

Public Meeting North Dakota



Chapter X

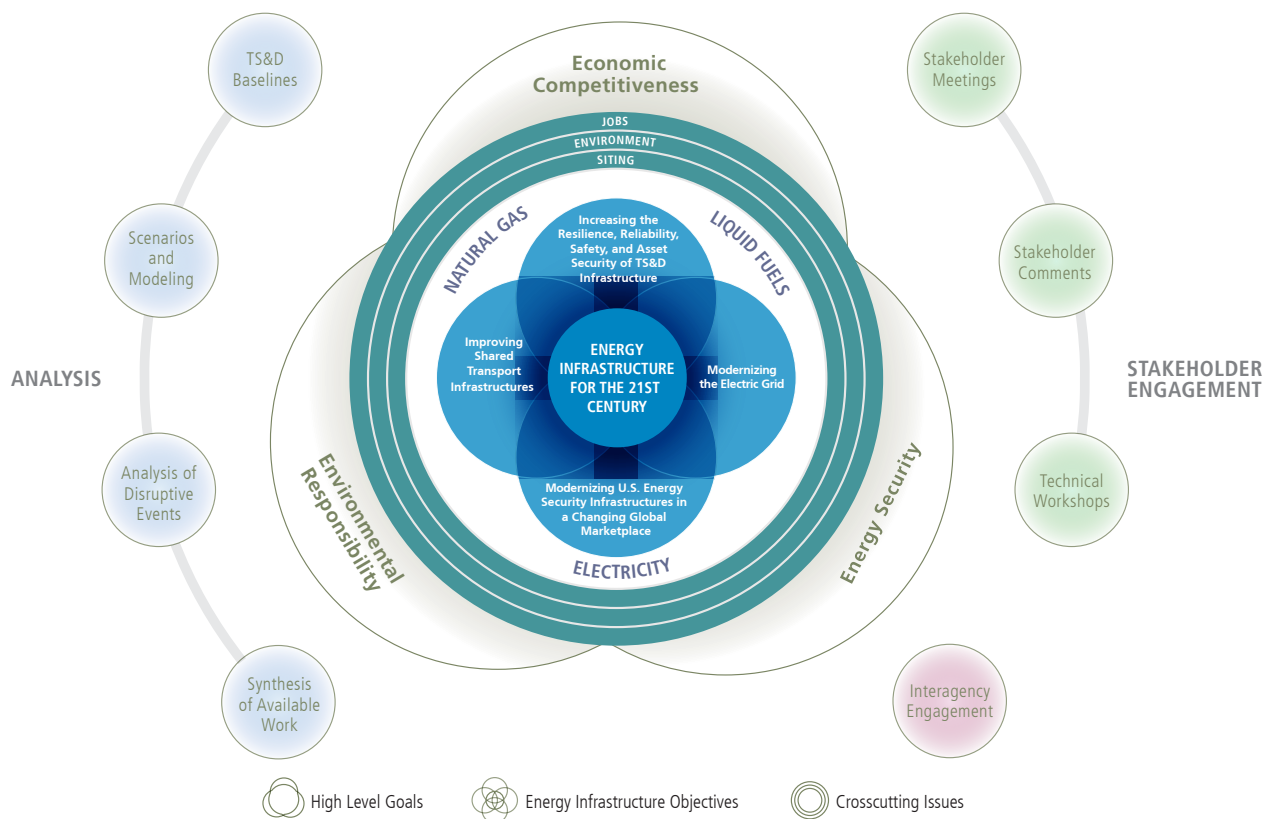
ANALYTICAL AND STAKEHOLDER PROCESS

This chapter describes the analyses and stakeholder engagement that provided the substantive basis for the Quadrennial Energy Review (QER). The first section describes the analytical work carried out for the QER, including baselines, scenarios, and specific analyses underlying some of the key chapters in this report. The second section describes how the QER process engaged a broad range of stakeholders across the Nation in its development, including through technical workshops, 13 formal public stakeholder meetings, and a special series of roundtables on methane emissions from transmission, storage, and distribution (TS&D) infrastructure. This chapter is intended to document the process of developing the QER and contains no recommendations.

QER Systems Analysis

The QER is a policy document based on robust systems/policy analysis and extensive stakeholder and interagency engagement (see Figure 10-1). These connected efforts support the findings and recommendations described in the main QER document, as well as the Natural Gas, Liquid Fuels, and Electricity appendices.

Figure 10-1. Inputs to the QER¹



This figure shows the analytical, stakeholder, and interagency efforts underpinning the QER.

In the Presidential Memorandum establishing the QER, President Obama directed the QER Task Force to conduct policy analysis and modeling to support QER recommendations and actions. The Department of Energy's (DOE's) Office of Energy Policy and Systems Analysis (EPSA)—serving as secretariat for the QER Task Force—undertook an extensive suite of analyses, focusing on energy TS&D infrastructures. This effort included the following:

- Commissioned analyses from DOE national laboratories, including scenario modeling, synthesis, and white papers.
- Commissioned analyses from energy consulting and analytics firms, including modeling, baselines, and scenarios.
- Internal EPSA analysis—in collaboration with partners across DOE and other Federal agencies—to generate analysis, policy working papers, and public reports.
- Overlapping analysis with stakeholder engagement efforts and technical workshops with associated analytical products.

This chapter lists commissioned analyses used to support QER findings and recommendations. Many of the QER analyses are crosscutting in nature and apply to more than one energy objective or sector. Analyses (some forthcoming) are posted at energy.gov/epsa/qer-document-library.

