to help set the nation on a cost-effective path to an resilient, secure, sustainable, and reliable grid that is flexible enough to provide an array of emerging services while remaining affordable to consumers. The scope of the GMI focuses on the development of new architectural concepts, tools, and technologies that measure, analyze, predict, protect, and control the grid of the future, and on enabling the institutional conditions that allow for more rapid development and widespread adoption of these tools and technologies. Through its Multi-Year Program Plan (MYPP), the Department will help frame new grid architecture design elements, develop new planning and real-time operations platforms, provide metrics and analytics to improve grid performance, and enhance government and industry capabilities for designing the infrastructure and regulatory models needed for successful grid modernization. The MYPP, developed in close collaboration with a wide range of key external partners, lays out a blueprint for DOE's research, development, and demonstration agenda to enable a modernized grid, building on concepts and

recommendations from the first installment of the QER and Quadrennial Technology Review (QTR).

As part of the GMI, the Energy Department announced funding in January, 2016 of up to $220 million over three years for DOE's National Labs and partners. The Grid Modernization Laboratory Consortium funding will support critical research and development in advanced storage systems, clean energy integration, standards and test procedures, and a number of other key grid modernization areas. This effort recognizes regional differences and will strengthen regional strategies while defining a diverse and balanced national strategy.

A key dimension of these R&D efforts is our engagement with industry. Last week Deputy Secretary Sherwood-Randall hosted a day-long meeting of the Electricity Subsector Coordinating Council (ESCC) at Sandia National Laboratory that specifically focused on aligning government and industry research and development efforts to enhance grid security and resilience. The Council is comprised of chief executive officers from 21 energy companies and nine major industry trade associations, and it serves as the Federal government's principal liaison with the electric power industry. Through the ESCC, we meet along with several other key Federal departments and agencies three times a year to develop and coordinate government and industry efforts to prepare for and respond to major disasters and threats to the U.S. energy infrastructure (of which more than 90 percent is privately owned).

At Sandia, the participants toured three Sandia facilities that demonstrated relevant capabilities that derive from DOE's decades of nuclear weapons work, such as on the impacts of EMP and how to protect against/mitigate against EMP effects, and on cybersecurity. Following the tours, they discussed how we can strengthen the R&D grid security collaboration between government and industry to advance our shared goals. Specifically, DOE and ESCC members committed to more closely aligning research and development priorities through joint strategic planning and increased coordination. DOE will also continue its work to expedite the commercialization of new technologies developed by our labs. The goal is to ensure that we are maximizing the prospects for rapid deployment of technologies that can contribute to securing our Nation's energy infrastructure. In addition, we are committed to a deliberate handoff of the vital ESCC work streams to the next Administration.

### VI. Emergency Authorities

With an updated framework of energy security, it is also worth noting the essential and expanded role DOE plays in energy emergency response.

The Department of Energy has its origins in the Manhattan Project and the Atomic Energy Commission. Under the Atomic Energy Act, DOE has authority to acquire, transport, store, and dispose of nuclear material in emergency and non-emergency situations. This extends to special nuclear material, source material, and byproduct material, and the Department has long performed vital emergency preparedness and response roles in this mission space. For example, at the Olympics in Rio, we had responders on the ground to address potential radiological incidents, in conjunction with other Federal partners and Brazilian authorities. The Department has been strengthened by the capabilities provided in this domain, and we have drawn upon the

competence they have built and maintained to begin to fulfill the newer responsibilities for which we are now organizing ourselves.

In the energy emergency domain, there is a range of authorities under which the Department can and does act. Statutes that govern DOE's emergency authorities include the Defense Production Act, the Energy Policy and Conservation Act (EPCA), the Natural Gas Act, the Federal Power Act and the Natural Gas Policy Act.

DOE's authorities can be divided into categories: independent DOE authorities; DOE authorities requiring a Presidential finding; and authorities that require consultation with other agencies.

- The Department has independent authority to order temporary electricity connections and the generation and transmission of electric energy; make exchanges of crude oil or petroleum products from SPR, Northeast Gasoline Supply Reserve (NGSR), or Northeast Home Heating Oil Reserve (NEHHOR); assist entities to procure the necessary energy materials and services to maintain supply during an emergency or to restore their systems; control nuclear material and gather information.
- Emergency authorities requiring a presidential finding include grid security emergency orders to protect or restore the reliability of critical electric infrastructure; sales from the SPR, the Northeast Gasoline Supply Reserve, the Northeast Home Heating Oil Reserve; allocation of energy materials, services, and facilities in the civilian market; allocation and certain purchases of natural gas; and fuel switching electric power plants or major fuel-burning installations.
- DOE has a consultative role for Jones Act waivers and a concurrence role for fuel waivers.

Examples include:

***Electricity Supply.*** The Department has used its independent authority to connect, temporarily, electricity lines to restore power (Hurricanes Ike, Katrina, and Rita), to require a power plant to continue operating to ensure grid reliability (Mirant Corp.'s Potomac River facility), to require specific transmission functions (Cross-Sound Cable Co. operation during the Northeast blackout), and to require generators to provide electricity when an Independent System Operator was otherwise unable to meet system demand (California energy crisis).

***Petroleum Supply.*** DOE's exchange authority under EPCA authorized the loan of one million barrels from the SPR to Marathon Oil following Hurricane Isaac in 2012; 5.4 million barrels with Marathon, Placid, ConocoPhillips, Citgo and Alon USA following Hurricanes Gustav and Ike in 2008; 9.8 million barrels following Hurricane Katrina in 2005; and 30 million barrels in anticipation of a heating oil shortage in 2000. After Hurricane Sandy, the Department loaned approximately 120,000 barrels from NEHHOR to the Department of Defense's Defense Logistics Agency for use in emergency operations, primarily to fuel the vehicles of emergency responders.

If the President determines that a severe energy supply interruption exists, DOE can sell crude oil from the SPR, home heating oil (*i.e.*, ultra-low sulfur diesel) from the NEHHOR, or gasoline from NGSR. The last time a President authorized a sale in response to a domestic emergency was in 2005 after Hurricane Katrina when President Bush issued a finding of a severe energy supply interruption and directed the sale of 30 million barrels.

***Natural Gas.*** If the President finds that a natural gas supply emergency exists or is imminent, the Department has been delegated authority under the Natural Gas Policy Act through Executive Order 12235 to allocate natural gas to meet priority uses and authorize certain natural gas purchases. This authority was used in 2001 (in combination with its Defense Production Act authorities) to respond to the California energy crisis.

***Procurement Prioritization.*** In addition to authorities for responding to emergencies concerning the supply of electricity or liquid fuels, the President has delegated authority to DOE under the Defense Production Act to require performance on a priority basis of contracts or orders deemed "necessary or appropriate to promote the national defense." This authority was used during the California energy crisis of 2000-2001 to direct entities that had recently provided a utility with natural gas to continue to make similar volumes available to the utility on the same payment schedule as before.

***Access to data for mission delivery:*** DOE has information-gathering authorities to compel energy sector entities to provide information that is relevant to DOE activities. For example, under section 13 of the Federal Energy Administration Act of 1974, the Secretary can order "[a]ll persons owning or operating facilities or business premises who are engaged in any phase of energy supply or major energy consumption" to make available energy-related information.

***Power Marketing Administrations (PMA).*** The PMAs deliver power from federal hydropower assets, which can provide critical black start capabilities to reenergize the grid and support safe nuclear plant shutdown. DOE has exercised these authorities in a variety of circumstances. In addition, three of the four PMAs, Bonneville Power Administration, Western Area Power Administration and Southwestern Power Marketing Administration are active participants in utility emergency response programs. Crews and equipment are dispatched in support of emergency restoration and neighboring utilities.

**Recent Emergency Authorities and Directives Related to Emergency Response**

***FAST Act.*** Last year, Congress recognized the growing complexities of the a rapidly evolving landscape and enacted important new energy security measures in the Fixing America's Surface Transportation Act (FAST Act) (P.L. No. 114-94). Part of the FAST Act provides DOE with a new authority to protect and restore critical infrastructure when the President declares a grid security emergency. This authority allows DOE to support the energy sector preparing for and responding to cyber, EMP, geomagnetic disturbance, and physical attack threats. These authorities do not apply, however, to natural disasters other than geomagnetic storms.

The FAST Act (Sec. 61004) also noted the critical nature of large power transformers to the electricity grid. The law requires DOE in consultation with Federal Energy Regulatory Commission (FERC), the Electricity Subsector Coordinating Council (ESCC), Energy Reliability Organization (ERO), and owners and operators of critical electric infrastructure to submit a plan to Congress evaluating the feasibility of establishing a Strategic Transformer Reserve for the storage, in strategically-located facilities, of spare large power transformers in sufficient numbers to temporarily replace critically damaged large power transformers.

***Balanced Budget Act of 2015.*** The 2015 Balanced Budget Act directly supports the findings of QER and states that "maximizing the energy security value of the SPR requires a modernized infrastructure that meets the drawdown and distribution needs of changed domestic and international oil and refining market conditions." The Act directs DOE to establish a SPR modernization program to protect the U.S. economy from the impacts of emergency product supply disruptions and that this program may include infrastructure and facilities to optimize the drawdown and distribution capacity of the SPR." Congress also authorized the sale of up to $2 billion in SPR crude oil sales to fund the SPR modernization program subject to appropriation.

***Presidential Policy Directive 21.*** Presidential Policy Directive-21: Critical Infrastructure Security and Resilience identifies DOE as the Sector-Specific Agency (SSA) for energy infrastructure. Within the Department, the authority and responsibility of the SSA are assigned to Office of Electricity Delivery and Energy Reliability, and play a pivotal role in ensuring unity of effort between private and government partners, including the Department of Homeland Security, Department of Defense, and Federal Bureau of Investigation, to improve preparedness and response to all hazards in the energy sector.

As the Energy SSA, we serve as the day-to-day Federal interface for the prioritization and coordination of activities to strengthen the security and resilience of critical energy infrastructure. This involves building, maintaining, and advancing collaborative efforts with the energy sector to bridge federal programs for sharing situational awareness information, modeling impacts, assessing vulnerabilities, conducting exercises, and promote innovation and research.

***Emergency Support Function 12.*** In addition to enhancing security and resilience through our role as an SSA, the DOE enhances security and resilience by serving as the lead agency for Emergency Support Function 12 (ESF-12) under the National Preparedness System's National Response Framework. As the lead for ESF-12, we are responsible for facilitating recovery from disruptions to the energy infrastructure. During a response operation, the Department works with industry and Federal, state, and local partners to:

- Assess disaster impacts on local and regional energy infrastructure;
- Coordinate the response to expedite restoration;
- Monitor and provide situational awareness of impacts; and
- Provide regular situational awareness updates to key decision makers in the Administration and our government and industry partners.

To achieve these operational priorities, the Department deploys responders who work directly with affected utilities and local officials on the ground during a disaster. The responders provide expertise on a variety of energy issues, and have direct access to our subject matter experts throughout the Department, and at our interagency partners, to coordinate the appropriate assistance including waivers or special permits to expedite restoration efforts. Our response force is entirely voluntary, and we are training nearly 100 members of our staff to be prepared to deploy for all hazards contingencies.

## VII. Conclusion

Our energy security investments and policies should be viewed in a broad sense to value and include the resiliency, reliability and modernization of key energy infrastructures, energy efficiency, responses to climate change, and the collective needs of our allies and partners.

Such a view of energy security should not discount the importance of oil security. Indeed, the SPR remains a highly valuable tool for meeting US energy security needs in 21st century global energy markets.

It is time to take a fresh and comprehensive look at how we define and implement an energy security policy that is based on 21st century energy market changes, challenges and needs.

Chairman Upton, Vice Chairman Olson, Ranking Member Pallone, Ranking Member Rush, and members of the Subcommittee, I appreciate the opportunity to share my thoughts on DOE's role in national, economic, and energy security and look forward to your questions.

Mr. OLSON. Thank you, sir, and we will begin the questions with myself—5 minutes for questions.

OK. Last year, Congress enacted the Bipartisan Budget Act and the FAST Act, as you mentioned. They have provisions to modernize the Strategic Petroleum Reserve—the SPR—and improve its emergency response capability.

One of the requirements was for DOE to complete a long-term strategic review and report to Congress. That report is out, as you mentioned.

It raised some serious questions about the ability of the SPR to meet its mission. My first question is how much oil are we supposed to have if we have to draw down from the SPR if we have an emergency?

Secretary MONIZ. The designed draw down rate is just over 4 million barrels a day.

Mr. OLSON. What Is the actual draw down rate?

Secretary MONIZ. Well, that depends very much on the specific circumstances but, of course, the whole point of the modernization of the SPRO is to improve our distributional capability, which has been compromised, actually ironically, by the very increase in production that we have seen in oil.

Mr. OLSON. But your reports show the actual draw down is more than 2 million barrels per day below the designed draw down rate of 4.4 million barrels per day. Are you concerned by this?

Secretary MONIZ. Again, we are going to increase that with the project that the Congress has authorized and we've submitted our appropriation request for the first tranche.

And if I may just add, Mr. Chairman, that it is urgent that that be approved because the authorization was only for 4 years. So we really need to get on with the project.

Mr. OLSON. How do you suggest to meet the mission to make sure the SPR is viable? How should we do that? Any ideas?

Secretary MONIZ. To make sure it is what? Well——

Mr. OLSON. Yes, sir. To prove its ability. To prove its ability.

Secretary MONIZ. It's modernization and it is building new marine distribution infrastructure in the Gulf region.

Mr. OLSON. Details. Great. The second line of questioning, both the House and Senate have passed bipartisan legislation to streamline a process for LNG exports and there's more than one legislative option to push that across the finish line.

