Department of Energy
Washington, DC 20585

October 28, 2015

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

Dear Mr. Chairman:

On June 2, 2015, Secretary Ernest Moniz, testified regarding "Quadrennial Energy Review and Related Discussion Drafts."

Enclosed are the answers to questions that were submitted by Representatives Pete Olson, Michael Doyle, David Loebsack, John Sarbanes, and you to complete the hearing 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]

Janine Benner
Deputy Assistant Secretary for House Affairs
Congressional and Intergovernmental Affairs

Enclosures

cc: The Honorable Bobby L. Rush
Ranking Member

QUESTIONS FROM CHAIRMAN WHITFIELD

Q1. On January 9, 2014, President Obama issued a Presidential Memorandum establishing a Quadrennial Energy Review (QER) Task Force to review existing energy policies in the context of current economic, environmental, and security conditions and provide recommendations for additional executive and legislative actions, as well as establishing priorities for research and development. The President directed the Secretary of Energy to provide support for the 22-member multi-agency QER task force, including support for the coordination of activities related to the preparation of the QER report, policy analysis, modeling, and stakeholder engagement. The Department's Office of Energy Policy and Systems analysis serves as the Secretariat of the QER task force, and provides systems analysis to support the Administration's initiatives.

Q1a. Please provide a detailed accounting of the 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.

A1a. The Office of Energy Policy and Systems Analysis (EPSA) performs a significant amount of work in support of Departmental and National Policy matters in addition to its support for the QER Task Force. Such policy work is broad and ranges across topics that include environmental and efficiency initiatives, energy security and market analysis, energy systems assessment and integration, energy system financing, state, local, and tribal stakeholder engagement, as well as other topics that develop on an ongoing basis. Like all EPSA activities, this work is broadly supportive of the QER while simultaneously contributing to Departmental and national goals and objectives.

EPSA work for the first installment of the QER (and other projects and programs) began in FY 2014 and continued in FY 2015. In FY 2014, EPSA was appropriated about $19 million and employed 51 FTEs. In FY 2015, EPSA was appropriated about $38.5 million and employed 64 FTEs. EPSA leveraged existing DOE publications and ongoing DOE analytical efforts. In addition, EPSA contracted with a number of national laboratories and other organizations to complete analyses that support the QER. A selection of these analyses are contained in the table below and can be found at the following website: http://energy.gov/epsa/qer-document-library

TITLE	ORGANIZATION	FOCUS AREA
United States Fuel Resiliency: US Fuels Supply Infrastructure (Vol 1-3)	Intek, Inc.	Resilience
Simulating Impacts of Disruptions to Liquid Fuels Infrastructure	Sandia National Laboratories	Resilience
Natural Gas Infrastructure Implications of Increased Demand from the Electric Sector	U.S. Department of Energy	Electric Grid
Impacts of Demand-Side Resources on Electric Transmission Planning	Oak Ridge National Laboratory, Lawrence Berkeley National Laboratory	Electric Grid
Opportunities for Energy Efficiency Improvements in the U.S. Electricity Transmission and Distribution System	Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Lawrence Berkeley National Laboratory	Electric Grid
Grid Integration and the Carrying Capacity of the U.S. Grid to Incorporate Variable Renewable Energy	National Renewable Energy Laboratory	Electric Grid
LNG Analysis Summary: A Different Way of Looking at the Future of World LNG Trade	Jensen Associates	Energy Security
The Future of U.S. Natural Gas: Supply, Demand & Infrastructure Developments	Bentek Energy	Energy Security
A Review of the CO2 Pipeline Infrastructure in the U.S.	National Energy Technology Laboratory	Energy Security
Coal-by-Rail Business-as-Usual Reference Case	Argonne National Laboratory	Shared Transport
Opportunities for Efficiency Improvements in the U.S. Natural Gas Transmission, Storage and Distribution System	Lawrence Berkeley National Laboratory	Multiple
Controlling Methane Emissions in the Natural Gas Sector: A Review of Federal & State Regulatory Frameworks Governing Production, Processing, Transmission, and Distribution	Joint Institute for Strategic Energy Analysis	Multiple

Quantification of the Potential Gross Economic Impacts of Five Methane Reduction Scenarios	Joint Institute for Strategic Energy Analysis	Employment and Workforce

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

A1b. Per the Presidential Memorandum of January 9, 2014, the White House Office of Science and Technology Policy (OSTP) and the Domestic Policy Council (DPC) ran the Quadrennial Energy Review Interagency Task Force. The task force, which included more than 20 executive departments and agencies, was co-chaired by the OSTP Director and the DPC Director. The Department also provided periodic updates to the President's Council of Advisors on Science and Technology (PCAST) and to the Secretary of Energy's Advisory Board (SEAB).