Crosscutting Scenario Analysis

The QER used scenario analyses to assess the impact of a range of factors on the need for liquid fuels, natural gas, and electricity transmission infrastructure between 2014 and 2030. These scenario analyses do not model any specific Administration policy or projection about energy technology or markets. Rather, the goal was to explore both infrastructure changes and investments that might be required under a range of possible future conditions (in particular, considering options different from those implied under the Energy Information Administration Annual Energy Outlook 2014 Reference case). Factors analyzed included, among others, an economy-wide cap on carbon dioxide emissions driving a 40-percent reduction in 2030, reductions in renewable generation costs, increased natural gas prices, and dramatic expansions of liquefied natural gas export capacity. The individual scenarios are described in Table 10-1 (note that some scenarios—such as the electricity scenarios—were run in combination).²

Table 10-1. Table of QER Modeling Scenarios³

Scenarios	Model
Base Case: Annual Energy Outlook 2014 Reference Case	
Natural Gas <ul style="list-style-type: none"> High domestic gas demand High world gas supply High U.S. exports 	Deloitte (MarketPoint) <ul style="list-style-type: none"> Coupled gas infrastructure and electricity market models Outputs include major pipeline capacity expansions and new pipeline builds
Electricity <ul style="list-style-type: none"> Low wind cost Low solar cost Low-cost storage High/low electricity demand High natural gas prices 40-percent economy-wide greenhouse gas reduction by 2030 High penetration of distributed generation (photovoltaic) High natural gas use No new transmission 	National Renewable Energy Laboratory (Renewable Energy Deployment System, ReEDS) <ul style="list-style-type: none"> Electricity generation capacity expansion model Outputs include transmission capacity expansion, generation, electricity costs, etc.
Liquid Fuels <ul style="list-style-type: none"> Low/high oil resource Revisit oil export ban/keep intact Low oil demand 	Energy Policy Research Foundation, Inc. (Ponderosa Crude Flow Model) <ul style="list-style-type: none"> Pipeline flow and refinery model allocates domestic and foreign crude oil based on refinery demand and margin optimization Oak Ridge National Laboratory/Jacobs Model <ul style="list-style-type: none"> Detailed refinery modeling (Jacobs) informs simplified refinery, crude distribution model (Oak Ridge)

The QER explored a wide range of natural gas, electricity, and liquid fuels scenarios.

Chapter-Specific Analyses

The QER commissioned multiple studies across TS&D, including the following for specific chapters:

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

- An INTEK study of U.S. regional fuel resiliency based on an extensive analysis of natural gas and liquid infrastructure systems, their specific vulnerabilities to natural threats, and options to increase overall system resiliency.⁴
- A national laboratory team synthesis—including the National Renewable Energy Laboratory, Argonne National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories, and Los Alamos National Laboratory—of more than 150 papers on disruptions and resilience of electricity, natural gas, and liquid fuels TS&D infrastructures, identifying vulnerabilities of each to a range of natural threats and hostile actions.⁵
- A RAND Corporation synthesis of resilience metrics, summarizing, categorizing, and analyzing the utilization of 172 metrics related to liquid fuels, natural gas, and electricity infrastructure.⁶
- A Sandia National Laboratories design and initial demonstration of a resilience analysis framework for energy systems that explicitly quantifies uncertainty in threats and disruption outcomes.⁷
- A Sandia National Laboratories modeling of a Marcellus freeze-off scenario in 2015 and 2030 using the Gas Pipeline Competition Model to assess shifts in gas production, storage withdrawals, and flow.⁸
- A BENTEK forecast of natural gas supply, demand, and infrastructure developments through 2030 using an inventory and cell model.⁹

Promoting Reliability and Climate Mitigation through the Electric Grid of the Future

- A Brattle Group report that examined the U.S. baseline electric grid system.¹⁰
- A Pacific Northwest National Laboratory-led workshop and analytical effort that assessed the system architecture of the electricity grid and provided future views of the architecture in addressing emerging trends, systemic issues, and structural constraints. Throughout the course of the work, two review sessions were held with industry and DOE.¹¹
- Multiple white papers on electricity TS&D issues from the national laboratories on renewable integration,¹² efficiency of TS&D,¹³ electricity-information technology interdependency,¹⁴ and transmission planning with demand-side resources.¹⁵
- A DOE report that identified the potential infrastructure needs of the U.S. interstate natural gas pipeline transmission system across a range of future natural gas demand scenarios that drive increased electric power sector natural gas use.¹⁶

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

- In conjunction with the Strategic Petroleum Reserve program office and analytical support, an Oak Ridge National Laboratory study of the needs associated with the Strategic Petroleum Reserve distribution capacity and life extension.¹⁷
- An examination of scenarios of liquefied natural gas exports and potential impacts and needs associated with natural gas midstream build-out by two different energy analytic firms—Deloitte and Jensen.^{18, 19}

Improving Shared Transport Infrastructures

- An Argonne National Laboratory analysis of coal transport by rail, including a business-as-usual case through 2030, exports, potential congestion, and other issues.²⁰

Developing and Managing Energy Infrastructures in an Environmentally Responsible Manner

- A Joint Institute for Strategic Energy Analysis review of Federal and state authorities that affect investment decisions regarding natural gas system modernization (safety, economic regulation, environment, and facility permitting), with a focus on policies that relate to methane emissions, energy efficiency, and safety.²¹
- A Joint Institute for Strategic Energy Analysis synthesis of marginal abatement cost-curve analysis for methane emissions, which involves examining the relative cost effectiveness of different methane abatement strategies throughout the natural gas supply chain.²²
- A Lawrence Berkeley National Laboratory review of opportunities for efficiency improvements in the U.S. natural gas transmission and distribution system, including recommendations of the major areas for efficiency gains based on the published literature.²³

Enhancing Employment and Workforce Training

- A National Renewable Energy Laboratory analysis of energy-related transmission and distribution jobs, including comparison of estimates and methodology to other studies.²⁴
- A Joint Institute for Strategic Energy Analysis examination of the employment implications of public and private sector investments in safety and methane abatement within natural gas TS&D segments of the supply chain.²⁵

No major externally commissioned analyses were conducted for Chapter VI (Integrating North American Energy Markets) or Chapter IX (Siting and Permitting of TS&D Infrastructure).

QER Stakeholder Engagement

In the Presidential Memorandum establishing the QER,²⁶ President Obama directed the QER Task Force to “gather ideas and advice from state and local governments, tribes, large and small businesses, universities, national laboratories, nongovernmental and labor organizations, consumers, and other stakeholders and interested parties...” The President ordered the Task Force to “develop an integrated outreach strategy that relies on both traditional meetings and the use of information technology.”

