

Testimony of Secretary Ernest J. Moniz
U.S. Department of Energy
Before the
U.S. Senate Committee on Energy and Natural Resources
Hearing on the Administration's Quadrennial Energy Review (QER)
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Thank you Chairman Murkowski, Ranking Member Cantwell, and distinguished Members of the Committee. I appreciate the opportunity to discuss with you the Administration's Quadrennial Energy Review (QER).

Last week, the Administration released the first installment of the QER, focused on energy transmission, storage, and distribution (TS&D), including the networks of pipelines, wires, storage, waterways, railroads, and other facilities that form the backbone of our energy systems.

QER Process

In a memorandum released on January 9, 2014, President Obama directed the Federal government to conduct a QER and to focus on infrastructure in its first installment: *“This first-ever review will focus on infrastructure challenges [emphasis added], and will identify the threats, risks, and opportunities for U.S. energy and climate security, enabling the federal government to translate policy goals into a set of analytically based, clearly articulated, sequenced and integrated actions, and proposed investments....”*

The President also instructed that the QER be overseen by an interagency QER task force, co-chaired by the Directors of the Office of Science and Technology Policy and the Domestic Policy Council, and comprised of 22 Federal agencies with equities in energy. The task force was directed to deliver a report to the President that:

- Provides an integrated view of, and recommendations for, Federal energy policy in the context of economic, environmental, occupational, security, and health and safety priorities, with attention in the first report given to the challenges facing the Nation's energy infrastructures;
- Reviews the adequacy...of existing executive and legislative actions, and recommends additional executive and legislative actions as appropriate;
- Assesses and recommends priorities for research, development, and demonstration programs to support key energy innovation goals; and
- Identifies analytical tools and data needed to support further policy development and implementation.

As directed by the President, the QER is envisioned as a focused, actionable document, designed to provide policy makers, industry, investors and other stakeholder's unbiased data and analysis on energy challenges, needs, requirements, and barriers that will inform a range of policy options, including legislation.

The President directed the Secretary of Energy to provide support for the interagency QER task force, including support for coordination activities related to the preparation of the QER report, policy analysis, modeling, and stakeholder engagement. DOE's Office of Energy Policy and Systems Analysis (EPSA) also performed or commissioned an extensive suite of analyses focusing on energy TS&D infrastructures.

As a policy roadmap, the QER recognizes the essential role of the States, tribes, cities and industry in shaping the Nation's energy future. The plan also includes a focus on North America, recommending ways to further integrate the energy infrastructures of the U.S., Canada and Mexico to enhance market opportunities, energy security, and sustainability. The White House and DOE undertook an open, transparent process for informing and engaging stakeholders, including the following activities:

- A series of public stakeholder meetings in Washington, D.C. and at 13 other venues across the country on essential regional and sector-specific topics;
- Discussions and meetings with our partners in Canada and Mexico;
- Briefings with industry associations, State officials; environmental groups; congressional staff and others; and
- Development of a public comments portal (QERcomments@hq.doe.gov) to allow interested stakeholders and general public to provide comments on QER.

Why Focus on TS&D Energy Infrastructure?

There has been an energy revolution in the United States over the last decade. We are now the largest combined producer of oil and gas in the world and our oil imports are the lowest they have been in more than 40 years. Natural gas use in power generation has significantly increased and U.S. liquefied natural gas exports are scheduled to start within a year. Wind and solar power generation has grown dramatically and ethanol is now ten percent of U.S. gasoline supply.

The United States is, however, at an energy crossroad. As noted, our energy landscape is dramatically changing with implications for infrastructure needs, options, and choices. The longevity and high capital costs of energy infrastructure mean that decisions made today will strongly influence our energy mix for a considerable part of the 21st century. The vulnerabilities of our energy infrastructures are growing, and the threat of climate change increasingly requires not only more resilient systems, but the integration of zero- and low-carbon power generation.

These rapid and dramatic changes in the Nation's energy fortunes have created enormous opportunities. At the same time, they pose a set of challenges for energy policy makers, investors, non-governmental organizations (NGOs) and industry. These challenges come in many forms. Addressing the opportunities, challenges, and vulnerabilities associated with our energy infrastructure will require action by many parties in the private sector, many of which are coordinated public sector action at the Federal, state, and local levels.

The transformation of our energy landscape has grown the economy, but also has implications for the Nation's energy transmission, storage and distribution infrastructures—the vast networks that move energy supplies to intermediate processors and end users. These infrastructures are

aging, not well-matched to new sources of supply, and exposed to increases in extreme weather events associated with climate change such as sea-level rise, drought, wildfires, and hurricanes. Further, the Nation's energy infrastructures are growing targets of cyber and physical attacks and are increasingly inter-dependent.