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

A1c. The Department is still developing the scope of work and schedule for the second installment of the QER.

Q1d. Please provide a rough timeline for the implementation of the current QER recommendations and, to the extent possible, the implementation timeline and scope of the recommendations to be developed in future QER installments.

A1d. The first installment of the QER released by the White House in April of this year contains a number of findings and recommendations to inform policy decisions that can lead to a more robust and resilient energy infrastructure. These recommendations are national in nature and the Department remains committed to supporting the 22 members of the multi-agency QER task force as they pursue implementation.

Q2. The Department's authority to regulate the export of liquefied natural gas (LNG) arises under section 3 of the Natural Gas Act (NGA). Section 3(a) of the NGA sets forth the standard of review of LNG export applications, creating a rebuttable presumption that a proposed export of natural gas is in the public interest:

[N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of the [Secretary of Energy] authorizing it to do so. The [Secretary] shall issue such order upon application, unless after opportunity for hearing, [he] finds that the proposed exportation or importation will not be consistent with the public interest.

Section 3 (c) sets forth a different standard of review for applications to import or export natural gas, including LNG, from or to those countries with which the United States has in effect a free trade agreement (FTA):

[T]he importation of …natural gas [from]…or the exportation of natural gas to a nation with which there is in effect a free trade agreement requiring national treatment for trade in natural gas, shall be deemed to be consistent with the public interest, and applications for such importation or exportation shall be granted without modification or delay.

Please clarify the Department's policy with respect to its review of export applications that involve LNG export facilities in Canada or Mexico. Since these countries hold an FTA with the United States, is it DOE policy in all cases to grant authorization to export natural gas in accordance with section 3(c), automatically and without modification or delay?

Q2a. Does the Department regulate the re-export of natural gas originating from the U.S.? Are there circumstances when a non-FTA application may also be required when gas is exported to Canada or Mexico? If so, when?

A2a. Section 3 of the Natural Gas Act differentiates between exports of natural gas to non-FTA countries and exports to FTA countries. In determining whether an export is to a FTA or non- FTA country, DOE believes it must look to the trade status of the country in which the natural gas or LNG is delivered for end use. To do otherwise would allow exporters to evade the public interest review and opportunity for public participation afforded in non-FTA export proceedings under NGA section 3(a), simply by transiting the natural gas or LNG through a FTA country en route to a non-FTA country, allowing the dual-track scheme Congress created in the NGA to be easily evaded.

Q2b. If U.S. natural gas is exported to Canada or Mexico via pipeline and sold or comingled, would the applicant for the DOE export license be required to track and inform the Department of its end-use destination?

A2b. In general, yes, DOE intends to include a provision in authorizations to export natural gas to Canada or Mexico for subsequent re-export as LNG to other countries, which requires

the authorization holder to report the country (or countries) of destination into which the LNG was actually delivered for end-use.

Q2c. How will DOE prioritize foreign projects, when the LNG export facility is not subject to an environmental review conducted by the Federal Energy Regulatory Commission? Will DOE apply a categorical exclusion under the National Environmental Policy Act (NEPA)?

A2c. Part of the review of applications to export natural gas to non-FTA countries includes the environmental review required by the NEPA. NEPA does not require DOE to consider the environmental impacts of proposed export projects outside of the U.S. However, NEPA does require DOE to consider the reasonably foreseeable environmental impacts in the U.S. of authorizing these natural gas exports. The environmental review completed as part of a non-FTA application is driven by the specific characteristics of the individual export project, but may include, for example, new pipeline construction in the United States necessary to supply a LNG terminal in Canada or Mexico. DOE will follow its process of reviewing projects in the order that they are ready for final agency action.