The House would like to see it included in the defense spending bill. It is also under consideration in the Energy Conference. Do you agree that LNG exports offer wide-ranging benefits to the economy, energy security and maybe even the climate?

Secretary MONIZ. The national interest determination that we make is precisely to answer those questions and so far we have approved and, frankly, since our change of the process in 2014 we have approved quite speedily every application that is ready for action.

The idea that we are somehow dragging this out is simply incorrect. The national interest determination requires us to get the appropriate information including, for example, FERC's action.

So right now we have acted on all of the applications and, frankly, up to now we've approved them all. Since our streamlining of

the process in 2014 we have approved them as short as one day after having the FERC action to a few weeks.

Mr. OLSON. Let us choose that one day all the time. That sounds like a benchmark we should over and over and over——

Secretary MONIZ. I think one day all the time would be stretching credulity since there are questions that we have to answer. But we have been committed to expeditiously addressing these applications.

Mr. OLSON. Thank you. My final question is what areas of the federal emergency permitting process need the most improvement? Why does it seem to take longer to permit midstream energy infrastructure like pipelines than it does to pass, site and approve a drilling rig and also power stations?

How come they are different than pipelines? How come upstream is different than downstream and midstream? Also for the energy permitting process?

Secretary MONIZ. Well, I think of energy infrastructure as a whole. The Congress has, frankly, distributed responsibility for different elements of infrastructure among multiple agencies.

DOE has some responsibility. The EPA has some. Department of Transportation has some. Department of State has some. Those particular issues that you raise certainly are not in the Department of Energy's bailiwick.

Mr. OLSON. Should they be? Should they be in your bailiwick? Can you take—you would be the big king of the jungle, so to speak?

Secretary MONIZ. I think that would be an interesting discussion between the Congress and the administration.

Mr. OLSON. Thank you. That's the end of my questions. I now yield to the ranking member, to Mr. Pallone, ranking member of the full committee for his 5 minutes of questions.

Mr. PALLONE. Thank you, Mr. Chairman.

Mr. Secretary, I wanted to ask you some questions on LNG particularly related to language in the energy bill on LNG exports that is concerning me.

As you know, applications for LNG export have been increasing in recent years. So since revising the approval process for LNG applications in 2014, DOE has been able to quickly approve applications after FERC completes their review. Is that correct?

Secretary MONIZ. Yes, it is.

Mr. PALLONE. And typically, how long does it take DOE to turn these applications around?

Secretary MONIZ. As I said, it has been between a day and a few weeks, since 2014.

Mr. PALLONE. Now, the Energy Conference is considering two provisions that would require DOE to approve an application for export within 30 days of FERC publishing the final EIS.

Proponents argue this deadline is necessary to ensure timely consideration by DOE. But given the department's track record, I find this arbitrary deadline to be completely unnecessary. In fact, it could be detrimental to the ultimate approval of an expert application.

In light of recent events related to the Jordan Cove application in Oregon, do you believe it makes sense to force DOE to hastily make a decision on an application based on the final EIS?

Secretary MONIZ. We have consistently said that we see no need for this by performance and as you've said, I think very correctly, there can be unintended consequences, in fact, which can go in the opposite direction.

The Jordan Cove, for example, when that was rejected by FERC for non-environmental reasons it would have caused a problem with the bills as proposed.

So, we really should be having records of decision by FERC in this case or MARAD for an offshore facility because that is the complete set of information that informs our final judgment.

Mr. PALLONE. Thank you.

Now, I wanted to ask you about climate change and note that climate change has to play—or is significant in terms of energy security.

By lessening our reliance on fossil fuels and reducing our carbon emissions we can make our energy future more secure and you recognize this in your testimony when you reference the vulnerability of our energy systems to climate change.

So my question is can you talk a bit more about the impacts climate change is having on our energy security and what can be done to address this important issue?

Secretary MONIZ. Climate change—first of all, we have seen just this week that a number of military leaders have pointed out how climate change is a risk to our national security broadly, which has, of course, energy security implications as well.

Then there are the issues around rising sea levels and weather, et cetera. But, of course, the threats of energy security ultimately come to fossil fuel supply since we all have our own solar supply, et cetera, et cetera.

So, clearly, as we go into a low-carbon transition we are addressing energy security. But in the near to midterm, we are also going to have to increase our approach to resilience of infrastructure because the many threats associated with climate change to our infrastructure are just growing and they will grow further. So that's where we need to harden our infrastructures.

We also need to improve our response to the inevitable disruptions that we have been seeing—flooding, obviously, in the southeast is an enormous issue—for example, wildfires in the West, droughts in the Southwest and California.

We can go on and on with these regional impacts. So we need to really think about addressing our security and our climate issues in an integrative way.

Mr. PALLONE. Thank you. I am going to try to get one more question here and that is about the electricity grid.

In your testimony you discuss modernizing our country's energy infrastructure. We have an electricity grid that represents the energy mix of the 20th century and not the present, more dynamic state in which we currently exist.

So in your view, what parts of our energy infrastructure are currently the most vulnerable and in need of attention.

Secretary MONIZ. Well, I think there are many parts including, as you mentioned, our old natural gas pipelines that are a major safety and environmental problem.

But I would just focus my comments on electricity because, as we know, electricity is the grid that all the other infrastructures depend upon as well.

There, we have many tasks at hand. One is we have to better integrate resources that are distributed and I think there is a lot of consumer and customer interest in more distributed generation. But that does not fit the traditional model of how electricity is delivered.

So we have both technical and regulatory issues. But I would say one very big overarching issue is that we need to really get on with the job, in my view, of a much more complete integration of information technologies into the grid both to provide reliability and resilience but also to integrate that with providing new consumer services.

So it is really an end-to-end kind of utilization of information technology. I think we are just scratching the surface right now.

Mr. PALLONE. Thank you. Thank you, Mr. Chairman.

Mr. OLSON. Gentleman's time has expired.

The chair recognizes the head of the full committee, Mr. Upton, for five minutes.

Mr. UPTON. Thank you, Mr. Chairman.

Mr. Secretary, welcome back. It's good to see you. I appreciate the relationship that we have had all these different years.

I want to go back to some of the questions as it relates to SPRO, and if you're not able to answer, something in writing afterwards will be certainly sufficient.

Some would argue that SPRO should now be eliminated or somewhat phased down. It's a relative of the 1970s era when we were subject to the Arab embargo.

I point out that, of course, domestic energy production is up and imports are down. Private domestic oil stockpiles are at record levels and, of course, we are able to export crude for almost a year now and, in fact, we see that happening.

And there is more than or there is almost a billion and a half barrels of crude oil petroleum products in private storage so they ask do we really need a government-owned stockpile.

Now, are we actually required to hold public stocks of oil to meet international agreements and how do other countries do it?

Secretary MONIZ. Well, first of all, of course, maybe it is worth saying that we are still importers of about 7 million barrels a day of crude oil. So we have very major imports. We are now net exporters of oil products but a lot of crude oil imports.

We are required by our agreements with the International Energy Agency, formed in the 1970s, not only to hold strategic reserves but also to have a particular share, which is about 44 percent, of the collective response capability of the OECD.

Mr. UPTON. Is there a mix that's required in terms of public and private supplies or not?

Secretary MONIZ. It's done differently in different countries. We do it by, obviously, having a physical reserve with four locations. Some other countries do it by requiring reserves with distributors, for example. So there are different ways, but that amount of oil always has to be on call.

I would say that and we can go into more detail but as you opened up your question—"Do we need a petroleum reserve?"—I think most vociferously I would answer yes and, again, that's very——

Mr. UPTON. I knew that answer which is why I didn't define it.

Secretary MONIZ. Right. But again, the issue is, as I said in my opening remarks, is that we cannot become complacent because we are producing more oil. Because we are and we will remain linked to the global oil price, and our economy is exposed to that and this is a very, very important tool. It's our premier energy security tool.

Mr. UPTON. Let me go a little bit into the maintenance. As you know, in the DOE IG report more than 70 percent of SPRO's equipment and infrastructure exceeded its serviceable life.

The report identified five separate major equipment failures in the last couple years. I know that we authorized $2 billion for SPRO modernization, which was intended to go to needed repairs and upgrades.

Is there a focus on major maintenance in the backlog of the repairs?

Secretary MONIZ. Yes. So we estimate and we will be seeking—well, we've already asked for the first appropriation.

Mr. UPTON. Right.

Secretary MONIZ. We seek $800 million, roughly, for the modernization and the upgrading of the equipment and another billion, roughly, for enhancing the marine distribution capability, which we really need now because of the new oil flow patterns with shale oil.

Mr. UPTON. And if that money came through how long would it take to complete the work?

Secretary MONIZ. It would be a few years and in fact the authorization that you all provided was for 4 years. So we need to get on with that now, and it should be finished within I think around 3 years.

Mr. UPTON. Thank you. Yield back.

Mr. OLSON. The chairman yields back. The chair recognizes the ranking member of the subcommittee, Mr. Rush, from Illinois for 5 minutes.

Mr. RUSH. I want to thank you, Mr. Chairman.

Mr. Secretary, it is always good to see you and welcome back to the committee and during these waning days of the Obama administration I want you to know that to some of us you will always be our rock star superstar secretary and we——

Secretary MONIZ. For 128 more days.

Mr. RUSH. Mr. Secretary, it has been indeed a pleasure working with you to establish the critically important Minorities in Energy Initiative in DOE and sometime before those 128 days are up I would like to sit down with you and look at the progress and what needs to be done and what we've accomplished so far in this particular area.

So my staff will be in contact with appropriate people in order for us to arrange that meeting.

Secretary MONIZ. That would be a pleasure and particularly if we could help to set up the transition to the next administration to continue that work.

Mr. RUSH. I look forward to it.

Mr. Secretary, in the House bill there is a provision that would have delayed any action on new efficiency standards for furnaces until after the department had issued a supplemental notice of proposed rulemaking.

This was a provision that Chairman Whitfield and I put together by arranging all the energy stakeholders and all the efficiency community stakeholders in a room together and having them negotiate directly with each other until a consensus was reached. To the best of my knowledge, everyone on both sides of the aisle supported that provision.

However, a little less than 2 weeks ago your department actually issued and that stated supplemental notice of proposed rulemaking.

To my mind, Mr. Secretary, you met the bar that we and, more importantly, the stakeholders set for you in the House bill as a condition for moving forward with the first new furnace efficiency standards in almost—in around 15 years.

Now as we are in conference on the House and Senate energy patent we have proposed that the House provision as well as a similar provision in the Senate bill be dropped because once again, Mr. Secretary, and I emphasize you met the bar that we set for you.

Do you agree that we should let your department move forward on the standards now that you have done what we asked? And then some of the stakeholders are unhappy and have threatened to take this to the courts.

Should we even let the courts handle this at the American Gas Association publically propose or let you and your department attempt to respond to these concerns? Isn't it in your court and shouldn't it be in your court right now?

Secretary MONIZ. Yes, Congressman Rush, I completely agree with you that I think this process has worked well for all kinds of efficiency standards.

We go through the process. We listen, which is why, as you said, we heard the input of industry, acknowledged that there were some issues raised. That's why we went back with the SNOPR, which did establish a new class of small furnaces, addressed, certainly, perhaps not all but some of the industry's concerns.

So this is working. We are now absorbing their comments on the SNOPR and we would look to try to get a final rule out actually this year.

So the process is working and I think there's a slippery slope if one starts to have the process interfered with for very specific rulemakings and because we do have a successful process that we are executing expeditiously. Thank you.

Mr. RUSH. Thank you. Mr. Chairman, I yield back.

Mr. OLSON. Gentleman yields back. The chair recognizes a fellow Texan, chairman emeritus of the full committee, Chairman Joe Barton for five minutes.

Mr. BARTON. Thank you, Mr. Chairman. I appreciate that.

Welcome, Mr. Secretary. We got a few folks in the audience. Congressman Gingrey, glad to have you back, sir—former member of the committee and I think the subcommittee—and Mr. Bud Albright, who's former chief of staff of the committee. Glad to have you.

I can't think of the last time, Mr. Secretary, we had a Cabinet secretary volunteer to testify. I am told that you wanted to be here. Usually, we got to drag you guys kicking and screaming and threatening and all kinds of stuff.

Secretary MONIZ. This is an important discussion.

Mr. BARTON. And so you just said hey, I want to come by and visit and we dropped everything we were doing so we could hear you. We appreciate that.

You mentioned in your opening statement the Strategic Petroleum Reserve and the FAST Act and the review of the function. You all put out a report, as you pointed out, a month or two ago.

That report is a little bit hazy on details. I've had a few inquiries in my office about when do you plan to put out, perhaps hopefully, for competitive bids some of the big projects—the Life Extension project, the Maritime Terminal Enhancement.

Are you going to competitively bid those and if so do you have a timetable for when those requests for bids might go out?

Secretary MONIZ. Yes. Well, of course, we need to have the appropriation before we can go out and so we have our first request in for the first appropriation, which would be focused principally on the modernization part. But just last——

Mr. BARTON. So the next year or so?

Secretary MONIZ. Oh, no, sir. Early in the next year. We'd like to move out early in the next year and, again, with only 4 years of authorization we need to be pretty snappy in terms of moving this all forward.

But the——

Mr. BARTON. Snappy is a technical term that you learned?

Secretary MONIZ. Yes. That's right. We have this under our formal project management system. The first milestone for the modernization was done last year.

So we are ready to go. The first milestone for the marine terminal distribution only just happened last month. So that project will kind of be second in line but we will be starting the conceptual engineering in the next year.

Mr. BARTON. You answered a question to Chairman Upton how important the Strategic Petroleum Reserve is and that it still is relevant. But you also answered his question that other countries do it differently.