EPSA, which is serving as the secretariat for the QER Task Force, undertook an open, transparent process for informing stakeholders of the purposes and scope of the first installment of the QER. This stakeholder engagement was accomplished by multiple means throughout the QER development process, including the following activities:

- Informal meetings at DOE headquarters involving hundreds of interested stakeholders.
- Briefings on the QER process at meetings with industry associations; groups of state, local, and tribal officials; the offices of environmental groups; and with Members of Congress, their staffs, and the staffs of multiple relevant congressional committees.
- Speeches and briefings by the Secretary of Energy, the Director of the President’s Office of Science and Technology Policy, other White House officials, and various members of DOE leadership to interested groups in Washington, D.C., and across the country.
- A series of informal briefings at DOE headquarters for the Washington, D.C.-based government affairs personnel and consultants of companies across all energy sectors, industry associations, organizations involved in infrastructure development or made up of users of particular infrastructures, environmental groups, organized labor, think tanks, and multi-industry/multi-client consultants—representing the widest possible spectrum of stakeholder interests.
- The creation of a public comments portal (QERcomments@hq.doe.gov) to allow interested stakeholders and the general public to provide comments on individual stakeholder meetings, as well as to allow outside experts to send the QER Task Force studies, reports, and data sets related to topics within the scope of the first installment of the QER.

- Technical workshops on topics relating to the QER where secretariat staff could explore issues in greater depth with technical experts from both inside and outside the government.
- Five methane stakeholder roundtables—convened by Secretary Moniz and with the participation of senior White House staff—to hear from stakeholders in industry, environmental nongovernmental organizations, consumer groups, public utility commissions, labor, and academia about strategies to achieve significant methane reductions from various segments of the natural gas industry.
- A series of formal public stakeholder meetings,^a beginning in Washington, D.C., in April 2014 and extending through early October 2014 at 13 additional venues around the Nation (see Table 10-2).

Comments Portal and QER Library

From the beginning of the QER process, stakeholders and the general public were encouraged to offer suggestions, comments, insights, and criticisms on issues surrounding the planning, siting, engineering, financing, development, and utilization of infrastructure for TS&D of energy. The secretariat established a Web-based portal for stakeholders to share comments (QERcomments@hq.doe.gov), as well as studies, reports, data sets, and any additional materials stakeholder organizations wanted to get in front of QER Task Force analysts. All comments submitted to the portal are available on EPSA's website at www.energy.gov/epsa/quadrennial-energy-review-qer.

The QER Task Force received more than 300 written comments, many of which included detailed reports and studies on behalf of trade associations, utilities, and energy companies; state and local governments; nonprofit organizations; and other stakeholders (totaling thousands of pages). Each of the comments received was reviewed by secretariat staff and contractors, and insights and recommendations gleaned from these comments and materials have been included in the QER itself. Stakeholder comments fell into three broad categories of concerns and recommendations: how to operate the system safely, fairly, and efficiently; who should be responsible for reliability, security, safety, and flexibility (new investments, standards, enforcement, etc.); and how to allocate costs of resilience measures. Across sectors, stakeholders also expressed a need to better quantify, model, and predict the value of new technologies and services.

Kicking Off the QER: Informal Meetings and Briefings

Secretary of Energy Moniz, Secretariat staff, and other high-ranking Administration officials met with energy industry representatives, other interested stakeholders, Members of Congress and their staffs, other public officials, and numerous other individuals and groups throughout the QER process to discuss the QER scope, the QER Task Force process, and how organizations and private citizens might involve themselves. The Secretary of Energy and senior DOE staff delivered numerous public presentations on the QER around the country to a variety of audiences, including industry groups, associations of state energy offices, public utility commissioners and other energy regulators, Federal advisory committee members, and various other interested stakeholder groups.

To foster discussion among stakeholders and stimulate interest in the QER in the relatively short time between the publication of the Presidential Memorandum and the beginning of the formal stakeholder events, secretariat staff held a number of informal briefings at DOE headquarters for stakeholders based in Washington, D.C. In these meetings, a representative group of stakeholders—nongovernmental organizations, industry, think tanks, state/municipality organizations, and others—received in-person briefings on the QER process and learned about the multiple ways their organizations could participate. Integral to the process, these briefings allowed secretariat staff to hear (at a very early stage) from interested parties about suggested paths

^a There were two stakeholder meetings in Providence, Rhode Island, and Hartford, Connecticut, on infrastructure constraints in New England; because the overall topic was the same for both, these meetings are treated as a single meeting for purposes of summaries in this chapter and on the QER meeting website.

of inquiry, to take and answer questions about the scope of the first installment of the QER, to describe the manner in which information would be sought and received, and to discuss substantive concepts and topics that might be considered. These meetings were very helpful to the QER Task Force in its inquiry.

QER Technical Workshops

In developing its plan to engage stakeholders to obtain a comprehensive overview of the Nation's energy TS&D infrastructure, the QER Task Force determined that some important topics were either unique or too technically complex to be given the requisite attention during the course of its formal public meetings. Those meetings were organized around regional or sector-specific themes and intended to tackle broad themes or regional circumstances. To ensure that stakeholders were heard on these important topics, the secretariat assembled subject matter experts from relevant fields for a number of technical workshops, or to participate in previously scheduled workshops organized by DOE programs, to provide the QER expert insights through the intensive analytical approach of these 1-day and 2-day symposia.

Three of the four technical workshops were held in Washington, D.C., to facilitate the participation of experts based at DOE headquarters. The remaining workshop—a follow up to the initial workshop in Washington, D.C.—was held at Long Island's Brookhaven National Laboratory. Each workshop featured a roster of subject matter experts from industry, academia, national laboratories, and other relevant organizations. Participants were told their attendance would be a matter of public record, in accordance with the mandate and desire for transparency in the QER process, and that while notes would be taken and a summary would be published, the public document would not attribute comments to the speaker to allow for a more open discussion.^b

Following are details about the topics, dates, and locations of the DOE technical workshops held to inform the QER:

Resilience Metrics for Energy Transmission and Distribution Infrastructure, Session 1

April 29, 2014 – Washington, D.C.

Measuring progress toward a more resilient energy system requires metrics that assess planning, operations, and policy changes. QER Task Force analysts found that differing definitions for “resilience” exist, depending on energy system attributes, outcomes, and time scale. Additionally, to date, resilience metrics for energy systems have been unable to quantify resilience benefits. Building on this theme and ongoing work by DOE's Office of Electricity Delivery and Energy Reliability, the secretariat convened two workshops with more than 140 authorities from academia, industry, and government to provide insight on resilience metrics and offer feedback on a framework to generate resilience metrics for infrastructures that transport, transmit, and deliver electric power, natural gas, and oil.