Q2d. Please clarify DOE policy with respect to the use of conditional authorizations in light of the procedural change to suspend issuance of such authorizations on applications to export LNG to lower-48 states, followed by the May 28th announcement granting conditional authorization to Alaska LNG.

A2d. It is DOE's policy to no longer issue conditional authorizations for proposed export projects in the lower-48 states, consistent with the procedural order issued on August 15, 2014. Recognizing that export facilities located in Alaska may present different considerations, the Department reserved the question of issuing conditional authorizations to Alaskan projects to later proceedings in which this question could be considered in light of the facts of an application.[1]

[1] Procedures for Liquefied Natural Gas Export Decisions, Final Revised Procedures, 79 Fed. Reg. 48,132 at 48,135 n. 6 (stating "The revised procedures will apply only to exports from the lower-48 states. In the Proposed Procedures Notice, DOE stated that no long-term applications to export LNG from Alaska were currently pending and, therefore, DOE could not say whether there may be unique features of Alaskan projects that would warrant exercise of the DOE's discretionary authority to issue conditional decisions. After publishing the Proposed Procedures Notice, DOE received one application to export LNG from Alaska. See Alaska LNG Project LLC, Application for Long-Term Authorization to Export Liquefied Natural Gas, Docket No. 14–96– LNG (July 18, 2014). DOE will consider whether to issue a conditional decision on that application, or any future application to export from Alaska, in the context of those proceedings.").

DOE discussed the rationale for granting conditional authorization to the Alaska LNG project in the order issued on May 28, 2015. The order states, "As Alaska LNG has shown, because the Project includes an 800-mile pipeline, it is substantially more capital-intensive and will require substantially greater expense toward environmental review than any project that has been proposed for the lower-48. For that reason, we believe that the regulatory certainty afforded by providing the Department's judgment on non-environmental aspects of the application will be of greater benefit than it would for projects proposed in the lower-48. In reaching this judgment we are informed by the history of multiple efforts since the 1970's to develop projects that access North Slope natural gas supplies, all of which failed despite supportive legislative initiatives by both the State of Alaska and the U.S. Congress.[2]"

[2] See, e.g., Alaska Natural Gas Transportation Act, 94 Pub. L. No. 586 (1976) (codified at 15 U.S.C. § 719 et seq.); Alaska Natural Gas Pipeline Act, 108 Pub. L. No. 324 (Division C) (2004) (codified at 15 U.S.C. § 720 et seq.); and Alaska Gasline Inducement Act, 2007 Alaska Sess. Laws 22, Alaska Stat. § 43.90.010 et seq. (2014). See also Alaska Natural Gas Pipeline Project History, Alaska Natural Gas Transportation Projects Office of the Federal Coordinator, http://www.arcticgas.gov/Alaska-Natural-Gas-Pipeline-Project-History, (last visited May 22, 2015) (maintained by the U.S. Arctic Research Commission).

QUESTION FROM REPRESENTATIVE OLSON

Q1. Mr. Secretary, my state of Texas has some native lignite, but it is my understanding that our coal plants are heavily reliant on shipments of Powder River Basin coal for environmental reasons. This means that we rely on rail to a fair extent. The QER described constraints facing rail lines transporting coal, and resulting issues for fuel supply at our nation's power plants. However, the rail industry has claimed that this was temporary and that there is now excess capacity.

Q1a. Could you please describe the extent to which constraints have been resolved?

A1a. A definitive answer, at least at this time, is difficult to provide, for the reasons below:

- When the Quadrennial Energy Review (QER) reviewed the movement of coal out of the Powder River Basin (PRB) over the last several years, the situation was one of an already constrained rail network taking on the added responsibility of serving a huge expansion of domestic petroleum production in the Bakken region (QER Pages 5-4 – 5-8).

- A confluence of circumstances, in addition to the Bakken production, tested the nation's rail network, in particular in the fall of 2013 and throughout 2014. Two years of record grain harvests, a cold fall and an early and cold winter of 2013-14, and all the other commerce moving out of Plains states and across the upper Midwest, complicated the delivery of coal to utilities across the country. Several railroads serve PRB coal at its origin, and most of the rest of the nation's Class I railroads are involved in delivering that coal to generating units in Texas as well as more than 30 other states (QER Page 5-9). Delays in coal deliveries related to commerce moving south and east of the Bakken/PRB regions continued through much of 2014.