When we passed the ban—to repeal the ban on crude oil exports we also put in a provision to do a study of the SPR.

I think it would be worthwhile to look at privatizing. You mentioned in an answer to Chairman Upton's question you're going to need about almost $2 billion to modernize it.

It would seem that now would be a good time to maybe take a page out of the play book of the Europeans and look at privatizing the SPR so that the government is not on the hook for the maintenance and the modernization. Any interest in doing that and while you're moving forward also look at privatizing?

Secretary MONIZ. Well, we can certainly make the next team aware of that possibility.

Mr. BARTON. You may be part of the next team. You're sitting there smiling and volunteering. If Mr. Trump is the president he may just ask you to stick around for a while.

Secretary MONIZ. We could discuss that.

Mr. BARTON. Yes. I am about to run out of time here. The folks in Chicago just have an attitude. That's all there is to it.

What's your view of the market for crude oil exports now that we have repealed that ban and we are exporting crude oil and we did it in a way that we really set up a market?

There is not a lot of bells and whistles in terms of government oversight or interference or anything. I think it is doing very well and I am very happy that we have brought balance to the world oil markets by repealing the ability of our domestic producers to export. Do you have any views on that?

Secretary MONIZ. Well, I think I would in many ways just repeat what I said last year in the discussion because I believe it is being played out.

Certainly, the increase in the amount of exports has been very, very modest—about 10 percent—because of course, we used to export to Canada but and that's in the context that we still import 7 million barrels.

But what's happened is that there are customers who really want the light sweet oil coming out of the shale and so I think there's been some optimization of refinery operations in various countries by getting some of our light sweet oil.

It's had some ironic changes. For example, I recently visited the biggest East coast refinery in Philadelphia and at one point, they were taking 20 percent of the Bakken crude and shut off their imports from Africa and now that's flipped. They're back to three-quarters African imports as the market has readjusted.

But macro, as I expected, frankly, at least for some years I don't see an enormous increase in the exports and that's shown because especially the Louisiana Light Index has actually been trading even above Brent. So there's not a big price differential to work with.

Mr. BARTON. Right. Well, that's the whole point of a market. As you know as secretary is you let them actually operate and that is in itself a tremendous achievement and over time I think it is going to bring benefits to the producers and to the—and to the consumer.

My time is expired. I simply want to say thank you for your service to the country. You've always been available to the members of the committee. You've always been cordial. Our differences have been on policy, not on personality. I think you've served your country well as secretary.

Secretary MONIZ. Thank you.

Mr. BARTON. And I wish you the best in whatever the future may hold for you.

Secretary MONIZ. Thank you very much.

Mr. BARTON. With that, I yield back, Mr. Chairman.

Mr. OLSON. Gentleman's time has expired.

The chair recognizes the gentleman from California, Mr. McNerney, for 5 minutes.

Mr. MCNERNEY. Well, again, I thank the chair.

Mr. Secretary, as more renewables come onto the grid and as localized generation increases, what future do you see for the transmission as a business, going forward, for electrical transmission?

Secretary MONIZ. Well, clearly, one of the important issues is the ability to integrate large sources, wind and solar, typically over large distances. And as we know, there is difficulty in the siting and building of these long-distance high-voltage lines.

We did use the congressional authorities given to the Department of Energy earlier this year to approve one such project that crosses several state borders.

It's sufficient, probably, to say that is now in litigation. But it is very important if we are going to be able to really maximize our system for the 21st century.

We need everything from the very long-distance transmission to distributed generation and bringing all of those things together is going to require grid and storage solutions.

Mr. BARTON. Well, following up with that question, what do you see the business models looking like for the large utilities as we get more distributed generation?

Secretary MONIZ. Well, I think that there's clearly a bit of a challenge in terms of how these business models evolve. And it is not just distributed generation.

Distributed generation is a very important part of that. But I would just also note that our success in demand side management is also a challenge to traditional business models because, particularly when the pie is getting bigger, when the market is getting bigger, there are many more ways of bringing in new players. So there is that kind of system.

And finally, I think—well, not finally but one other factor is that the regulatory structures, largely in many ways state-based, certainly on the distribution side, clearly, but the issue of how to value all the new pieces in the grid like storage, like capacity value, like low-carbon value, et cetera, we really have not yet managed to solve that problem.

And so valuation, which will open up new business models, will be extremely important and that is a focus of our quadrennial energy review work right now that we hope to get out in December or so.

Mr. MCNERNEY. Good. Well, water is an essential component to energy security. Can you elaborate on DOE's water energy technology team? How are they addressing that issue—the water-energy nexus in security?

Secretary MONIZ. Yes. Now for the last 2 years we have been ramping up this water-energy nexus work and there are several elements there.

One, by the way, that we are focused on besides new technologies and we have proposed, by the way, in our fiscal year 2017 budget a new kind of, roughly, $25 million a year hub around water. It's called "de-sal" but it is not just about the membranes. It's about the system and how you clean up the water and everything else. So that's a focus.

But in addition, I would just note that from our perspective we think the quality and comprehensiveness of data on water is not up to where it needs to be, certainly in terms of publicly available databases.

So I think this issue of working on data, working on technology and working on the systems issues are all critical.

Mr. MCNERNEY. Very good.

Secretary MONIZ. And if I might add one more thing, international partners are really excited about working with us on this, and certainly Israel, which is so far advanced in these technologies, is one that we are building up a stronger collaboration on.

Mr. MCNERNEY. And could you briefly talk about the energy storage program at the department?

Secretary MONIZ. The energy storage program is also one that we have expanded—a lot of congressional interest in that and support, which we appreciate. So we have a battery hub, which is doing extremely well. It is centered at Argonne. Berkeley is the major partner. So that's going on.

And I might just add we recently put out—maybe a month ago—a report on hydro and pointed out that in terms of storage we still have a lot of capacity for pumped hydro in the country, which today is the most cost effective in the places where you can do it.

Mr. MCNERNEY. Thank you. Mr. Chairman, yield back.

Mr. OLSON. Gentleman yields back.

The chair recognizes the gentleman from Ohio, Mr. Latta, for five minutes.

Mr. LATTA. I thank the chairman very much and, Mr. Secretary, thanks for being with us today. It's good to see you again.

And I would like to touch on a couple of areas that you brought up in your testimony, one being fixing America's surface transportation under the FAST Act, and under the FAST Act provides that DOE, with a new authority to protect and restore critical infrastructure when the president declares a grid security emergency.

How has this new authority changed the way DOE works with the private sector to protect and restore critical infrastructure?

Secretary MONIZ. So we are really ramping up that intersection. In fact, our Deputy Secretary just hosted a meeting with leaders from the electricity sector last week at our Sandia laboratory.

And in fact if I just mention, say, cyber security as an example of that, we have developed now with private sector CEOs—well, CEOs and people who work for the CEOs—a number of tools.

Partly, it is something called CRISP, and I've forgotten what the acronym stands for, but it is a program of much more bidirectional exchange and situational awareness about cyber threats including the exchange of classified information.

Secondly, we have developed what's called a maturity model which allows the electricity sector—but also we've extended it to the oil and gas sectors—to get a much better understanding of where they are in their cyber capabilities. And third, we have just instituted in August an integrated joint cyber activity that knits together all of our capabilities from our laboratories on cyber for a faster identification and response to cyber threats. That's already shown its potential in a particular cyber threat that was identified much faster than was done in the industry itself.

Mr. LATTA. Since you brought up on the cyber side and especially what's happening there, how's your cooperation then working with other departments and agencies in the government, especially Homeland Security?

Secretary MONIZ. I think it has been good and is getting better. In fact, this information sharing CRISP initiative is with DHS and

certainly we also work, I might say, not in electricity so much—well, it is electricity too but it is other areas—we work extremely well with FEMA in terms of addressing issues that included some of the flooding issues recently, for example.

Mr. LATTA. OK. And the FAST Act also requires you to submit a plan to Congress by the end of the year evaluating the feasibility of establishing a strategic transformer reserve for the storage of spare or large power transformers in emergency mobile substations to temporarily replace critically damaged equipment.

Could you tell me what the status of the review is and when you would be able to complete that?

Secretary MONIZ. We expect to meet that December target. We are well along in that.

Mr. LATTA. OK. And one other thing, if I could, because it is one of the areas I am always interested in. In your testimony—you also brought it up in our opening statement that when you were talking about different threats that are out there, either natural or manmade, where are we at on especially DOE and trying to combat electromagnetic pulses, especially when they are manmade?

Secretary MONIZ. We have done quite a bit of work on that in collaboration with EPRI. In fact, this is part of a report that we'd be happy to share with you if you get a chance——

Mr. LATTA. Yes, I'd like to get that.

Secretary MONIZ [continuing]. On resilient strategy. That was done with EPRI. We also have, of course, classified information that could be discussed in a different venue.

Mr. LATTA. Right. Well, thank you very much, Mr. Secretary.

Mr. Chairman, I am going to yield back the balance of my time.

Mr. OLSON. Gentleman yields back. The chair now is happy to recognize the University of Houston's biggest fan in Florida, Ms. Castor, for 5 minutes.

Ms. CASTOR. Well, thank you, Mr. Chairman. He says that because the university president used to be the provost at the University of South Florida campus. So we take ownership of her, too.

But I want to thank you. At the University of South Florida in June at the Patel Center for Global Sustainability, Dr. Lidija Sekaric, your director of the Office of Solar Technologies, came to give a presentation and the room was packed even though we were in the midst of a huge rain event due to a tropical storm.

And I think you're absolutely correct that American families and businesses across the country have so much interest in the growing renewable marked and the potential to save money through energy efficiency.

In fact, at the end of August during the primary election we had a constitutional amendment on the ballot to provide a little help to solar industry and it passed by 73 percent.

And I think folks are frustrated in the Sunshine State because we have no goals for renewable portfolio standards and they even cut back on energy efficiency.

So what you say about the business models at the state level really hit home and we can talk a little bit more about that.

But the Energy Information Administration is projecting that growth in renewable energy is going to grow faster than just about

any other energy sector and in fact they say over the past year we've exceeded projections month after month after month.

You've said, in this QER right now, that it is outdated—that we've got to look beyond oil security and energy security needs to be more broadly defined to cover not only oil but other sources.

Combating climate change is also essential to strengthening collective energy security. How far behind are we? I know the big grid modernization effort is very important but what else do we need to be focused on?

Secretary MONIZ. Well, I think, addressing the clean energy part, which were the third, fourth, and fifth principles. There the major initiative that we put forward is the idea of doubling our innovation budgets over, say, a 5-year period and we've been pleased that the concept has gotten very strong bipartisan support. That's got to get translated into numbers over these years.

But I think that's very important. I might also add, and it'll probably be referred to soon by Mr. McKinley, that I was in Morgantown earlier this week for our thirteenth regional innovation meeting because we are emphasizing that we think regional portfolio management actually will be a real plus, and I am pleased to say there's been a lot of support for that, too. Now we need Congress to hopefully authorize that.

So that is on that side. But in terms of the more global aspects of energy security, I think since 2014 when those principles were put out we had made substantial progress, particularly in our discussions with the European Commission.

The European Commission then adopted a very strong energy security policy in line with those principles and we work closely with them.

There is still a lot of implementation to go in the European context. But that's been important and I might say a lot of it was driven initially by the Ukraine aggression.

Ms. CASTOR. I think that's right because what I hear back home they think the clean energy future will involve a lot of job creation so that investment in innovative technology is very important.

They know it is going to save them money as they take control of distributed energy or even right at their thermostat in their home and climate change—they see the cost right now after this recent tropical storm. They understand. We have salt water intrusion.

These huge rain events are costing people money—flood insurance, emergency response—and if we don't do more up front it is going to be very, very costly and they understand that.

Secretary MONIZ. And if I may say, I visited Florida Power and Light and, yes, they are doing a lot but it costs money to harden the system because of the obvious risk to sea level rise, et cetera.

Ms. CASTOR. Thank you.

Mr. OLSON. The gentlelady yields back and, Mr. Secretary, ask and you shall receive. We recognize the gentleman from West Virginia, Mr. McKinley, for 5 minutes.

Mr. MCKINLEY. Thank you, Mr. Chairman, and thank you again, Mr. Secretary, for coming to West Virginia to participate in that panel and also the trip to Longview power plant that was—I hope it was beneficial to you.

I have got a couple comments. I want to build up a bit of what my friend from California was talking about because when I read the—your written statements and listened to your opening statement there were two omissions that I heard.

One was you didn't talk about water as being part of our national and economic security for this country, which I thought was made. But even more, so you didn't mention coal, other than the fact that gas is going to supplant coal perhaps in the near to long-term future.

So just getting past that, we are just going to have a disagreement. I think it deserved to have some mention as part of our national economic security of this country on that.

But let me go to some questions, however quickly. We've had testimony from Phil Moeller when he was back with FERC and he has since confirmed again that we have apparently—talking about grid security and reliability that we have lost apparently somewhere in the neighborhood of 70 gigawatts of coal-fired power plants around the country and we've been replacing them with gas and renewables but more, from what I understand, with renewables so it's an intermittent load. It's not base load.

We are still at a net loss but much of that gain that we've made that replacement is over in renewables, which we can't count on because of their intermittent use with it.

So how do we—how can FERC—how can Congress get involved in valuing just dependable base load power plants, whether that's using gas or coal? What do we do to incentivize that so we've got a satisfactory grid?

Because we know there's a fair—we know we can't count on wind and solar to power our base load.

Secretary MONIZ. Well, OK. Of course, at the current levels of penetration in effect, the grid is the storage system for wind and solar.