These vulnerabilities and stresses come at a price. From 2008 to 2012, weather-related power outages cost the economy as much as \$200 billion. Hurricanes Katrina and Rita shut down 28 percent of the Nation's refining capacity, sending gasoline prices soaring. Nationwide, the replacement of aging natural gas distribution pipelines is estimated to cost \$270 billion.

Also, the availability of affordable rooftop solar panels has, for example, created new options for meeting household electricity needs, yet broader use of these technologies challenges the traditional electricity business model. Coupled with other cost-saving technologies that enable consumer interactions with the grid, these new options put a premium on policies that appropriately value smart grid, distributed generation and other technologies and services relative to those provided within the traditional electric utility model.

Our energy infrastructures need to meet today's energy's changing supply and demand profiles while being flexible enough to incorporate rapid market changes and new technologies going forward. Modernizing our existing energy infrastructures while simultaneously working on their transformation warrants a consistent, sustained, and thoughtful Federal approach. Decision making in this environment is not easy or simple—particularly in this time of rapidly shifting demands and objectives.

Given the condition and location of today's energy infrastructures and the evolving energy marketplace, the essential rationale for choosing energy TS&D infrastructure as the starting point for this QER is straightforward: We need a step change to modernize and transform our energy systems to meet U.S. environmental, energy security, and competitiveness goals for the 21st century. Energy infrastructure is both a fundamental enabler and a limiting factor in transforming the Nation's energy marketplace.

QER Structure

The first installment of the QER underscores the strong public interest in advancing key national goals of jobs, competitiveness, energy security and a cleaner energy future. It also provides policy makers with a roadmap for meeting key energy objectives: enhancing energy infrastructure resilience, reliability, safety and security; modernizing the electric grid and our energy security infrastructures; and improving "shared" energy infrastructures—railways, waterways, ports and roads—that move both energy and other commodities. Several crosscutting themes were also considered, including jobs, the environment, infrastructure siting, and integration of North American energy markets.

- In our analysis of energy infrastructure resilience (contained in Chapter 2 of the report), we determined that TS&D infrastructure is vulnerable to a range of natural phenomena; that vulnerabilities vary substantially by region; and that many threats, including cyber and physical attacks, are on the rise. Furthermore, the growing interdependencies

between energy systems—such as the electricity required to move liquid fuels and natural gas, and the natural gas used to produce electricity—present new vulnerabilities. In our review of the electric grid (Chapter 3 of the report), we anticipate that investments in transmission and distribution upgrades will continue to grow. However, we also find that while costs will rise, in almost all scenarios the actual circuit-miles of anticipated new lines fall within historical build rates. We also draw attention to the need for accurate and appropriate valuation of the services that new technologies can provide to the grid, and we recognize that there is no "one size fits all" solution to the challenges seen across the different utility business models and market structures for electricity.

- Chapter 4 analyzes the security implications of our energy use, and in particular how the changes in domestic production, the U.S. midstream, and international markets for oil call for reassessing our readiness to withstand and recover from shocks utilizing the Strategic Petroleum Reserve (SPR). It also evaluates how biofuels production and the introduction of new “drop-in” fuels are enhancing our security posture.
- Our review of “mid-stream” energy infrastructure analyzes the rapidly expanding role that rail, waterborne, and roadway infrastructures are playing in the energy marketplace. Further examination of the benefits and costs of this expansion led to the development of Chapter 5 on “shared transport” systems. Unlike pipelines and electrical wires, shared transport systems serve a wide variety of commodities (such as coal, agriculture, and chemicals) and intermodal freight. The increase in energy movements on shared transportation systems has, in many cases, created new competition for limited capacity on these systems, while also drawing attention to the impact that traffic congestion and deficient infrastructure can have on communities and economic growth.
- Building on our work with Canada and Mexico, as well as our neighbors in the Caribbean, Chapter 6 of the QER explores the benefits of enhanced integration of energy TS&D systems and energy markets in North America. Special attention should also be paid to the growing concerns over the vulnerabilities of Arctic communities and ecosystems in the face of climate change and expanding energy production.
- Chapter 7 covers some of the environmental implications of TS&D infrastructures, both in terms of its impact on public safety and the environment, as well as how prudent investment can enable better environmental outcomes from our energy use.
- The importance of maximizing the broader economic value of our TS&D infrastructure cannot be overstated when it comes to the opportunities for good paying jobs that new investment presents. Chapter 8 looks into some of the current employment trends and future projections for the energy sector, and proposes a suite of programs to improve the training of energy professionals and the transition of former military personnel to energy jobs.
- Finally, Chapter 9 illustrates the challenges of siting and permitting of TS&D infrastructures, including the importance of close and early collaboration between developers and affected communities.