- The BNSF Railway is one of the major railroads for movements of both Bakken crude and PRB coal. Many of the publicized difficulties in the 2013-14 timeframe happened on BNSF's part of the rail network. Since then, BNSF has made investments across its service area, and has taken other strides to address capacity

constraint problems (e.g. track building, purchase of additional rolling stock, and hiring and training of new crews) (QER Page 5-10).

- The circumstances that created problems two years ago – a dramatic increase in oil shipments, weather, and harvest-related high demand for constrained rail infrastructure by coal and agricultural shippers may not occur concurrently again. The decrease in the world price of oil had the effect of reducing the amount of oil moved by rail nationally and out of the Bakken.[3] Other factors – including an increase in pipeline capacity and the opening of a refinery in North Dakota – have eased rail congestion attributable to crude-by-rail from the Bakken.[4] A milder winter of 2014-15 may have temporarily alleviated some of the concerns we heard from coal-fired utilities about deliveries of PRB coal. Notwithstanding the current easing of rail congestion, oil production levels in the Bakken remain steady, even with smaller rig counts.[5] Consequently, the circumstances that contributed to slower than desired (or lower than desired) coal deliveries over the 2013-2014 period have the potential to disrupt rail service again in the future.

Your concerns about the timely delivery of fuel to coal-dependent plants serving your district and throughout Texas are understandable. Further analysis of the movement of energy products by multiple modes is part of an all-of-the-above energy policy. Three of the recommendations in the QER seek to improve policymaking regarding the rail transportation of coal and other energy commodities (Page 5-13):

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[3] *See, e.g.,* Ron Patterson, "Oil Shipments by Rail Declining," Oilprice.com, July 20, 2015. http://oilprice.com/Energy/Crude-Oil/Oil-Shipments-By-Rail-Declining.html. *See also* Gabriel Collins, "When Oil Prices Head South, So Do the Bakken Oil Trains," North America Shale Blog, BakerHostetler, February 11, 2015. http://www.northamericashaleblog.com/2015/02/11/when-oil-prices-head-south-so-do-the-bakken-oil-trains/

[4] "Slowdown in N.D. drilling opens up space on Amtrak rails," Energywire, E&E Publishing, LLC, July 16, 2015. http://www.eenews.net/energywire/stories/1060021860/search?keyword=oil+pipeline. *See also* Matt Olberding, "Number of oil trains coming through state continues to drop," Lincoln Journal Star, July 16, 2015. http://journalstar.com/business/local/number-of-oil-trains-coming-through-state-continues-to-drop/article_6057b20e-e939-53b8-b83d-77591f58742f.html.

[5] Brian Scheid, "The conundrum of North Dakota's oil output: At the Wellhead," The Barrel, Platts/McGraw Hill Financial, July 20, 2015. http://blogs.platts.com/2015/07/20/north-dakota-oil-output/

- A call for DOE, the Federal Energy Regulatory Commission, and the Surface Transportation Board (STB) to further analyze the effects of rail congestion on these commodities;
- An analysis of the effects on the stability of the grid caused by delayed or incomplete coal deliveries; and
- An effort to improve the data available for policymakers regarding the movement of energy commodities.

In the course of developing the QER, the analysts encountered data gaps in many areas touching on the nation's transmission, storage, and distribution infrastructure for energy and energy products. Although STB currently monitors reporting requirements in response to service disruptions, increased data might allow federal policymakers to make objective, long-term recommendations regarding how, when, and in what priority coal and other energy products move, and how that commerce might be improved to the benefit of consumers.

QUESTIONS FROM REPRESENTATIVE DOYLE

Q1. Mr. Secretary, the QER highlights single source dependency – the rising shift to natural gas – as a potential threat to our country's security. I certainly agree that we need to make sure we use a broad range of sources for our energy, and have expressed my concerns that potential new rules like the clean power plan will force us to rely on natural gas even more.

Q1a. How do you recommend ensuring we keep a balanced portfolio of energy sources?