Now, as those penetrations—if they get much, much higher, of course, then we will have to manage the variability of those sources.

Now, part of it can be, of course, technology like storage. Energy storage would take care of that. But your suggestion I think goes right to something I mentioned earlier and that is, "What is the way of valuing different services in the grid that have not been part of the traditional regulated utility model?"

And one of those would be this question of value of base load which, by the way, of course, right now that's a major issue as well with nuclear with the shutdown of a number of nuclear plants as well.

And so in terms of response, currently I would say that there are certainly very few authorities in the federal government, certainly at DOE.

FERC is doing work on what they call price formation, which is a question of how do you value these other qualities, and states are the center of the action.

Mr. MCKINLEY. Thank you. I'd like to follow up more with you. Maybe we can have more of a conversation about that so that we can have more to battle with.

But you also talked about that energy storage and part of the House package and also in the Senate package—the energy bill—there is the ethane storage and what we refer to as the Appalachian hub so that we would be able to have storage of ethane not only on the Gulf coast but someplace in the northeast.

Are you aware of that and do you see an advantage of having a—for energy security and national security having a separate ethane storage facility?

Secretary MONIZ. I have to be honest, I haven't really thought that through. So I really would like to think about that and get back to you.

But I would say that, of course, as we know, in Pennsylvania, West Virginia, Ohio there's a tremendous opportunity given all the ethane production for building on industry and so it is an extremely valuable commodity.

But, again, specifically on the issue of ethane storage, I have to admit I have not thought that through.

Mr. MCKINLEY. Just in the remaining time I have, just quickly. When you met with Longview and they made the statement that they are the most efficient and cleanest coal-fired power plant in America ahead of Turk but yet they've said they can't get a permit to build a second facility to build off that. What did you learn at how we could help another facility like that be constructed?

Secretary MONIZ. Well, again, as we discussed in Morgantown, first of all, we continue to be very committed to carbon capture sequestration as a critical technology that we will need—and the IEA says that and everyone else says that—to meet our climate goals most economically. So that's very important.

I thought the proposal that they made there about a 50 percent coal-firing was quite interesting, and in fact I hope I do get a spreadsheet on that to look at, meeting the clean power plant goals with the coal and gas coal-firing will be quite interesting.

So I am happy to discuss it. Oh, and a third one, which I mentioned as a big game changer if we can really solve it but it is probably longer term is the question of "what are the technologies for economic very, very large-scale utilization of $CO_2$."

Mr. MCKINLEY. Thank you.

Secretary MONIZ. That's a big deal if we can solve that problem.

Mr. OLSON. Gentleman's time has expired.

The chair now recognizes the number-one fan of the Houston Cougars from Houston, Mr. Green, for 5 minutes.

Mr. GREEN. Thank you, Mr. Chairman.

Welcome, Mr. Secretary. It's good to see you again and I know each of us have worn different hats over the years and I appreciate the job you're doing.

Let me start out on the Strategic Petroleum Reserve. We import now 7 million barrels a day. How long would it take if all of a sudden we had an embargo and we couldn't ramp up in our own domestic production, which I think we could, to be able to draw anything out of the SPRO?

Secretary MONIZ. Well, we could certainly start withdrawing from the SPRO. I think it is in a week time frame, something like that.

Mr. GREEN. OK.

Secretary MONIZ. So it is a rapid reaction. Whereas going to the uncompleted wells would be a several month activity.

Mr. GREEN. Because I was told it was much longer than that because and that's why some of the things we did——

Secretary MONIZ. I will check on that. But I believe it is more like a week. It's not so much a technical constraint as it is getting sometimes all of the bids required for the distribution of the oil.

Mr. GREEN. Yes. Because even though we have a great pipeline accessing Louisiana and Texas, like you said, the bare time issues that we have to actually get it——

Secretary MONIZ. Yes, because of reverse flows in some of those pipes to get incremental barrels out is probably going to require, as we said, much more maritime distribution.

Mr. GREEN. OK. Well, the main questions I have, and you talked a little bit about it is that in 2014 one-third of the intentional cyber attacks targeted energy infrastructure.

In your testimony speaking about cyber security you stated we are seeing threats continuing to increase in numbers and sophistication. This evolution has profound impacts on the security and resilience of our energy sector.

I hope in our hearing today we can understand what's being done and on what more we can do in Congress to protect from these increasing hazards.

Of course, it is not just Russians looking at Democrat or Republican. But we are talking about refineries in East Harris County and Louisiana—you know, coal plants, natural gas facilities and things like that.

What are the most significant challenge in securing energy delivery systems against the cyber attacks?

Secretary MONIZ. I would just add, if I may, the point you make about the interconnectedness I think is very important and as we've pointed out that electricity problems have led to enormous refinery and fuels problems, et cetera, et cetera.

So it is really important and cyber is a growing threat. So I think the key is, as I said earlier, working with industry. At DOE, let me emphasize, we have, I would say, three different kinds of cyber challenges.

One is a standard big entity, administrative systems and personal information. A second is our nuclear weapons information. And third, and the hardest one in many ways, is working with the private sector on the energy system.

So it is really information exchange including making technology available to the private sector is really a key in many ways. A second key for us is to use all of our assets including those at our laboratories and bring those to the table on cyber threats, and we've done enterprise wide.

One thing that I would say is, in terms of possible changes and maybe legislative—and it is not only for cyber, it is for other issues as well—is that we need to make sure that there are not barriers which could be competitiveness barriers, for example, that are out there for different parts of the industry working together on the response.

Mr. GREEN. Well, I will close with one example. When we had Hurricane Ike come through East Harris County and it shut down

the refineries in Galveston Bay and both United Airlines who said we'd never lighter planes out of Houston and we are having to do it and the Air Force was there too, saying—and the Navy because we needed to have this jet fuel and so that's why we need the grid up.

Secretary MONIZ. Coordination.

Mr. GREEN. Each plan has their own but you can't run a plant on generators. You have to have the grid to help and so that's why it is so important.

And I know in some areas, like in East Harris County we have a partnership both for security and other things. But I just want to make sure that everybody is on the same page.

Secretary MONIZ. Yes. The coordination is important. I might add that, for example, in May we ran a very big so-called tabletop exercise in the northwest with lots of industry participation, many agencies, so that everybody could understand the challenges of everybody working together on the same page. So that's important.

Another thing I'll just mention is that, because the SPRO was mentioned, even though it is much smaller, we have moved out in a couple of product reserves as opposed to crude oil reserves and that came into play in Sandy when we released that to some of the first responders so that they would have the fuel to respond.

Mr. GREEN. Yes, the diesel and everything else.

Secretary MONIZ. And so that's another interesting discussion.

Mr. GREEN. Thank you, Mr. Chairman.

Mr. OLSON. Gentleman yields back.

The chair now recognizes the gentleman from the Commonwealth, Mr. Griffith, for 5 minutes.

Mr. GRIFFITH. Thank you very much, Mr. Secretary. Thank you for being here as well.

The last time you were before this committee back in March I expressed my appreciation for the folks at Department of Energy working with me to set up a visit to my district to discuss the future of coal.

About a month later, David Mohler, DOE's deputy for clean coal and carbon management, came down to our coal field region for a round table discussion with community leaders. A public symposium at the University of Virginia's College at Wise was held on the future of coal technology, innovation in industry.

And I'll also highlight after we did that with all the opinion shapers and the business leaders and the folks who work in the coal industry your team went over to Clintwood, which doesn't get many visitors—there's no four-lane highways in Dickinson County—to visit students at Ridgeview High School, which is a brand new high school built with a lot of dollars from the federal government because the county is not wealthy. It is central Appalachia and the coal fields, mountains, trees, and lots of good people and not a whole lot else.

That visit was particularly important for the students there in Dickinson County because your team made it clear that there are possibilities in science that can affect the coal industry positively. It was just a great visit and I commend your folks for doing that.

I also commend you for having the leadership to have folks—I heard you talking about with some of the other folks visits that

had been made by yourself and members of your team in other districts as well.

I think that speaks highly of the work that you're doing. And while we may not always agree——

Secretary MONIZ. Thank you.

Mr. GRIFFITH [continuing]. With your leadership at the Department of Energy we are headed in a better direction and I appreciate that.

Secretary MONIZ. May I say, Congressman——

Mr. GRIFFITH. Please.

Secretary MONIZ [continuing]. That because maybe it has been provided to you but just to make sure—actually at the end of August we produced I think a very nice synthetic paper on all of the coal issues that we are dealing with and if you not seen that we'll shoot it to your office.

Mr. GRIFFITH. I haven't seen it but my staff may have it and it has been one of those busy times in DC, as you know, when I have a few weeks. But I'll try to read that when I get home.

Secretary MONIZ. OK.

Mr. GRIFFITH. But we had a lot of good discussions and we talked about a lot of different things on how we can get our coal miners back to work, how we can find a continued future in the coal region and our economy and in our electric generation fleet.

It meant a lot to the people of southwest Virginia and particularly in the coal fields in those counties. So I appreciate the hard work that you did in making all that happen.

Now, one of the main things that I found particularly interesting in our discussions is we talked about the need for research parity for clean coal technology, and while you've touched today already on some of the things with carbon capture and sequestration, I think that's the hot button issue and probably a good source in the short run. But with research I am convinced we can use our fossil fuels—not just coal but the other fossil fuels as well in better ways.

Can you just take a minute and discuss some of the things you all are working on with all of the different fossil fuels and research and the importance of having parity with—there's nothing wrong with renewables but parity in that research because we are going to continue to need the fossil fuels as well.

Secretary MONIZ. Well, first of all, on carbon capture I want to emphasize that's not only about coal. Coal is, obviously, kind of the marquee application in many ways but I believe ultimately we will need it for natural gas and, very importantly, for a whole variety of industrial facilities. We also support ethanol plants and natural gas processing plants, et cetera.

So that's important, and I want to emphasize, we have spent $5 billion on CCS. We also have an $8.5 billion loan guarantee program open right now for fossil technologies, et cetera.

But one of the things that really excites me for the longer term—and I just mentioned one example of really breakthrough carbon management possibilities would have enormous implications for how fossil fuels then can be used in the energy economy—one of those is, as I said, the potential for really big-scale $CO_2$ utilization. And if I toss out, like a holy grail of that, sunlight, water and $CO_2$ to hydrocarbon fuels, that would be a complete game changer.

Some in the fuels industry would be challenged. But that would be, for example, a game changer. There are negative carbon technologies that we should pursue.

So I think, in terms of coal, when I say coal there's three big thrusts. One is the innovation agenda around things like CCS, et cetera.

Another is the transitional assistance to economies and workers in coal country and we just issued $39 million there. And then third is these really big breakthrough possibilities that could change the entire carbon management equation.

Mr. GRIFFITH. Thank you. My time is up. I yield back.

Mr. OLSON. The gentleman yields back.

The chair now recognizes the gentlelady from California, Ms. Capps, for 5 minutes.

Ms. CAPPS. Thank you, Mr. Chairman. And I want to echo what my colleague, Mr. Barton, said earlier and thank you for—you're a pretty regular witness here on our committee over your tenure at the White House and you have been by all appearances very willing to answer all kinds of questions on this, which is a most pressing topic. So I thank you for the time you've spent with us.

Your testimony today indicates this is a timely and pressing issue before us. We are currently in a conference level committee trying to negotiate an energy bill that will help define our energy landscape for the next decade.

At the same time, we know these threats from climate change are real. So bold action needs to be taken.

Communities across the nation are already facing the threats of climate change. In fact, I don't call it a threat anymore as much as dealing with the outcomes which we are experiencing, whether through increased storm severity or flooding or, as in California, the crippling impacts of our drought. My area—5-year drought.

We're building a desal plant. It's very expensive and the technology is pretty precarious. And the massive forest fires that we've had to deal with are very costly, too.

So I believe it is time we stop considering these conditions as anomalies and start addressing them as the new normal and we start implementing strategies not only to adapt to these scenarios but to the extent possible mitigate them by reducing our contributions to climate change that's happening.

President Obama has made real progress in laying out a framework to start this transition but there is a lot more work that needs to be done.

We must expand the implementation of existing green technologies such as solar power and increased energy efficiency and invest in the new technologies that will carry us into the future.

Many of our research universities are really leading the way and doing this, which will benefit not only our energy security but our national security and our economy at the same time.

You mentioned this in your opening statement but I'd like to give you a little more time to discuss the ways renewable energy and investments in renewable energy and efficiency will bolster our energy and national security.

Secretary MONIZ. Yes. Well, the answer to the last part is pretty straightforward. Again, the renewable technologies are not looking at—there's no issue of importing or exporting the fuels.

Ms. CAPPS. Right.

Secretary MONIZ. It's what we have and that's true anywhere in the world, basically. The mix may be different but that's true anywhere.

So the importance of this as an element of our energy and national security is, I think, quite clear. Now, in terms of moving the ball, again, I, of course, am maybe not totally objective but I think innovation is absolutely the core to this, and that's good news for us because we lead in innovation and we've got to stay the leaders in innovation. Particularly because, as one of our CEO friends in the industry, Tom Fanning, the head of Southern Company, says you can't keep the waves off the beach.

We are heading in this direction inexorably in terms of lower carbon and the Paris Agreement, no matter what one thinks about it, it tells you that we are developing a multi-trillion dollar global clean energy technology business. So we also want to be at the head of that train.

Now, cost reduction is critical and we, through innovation and through deployment—they work together. More deployment, more innovation drives those costs down. We've seen that now for solar PV. We've seen it for wind.

We've seen it for LEDs, which is not quite renewable energy but uses less energy, and now we have to keep that kind of cost reduction pathway going and do it for carbon capture and do it for nuclear and do it for offshore wind as opposed to the onshore wind progress.