During the initial workshop, participants explored technical research and modeling on resilience metrics, the applicability of existing metrics to energy infrastructure, and areas for further research. Subject matter experts from the American Gas Association, ConEdison, Dominion Electric, and Kinder Morgan presented sector-specific considerations and associated metrics. Workshop findings suggested that industry is currently addressing specific aspects of resilience; however, participants agreed that a comprehensive approach could help to drive policy and planning decisions (e.g., investment priorities) on a larger scale. Industry representatives asked that incorporating resilience metrics into a regulatory framework have minimal impact on reporting requirements.

^b The names of each participant in the technical workshops, attendees at the agency's methane roundtables, and panelists at the formal public stakeholder meetings can be accessed on EPSA's website at www.energy.gov/epsa/quadrennial-energy-review-qer.

Resilience Metrics for Energy Transmission and Distribution Infrastructure, Session 2

June 10, 2014 – Upton, New York (Brookhaven National Laboratory)

At a subsequent workshop at Brookhaven National Laboratory, Sandia National Laboratories researchers presented a prototype framework for developing resilience metrics for the electricity, oil, and gas sectors. Workshop participants expressed eagerness to put the resilience framework to use, while stressing significant research and development needs, such as improved quantification of human and societal consequences based on reduced system performance during a disruption. Feedback collected during this workshop helped to refine the resilience metrics framework, and it also informed the QER Task Force analysis and recommendations about the need for resilience metrics and tools.

Collectively, the April 29 and June 10 workshops culminated in the development of a “Conceptual Framework for Developing Resilience Metrics for the Electricity, Oil, and Gas Sectors in the United States.” The framework provides a general resilience metric structure and procedures for analyzing, quantifying, and planning for resilience of energy infrastructure systems. The approach under this framework encourages a shift to energy resilience metrics that quantify expected consequences due to low-probability, high-consequence events; relies on the performance of the system rather than its attributes; and incorporates uncertainty. Suggested next steps include testing of the framework at utilities and developing a task force to address the refinement and standardization of energy resilience metrics.

Lessons Learned on Alternative Transportation Refueling Infrastructure: Implications for the QER

June 20, 2014 – Washington, D.C.

The secretariat worked with DOE’s Office of Energy Efficiency and Renewable Energy on a technical workshop that examined the trends and long-term policy needs relating to the alternative transportation refueling infrastructure program to produce inputs for the QER. The workshop was held in conjunction with an Office of Energy Efficiency and Renewable Energy merit review meeting to review research, development, and demonstration trends in the transportation sector and contributions made by program grantees.

The goal of the meeting was to leverage the inherent synergies between DOE’s research and policy functions and to gather expert input. Specifically, this workshop focused on the current status of deploying alternative transportation refueling infrastructure, as well as on various business models for such infrastructure. The workshop informed analysis of alternative fuel vehicles for the first installment of the QER, and it will provide baseline context and data for the next installment of the QER.

Grid Architecture

August 26 and September 23, 2014 – Washington, D.C.

The purpose of these workshops was to solicit the views of a wide variety of stakeholders to help inform the grid architecture work being performed by Pacific Northwest National Laboratory in support of the QER. This project developed a preliminary reference architecture for identifying and characterizing technical and policy issues that will affect the development of the future grid. The project was coordinated by EPSA with two other DOE offices: the Office of Energy Efficiency and Renewable Energy and the Office of Electricity Delivery and Energy Reliability.

Participants from industry, academia, national laboratories, and other interested stakeholder groups were asked to provide their organizations’ views of grid architecture as a system-level model, with analysis of electrical infrastructure, communications and control, industry and regulatory structure, energy sources and related sub-structures, and value accrual frameworks. The workshop informed analysis of alternative fuel TS&D infrastructure for the first installment of the QER, and it will provide baseline context and data for future installments.

Estimating the Benefits and Costs of Distributed Energy Technologies

September 30 – October 1, 2014 – Washington, D.C.

As with the earlier alternative fuel infrastructure workshop, for this valuation workshop, EPSA worked with DOE colleagues to derive value for the QER from a previously planned technical symposium organized by DOE's Grid Tech Team. The Grid Tech Team was initiated in the first term of the Obama Administration as a crosscutting, intraagency organization to better understand the challenges and critical issues arising from the complex, pervasive, and interdependent nature of the electric power system. The Grid Tech Team has worked to foster collaborative discussions with both public and private sector grid stakeholders, as well as to develop an effective network of public-private partnerships to ease the transition to a more modern grid.

The Grid Tech Team planned this workshop to be a technical discussion about distributed energy technologies, to support the development of grid planning tools and models, and to assist states with their regulatory responsibilities as they seek to integrate more distributed electricity assets. Grid Tech Team leaders emphasized that this was part of a multi-year discussion and—specifically—a reconnoitering of the key challenges regarding valuation, including what role DOE and other parts of the Federal Government should perform in the process going forward.

Formal Public Stakeholder Meetings

The QER Task Force's most visible effort to engage stakeholders—and to highlight the various sectoral or regional differences that should be considered in a comprehensive overview of the Nation's energy systems—was the series of 13 public meetings held around the country from April 2014 to October 2014 (see energy.gov/epsa/listings/past-quadrennial-energy-review-qer-meetings). The meetings provided opportunities for energy TS&D infrastructure stakeholders, as well as the general public, to speak directly to members of the QER Task Force and to have their statements and presentations become a permanent part of the QER Library for use by Task Force analysts and later, researchers.

Each meeting began with statements by the hosting administration representatives, along with local, state, and national political leaders who participated at events in their regions. The remainder of the meetings consisted of expert stakeholder panels; panelists made individual presentations and engaged in moderated group discussions on the themes of that day's event. Each meeting concluded with an "open microphone" segment, during which members of the general public could make statements for the QER record and had the opportunity to offer prepared presentations, studies, reports, and more for review by Task Force analysts and inclusion in the QER Library.