A1a. Among the Department's missions is to "catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in clean energy technologies." The Department fulfills this mission by supporting technology development and energy systems analysis under an all-of-the-above approach, as reflected in the FY 2016 budget currently before Congress, which requests:

- $645 million for Renewable Power within the Office of Energy Efficiency and Renewable Energy to support research on advanced solar, wind, and other renewable sources of energy, much of it aimed at enhancing the cost-competitiveness of these technologies;

- $908 million for the Office of Nuclear Energy to support the sustainability of light water reactors, the development of advanced nuclear systems, and modeling of nuclear systems, among other activities;

- $842 million for the Office of Fossil Energy to support research on carbon capture and storage from coal and natural gas fired electricity sources, and prudent development of oil and natural gas resources, as well as supporting the Strategic Petroleum Reserve; and

- $270 million for the Office of Electricity Delivery and Energy Reliability to support grid modernization to enhance the reliability, efficiency, and security of the Nation's electric power grid through efforts to foster the deployment of smart grid systems and technologies, research in basic materials to improve energy storage, energy reliability assessments, and other activities.

The best plan for maintaining a balanced portfolio of energy sources is to provide these funding levels for these critical activities that support a wide range of energy technologies.

In addition, the Quadrennial Energy Review includes several recommendations that, once implemented, will support a balanced approach. Among these is a recommendation to "work with stakeholders to develop a framework(s) for identifying attributes of services provided to the grid by electricity system components, as well as approaches to incorporate the valuation of grid service attributes in different regulatory contexts (e.g., pricing or incorporation in planning processes)" (QER Page 3-27).

Q2. The Quadrennial Energy Review examines existing CO_2 pipeline infrastructure and suggests we should look to expand this network. As a longtime advocate for the cleaner use of fossil fuels, like coal, I think that the capture and reuse of carbon emissions from power plants is crucial as doing so will help keep the leading source of baseload power reliable and affordable for consumers, while ensuring that we are prudent in reducing our carbon emissions.

Q2a. Can you please elaborate on the potential for, and necessity of, these CO_2 pipelines?

A2a. There is an opportunity to facilitate CO_2 capture in the power and other industrial sectors by creating CO_2 pipeline networks linking CO_2 supply with demand in current markets. Additional CO_2 pipeline networks could bring CO_2 to market for CO_2 enhanced oil recovery (EOR) operations. At the present time, there is a market driver for CO_2-EOR as well as federal tax incentives available (on a $/ton of CO_2 injected) for both CO_2-EOR and geologic storage in saline reservoirs. There is considerable opportunity for oil recovery in the US from CO_2-EOR and there has been a recent shortage of CO_2[6]. As noted in the QER and supplemental analysis,[7] most of the CO_2-EOR opportunities are concentrated in oil production basins and served by CO_2 pipeline networks that are concentrated within those regions. However, existing pipeline networks remain distant from major sources of CO_2 from power generation in other parts of the country. Building up a more regionally expansive CO_2 pipeline infrastructure that services the needs of the CO_2-EOR market could facilitate carbon capture from the power sector and major

[6] https://www.netl.doe.gov/file%20library/research/oil-gas/small_CO2_EOR_Primer.pdf
[7] http://www.energy.gov/epsa/downloads/review-co2-pipeline-infrastructure-us

industrial facilities, where CO_2 capture may be at a smaller scale and lower cost but still provide significant learning opportunities. It would also enable geologic CO_2 storage in these oil and gas reservoirs and other types of geologic formations by providing a more expansive CO_2 infrastructure network.

Q3. The QER recommends enacting financial incentives for the construction of CO_2 pipeline networks, specifically connecting them to nearby oil fields or saline storage formations.

Q3a. Are there any limitations as to what would qualify as nearby?

A3a. Long distance CO_2 pipelines (hundreds of miles) have been in operation for decades. A number of factors determine the economic viability of a CCUS project and associated CO_2 pipeline, including but not limited to: potential oil revenue from oil produced from the geologic storage formation, long term potential for the geologic storage formation, and what other CO_2 sources are available to make the pipeline more economical. A review of the 500 largest CO_2 point sources (primarily coal-fired power plants) in the United States shows that 95 percent are within 50 miles of a possible storage site[8]. However, until a geologic storage formation is fully characterized and economic considerations are taken into account, the specific length of the pipeline needed cannot be assumed.

Q3b. Oil fields, and correspondingly, the existing CO_2 pipeline infrastructure are fairly geographically concentrated; however, power plants are not. How can we expand this network to make sure that CCS technology – or other technologies we haven't discovered yet – are encouraged across the country?