So we've just got to keep at this across the board. I remain an all-of-the-above guy aimed at a low-carbon future where hopefully all of our industries, all of our people can be part of that solution.

Ms. CAPPS. That's right. And just the right amount of time, but a word to say thank you because this path of progress during your administration, your leadership at the department and to the extent that we were able to work with you has really made, I hope, significant progress.

Although, as I said, there's a lot more work to be done but hopefully this is a movement now that will not be questioned as much as it used to be but that we'll see it as progress all along the way.

Secretary MONIZ. Innovation. Innovation.

Ms. CAPPS. Exactly. Innovation. That's a great word.

Thank you.

Mr. OLSON. The gentlelady's time has expired. The chair now recognizes a fellow Texan, Mr. Flores, for 5 minutes.

Mr. FLORES. Thank you, Mr. Chairman.

Thank you, Mr. Secretary, for joining us today. The U.S. is now the leading producer of oil and natural gas and how is this new age of energy abundance benefitted our global competitiveness and allowed the U.S. to position itself as a global superpower?

Secretary MONIZ. Oh, it has had an enormous impact on natural gas, first of all. First of all, we have not become major importers of LNG. Now we are going to be exporting LNG. We expect to be net natural gas exporters in 2017. But domestically it has both led

to a tremendous renewal in manufacturing—$170 billion capital invested in just in the kind of the chemical arena and, by the way, also reducing carbon emissions.

On the oil side, again, we remain very large crude oil importers but the dramatic decrease in our net oil and oil products imports has had a tremendous balance of payments impact.

Both of them have changed the world energy scene and we are now looked at in a very, very different way.

Mr. FLORES. Right. You haven't even talked about the geopolitical implications.

Secretary MONIZ. That's what's I meant. Geopolitically we are looked at in a very, very different way.

Mr. FLORES. Right. Right. I am talking about from a world security, world stability standpoint. But that's for another day.

So moving on, you've talked about the failure of our nation's infrastructure to keep up with the new dynamics that we have in this energy industry not only with respect to transmission of electricity but also transmission of oil and natural gas.

And so the lack of capacity and the recent opposition to new infrastructure means that the average consumer pays more energy than they should. Are we headed for price spikes again this winter because of the lack of infrastructure under the——

Secretary MONIZ. Well, I would not want to predict. But, obviously, there's a vulnerability if the infrastructure is not there. Another polar vortex or who knows what would happen.

Mr. FLORES. Right.

Secretary MONIZ. But also with that, it is not even just wires and pipes but also, as we pointed out in the QER, inland waterways, ports, et cetera.

Mr. FLORES. Right. Right. And also cyber as well.

Secretary MONIZ. Cyber, yes.

Mr. FLORES. Cyber issues. Your QER devotes an entire chapter to improving North American energy integration. But it makes no mention of the issues that arise with cross-border presidential permitting, in general or in particular the Keystone XL Pipeline.

Do you agree that our current ad hoc or siloed permitting process, as the QER puts it, creates significant uncertainty?

Secretary MONIZ. Well, that's what the QER said so therefore we back it.

Mr. FLORES. All right. You agree, since it said it.

So that goes to the next question. That is, how has the inability to render a decision on the Keystone Pipeline impacted other energy projects?

Secretary MONIZ. I cannot say that I've seen any impact, to be honest. Again, I think the QER pointed out—I've forgotten the exact number but we have a lot of infrastructure crossing the border and, certainly, our electricity systems are essentially integrated with Canada and now with Mexico. There's going to be increasing integration there as well.

Mr. FLORES. Right. Right. Are you——

Secretary MONIZ. In fact, Texas and Mexico, as you know, do trade electricity.

Mr. FLORES. Right. Oh, absolutely. We already trade. Texas leads the country in all this.

Secretary MONIZ. Correct.

Mr. FLORES. Including wind power as well so——

Secretary MONIZ. Yes.

Mr. FLORES [continuing]. Let me ask you this. Are you happy with the time it took to reach a decision on Keystone?

Secretary MONIZ. I think that's a question for the Department of State. That's not my responsibility.

Mr. FLORES. Oh, OK. All right. I mean, you're the—you're the head of DOE so you've got a dog in this hunt.

Secretary MONIZ. That's a question for the Department of State.

Mr. FLORES. All right. OK.

Is there room to establish a more uniform coordinated modern process for the consideration of cross-border pipelines and electric transmission facilities? I am sure you've got an opinion on this.

Secretary MONIZ. Well, I think that what's—the only thing I would say more broadly, and it does apply to other DOE responsibilities, is I think the Congress has, for good reason, over the years put in all of these statutory assignments, the idea of national interest determinations, and I think that's what we do for LNG exports. And that's what state does for their responsibilities. We also have it for cross-border electricity lines.

Mr. FLORES. Of course, in my opinion, this is an area where Congress needs to get involved and clean up the statutory underpinnings of the decisionmaking process in this regard. And so I am assuming you'd be willing to provide technical assistance to Congress in trying to formulate this?

Secretary MONIZ. We are always happy to provide technical assistance.

Mr. FLORES. Thank you very much and I yield back the balance of my time. Thank you.

Mr. OLSON. The gentleman's time has expired.

The chair now calls upon the gentleman from Pennsylvania, Mr. Doyle, for 5 minutes.

Mr. DOYLE. Thank you, Mr. Chairman.

Mr. Secretary, first of all, thank you for your service. I've been in Congress 22 years and been through five or six secretaries of energy. You're by far one of the best and you're going to be missed here. So I want to say that right up front.

Just two quick things. I know we all agree on the importance of carbon capture, utilization, and storage. There is international consensus that it would be very difficult if not impossible to meet our climate change goals by 2050 without this in place.

And also, without additional investment in the electricity sector—if we try to limit global warming to the 2 degree scenario without it it is going to cost $2 trillion over the next 40 years.

So it is not only necessary to meet the goal but it is necessary to meet the goal in an affordable way. Now, I know the white paper that you issued recently listed several bills here in Congress which would change tax credits or financing options or CCS.

But my question is do you think what we are doing is substantial enough and what other options might we pursue? It seems like we have been talking about CCS forever but it doesn't seem we are any closer to actually seeing, you know, implementation of this technology on a scale where it can be helpful.

And as you said, it is not just coal. It is natural gas, too. And what do we need to do to sort of make this a moon shot and get this technology out there?

Secretary MONIZ. Well, I think, in terms of where we have come, how far or how not far, depends on how you look at it, we have come—of course, the point is that there has not been a price signal to the private sector there, and I think that's what we need to have for sure.

And I would just make another point, if I might, on this kind of finance side. As you know, the administration has proposed now for 2 years tax credits for carbon capture, both investment tax credits and storage credits.

In Congress there is a lot of discussion around 45Q, as they have some different numbers but fundamentally it is the same idea.

I think a point that has not been appreciated enough and is why I think Congress addressing this with some urgency is called for, is that big capital expenditures by utilities, by investors, et cetera, have a long gestation time, and I think that there are two signals that would be very powerful for pushing on CCUS.

One would be something like these tax credits that were put in place for a long period of time. OK. Now I understand what I am getting into and, secondly, of course, is the clean power plan does that through the regulatory approach. There are other approaches, obviously, including a direct one.

But all I am saying I think signals now—it is not saying, look, CCS might be a big deal in 2030 so let's wait. You need the signals now if you're going to get those investments made.

Now, on the research side, it goes back to this need to increase our innovation investments. Now, in fiscal year 2016 and 2017, we are moving forward into pilot project scale—10 megawatt scale for alternative technologies.

We could take a lot bigger steps with more resources. So I think those are the two areas that are kind of that signal side on finance and carbon management and the innovation.

Mr. DOYLE. Thank you.

Let me ask you quickly about nuclear energy, too. We are seeing some of these premature nuclear plant retirements and that could cause a threat to our diversity in power generation.

And I know during the summit you emphasized some of the valuable attributes that nuclear plants provide like carbon-free electricity, high availability, reliable service, fuel diversity, and explained that these are not systematically valued by electricity markets.

You further stated that the department is prepared to take action to help address the economic market and valuation challenges for nuclear power.

So could you explain the actions that the department has taken since the nuclear summit to ensure that nuclear plants are compensated for the energy security, reliability, and other benefits they provide to the electricity sector?

Secretary MONIZ. We don't have the authorities to take those regulatory actions. But what we have been doing and are doing are the studies of how to value those attributes and then that will lead

to some recommendations in our quadrennial energy review second installment at the end of the year.

So that's one thing. Now, it is true we also continue to have discussions with FERC, which does have some authorities in terms of the price formation at the wholesale level. That's going on.

But of course, a lot of the action is at the states and certainly, one of the notable actions was the New York initiative in August for the so-called clean energy standard, so a kind of technology-neutral carbon approach. That's very important.

Now, the other thing is, in terms of the nuclear plants shutting down is, clearly, the clean power plant implementation plans and we are rather confident on the court side. 2018 is when the implementation plans are due.

Now, it would seem ironic to have lost zero carbon assets just as states are going forward with implementation plans.

So that's why something like the New York activity and Illinois is considering something similar, I think, are quite important.

Mr. DOYLE. Thank you. Thank you very much.

Mr. OLSON. Gentleman's time has expired. The chair calls upon the gentleman from Ohio, Mr. Johnson, for 5 minutes.

Mr. JOHNSON. Thank you, Mr. Chairman, and Mr. Secretary, I do want to echo the comments of some of my colleagues. It's been a pleasure working with you over the last few years.

As we talk about these important ideas around energy security I am glad to hear you say that you remain an all-of-the-above advocate.

I certainly hope that as you transition—assuming that you transition out someone else transitions in—that you will pass that advocacy on to your successor in the sense that we—one of these days, because we are problem solvers here in America—we always have been.

You look back throughout our history. We won't go through the litany but there have been a lot of them. Someday somebody might solve the problem, I suspect, of harnessing the sun's energy and storing it up so that it can be made available on the energy grid for base load. Same thing with wind energy, other alternative energy forms.

I just hope that we can return once again to kind of a common sense approach to an all-of-the-above energy policy where we don't throw out the baby with the bathwater and we are not killing jobs and that we are looking more for market-driven solutions rather than solutions from inside the Washington Beltway because I think the American people are screaming for that.

And I don't think we can forget about the impact that we have made to our communities that have served our energy and national security needs and I hope that we can continue to work together throughout the rest of your tenure and that you also pass along the importance of finding a long-term funding solution for those funding challenges at DOE's cleanup sites like the Piketon facility.

Those are very important that we keep those projects on a path to completion so that we can redevelop those properties and put them back into good use for the communities that have given so much already for our energy future.

Mr. Secretary, DOE, as you well know all too well, is central to America's role in international, civil, and nuclear commerce markets through what is known as the Part 810 process.

Under the Atomic Energy Act, DOE authorizes certain foreign interactions such as technology transfer and assistance on commercial nuclear power plants provided by our domestic nuclear industry.

This authorization process has been the subject of scrutiny from both GAO and this committee due to a long bureaucratic approval process and I recognize that DOE has been working to address these criticisms over the last several years by developing and implementing an updated streamlined process. Are you the deputy secretary monitoring progress of these reforms?

Secretary MONIZ. Yes. Yes, we are, in fact, and I would be happy to share with you some data that I saw just maybe 2 months ago, I think, in terms of some progress actually in terms of shortening the times. Because one of the issues we have managed with the interagency because DOE is responsible, again, but yet we work with state and other agencies and what we have, I think, succeeded in is eliminating a lot of serial activity with some parallel activity. And so the data suggests that there has been some progress. I'd be happy to share those with you.

Mr. JOHNSON. OK. All right. Can you send that over to us?

Secretary MONIZ. Yes.

Mr. JOHNSON. That would be great. That would be great.

In the remaining time, I understand DOE after two years of talking about it has not yet deployed its electronic tracking system to incorporate transparency and accountability into the process and assist applicants.

What is the source of that delay and do you have an estimate for when this new tracking system will be active?

Secretary MONIZ. On that, I'll have to get back to you and respond for the record. I am just not up to speed on that.

Mr. JOHNSON. OK. You can—you can respond back on both of those. That would be great, Mr. Secretary.

Good luck to you. I too have enjoyed working with you and I appreciate your sound reasoned approach on most of the issues that we have dealt with here.

Secretary MONIZ. Thank you. And Mr. Chairman, may I just make——

Mr. OLSON. Yes, sir. Absolutely. Absolutely.

Secretary MONIZ [continuing]. I am going back to the congressman's earlier statements. On the job creation front, I do want to emphasize that things like the renewable space, energy efficiency, we have had tremendous job growth.

So certainly in the energy sector—and I am not talking about oil and gas production. There is that, too. But we have had tremendous job growth net.

But we also recognize that there are distributional issues. That's not a uniform issue and that's why working with our communities and talking about transitional activities is quite important.

But the net job growth has been actually quite substantial. Just solar alone is over 200,000 full time jobs.

Energy efficiency jobs, which are a little bit hard to define, I would also be happy to share with you an energy jobs report that we did earlier this year. It was quite surprising—1.9 million jobs associated with energy efficiency in the country.

But we have distributional problems and, obviously, Appalachia is prime among those.

Mr. JOHNSON. Yes, and the coal industry and the job losses associated with that. It's pretty hard to get my folks to look at a jobs report that shows all of this optimism that you're reflecting when we are seeing communities go into shutdown mode because of the coal industry.

I yield back, Mr. Chairman.

Mr. OLSON. The gentleman's time has expired. The chair now calls upon the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. TONKO. Thank you, Mr. Chair, and Mr. Secretary, thank you for your bold leadership and for your visionary approach to what is a very difficult policy area, and we as a nation have prospered from your knowledge base and your determination to make a difference and——

Secretary MONIZ. Thank you.