Table 10-2. List of QER Formal Public Stakeholder Meetings (with topic, location, and date)²⁷

Topic	Location	Date	Administration Chair(s)
Vulnerabilities (cyber, physical, climate, and interdependencies)	Washington, D.C.	4/11/14	Secretary of Energy Ernest Moniz Director of the Office of Science and Technology Policy John Holdren
Infrastructure Constraints— New England	Providence, RI Hartford, CT	4/21/14	Secretary of Energy Ernest Moniz
Petroleum Product Transmission, Storage, and Distribution	New Orleans, LA	5/27/14	Secretary of Energy Ernest Moniz Deputy Secretary of Interior Michael Connor
Water-Energy Nexus	San Francisco, CA	6/19/14	Director of the Office of Science and Technology Policy John Holdren Deputy Secretary of Interior Michael Connor
Electricity Transmission, Storage, and Distribution—West	Portland, OR	7/11/14	Deputy Secretary of Energy Daniel Poneman
Natural Gas Transmission and Distribution	Pittsburgh, PA	7/21/14	Secretary of Energy Ernest Moniz
Gas-Electricity Interdependence	Denver, CO	7/28/14	Deputy Assistant to the President for Energy and Climate Change Dan Utech
Rail, Barge, and Truck Transportation	Chicago, IL	8/8/14	Secretary of Energy Ernest Moniz Secretary of Transportation Anthony Foxx Director of the Office of Science and Technology Policy John Holdren Assistant Secretary of the Army (Civil Works) Jo-Ellen Darcy
Infrastructure Constraints— Bakken	Bismark, ND	8/8/14	Secretary of Energy Ernest Moniz Secretary of Transportation Anthony Foxx Director of the Office of Science and Technology Policy John Holdren Assistant Secretary of Interior for Land and Minerals Management Janice Schneider
State, Local, and Tribal Issues	Santa Fe, NM	8/11/14	Secretary of Energy Ernest Moniz Secretary of Interior Sally Jewell
Infrastructure Siting	Cheyenne, WY	8/21/14	Secretary of Energy Ernest Moniz Assistant Secretary of Interior for Land and Minerals Management Janice Schneider
Electricity Transmission, Storage, and Distribution—East	Trenton, NJ	9/8/14	Secretary of Energy Ernest Moniz
Finance and Market Incentives	New York, NY	10/6/14	Secretary of Energy Ernest Moniz

Federal Register notices announcing each formal public stakeholder meeting were published; these notices were also made available via the EPSA website at www.energy.gov/epsa/office-energy-policy-and-systems-analysis. DOE publicized the meetings by sending advisories to local media; using social media; and emailing state, local, and tribal governments, as well as representatives of energy stakeholders—both in the region of each meeting and in Washington, D.C.

To allow people to participate in the meetings without traveling, all meetings (except for the April meetings in New England) were live streamed. However, the Hartford, Connecticut, meeting was broadcast by Connecticut Public TV. In the interests of transparency and open government, court reporters produced a transcript for each meeting, and the secretariat produced a summary of each meeting's presentations and discussions. The transcripts and summaries, along with links to the live-streamed recordings and panelists' prepared remarks and presentations, are available on the EPSA website at www.energy.gov/epsa/quadrennial-energy-review-qer.

Following are details about the dates, topics, locations, and foci of the formal public stakeholder meetings organized by the secretariat to inform the QER.

Meeting #1: Enhancing Energy Infrastructure Resiliency and Addressing Vulnerabilities

April 11, 2014 – Congressional Visitors Center; Washington, D.C.

Hosted by Secretary of Energy Ernest Moniz; Director of the President's Office of Science and Technology Policy John Holdren; and Representative Henry Waxman (CA-33), Ranking Member on the House Energy and Commerce Committee.

The QER Task Force convened its first public stakeholder meeting to examine the challenges and opportunities resulting from the evolving U.S. energy sector. New domestic sources of energy and the expanded use of renewables have improved America's energy security and economic competitiveness and will help in achieving its environmental goals. However, not all of the changes across the energy marketplace are universally positive. As the energy sector expands and new market entrants emerge, the number and complexity of vulnerabilities threatening energy TS&D infrastructure increase. The QER Task Force asked stakeholder experts at this meeting to discuss the vulnerabilities identified by QER analysts, suggest additional topics for research and analysis, and offer policy prescriptions for consideration in preparation of this first QER installment. The vulnerabilities identified include, but are not limited to, the following:

- Challenges to TS&D infrastructure caused by new markets, changes in energy user demographics, and energy usage patterns
- Aging infrastructure and workforces
- Current and anticipated capacity constraints
- Impacts of climate change
- Threat of cyber attacks and physical attacks on the infrastructures
- Potential for any vulnerability to be exacerbated by the increasing interdependencies of energy systems with water, telecommunications, transportation, and emergency response systems.

Additionally, stakeholder experts were asked to discuss the resilience of energy infrastructure; in particular, the ability to withstand the variable nature of vulnerabilities—like climate-change-driven extreme weather—and the concept of the changing universe of energy supply options as a vulnerability in and of itself. The QER Task Force sought insights about what relevant industries are doing to plan and execute strategies that address these vulnerabilities; how the public and private sectors could work together to responsibly develop necessary new infrastructure; and what will be the appropriate roles and responsibilities of Federal, state, local, and tribal governments in these endeavors out to 2030 and beyond.

Meeting #2: New England Regional Infrastructure Constraints

April 21, 2014

Morning Session – Rhode Island Convention Center; Providence, Rhode Island

Hosted by Secretary of Energy Ernest Moniz; Governor Lincoln Chafee; and U.S. Senator Jack Reed (RI).

Afternoon Session – Connecticut Department of Energy and Environmental Protection; Hartford, Connecticut

Hosted by Secretary of Energy Ernest Moniz; Governor Dannel Malloy; Representative Elizabeth Esty (CT-5); Representative John Larson (CT-1); and Connecticut Department of Energy and Environmental Protection Commissioner Robert Klee.

The second formal public stakeholder meeting consisted of morning and afternoon sessions in separate cities to examine infrastructure constraints for energy TS&D in New England. New Englanders pay high prices for electricity, home heating oil, gasoline, and natural gas, and these prices can be volatile. For instance, the unusually severe winter of 2013-2014 saw extremely high natural gas prices (greater than \$120 per million British thermal units compared to normal summer prices of around \$5 per million British thermal units). These spikes can be attributed to strong demand, pipeline constraints, wellhead freeze-offs, limited regional liquefied natural gas deliveries, and a lack of storage. Similarly, the regional electricity market suffers from outdated regulatory constructs and business models that do not take full account of the importance of ensuring adequate natural gas and electric transmission.