A3b. The present CO_2 pipeline network is concentrated in four clusters: Permian Basin (W. TX, NM, and S. CO), Gulf Coast (MS, LA, and E. TX), Rocky Mountains (N. CO, WY, and MT), Mid-Continent (OK and KS) http://www.energy.gov/epsa/downloads/review-co2-pipeline-infrastructure-us. The primary source of CO_2 for each cluster is natural, either reservoirs of CO_2 (Mc Elmo Dome, Bravo Dome, Jackson Dome) or natural gas production with high CO_2 content (LaBarge). Connecting these clusters would facilitate transport of CO_2 between regions and allow opportunities to expand existing gas processing plants or other industrial sources to meet increasing demand. New pipelines

[8] http://www.globalchange.umd.edu/data/gtsp/docs/gtsp_reportfinal_2006.pdf

could also be 'clustered' in regions with a large number of CO_2 point sources such as coal fired power plants and other facilities with high-purity CO_2 streams, using a central gathering point to support a larger diameter pipeline.

Q3c. Do you think that building out pipelines for this important, beneficial reuse of CO_2 emissions is preemptive when we are, in my opinion, severely underfunding CCS research or research into new, yet-to-be-discovered technologies that limit these harmful emissions?

A3c. A more expansive national CO_2 pipeline infrastructure could serve both the existing CO_2-EOR market and projects that employ carbon capture, utilization and storage (CCUS) for climate mitigation. Investment in this infrastructure would complement investments in research, development and demonstration and other policies designed to accelerate CCUS. This pipeline investment would ultimately support additional CCUS projects, providing an in–place solution and existing market to support them.

Q3d. I strongly feel that if we don't incentivize it, private industry won't develop this technology because it's not yet required, and the government needs to take the lead on this. Do you think that funding for that type of research should be something we seriously consider going forward?

A3d. Yes. Continued research and development, such as the work undertaken by DOE's Office of Fossil Energy (FE), are needed to enable the deployment of CCUS. Such research and development experience is expected to accelerate innovation and further drive down the cost of capturing CO_2 from power plants and other industrial sources of CO_2. Ongoing work within FE's Carbon Storage program is characterizing potential sites for saline storage.

Expanding CO_2 pipeline networks and lowering the cost of CO_2 capture is only part of the challenge in advancing CCUS. Finding suitable reservoirs that will utilize and/or safely and permanently store CO_2 and mobilizing the capital necessary to fund CCUS projects are other challenges to be met.

The President's FY 2016 Budget proposed CCUS tax incentives in order to catalyze greater investment of private capital in CCUS. As stated in the QER recommendations at 7-26:

"The President's FY 2016 Budget Request proposes the creation of a Carbon Dioxide Investment and Sequestration Tax Credit in order to accelerate commercial deployment of carbon capture, utilization, and storage, as well as to catalyze the development of new carbon capture, utilization, and storage technologies. Specifically, the proposal, part of the President's POWER+ Plan to invest in coal communities, would authorize $2 billion in refundable investment tax credits for carbon capture technology and associated infrastructure (including pipelines) installed at new or retrofitted electric generating units that capture and permanently "sequester" CO2. Congress should enact this proposed tax credit."

Q4. The QER highlights the importance of investing in our country's energy infrastructure. However, many of my constituents only think about energy, or how it actually gets to their office or home, when they go to turn on the lights and nothing happens.

Q4a. This report on TS&D focuses on the largely invisible back-end of the equation. How do you recommend we approach this issue and explain it to our constituents back home?

A4a. In our discussions with the public we tried to emphasize the importance of Transmission, Storage, and Distribution (TS&D) infrastructure for energy by describing the current challenges facing our infrastructure and the ways in which it needs to evolve to provide important direct benefits to energy consumers.

For example, the backbone of this system is the networks of pipelines, wires, storage, waterways, railroads, and other facilities that enables us to connect our sources of energy – such as oil fields and power plants – and deliver to consumers the energy services they need in their daily lives (QER Page 1-2).