Mr. TONKO [continuing]. For the leadership of the past and, I am certain, into the future, thank you. Thank you for leading us.

The major player in our energy arena—the utilities—in the past the tradition was spin those meters, assess the bills, print those bills to the customer and all functioned.

As we transition to transform with technology, with renewable, with research, with distributed generation, with customer choice, how do we bring the utilities along in that effort to make certain that they are able to be as strong a player as possible assisting the growth of commerce and responding to quality opportunities to the residential base and commercial base they serve and at the same time address national security?

There is a big challenge there as we transition and transform. How can we best assist in that effort?

Secretary MONIZ. Well, I think with the link to security, certainly, a critical element is their responsibilities and maybe opportunities to address resilience and reliability together because that's a new challenge.

Now, that has to be typically, of course, appropriately internalized in rate structures, which tends to be a state-by-state activity.

So I think the Congress would have to think through how it wanted to do that intersection with the states. Perhaps by incentivizing the build-out of infrastructure that we need, particularly for resilience against that entire threat spectrum that I mentioned earlier including climate-induced threats, physical threats to cyber, and the like.

So I think that is a very, very important part. A second part which, again, would typically be at the state level because it involves the distribution system, as opposed to the high voltage transmission lines, is the question of what are utilities able to do regulatorily, and what are they able to do in a business sense in terms of bundling new services to customers along with electricity

supply. Because, again, as I said earlier, we don't anticipate a big growth in electricity demand.

Maybe even eventually decreasing demand, even as the economy grows. And then that means the business model needs to evolve as well—probably into new services.

Mr. TONKO. OK. Well, as you know, in New York, my home state, the REV process is underway and everyone is waiting for what that produces because it does, I think, look very strategically at the transformation taking place in this industry.

And, again, with having lived through Super Storm Sandy, we saw what worked and what didn't. Distributed generation had a major plus report card after that aftermath of Super Storm Sandy. So——

Secretary MONIZ. Right. And New York is certainly a leader and also, I might say, not in the policy arena but also integrated with its very strong NYSERDA and the strong R & D as well at a state level.

Mr. TONKO. My old digs before I came here so thank you for mentioning them.

What do commitments to Mission Innovation, and other investments in clean energy research mean to a stronger outcome for national security?

Secretary MONIZ. Well, I think it is absolutely critical because, as we said, first of all, the whole clean energy push is part and parcel of a modern energy security picture.

So I've said it before that I think that—well, I've said it also here—there is also an enormous economic opportunity that we have to take advantage of, and it wasn't exactly a question but I want to emphasize that the question of doubling our innovation budget raises the question of, "do you have the capacity to absorb it well?"

I think we have so much unused capacity for innovation in this country that that will not be a problem and I can go through examples, like, with ARPA–E, for example, where we are funding, you know, 2.5 percent of the proposals in a program that is by any logical measure extremely successful.

So I think there is a big payoff for us in the economy, in environment and security with that kind of investment.

Mr. TONKO. I agree. Having watched some of those activities, the ripple effects of sound paying jobs that are associated with that too is also a shot in the arm for the economy.

Secretary MONIZ. To me, it is that and the infrastructure renewal agenda which is just absolutely critical.

Mr. TONKO. Again, Secretary, thank you and we are all made stronger because of your leadership.

Secretary MONIZ. Thank you.

Mr. OLSON. The gentleman's time has expired.

The chairman calls on the gentleman from New York, Mr. Engel, for 5 minutes.

Mr. ENGEL. Mr. Secretary, you get two New Yorkers in a row. That's pretty good.

First of all, I want to add my voice to the thanks and the accolades that have been given to you. You have been accessible. You have been intelligent. You've been just terrific, not only with En-

ergy and things that this committee does but, on the Iran deal you were right up front and answering questions. And we didn't always agree but you were always brilliant so I want to just thank you for your hard work.

Secretary MONIZ. Thank you.

Mr. ENGEL. We really appreciate it. I want to start by talking about offshore wind energy. That hasn't really been talked about very much here today. A small percentage of our global wind energy is generated offshore and much of the capacity is in northern Europe. But we are now starting to invest here in the United States.

The first offshore wind farm is set to begin commercial operation in early November and several others are being developed. And in New York the Long Island Power Authority is currently working to approve a 90-megawatt wind farm that would become the largest in the United States.

So can you talk a little bit about that, what your take is on the future appetite for offshore wind generation in the U.S.? What are the challenges, security or otherwise, that the federal government needs to address with this?

Secretary MONIZ. Yes. Well, this is a very interesting time for offshore wind. As you mentioned, the Block Island project—the 30-megawatt project will be—actually they finished construction and they will start getting into the grid in November. So that's the first U.S. offshore wind farm.

Number two, actually last Friday, Secretary Jewell and I released a jointly developed offshore wind strategy, and if you haven't seen that we'd be happy to shoot that over to you——

Mr. ENGEL. Thank you.

Secretary MONIZ [continuing]. To lay out a bunch of the issues. And by the way, one of the issues is not just kind of the technology we think about but there is a lot more data we need to understand the development of offshore wind.

Third, I do want to emphasize that in the Block Island project there is really excellent collaboration between the wind people and the Wildlife Federation protecting whales and this kind of thing. So I think that's an important part of the development. That's kind of going well.

Then I think we are now also moving into an arena where we will start to see floating platforms and we have three pilot projects—one in Maine; one in Jersey-New York area, Fisherman's Wharf; and one in Lake Erie, the so-called North Coast—that are looking at novel technologies.

The Maine project in particular is a floating platform that will ultimately be for deepwater. There is discussion of a massive deepwater wind farm off of Hawaii as well. So I say all of this that I think it is the same story I said earlier. Technology, development and deployment going hand in hand to drive cost down. So I think we are now at that place for offshore wind where we can anticipate that kind of trajectory of getting the cost down.

Now, the Block Island project PPA I think is 24 cents per kilowatt hour. Of course, for an island like that, that is a lot less than they are now paying by bringing in diesel fuel.

So I think we are at that beginning of that virtuous cycle of technology and deployment and cost reduction and then we will see much more.

Mr. ENGEL. It's really exciting. I want to talk about one other thing and that's—your testimony, which we have read, touched on the increasing electrification of certain aspects of our economy including telecommunications and transportation and I want to talk a little bit about how the relationships among these sectors apply to the emergency response capabilities.

Let's talk a little bit about Hurricane or Super Storm Sandy. When it hit the East coast in 2012 it is impact on energy infrastructure was, obviously, especially devastating and it illustrated in many ways that our energy systems were vulnerable to disruption because we all know more than 8 million people lost power and field distribution networks were paralyzed and service stations couldn't pump gas into New York and New Jersey and critical terminals for petroleum and petroleum products were badly damaged.

Since that time, we have instituted a wide range of policies and procedures designed to better protect our citizens and infrastructure and we have made tremendous improvements. But it is still a work in progress.

Mr. Tonko talked about distributed generation. In your view, what are the biggest remaining vulnerabilities that need to be addressed and what steps should the government and the private sector take next?

Secretary MONIZ. Well, certainly for Sandy and, obviously, Katrina and Rita and go through the list—certainly, in the coastal areas the reality is that we have to be preparing much more and hardening our infrastructure for the inevitable, continually increasing sea level and water temperature which both contribute to the amplification of storm surges and the damage that we have seen.

So there is a lot of blocking and tackling there that we have to do. I mentioned earlier, for example, Florida Power and Light. They are going through replacement of all the, essentially, the wooden poles. They are worried about the substations that are in flood areas.

But as they are doing it and I am sure they could do other things too but I give them credit, as they do the kind of straightforward hardening, at the same time they integrate smart technology.

So they are getting resilience, reliability, and the possibilities also of more information for managing the grid. So I think there is a lot of that that we have to do.

A second point I'll make and, again, in New Jersey, we did a project with our Sandia laboratory after Sandy to design a major micro-grid system with distributed energy that will sustain the electrified transport corridor, which is a critical public safety issue. That went down, too, with Sandy.

So there is also now getting that kind of micro-grid structure to make sure that really critical pieces of infrastructure can operate during these storms. So that's important, and there is a whole string of things but those are some examples.

Mr. ENGEL. OK. Thank you, and once again, thanks for all you've done. We very much appreciate it.

Secretary MONIZ. Thank you.

Mr. OLSON. The gentleman's time has expired.

Mr. Secretary, it is over. I want to close by saying thank you so very much for your patience, your expertise and your frankness.

In Texas, we say you're a straight shooter. That's a very high compliment. No matter what happens in the future, I want you to know you have a standing invitation to come to Texas 22, my district, to see the Petra Nova project up and running.

A big part of that at MIT and at DOE, as you know she's coming online this December. She will capture 95 percent of the $CO_2$ out of one stack of carbon that's powered from coal, capturing 95 percent of $CO_2$, use it to get an old oilfield about 65 miles south.

It's the first economically viable carbon capturing sequestration project in America and a big project. So thank you, thank you, thank you.

Secretary MONIZ. And we are excited about it.

Mr. OLSON. We are as well. Give us a little more time. Best barbecue at the Swingdoor up there in Rosenberg and actually pop by also Bob's Taco Station, the best tacos in Fort Bend County.

With that, members, you have 5 days to submit questions for the record.

Without objection, this hearing is adjourned.

Secretary MONIZ. Thank you.

[Whereupon, at 12:28 p.m., the subcommittee was adjourned.]

[Material submitted for inclusion in the record follows:]

## PREPARED STATEMENT OF HON. FRED UPTON

The Subcommittee on Energy and Power has accomplished a good deal to say yes to energy and update and improve the nation's energy policy, and the American people are beginning to see the economic and energy security benefits. The Department of Energy has been a partner in these efforts, and I welcome back Secretary Moniz to discuss what we have already accomplished and what we hope to do in the years ahead.

The most direct benefit of America's newfound energy abundance can be seen at gas stations in Southwest Michigan and across the country, where fuel prices have dipped toward $2 per gallon, even in the midst of serious Middle East turmoil. This would not have been possible without the tremendous growth in domestic oil output along with the emergence of a North American energy market that now plays a prominent role on the world stage. We are also seeing abundant natural gas supplies and modest prices, which of course is critical as we head into the cold weather months.

But the benefits go well beyond cheaper fill-ups and more affordable heating bills. Energy has been one of the most important drivers for economic growth, and with expanded domestic energy production, reduced reliance on foreign imports, increased energy efficiency and productivity, and significant cost reductions, we are arguably more energy secure than ever before.

Although the private sector deserves the bulk of the credit for its advances in innovative technologies that have expanded our oil and gas supplies, Congress is making important policy changes, and DOE has been a valuable source of information in these ongoing efforts. For example, the agency's Quadrennial Energy Review detailed the existing permitting challenges we face as we struggle to update and expand the nation's energy infrastructure, and the Long- Term Strategic Review helped bring to light the need for improvements to the Strategic Petroleum Reserve (SPR).

With input from DOE, this subcommittee has spearheaded a number of efforts that have been passed into law. Last year's long-term highway bill, the FAST Act, contains key provisions to modernize the SPR, improve emergency preparedness for energy supply disruptions, protect critical electric infrastructure security, and prioritize energy security in federal decision-making. Last year's government funding bill lifted the decades-old restrictions on the export of crude oil, a long-cham-

pioned priority of this committee, and we are beginning to see the job creation and energy diplomacy benefits of doing so.

We continue working on legislation. The pending energy bill contains language addressing the siting and permitting process for pipelines and hydroelectric generation, efficiency measures, and energy workforce development initiatives. Many of these provisions will be implemented by DOE.

Whether by backing basic research and development to enable a technology based energy revolution, protecting the electric grid from cyber-attacks, or by tracking and responding to energy disruptions around the world, the department has an important role to play in our evolving energy marketplace.

Today's hearing will provide an opportunity for Secretary Moniz to preview some of the major challenges and opportunities presented by the nation's changing energy landscape. We will also have a chance to examine DOE's progress in implementing recently enacted legislation, including the upgrades to the SPR. Our energy future can be a bright one—if we adopt the right policies and implement them effectively and I welcome DOE's continued role in this effort.

FRED UPTON, MICHIGAN
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FOURTEENTH CONGRESS

# Congress of the United States

## House of Representatives

COMMITTEE ON ENERGY AND COMMERCE

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October 12, 2016

The Honorable Ernest J. Moniz
Secretary
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Secretary Moniz:

Thank you for appearing before the Subcommittee on Energy and Power on September 15, 2016, to testify at the hearing entitled "The Department of Energy's Role in Advancing the National, Economic, and Energy Security of the United States."

Pursuant to the Rules of the Committee on Energy and Commerce, the hearing record remains open for ten business days to permit Members to submit additional questions for the record, which are attached. The format of your responses to these questions should be as follows: (1) the name of the Member whose question you are addressing, (2) the complete text of the question you are addressing in bold, and (3) your answer to that question in plain text.

Also attached are Member requests made during the hearing. The format of your responses to these requests should follow the same format as your responses to the additional questions for the record.

To facilitate the printing of the hearing record, please respond to these questions and requests with a transmittal letter by the close of business on October 26, 2016. Your responses should be mailed to Will Batson, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, D.C. 20515 and e-mailed in Word format to Will.Batson@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,

Fred Upton
Chairman

cc: The Honorable Bobby Rush, Ranking Member, Subcommittee on Energy and Power

Attachments

**Department of Energy**
Washington, DC 20585

December 14, 2016

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

Dear Mr. Chairman:

On September 15, 2016, Secretary Ernest Moniz, testified regarding "The Department of Energy's Role in Advancing the National, Economic, and Energy Security of the United States". To complete the hearing record, please find enclosed answers to the questions submitted by Chairman Fred Upton, Representatives Adam Kinzinger, Markwayne Mullin, and Jerry McNerney regarding this hearing.