New England governors, other political leaders, the business community, and residents in all six states are paying close attention to the region's infrastructure. The QER Task Force convened this meeting to hear these stakeholders' concerns, but also to hear about efforts underway to create regional solutions. In Providence, the Task Force heard presentations and panel discussions on two infrastructure topics: (1) needs for heat and power, and (2) how to ensure reliability and affordability of the region's energy systems. In Hartford, the Task Force heard stakeholder experts address two infrastructure topics: (1) gas-electricity interdependence, and (2) current challenges and solutions. A fifth panel made up of representatives from the Governors of Connecticut, Maine, Massachusetts, New Hampshire, and Vermont (the State of Rhode Island had participated in the morning session) discussed regional approaches to infrastructure solutions.

Meeting #3: Petroleum Product Transmission and Distribution

May 27, 2014 – Louisiana State University Health Sciences Center; New Orleans, Louisiana

Hosted by Secretary of Energy Ernest Moniz; Deputy Secretary of the Interior Mike Connor; and U.S. Senator Mary Landrieu (LA), Chair of the Senate Energy and Natural Resources Committee.

The third QER public meeting was convened to give the QER Task Force an appreciation for the regional and nationwide importance of petroleum TS&D infrastructure. Stakeholder experts were asked to discuss the implications of shifting energy flows from the standpoint of their particular organization or sector, as well as the U.S. petroleum industry, and to provide a particular focus on the onshore and offshore regions in the Gulf of Mexico. Additionally, panelists were asked to discuss the need for petroleum storage; interdependencies between various infrastructure energy systems (e.g., pipelines, rail, electricity, and telecommunications); workforce issues; and rapidly evolving challenges to petroleum infrastructure, particularly the degree to which it can be made more resilient in light of increasingly severe weather patterns.

While petroleum TS&D infrastructure was the announced topic, panelists and U.S. Senator Landrieu (LA) also emphasized that the New Orleans area (including the region's rail and marine infrastructure) was important for other industries (in particular, for the natural gas industry) and integral to the movement of other commodities (in particular, coal and agricultural products moving down the Mississippi to both foreign and domestic customers).

Meeting #4: The Water-Energy Nexus

June 19, 2014 – City Hall; San Francisco, California

Hosted by Director of the Office of Science and Technology Policy John Holdren and Deputy Secretary of the Interior Mike Connor.

The fourth QER meeting examined the intrinsic linkages between water and energy. While the first installment of the QER focused on TS&D infrastructure, the San Francisco meeting addressed a broader set of issues that relate to both current and future QER topics, as well as DOE's ongoing work on the water-energy nexus. Water is essential to energy production and electricity generation, and energy is required to extract, convey, and deliver water for these purposes, as well as to treat associated wastewater. Increasingly, the water-energy nexus is on the minds of policymakers and stakeholders: climate change has altered precipitation levels, temperature patterns, and the availability of water; population growth and migration to arid regions intensifies battles over water rights; and new technologies have been introduced and are shifting or increasing water and energy demand. Finally, governments and private sector stakeholders are trying to come to terms with the increasing interdependence in light of the fact that, though closely linked, energy and water systems historically have been developed, managed, and regulated independently at the local, state, national, and international levels.

The QER Task Force heard from two expert panels on the increasing urgency to act on the water-energy nexus, as well as how state, local, tribal, and international governments can work together to integrate water and energy infrastructure development, management, and regulation, including identifying opportunities to improve efficiency, conservation, and infrastructure resilience.

In conjunction with the San Francisco meeting, DOE released an associated report, "The Water-Energy Nexus: Challenges and Opportunities."²⁸

Meeting #5: Electricity Transmission, Storage, and Distribution—West

July 11, 2014 – Lewis & Clark College; Portland, Oregon

Hosted by Deputy Secretary of Energy Daniel Poneman.

The fifth QER public stakeholder meeting addressed electricity transmission and distribution issues from a Western U.S. perspective. Panelists were asked to respond to a set of framing questions. For the first panel on transmission, panelists delivered presentations and opined on the broad question, "Can we build and operate the appropriate amount of TS&D for future needs?" Panelists discussed how to maintain reliability with a changing generation and end-use resource mix; the planning, cost-allocation, and state and Federal siting processes needed to build new transmission; and when to build new versus upgrading existing transmission. For the second panel on electricity distribution, experts were asked to react to the question, "How do we cope with new distribution challenges and opportunities?" The second panel considered a broad array of emerging technologies on the distribution grid, as well as greater customer engagement and other factors providing both technical and policy challenges to the delivery of energy services to customers.

Portland's final panel focused on whether electricity storage was finally coming of age. As part of this discussion, panelists were asked whether changing needs and improving technologies might finally make wide-scale storage a reality for the transmission and distribution grid.

Meeting #6: Natural Gas: Transmission, Storage, and Distribution

July 21, 2014 – Carnegie Mellon University; Pittsburgh, Pennsylvania

Hosted by Secretary of Energy Ernest Moniz and Representative Tim Murphy (PA-18), Chair of the Investigations and Oversight Subcommittee of the House Energy and Commerce Committee.

The sixth QER stakeholder meeting focused on natural gas infrastructure. While national in scope, the Pittsburgh meeting featured a number of expert speakers who addressed natural gas development in the Marcellus and nearby Utica shale formations. The shale gas boom has created questions about how our existing infrastructure is adapting to serve a newfound abundance in supply, as well as the need for additional infrastructure—both to maximize resource utilization and to create localized and sustainable economic development for newly producing regions.

While the American economy continues to adapt to the abundance of accessible shale and the resulting low natural gas prices, decreased carbon emissions, lower imports, and enhanced industrial competitiveness, the QER Task Force sought stakeholder insights on the effects of the shale revolution that are already being seen, what we as a Nation should focus on in terms of infrastructure and policy development to harness these resources for the regional and national economies, and how to balance the challenges and opportunities arising from the shale boom.

Meeting #7: Gas-Electricity Interdependencies

July 28, 2014 – University of Denver; Denver, Colorado

Hosted by Deputy Assistant to the President for Energy and Climate Change Dan Utech and Colorado Public Utilities Commission Commissioner Pamela Patton.