TS&D infrastructure is facing a number of significant challenges in the 21st Century. The workforce that maintains the nation's TS&D infrastructure, like the infrastructures themselves, is aging (QER Page 1-3). TS&D infrastructure is increasingly vulnerable to extreme weather events like hurricanes, flooding, and wildfires, as well as cyberattacks due to the integration of information technology in the electric grid (QER Page 2-2). Meanwhile, the United States is undergoing an energy revolution. Solar electricity generation has increased 20-fold since 2008, and electricity generation from wind energy

has more than tripled (QER Page 1-7). During that period, the United States has also become the world's leading producer of oil and natural gas combined (QER Page 1-5). While our economy benefits from increased renewables integration and domestic oil and gas production, these trends also place new, disruptive stresses on our energy infrastructure (QER Pages 1-5 - 1-7).

To respond to these trends and the vulnerabilities that come with them, the QER proposes investments, as well as regulatory and statutory changes intended to enable our TS&D infrastructure to be:

- More resilient against extreme weather and cyber- and physical attacks, which can cause power outages and disrupt fuel supplies (QER Page 2-2), put human health and safety at risk, endanger property, and create economic dislocations. The QER recommends that states create energy assurance plans so that power will remain online or recover quickly in the event of a disruption (QER Page 2-39);

- Safer, through replacement of pipelines in major metropolitan areas and wherever else aging infrastructure can present a hazard to human health and safety, and to property (QER Page 2-38);

- More environmentally responsible, by modernizing the electric grid to support more clean energy and reduce consumption (QER Page 3-2). The QER also proposes a program to improve infrastructure around ports, which will reduce local diesel particulate pollution by enabling trucks and boats carrying energy resources to move in and out of the surrounding areas quickly (QER Pages 5-27 and 7-16); and

- A creator and supporter of good jobs in the energy sector. Nearly one million American workers were employed in energy TS&D jobs in 2013, and an additional 900,000 jobs were indirectly supported by energy TS&D activity. By 2030, projections indicate that the energy sector will employ an additional 1.5 million workers, mainly in the construction, installation and maintenance, and transportation sectors, and more than 200,000 additional workers with computers and mathematics skills will be required (QER Page 8-2). The QER recommends investments and

professional support with the goal of creating and sustaining jobs in Energy TS&D (QER Page 8-10).

QUESTION FROM REPRESENTATIVE LOEBSACK

Q1. The QER points out that biofuel production in the United States has "increased rapidly over the last decade, enhancing energy security and reducing greenhouse gases from transportation." It points out that ethanol is responsible for most of this growth, and it currently displaces about 10 percent of US gasoline by volume. It finds that continued growth in ethanol and other biofuels will depend on investment in distribution capacity and continued investment in research, development, demonstration, and deployment.

Right now, the most significant thing slowing investment in all biofuels - particularly advanced and cellulosic — is the EPA's proposed rule setting blending targets under the Renewable Fuel Standard (RFS.) The EPA went back to the drawing board after a failed rulemaking in 2014, and the Agency released a 3–year rule at the end of May. All of the biofuels stakeholders I've talked to said this rule falls short of what is needed to expand the role of biofuels in the U.S. to help diversify our fuel supply and stem climate change.

Q1a. What is DOE doing to ensure that the investment contemplated by the QER can actually occur and our progress to date can be maintained in light of the problematic proposal from EPA?

A1a. The Department of Energy has a suite of programs and initiatives to promote the development and commercialization of advanced and cellulosic biofuels. The program areas covered include feed stocks, conversion technologies, demonstration and market transformation, and sustainability. These programs are described in the 2016 Congressional Budget Request for the Office of Energy Efficiency and Renewable Energy.

Q1b. What infrastructure is needed to compliment the increased capabilities of renewables such as wind and solar?

A1b. As new sources of intermittent electricity generation come online, the grid will require additional infrastructure in the form of short-haul transmission lines to connect them as well as long distance transmission lines. In addition, the grid will require additional sources of generation or demand flexibility to accommodate the increased intermittency; these flexibility solutions could include infrastructure (e.g., battery storage, natural gas back-up systems, or additional transmission) or changes in operational strategies like demand response.

Modeling conducted for the first installment of the Quadrennial Energy Review indicated that even with relatively high penetrations of wind and/or solar, additional transmission capacity needs through 2030 were commensurate with expected base-case transmission additions.

Q1c. Can you give me examples of funding mechanisms for transportation infrastructure improvements?