Also enclosed is the information requested by Representative Bill Johnson to insert in the record.

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,

[redacted]

Aaron Shapiro
Acting Deputy Assistant Secretary for House Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Bobby L. Rush
Ranking Member

QUESTION FROM CHAIRMAN FRED UPTON

Q1. On April 21, 2015, the Quadrennial Energy Review (QER) Task Force released its first installment of the Quadrennial Energy review report entitled, "Energy Transmission, Storage, and Distribution Infrastructure." DOE announced that a second installment of the QER will conduct a comprehensive review of the nation's electricity system, including a more comprehensive look at electricity transmission, storage, and distribution infrastructure covered in the first installment.

Q1a. What was the total cost of the first installment of the QER?

i. Please provide a detailed accounting of all costs associated with the development of the QER, including the amount of annual agency funds and the number of personnel, including FTEs attributed to QER activities.

ii. What share of the total cost of the QER was covered by DOE?

A1a. The January 9, 2014 Presidential Memorandum establishing the QER directed the Secretary of Energy to provide support to the multiagency QER Task Force for coordination activities related to (1) policy analysis and modeling, (2) stakeholder engagement, and (3) report preparation. In order to leverage existing resources and minimize additional efforts needed to produce the QER, the QER Secretariat is located within the Department's Office of Energy Policy and Systems Analysis (EPSA). EPSA conducts independent, objective, strategic studies and policy analyses in addition to maintaining and coordinating a supporting set of analytical capabilities. Additionally, EPSA coordinates with states and local entities, helps to orchestrate technical assistance and advice for various energy policies and measures, and ensures adequate stakeholder input from industry, non-profit organizations, and other key stakeholders.

Work on the first installment of the QER, which overlapped with ongoing projects and programs in EPSA and the Department, began in Fiscal Year (FY) 2014 and continued into FY 2015. In FY 2014, EPSA employed 51 FTEs and received $19.269 million in appropriations in total. In FY 2015, EPSA employed 64 FTEs and received $31.181 million in appropriations in total. EPSA utilized approximately half of its annual appropriation for modeling and analytical products with multiple uses that supported the QER as well as the Department's other policy initiatives.

During the development of the first installment, EPSA contracted with Department of Energy's (DOE) National Laboratories and other organizations to complete QER analyses

that were also used for non-QER purposes. A selection of these products is available on EPSA's website (http://energy.gov/epsa/qer-document-library). To reduce replication by leveraging existing resources, EPSA also utilized the significant body of energy analysis already available across the Federal Government and the Department's National Laboratories. A list of the 52 publications is available on EPSA's website (http://energy.gov/epsa/qer-related-documents-and-sites).

Q1b. Please identify all QER related interagency task forces, advisory committees, working groups, and initiatives in which the Department currently participates or has participated in since January 2014.

A1b. Per the January 9, 2014 Presidential Memorandum that established the QER, the Department is a member of the QER Task Force. The Task Force includes representatives from more than 20 Federal agencies and is co-chaired by the Director of the Office of Science and Technology Policy and the Director of the Domestic Policy Council. During the development of the first installment of the QER, DOE provided periodic updates to the President's Council of Advisors on Science and Technology and to the Secretary of Energy's Advisory Board. The Department is providing similar updates during the development of the second installment.

Q1c. Please provide a description of the Department's plans for future installments of the QER, including a schedule of each release and an estimate of the cost associated with the development of each installment.

A1c. Due to the cross-cutting nature of the QER's analysis with the Department's larger policy work, the costs associated with development of the second installment—and any future installments—are inseparable from EPSA's total annual appropriation. The Department plans to release the second installment of the QER by January 2017 and has not developed the scope of work or schedule for the third installment.

QUESTIONS FROM REPRESENTATIVE ADAM KINZINGER

European Energy Security

Q1. Mr. Secretary, when you were before the Committee in March you mentioned that your Department and the State Department are working on an energy security report that would touch on the issue of helping our European partners to develop their infrastructure and capacity to produce their own LNG. As I have emphasized before, Europe continues to be reliant on oil and gas from Russia with Putin using this as an effective weapon against our allies.

Can you provide an update on the steps your Department and the State Department are taking to assist our allies in Europe with this issue?

A1. Independently and in cooperation with our interagency colleagues, the U.S. Department of Energy (DOE) is significantly contributing to European energy security, both in the natural gas sphere and throughout the entire energy spectrum. The DOE has contributed to an open and competitive natural gas market in Europe by approving liquefied natural gas (LNG) exports equivalent to over 15 billion cubic feet per day (bcf/day) or 155 billion cubic meters per year (155 bcm/year) to countries with which we do not have a Free Trade Agreement. By way of comparison, this volume of LNG exports represents approximately one-third of total natural gas demand in the European Union and, if exports near full capacity, could make the United States the world's largest LNG exporter. The destinations of future LNG cargoes will be determined by the market, but a number of European trading and utility companies have entered into contracts to export LNG from U.S. liquefaction terminals. According to information filed with DOE, approximately 5 bcf/day has been contracted to European–based companies.

DOE is also working with several European countries to help them improve the resiliency and flexibility of their energy markets, including natural gas markets. Since 2014, DOE has provided analysis and planning assistance to Ukraine to help that country better prepare for its winter heating seasons. DOE has also funded analysis on incorporating energy efficiency into Ukraine's energy strategy and planning and is currently working with Ukraine to improve its medium-term energy resiliency planning. With the enhanced capacities established through this cooperation, we believe Ukraine can develop a more open, transparent, and resilient energy system, helping that government to continue their progress toward greater integration with the European Union.

We are now engaging in similar work, on a smaller scale, with the Baltic states of Latvia, Lithuania, and Estonia. DOE and national laboratory specialists are working with those countries to share natural gas market experience and assist in decoupling their Soviet-era electricity systems. These steps encourage increased connections and cooperation with EU partners such as Finland, Poland, and Sweden.

DOE's role as a leading energy research institution also contributes to European energy security. Through our national laboratories and in partnership with industry and academic research institutions, we conduct groundbreaking renewable energy, energy efficiency, grid management, and carbon capture and storage research with European partners such as Norway, the United Kingdom, and others. Thousands of scientists from allied countries in Europe visit and conduct research in our national laboratories each year. Through this ongoing collaboration, we assist – and learn from – our European colleagues as we seek to uncover new breakthroughs that will further lessen Russian leverage in Europe.

We work closely with our State Department colleagues in these endeavors. Additionally, the State Department leads U.S. energy diplomacy efforts in Europe. Our colleagues at State have traveled across Europe, working with foreign leaders – especially in the vulnerable countries of central, eastern, and southern Europe, to encourage them to commit to open and transparent energy markets. As a result of those efforts, many European countries –working with the European Union – have made breakthroughs in connecting natural gas systems to new LNG terminals, establishing new transportation routes and interconnectors for natural gas and electricity, and turning away from inflexible Russian contracts toward more open and transparent spot markets.

DOE and State also work together through the G-7 Energy Ministerial, in order to achieve collective energy security of the G-7 countries and European Union based on the 2014 Rome Principles. Each year, DOE engages with G-7 partners to promote a common understanding of energy security challenges and conduct collaborative activities in areas such as cyber security and energy resilience.

Q2. There have been reports that ISIS' oil revenue is plunging due to U.S.-led airstrikes. There is currently legislation before this Committee, of which I am a proud original co-sponsor, that would authorize the Department of Energy to work with our Armed Forces to address ISIS' use of oil resources to support their atrocities.

Q2a. What type of assistance are you providing our Armed Forces tackle this issue at the moment?

A2a. DOE has been engaged in the interagency effort to reduce ISIS oil revenues. DOE technical experts in oil and gas operations have lent their expertise to the interagency to better understand how ISIS generates oil revenue and how these revenues can be disrupted. DOE has also provided analytical support to the intelligence community.

Q2b. What more do think the Department of Energy can do to combat ISIS?

A2b. DOE has provided expertise to review and analyze existing technical data related to the oil fields and associated infrastructure to strengthen Department of Defense efforts to target ISIS' most productive fields and wells. DOE can continue to provide expertise to help combat ISIS.

QUESTIONS FROM REPRESENTATIVE MARKWAYNE MULLIN

Q1. My district has a large amount of hydropower generation that contributes greatly to the electrical needs in Oklahoma. Licensing hydropower projects is long, difficult, and expensive.

Q1a. Can you identify the challenges in hydropower licensing?

A1a. Existing regulatory processes are intended to ensure that hydropower development is carried out responsibly and consistently. The regulatory processes for hydropower have value to stakeholders to the extent that desired outcomes are achieved or enabled. Those outcomes can include stewardship of natural resources, energy development, socioeconomic improvements, and many other water resource uses, which vary from region to region.

As acknowledged in the 2016 Hydropower Vision Report, with many regulatory processes, the broad spectrum of the hydropower regulatory environment has evolved over time rather than having been planned and implemented at one point in time as a unified, fully efficient, integrated process. As a result, hydropower project developers face a complex set of approval and compliance processes administered by various authorities including the Federal Energy Regulatory Commission (FERC), federal and state resource agencies, local governments, and tribes. In some cases, agencies operate on an independent schedule outside of the FERC process as required by or allowed under their statutory authority, such as the U.S. Army Corps of Engineers' Section 404 and 408 regulatory processes. Additionally, certain agencies have mandatory conditioning authority. While this complexity can ensure that important potential impacts are assessed and mitigation measures are implemented, it also results in uncertainty in study and administrative costs and schedules that can make it challenging to undertake, finance, and complete projects.

Q1b. How do we improve on those?

A1b. The Department supports research and engagement with other Federal agencies and other partners to reduce environmental impacts and promote regulatory process efficiencies. For example, in partnership with the Army Corps of Engineers (Corps) and the FERC, the Office of Energy Efficiency and Renewable Energy's (EERE) Water Power Office

facilitated the negotiation of an agreement between FERC and the Corps that better synchronized their respective approval processes and will ideally result in a more efficient regulatory process for private hydropower development at Corps non-powered dams. Another example of this kind of activity is EERE's partnership with other Federal agencies to develop the Renewable Energy Application and Permitting Desktop toolkit for hydropower, with the goal of increasing transparency and access to information about hydropower regulatory processes, ultimately reducing the time and complexity associated with permitting new projects.

In addition, in Chapter 4 of the 2016 Hydropower Vision Report, the Department identified a detailed roadmap of potential technical, economic, and institutional actions that can be initiated by the hydropower community to optimize hydropower's continued contribution to a clean, reliable, low-carbon, domestic energy generation portfolio, while also ensuring that the nation's natural resources are adequately protected or conserved.

Regulatory process enhancements that reduce implementation timeframes may be possible through process efficiency improvements and by providing stakeholders with an increased knowledge base, easier access to information, and increased capabilities for collaboration. Achieving outcomes more quickly and predictably may reduce the risks and costs to the developer without a reduction in environmental protection.

The actions discussed in the Hydropower Vision Report intend to assist parties in navigating regulatory processes, and not to propose additive components, requirements, or modifications to regulations. The Vision's "Roadmap" proposes evaluating the process from a process improvement perspective, identifying opportunities to make steps more efficient while also being consistent with environmental protection statutes and equally protective of affected resources. The Vision report recommends initiation of a "national dialogue" consisting of a collaborative, multi-stakeholder effort led by a neutral entity. This effort would allow stakeholders to collaboratively brainstorm ideas for achieving the licensing process improvement opportunities with the greatest impact. Ideas with broad support might be further discussed in terms of how to implement them. The purpose of identifying the highest opportunities for process efficiency improvement and ideas as to how they might be achieved is to inform stakeholders, regulators, and

policy makers as to where to focus efforts to have the greatest impact on improving process efficiency.

Considering the collective regulatory experience from multiple perspectives may identify opportunities to enhance the effectiveness of the process in terms of both project development and environmental stewardship. Costs, risks, and implementation timeframes may be reduced by providing stakeholders with an increased knowledge base, easier access to information relevant to their projects, and increased capabilities for collaboration. Achieving the same or improved outcomes more quickly and predictably will reduce the risks and costs to developers and encourage investment in new projects by the financial community, without a reduction in environmental protection. Section 2.4.6 in Chapter 2 of the Hydropower Vision provides examples of process enhancements that have had positive effects on licensing costs or timelines without changes in regulations.

Q1c. As you know, the energy bill (S.2012) is currently in conference. Are there any provisions in there with regard to hydropower licensing that you believe would be beneficial to increased hydropower generation?

A1c. The Department does not comment or assume a position on proposed or pending legislation, and respectfully refers you to the Statement of Administration Policy for S.2012, regarding the Energy Policy Modernization Act of 2015, released January 27, 2016, which states, "the Administration appreciates the role that carbon-free hydropower plays in meeting the Nation's energy needs. S. 2012 would improve upon the hydropower relicensing provision contained in H.R. 8, but the Administration has concerns about its implementability."

Q2. I would like to follow up on that with natural gas, which is an abundant resource in my state. How would the FERC process coordination language in the energy bill assist in getting necessary projects approved in a timely manner?

A2. Both the House and Senate included language in their respective energy bills that would adjust the process for coordinating regulatory approval of natural gas projects. While the provisions differ in significant ways, both section 3103 of S. 2012 and section 1101 of H.R. 8 would require additional monitoring of the steps in the approval process and notification of Congress by each agency for failure to meet the deadline and an implementation plan to ensure completion.