QER Recommendations

The QER includes many recommendations to meet the Nation's energy infrastructure objectives. Some of these are summarized below.

Ensuring the Resilience, Reliability, Safety, and Security of TS&D Infrastructure

Ensuring the resilience, reliability, safety, and security of TS&D infrastructure is a national priority and vital to American competitiveness, jobs, energy security, and a clean energy future. To continue supporting these shared priorities, the QER recommends taking the following additional actions:

- **Establishing a competitive program to accelerate pipeline replacement and enhance maintenance programs for natural gas distribution systems.** DOE should establish a program to provide financial assistance to states to incentivize cost-effective improvements in the safety and environmental performance of natural gas distribution systems, through targeted funding to offset incremental costs to low-income households and funding for enhanced direct inspection and maintenance programs. The estimated cost for this program is \$2.5-\$3.5 billion over 10 years.
- **Supporting the updating and expansion of state energy assurance plans, and establishing a competitive grant program to promote innovative solutions to enhance energy infrastructure resilience, reliability, and security.** DOE should undertake a multi-year program of support for state energy assurance plans, focusing on improving the capacity of states and localities to identify potential energy disruptions, quantify their impacts, share information, and develop and exercise comprehensive plans that respond to those disruptions and reduce the threat of future disruptions. The estimated cost for this program is \$350 - \$500 million over 10 years. DOE should also establish a program to provide competitively awarded grants to states to demonstrate innovative approaches to TS&D infrastructure hardening and enhancing resilience and reliability. A major focus of the program would be the demonstration of new approaches to enhance regional grid resilience, implemented through the states by public and publicly regulated entities on a cost-shared basis. The estimated cost for this program is \$3 - \$5 billion over 10 years.
- **Analyze the policies, technical specifications, and logistical and program structures needed to mitigate the risks associated with loss of transformers.** As part of the Administration's ongoing efforts to develop a formal national strategy for strengthening the security and resilience of the entire electric grid for threats and hazards (planned for release in 2015), DOE should coordinate with the Department of Homeland Security and other Federal agencies, states, and industry—an initiative to mitigate the risks associated with the loss of transformers. Approaches for mitigating this risk should include the development of one or more transformer reserves through a staged process.

Modernizing the Electric Grid

Electricity is central to the well-being of the Nation. The United States has one of the world's most reliable, affordable, and increasingly clean electric systems, but it is currently at a strategic inflection point—a time of significant change for a system that has had relatively stable rules of the road for nearly a century. To enhance the development of a modern electric grid, the QER recommends:

- **Providing state financial assistance to promote and integrate TS&D infrastructure investment plans for electricity reliability, affordability, efficiency, lower carbon generation, and environmental protection.** In making awards under this program, DOE should require cooperation within the planning process of energy offices, public utility commissions, and environmental regulators within each state; with their counterparts in other states; and with infrastructure owners and operators and other entities responsible for maintaining the reliability of the bulk power system. The estimated cost for this program is \$300 - \$350 million over 5 years.
- **Promoting grid modernization.** DOE has made a comprehensive grid modernization proposal in the President's Fiscal Year (FY) 2016 Budget request. The crosscutting proposal supports strategic DOE investments in foundational technology development, enhanced security capabilities, and greater institutional support and stakeholder engagement, all of which are designed to provide the tools necessary for the evolution to the grid of the future. The estimated cost for this program is \$3.5 billion over ten years.
- **Improving grid communication through standards and interoperability.** In conjunction with the National Institute of Standards and Technology and other Federal agencies, DOE should work with industry, the Institute of Electrical and Electronics Engineers, state officials, and other interested parties to identify additional efforts the Federal Government can take to better promote open standards that enhance connectivity and interoperability on the electric grid.

Modernizing U.S. Energy Security Infrastructures in a Changing Global Marketplace

Until recently, the concept of energy security has focused on “oil security” as a proxy for “energy security.” It is clear, however, that energy security needs to be more broadly defined to cover not only oil but other sources of supply, and to be based not only on the ability to withstand shocks but also to be able to recover quickly from any shocks that do occur. To achieve this shared goal, the QER recommends:

- **Investing to optimize the Strategic Petroleum Reserve (SPR's) emergency response capability.** DOE should analyze appropriate SPR size and configuration, and, after carrying out detailed engineering studies, DOE should make infrastructure investments to the SPR and its distribution systems to optimize the SPR's ability to protect the U.S. economy in an energy supply emergency. It is anticipated that \$1.5–\$2.0 billion is needed for infrastructure life extension investments and to increase the incremental distribution

capacity of the SPR.