A1c. An example of funding mechanisms for transportation would include the GROW AMERICA Act proposal, in which the Administration provides $18 billion over six years for targeted investments in the nation's transportation system that will improve the movement of freight. In addition, the President's FY 2016 Budget proposes a new per-vessel user fee for the inland waterways that will raise $1.1 billion over the next 10 years, effectively doubling the level of resources available in the Fund for investments in these waterways.

In addition, the first installment of the QER recommends alternative funding mechanisms for waterborne freight infrastructure such as public-private partnerships that help encourage private sector participation (Page S-21).

QUESTIONS FROM REPRESENTATIVE SARBANES

Q1. What are the most significant barriers to maturation and broader adoption of Smart Grid technologies in our electric delivery and consumption systems?

A1. Major barriers to smart grid technology maturation and adoption include a lack of business cases to justify the investment, lagging smart grid technology standards, and regulatory structures, market structures, and rate designs that limit taking better advantage of the opportunities. Broadly, these barriers are analogous to those that occurred when cheaper information and communication hardware and software diffused widely through the U.S. economy, beginning in the early 1990s. These barriers were worked through in the last several decades in the larger economy, and are now being worked through as our electric delivery and consumption systems adopt increasingly economic advanced communication and information technologies (e.g., the "smart grid"). Much progress has occurred over the last several years, yet more remains to be done. Indeed, a revolution in communication and information technologies is changing the nature of our electricity system.

Electric utilities and their regulators require established business cases for investments that ensure both reliability and affordability, requiring proof that spending meets a "just and reasonable" regulatory standard commonly used. This includes verification and validation of technical performance and a robust cost–benefit analysis, before the electric utilities and their regulators approve adoption of new smart grid technologies.

The American Recovery and Reinvestment Act of 2009 supported development of business cases, leading to many deployments of smart grid technologies, including advanced metering infrastructure, wide-area grid monitoring (synchrophasor technology), distribution automation, customer systems, and electric distribution and transmission systems. Lagging smart grid standards also pose issues, which could result in higher costs (from needing to retrofit assets) and high risks (due to potentially stranded assets) for smart grid technology adoption once standards are finalized. Government and industry experts are actively advancing standards development, testing, and supporting policies, but solutions still often lag industry needs. Continued coordination for standards identification and independent testing is needed to define the rules of the road and

streamline new technology integration, as stated in the DOE 2014 Smart Grid System Report[9] and more recently in the Administration's QER recommendation for DOE to assist in accelerating standards development.

Regulatory structures may need to adapt to changes in smart-grid-enabled business models that build on new opportunities for the customer in local electricity generation and management. Demand-side management technologies such as smart meters and other enabling technologies, when coupled with alternative rate structures such as time-based rates, could succeed in improving utility system efficiencies, particularly during peak consumption periods. Changing rate structures to embrace new technologies, however, does require thoughtful consideration, as affordable and reliable electricity for all is important to maintain. A number of states have opened regulatory dockets to consider changes to their electricity regulatory structures, taking all these factors into account. Market structures of the Independent System Operators and Regional Transmission Organizations (RTOs) may also need to adapt to the opportunities offered by new products and services. For example, PJM, an RTO operating in 13 states and the District of Columbia, now has a market for fast ramping products that take advantage of certain storage and demand response technologies that can provide a valuable grid reliability service. Efficient new market structures can fully realize the benefits of new products and services, while also promoting new smart grid technology adoption.

Q2. What specific policies should the Congress adopt to overcome these barriers and hasten the deployment of Smart Grid technologies?

A2. To overcome barriers and hasten the deployment of Smart Grid technologies, the QER highlights the following issues: Lack of a business case to justify investments; lagging technical standards; and economic factors that limit the ability to take advantage of Smart Grid opportunities. In particular, developing standards and supporting policies facilitates industry innovation and could have the largest impact of the three. Additionally, policies that encourage states to develop common methodologies for cost/benefit analysis of incorporating smart grid technologies, including value of reliability, resilience, and

[9] http://energy.gov/oe/downloads/2014-smart-grid-system-report-august-2014

security are discussed. Finally, states and other stakeholders need to work together to support and adopt the Smart Grid Interoperability Panel in developing interoperability standards that could hasten deployment of Smart Grid technologies.