The seventh formal QER public stakeholder meeting was convened to demonstrate how the increasing demand for natural gas (in the power sector and in the economy) and the increased share of the electricity generation mix represented by natural gas have heightened the interdependence between the electricity and natural gas transmission systems. The meeting also highlighted how the importance of careful and coordinated planning and development of infrastructure for both systems is increasingly imperative. While the electricity and natural gas pipeline industries have operated together for decades, the two systems' growing interdependence has created more frequent reliability challenges in recent years. To help craft policy recommendations to avoid a future of uncertain and periodically curtailed electricity services—especially during periods of extreme temperatures—or other gas disruptions that could adversely affect human health or the economy, the QER Task Force asked stakeholder experts to address the following issues in their presentations and moderated group discussions: (1) industry and government efforts to improve coordination between the gas and electricity sectors, and (2) how the gas and electricity sectors can reconcile differing planning, financing, and construction processes to improve infrastructure development, operation, and end use, and generally reduce the risks of increased interdependence out to 2030 and beyond.

Meeting #8: Rail, Barge, and Truck Transportation

August 8, 2014 – University of Illinois at Chicago; Chicago, Illinois

Hosted by Secretary of Energy Ernest Moniz; Secretary of Transportation Anthony Foxx; Director of the Office of Science and Technology Policy John Holdren; Assistant Secretary of the Army (Civil Works) Jo-Ellen Darcy; and Mayor Rahm Emanuel.

The eighth public meeting considered the effects of the last decade’s energy boom on our Nation’s shared transportation infrastructure—how the Nation’s rail network, highways, and the various vessels and infrastructures that make up our inland waterway, Great Lakes, and coastal maritime trade have adapted to increased commerce in crude oil and refined petroleum products, coal, ethanol, and other biobased and alternative fuels and natural gas liquids. The Chicago meeting sought to shed light on how the transformation of our domestic energy sector has created new issues for the “rail,” “truck,” and “barge” infrastructures; how it has exacerbated old problems; and how moving new and more energy products in a safe and efficient manner on these shared infrastructures has challenged policymakers and infrastructure planners.

The QER Task Force sought to gain a better understanding of the complexities of the interrelated systems, as well as the opportunities and challenges inherent in changes—some planned, some not—coming to these infrastructures. Industries across multiple sectors are adjusting to new or vastly increased movements of energy products by multiple modes, and the goal of the Chicago meeting was to provide QER Task Force analysts and agency leadership with an opportunity to hear how things are functioning and how they might be improved.

Meeting #9: Infrastructure Constraints—Bakken

August 8, 2014 – Bismarck State College; Bismarck, North Dakota

Hosted by Secretary of Energy Ernest Moniz; Secretary of Transportation Anthony Foxx; Director of the Office of Science and Technology Policy John Holdren; Assistant Secretary of the Interior for Land and Minerals Management Janice Schneider; Governor Jack Dalrymple; U.S. Senator John Hoeven (ND); U.S. Senator Heidi Heitkamp (ND); and Representative Kevin Cramer (ND-AL).

The ninth public meeting (and the second on August 8) examined the dramatic changes to the U.S. energy profile that resulted from the development of the fossil fuel resources of the Bakken formation, as well as the infrastructure constraints created or exacerbated by the Bakken boom. Due to Administration principals flying into North Dakota for this meeting from a morning QER meeting in Chicago, the format of the Bismarck meeting was slightly different than the rest in the series. The meeting opened with a panel on workforce development issues, which were introduced by U.S. Senator Heitkamp (ND). The QER Task Force heard from representatives of state and tribal colleges, state and local government officials, and other experts on how to address the shortage of workers and housing in the region.

After the workforce panel, state, Congressional, and Administration officials made remarks and took questions from the audience. The next two panels focused on Bakken infrastructure constraints and solutions and sought stakeholder input on changing infrastructure needs. During the meeting, panelists discussed shipping oil by rail, developing oil and gas pipelines, building electricity transmission for wind energy and conventional energy, reducing gas flaring, managing infrastructure siting and permitting issues, and extending the Highway Trust Fund.

Meeting #10: State, Local, and Tribal Issues

August 11, 2014 – New Mexico State Personnel Office; Santa Fe, New Mexico

Hosted by Secretary of Energy Ernest Moniz; Secretary of the Interior Sally Jewell; and U.S. Senator Martin Heinrich (NM).

The 10th formal QER public stakeholder meeting addressed the challenges of the changing energy marketplace for the state, local, and tribal authorities responsible for regulating energy infrastructure and maintaining the appropriate balance among pursuing economic goals; addressing system vulnerabilities; and maintaining a secure, affordable, reliable, and environmentally responsible energy system. The Santa Fe meeting sought insights from state, local, and tribal governments on a variety of topics, including the multi-jurisdictional nature of many of the regulatory and other responsibilities regarding energy TS&D infrastructure, particularly in the electricity and oil and gas sectors.

During this meeting, state policymakers, public utility commissioners, agency heads, tribal leaders, and city and county officials described new jurisdictional, regulatory, and coordination models that could enhance the Nation's energy infrastructure and allow them to adapt to changing needs. Importantly, they also explored the broader policy implications of this transition, including infrastructure's ability to withstand increasing threats; developing the workforce and training needed to build, operate, and upgrade infrastructure; designing affordable rate structures to pay for infrastructure; and addressing environmental quality concerns.

Meeting #11: Infrastructure Siting

August 21, 2014 – Little America Hotel; Cheyenne, Wyoming

Hosted by Secretary of Energy Ernest Moniz; Assistant Secretary of Interior for Land and Minerals Management Janice Schneider; and Governor Matt Mead (WY).

The 11th formal QER public stakeholder meeting focused on infrastructure siting. State government officials, infrastructure developers, representatives of utilities and the oil and gas industry, community leaders, environmentalists, and other stakeholders were given the opportunity to inform the QER Task Force on ways to improve the planning and siting processes for building new energy TS&D infrastructure. Three expert panels (on electricity transmission, oil and natural gas infrastructure, and data needs) highlighted key lessons learned in siting and planning new TS&D infrastructure that can be applied to national policy determinations, or exposed problems that might be mitigated by research and development initiatives.

As with each of the other public stakeholder meetings, the general public was provided with an opportunity to make comments at the conclusion of the expert panels. The Cheyenne meeting was the only one in the series during which no public comments were offered.

Meeting #12: Electricity Transmission and Distribution—East

September 8, 2014 – New Jersey Institute of Technology; Newark, New Jersey

Hosted by Secretary of Energy Ernest Moniz.