- **Updating SPR release authorities to reflect modern oil markets.** Congress should update SPR release authorities to allow the SPR to be used more effectively to prevent serious economic harm to the United States in case of energy supply emergencies.
- **Supporting fuels diversity through research, demonstration, and analysis.** DOE and the Department of Defense should continue research and demonstration activities to develop biofuels that are compatible with existing petroleum fuel infrastructure, especially in aviation and for large vehicles. DOE should provide technical support to states, communities or private entities wishing to invest in infrastructure to dispense higher-level ethanol blends. DOE should ensure adequate support for data collection and analysis on fuels, like propane, that play an important role in the Nation's diverse energy mix and are challenged by changing TS&D infrastructures.

Improving Shared Transport Infrastructures

Changes in the U.S. energy production and use affect the way that energy and other commodities are transported in the United States. The use of transportation modes (e.g., rail, barge, and truck transport) that are also shared by agricultural and other major commodities, has been joined by significant growth in the use of these transport modes by crude oil, refined petroleum products, and petrochemicals. To better manage shifting utilization patterns, the QER proposes:

- **Supporting a new program of competitively awarded grants for shared energy transport systems.** A new grant program – Actions to Support Shared Energy Transport Systems or ASSETS -- should be established and supported at the U.S. Department of Transportation (DOT), in close cooperation with the DOE. This program should be dedicated to improving energy transportation infrastructure connectors. The estimated scale of ASSETS investment should be on the order of \$2 - \$2.5 billion over the next 10 years, which would likely mobilize \$4 - \$5 billion in non-Federal investment, based on typical TIGER (Transportation Infrastructure Generating Economic Recovery) cost shares.
- **Addressing critical energy data gaps in the rail transport of energy commodities and supplies.** Congress should fund the President's FY 2016 Budget request for the Energy Information Administration to address critical energy transportation data gaps and continued data sharing with the Surface Transportation Board.
- **Supporting alternative funding mechanisms for waterborne freight infrastructure.** The Administration should continue to examine alternative financing arrangements for waterborne transportation infrastructure and to develop strategies for public-private partnerships to finance port and waterway infrastructure.

Integrating North American Energy Markets

The United States, Canada, and Mexico, as well as other North American neighbors, benefit from a vast and diverse energy TS&D network that has enabled the region to achieve economic, energy security, and environmental goals. To bolster this strong foundation, the QER recommends:

- **Establishing programs for academic institutions and not-for-profits to develop legal, regulatory, and policy roadmaps for harmonizing regulations across borders.** In partnership with universities, qualified not-for-profits, and relevant U.S. energy regulatory authorities, state/province, local, and national energy regulations will be compared to identify gaps, best practices, and inconsistencies with regulations in Canada and/or Mexico with the goal of harmonization.
- **Increasing the integration of energy data among the United States, Canada, and Mexico.** Provide resources for the Energy Information Administration to collaborate with its Canadian and Mexican counterparts to systematically compare their respective export and import data, validate data, and improve data quality. In addition, efforts should be taken to better share geographic information system data to develop energy system maps and review forward-looking assessments and projections of energy resources, flows, and demand.
- **Promote Caribbean energy TS&D infrastructure.** As part of a larger Caribbean strategy, the United States should support the diversification of energy supplies, including actions to facilitate the introduction of cleaner forms of energy and development of resilient energy TS&D infrastructure in the Caribbean.

Additional insights and recommendations are included in the Summary for Policymakers from the QER. I ask the Chairman's permission to submit this summary for the record.

Conclusion

Periods of significant national prosperity have been frequently accompanied by Federal investments in a range of infrastructures—highways, rural electrification, providing water to open up the West. Some of the QER's recommendations will require similar investments in our energy infrastructures at a critical time for shaping our energy system. These will however, leverage significant private investment and pay big dividends for the country—high-paying jobs, increased energy security, and a cleaner environment.

The Administration's most recent budget request includes funding for some of the QER's key recommendations. Its full implementation will, however, require a bipartisan commitment to modernizing the Nation's energy infrastructures. The decisions to do so will strongly influence our energy mix for much of the 21st century. The QER released by the Administration earlier this week provides a roadmap to help us make the right choices.

In closing, we at the Department of Energy, and all of the agencies that have developed this report and its recommendations, see enormous potential for benefit from the recommendations we have made. We very much look forward to working with Members of this Committee, and others in Congress, as we take the next steps together to assure our energy TS&D infrastructure is resilient, and sustains our economy in the future.

Chairman Murkowski and Ranking Member Cantwell, this concludes my statement. I will be pleased to answer any questions.