Q3. Let's turn to cybersecurity. You are the lead agency for cybersecurity in the energy sector. In your testimony, you say cybersecurity will likely remain one of the highest priorities at DOE and in the energy industry. With the threats that are out there, what is your agency doing to prepare for cybersecurity attacks from domestic and foreign sources?

A3. Under Presidential Policy Directive-21: Critical Infrastructure Security and Resilience and the Fixing America's Surface Transportation Act of 2015, the Department of Energy (DOE) is the Sector-Specific Agency (SSA) for the energy sector.[1] The SSA plays the pivotal role of ensuring unity of effort and message across Federal, state, local, tribal, and territorial government partners and the private sector.

As the energy SSA, the Department's ongoing collaboration with vendors, utility owners, and electricity sector and oil and natural gas sector operators strengthens the cybersecurity of critical energy infrastructure against current and future threats. SSAs serve as a day-to-day Federal interface for the dynamic prioritization and coordination of sector-specific activities; carry out incident management responsibilities consistent with statutory authority and other appropriate policies, directives, and regulations; and provide, support, and facilitate technical assistance and consultations for each sector to identify vulnerabilities and help prevent or mitigate the effects of incidents, as appropriate. In meeting this requirement for the Department, the Office of Electricity Delivery and Energy Reliability's (OE)'s Cybersecurity for Energy Delivery Systems (CEDS) program is supporting cyber risk and incident management activities with four key objectives:

Accelerating information sharing to enhance situational awareness

Expanding implementation of the Cybersecurity Capability Maturity Models and Risk Management Process[2]

Exercising and refining the energy sector's cyber incident response capabilities

Researching and developing technologies to improve energy reliability and resilience

[1] http://www.whitehouse.gov/the-press-office/2013/02/12/presidential-policy-directive-critical-infrastructure-security-and-resil

[2] http://energy.gov/oe/services/cybersecurity/electricity-subsector-cybersecurity-capability-maturity-model; http://energy.gov/oe/services/cybersecurity/cybersecurity-risk-management-process-rmp

The first three objectives build the energy sector's day-to-day operational capabilities to share cyber-incident information, improve organizational and process level cybersecurity posture, and perform cyber-incident response and recovery. The last objective leads to innovative cyber-resilient energy infrastructure through the research, development, and demonstration of new tools and technologies to reduce the risk that energy delivery might be disrupted by a cyber incident.

The OE program aligns its activities to support Federal priorities as well as the strategy and milestones articulated in the energy sector's *2011 Roadmap to Achieve Energy Delivery Systems Cybersecurity*, which envisions resilient energy delivery control systems designed, installed, operated, and maintained to survive a cyber incident while sustaining critical functions.[3] The DOE-facilitated, energy-sector-driven Roadmap offers five strategic goals: build a culture of security, assess and monitor risk, develop and implement new protective measures to reduce risk, manage incidents, and sustain security improvements. All aspects of the program focus on enhancing the cyber-resiliency of energy infrastructure, including the electric grid, as well as oil and natural gas.

[3] http://energy.gov/sites/prod/files/Energy%20Delivery%20Systems%20Cybersecurity%20Roadmap_finalweb.pdf

QUESTIONS FROM REPRESENTATIVE JERRY MCNERNEY

Q1. DOEs budget request included a provision that a "national review of transmission plans and assessment of barriers to their implementation" will be completed by the Office of Electricity. What is the status of this review?

A1. 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 through its Orders No. 890 and 1000. As input to QER 1.2, we have tasked experts at Lawrence Berkeley National Laboratory (LBNL) to examine 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. LBNL also examined a number of recently proposed transmission projects and possible barriers to their implementation. The LBNL review concluded it will be some time before there is sufficient implementation experience to assess the effectiveness of the plans, and it proposes a monitoring system to enable more effective assessments in the future.

Q2. DOEs Energy Storage Program intends to collaborate with utility regulators to develop analytic tools and standards for energy storage. Can you provide an update on the status of this effort? How many utility regulators has DOE worked with to date? Does DOE currently have a framework and strategy for storage?

A2. DOE's Energy Storage program conducted two workshops focused on utility regulators. The workshop hosted by Pacific Northwest National Laboratory on June 15–16, 2015, was attended by public utility commission commissioners and regulators from Washington, Oregon, Montana, and Idaho. The workshop hosted by Sandia National Laboratories on May 3, 2016, included representation from New Mexico, Utah, Arizona, and Nevada. Together, the workshops had approximately 100 attendees, including 20–25 commissioners and staff representation from the Pacific Northwest and Southwest regions of the United States.

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.

Q3. Secretary Moniz mentioned at the hearing that more can be done to provide companies with cyber enhancements from the national labs. Do DOE national labs provide adequate attention and funding towards nascent technologies for the electric grid, rather than those that are commercially deployable?

A3. The Office of Electricity Delivery and Energy Reliability (OE) works with DOE national laboratories to maintain a research, development, and operations portfolio that includes long-, mid-, and short-term R&D efforts addressing long-, mid-, and short-term milestones in the energy sector's *Roadmap to Achieve Energy Delivery Systems Cybersecurity*.[4] This approach allows the laboratories to engage in a wide range of activities including research towards nascent technologies.

For example, Sandia National Laboratories is developing a moving target approach to cybersecurity that changes the logical and/or virtual configuration of energy delivery systems on a moment-by-moment basis to impede adversarial reconnaissance and cyber-attack planning. In another example, Los Alamos National Laboratory and Oak Ridge National Laboratory are developing Quantum Key Distribution techniques tailored to energy infrastructure that will help reveal adversarial attempts to steal secret keys used to encrypt energy sector data.

In addition, the Grid Modernization Laboratory Consortium is a strategic partnership between DOE and the national laboratories that brings together our leading experts and resources to collaborate on the goal of modernizing the Nation's electric grid. The Consortium employs an integrated approach to ensure that DOE-funded studies and research and development are efficiently coordinated to reap the greatest return for the taxpayer dollar.

Q4. Does DOE support moving its commercializing technology program beyond the pilot phase? What have been the results of this program to date? Would DOE support expanding this program to include start-up companies, and small business?

A4. Transition to practice of cyber-resilience technologies beyond the pilot phase of research and development efforts is a program expectation. OE cybersecurity projects must demonstrate an effective commercialization strategy for the tool or technology to facilitate broad adoption throughout the energy sector. This includes but is not limited to

[4] http://energy.gov/sites/prod/files/Energy%20Delivery%20Systems%20Cybersecurity%20Roadmap_finalweb.pdf

meeting the needs of the energy sector in a cost effective manner and gaining acceptance by energy sector stakeholders, such as asset owners/operators and suppliers, through demonstrations at their facilities and research partnerships that engage stakeholders at the earliest research stages.

More than 30 research and development (R&D) projects awarded by the OE cybersecurity program have transitioned to practice (commercialization, open source, documents, and guides). These include guidance documents, and technologies that have been developed and made available to the energy sector through OE R&D partnerships among the private sector, national laboratories, and academia. Many of these advanced technologies are being deployed in the Nation's energy delivery systems today to enhance security. Some have achieved Nation-wide impact.

For example, Schweitzer Engineering Laboratories partnered with the Tennessee Valley Authority and Sandia National Laboratories to develop a technology called Padlock—a security gateway that helps to prevent unexpected cyber-activity and to detect cyber and physical tampering on energy infrastructure field devices often found on pole tops and in cabinets throughout distribution systems. This is commercially available and thousands have been sold.

In another example of a now commercially available technology, Applied Communication Sciences partnered with DTE Energy, the Electric Power Research Institute (EPRI), and the University of Illinois at Urbana–Champaign (UIUC) to develop intrusion detection technologies for mesh networks often used for distribution automation and advanced metering infrastructure.

Several start-up companies have commercialized technologies developed under the OE cybersecurity program. For example, UIUC through the Trustworthy Cyber Infrastructure for the Power Grid (TCIPG) university collaboration, led the development of the energy delivery system operational network access policy tool, which became NP-View.[5] This technology is being made commercially available through Network Perception, a startup company that launched in the spring of 2013 at the UIUC Research Park. Founded by a team of experts on network security and critical infrastructure

[5] http://www.network-perception.com/

protection, Network Perception is developing network analysis technology for critical infrastructures. The TCIPG was funded in partnership between DOE and the Department of Homeland Security (DHS).

OE is working with public and private entities, including start-up companies and small businesses, to develop advanced technologies to better secure the grid against cyber events. The program maintains a R&D portfolio that engages at least 30 asset owners and operators, 30 suppliers, 22 universities, and 10 national laboratories in R&D of tools and technologies that strengthen the cybersecurity of energy grid digital components, working in partnership toward resilient energy delivery systems that can survive a cyber incident while sustaining critical functions.

Q5. Does DOE work with manufacturers of electric grid equipment to help review the chain of supply and manufacturing?

A5. This year, the OE, in collaboration with the DHS's Office of Infrastructure Protection Sector Outreach and Programs Division, established a working group of energy asset owners, electric grid equipment manufacturers, and trade associations to ensure an open dialog exists between suppliers and customers relating to supply chain issues. We have brought in groups such as Underwriters Laboratories, the EPRI, and Vendor Security Alliance to present their mitigating solutions to the asset owners and manufacturers. We have not investigated the supply chain networks of specific manufacturers as this information becomes perishable in the very dynamic environment of lower tier company buyouts and code development. Instead we are attempting to develop indicators that focus on security and integrity which both asset owners and manufacturers can use.

Q6. Secretary Moniz discussed "value creation" at the hearing. Does DOE have any comments on value of certain technologies, price formations, or efforts that reduce carbon emissions in the electric sector pricing structure?

A6. Value creation, emerging technologies, the price formation process, reducing carbon emissions, and electricity pricing are all important and interactive topics in today's electricity sector. DOE will discuss them in detail in the forthcoming QER 1.2.

plant implementation plans and, you know, next year we -- you know, we are rather confident on the court side. 2018 is when the implementation plans are due.

Now, it would seem ironic to have lost zero carbon assets just as states are going forward with implementation plans.

So that's why this -- something like the New York activity and Illinois is considering something similar, I think, are quite important.

Mr. Doyle. Thank you. Thank you very much.

Mr. Olson. Gentleman's time has expired. The chair calls upon the gentleman from Ohio, Mr. Johnson, for five minutes.

Mr. Johnson Thank you, Mr. Chairman, and Mr. Secretary, I do want to echo the comments of some of my colleagues. It's been a pleasure working with you over the last few years.

You know, as we talk about these important ideas around energy security I am glad to hear you say that you remain an all-of-the-above advocate.

I certainly hope that as you transition -- assuming that you transition out someone else transitions in -- that you will pass that advocacy on to your successor in the sense that, you know, we -- one of these days, because we are

problem solvers here in America -- we always have been.

You look back throughout our history. We won't go through the litany but there have been a lot of them. Someday somebody might solve the problem, I suspect, of harnessing the sun's energy and storing it up so that it can be made available on the energy grid for base load. Same thing with wind energy, other alternative energy forms.

I just hope that we can return once again to kind of a common sense approach to an all-of-the-above energy policy where we don't throw out the baby with the bathwater and we are not killing jobs and that we are looking more for market-driven solutions rather than solutions from inside the Washington Beltway because I think the American people are screaming for that.

And I don't think we can forget about the impact that we have made to our communities that have served our energy and national security needs and I hope that we can continue to work together throughout the rest of your tenure and that you also pass along the importance of finding a long-term funding solution for those funding challenges at DOE's cleanup sites like the Portsmouth -- the Piketon facility.

Those are -- those are very important that we keep those projects on a path to completion so that we can redevelop those properties and put them back into good use for the

communities that have -- that have given so much already for our energy future.

Mr. Secretary, you know, DOE, as you well know all too well, is central to America's role in international, civil and nuclear commerce markets through what is known as the Part 810 process

Under the Atomic Energy Act, DOE authorizes certain foreign interactions such as technology transfer and assistance on commercial nuclear power plants provided by our domestic nuclear industry.

This authorization process has been the subject of scrutiny from both GAO and this committee due to a long bureaucratic approval process and I recognize that DOE has been working to address these criticisms over the last several years by developing and implementing an updated streamlined process. Are you are the deputy secretary monitoring progress of these reforms?

Secretary Moniz. Yes. Yes, we are, in fact, and I would be happy to share with you some data that I saw just maybe two months ago, I think, in terms of some progress actually in terms of shortening the times because there were -- one of the issues is we have managed to with the interagency because it is -- DOE is responsible, again, but yet we work with State and other agencies and what we have, I

COMMITTEE: HOUSE ENERGY AND COMMERCE, SUBCOMMITTEE ON ENERGY AND POWER

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INSERT FOR THE RECORD

In February 2015, the Department of Energy's National Nuclear Security Administration (DOE/NNSA) concluded a comprehensive revision of its regulations at Part 810. This was the first comprehensive revision in over 20 years, and focused on bringing the regulation up to date with current industry practices. The final rule was published in the Federal Register on February 23, 2015 (80 FR 9359), and went into effect on March 25, 2015. In addition, DOE/NNSA commissioned the development of a Part 810 Process Improvement Plan (PIP), coordinating with U.S. interagency partners, to identify key factors causing the processing delays and process improvements to streamline the current average processing time.

As a result of the revisions made in the new Part 810 rule and the steps taken by DOE/NNSA as part of the PIP, the current average processing time for authorizations, including general authorizations, is less than 60 days.

Additionally, at the suggestion of industry partners, DOE/NNSA published on its public website detailed Frequently Asked Questions to which applicants can refer. DOE/NNSA also submitted for publication in the Federal Register an amendment to the interagency procedures for review of applications for specific authorization under Part 810, including timelines for review and issuance of Secretarial Authorizations. The amended procedures are currently pending publication in the Federal Register.