The 12th public stakeholder meeting sought expert insights on the same two topics covered at the July 11 Portland, Oregon, meeting (electricity transmission and electricity distribution), but from an eastern U.S. perspective. The Newark meeting also featured a panel on business models and regulation of regulated electric utilities. Stakeholder experts were asked to respond to the same questions asked in Portland: (1) Can we build and operate the appropriate amount for future needs?; and (2) How do we cope with new challenges and opportunities in distribution? The first panel emphasized reliability amid changing conditions, siting and other

planning challenges, cost allocation, changing load growth, resource diversity, and cost-benefit analyses of new construction versus existing asset optimization. The second panel focused on technical and policy options created by emerging technologies.

The last panel on business models and regulation for regulated electric utilities had, as its context, the following trends: declining sales or low load growth for many utilities; increasing self-generation by some customers; and, despite this phenomenon, increasing spending to maintain and continue updating electricity transmission and distribution. Taken together, these factors had some panelists calling into question whether current business models and regulation for regulated electric utilities are still appropriate or if they need to evolve.

Meeting #13: Energy Infrastructure Finance

October 6, 2014 – New York University; New York, New York

Hosted by Secretary of Energy Ernest Moniz and Representative Carolyn Maloney (NY-12), Ranking House Member on the Joint Economic Committee and Ranking Member on the Subcommittee on Capital Markets and Government Sponsored Enterprises of the House Financial Services Committee.

The last public meeting for this installment of the QER focused broadly on the financing of energy TS&D infrastructure. The dramatic transformation of the U.S. energy sector has produced a variety of benefits, but also has resulted in a number of challenges and uncertainties. These uncertainties include how the financial industry should react when traditional signals from the energy sector—historical flow patterns, as well as assumptions of supply scarcity and demand growth—have been upended by an unprecedented period of technological advancement and adaptation. With the energy landscape seeming to change before the eyes of investors, and with the risk calculations traditionally used by the banking industry not necessarily being relevant any longer, the 13th QER public meeting examined how players in infrastructure finance were meeting the challenge of these new realities to support the development of new and expanded pipeline networks, transmission and distribution assets, storage facilities, and other infrastructure.

Financial experts in three sectors (capital acquisition, electricity, and oil and natural gas) explored the following: how to minimize the cost of capital/maximize the availability of capital in a new energy economy; the potential for stranded investments or underinvestment in assets in fast-moving market conditions; balancing regulatory costs with the need for regulation as an incentive for desired infrastructure development; how to improve cost-benefit analyses and broader dissemination of best practices; and how to evaluate the financial risk of new, unproven technologies and processes.

Methane Stakeholder Roundtables

Secretary of Energy Ernest Moniz hosted five stakeholder roundtables with government, industry, environmental, labor, and academic leaders involved in the natural gas sector to identify and highlight best practices, technology solutions, and policies for securing reductions in methane emissions from its midstream and downstream segments. The roundtable sessions allowed experts to provide input into the Administration's Strategy to Reduce Methane Emissions;^c discussions and information shared by stakeholders also proved very informative for the QER.

The primary goal of these roundtables was to catalyze action to reduce methane emissions from distribution, transmission, storage, and processing segments of natural gas systems. Roundtable participants were invited based on their expertise in methane emissions abatement.

^c See: The White House Blog, "A Strategy to Cut Methane Emissions." March 28, 2014. www.whitehouse.gov/blog/2014/03/28/strategy-cut-methane-emissions.

Additional goals of the methane roundtables included the following: (1) promoting a common understanding of the scale of methane emissions from natural gas systems and related abatement opportunities, (2) catalyzing greater action and engagement by policymakers at all levels of government, and (3) encouraging visible leadership and demonstrated commitments to a common vision that embraces the need to reduce methane emissions from natural gas systems. After review and consideration of stakeholder input, Secretary Moniz joined stakeholder participants at the White House in announcing several new initiatives to help advance the goals of the Administration's broader Strategy to Reduce Methane Emissions.

Following are details about the dates, topics, locations, and foci of the methane stakeholder roundtables held by DOE to inform the QER.

Kickoff Roundtable

March 19, 2014 – DOE Headquarters; Washington, D.C.

The initial meeting of the methane stakeholder roundtable series included participants from industry, state government, academia, nongovernmental organizations, and labor organizations. Participants expressed a common interest in repairing natural gas infrastructure to improve safety, create jobs, and reduce greenhouse gas emissions. There are significant remaining opportunities to reduce methane emissions from all segments of the natural gas supply chain; however, industry representatives noted that their companies have been focused on repairing leaks, replacing leak-prone pipelines, and conducting preventative maintenance for many years. The primary barrier to natural gas infrastructure modernization is getting cost recovery for the capital-intensive investments. While most states have trackers or surcharges on consumer bills to facilitate cost recovery for pipeline replacement efforts by local distribution companies, there is no equivalent mechanism for interstate pipeline networks that are regulated by the Federal Energy Regulatory Commission. Stakeholders suggested that there are still opportunities for DOE to help facilitate industry efforts (e.g., by supporting the development of new and lower-cost technologies to enable the broader use of leak detection and repair and by coordinating research efforts across government agencies and with stakeholders).

Participants shared many examples of successful infrastructure modernization programs and best practices. For example, Arkansas recently completed its statewide replacement of cast iron pipe. Arkansas policy has succeeded in part because companies can immediately recover costs with a line item on consumer bills, meaning that utilities do not have to wait for a new rate case. Georgia, Ohio, and Oklahoma are also making big strides, in part by enabling immediate cost recovery for infrastructure investments.

Labor Unions and the Manufacturing Sector

April 24, 2014 – DOE Headquarters; Washington, D.C.

Participants at the second methane stakeholder roundtable reiterated the shared interest in infrastructure modernization to increase the reliability of the natural gas system, create jobs for skilled workers, and reduce greenhouse gas emissions. Often, local distribution companies are willing to make upgrades if funding is available. Securing funding for infrastructure modernization can be challenging, but some state policies—such as the Strategic Infrastructure Development and Enhancement Program in Maryland—have made it easier for local distribution companies to acquire funding for infrastructure projects. However, even if funding is made available, a project-by-project approach to regulatory approval can still be a barrier to achieving widespread improvements and coordination in infrastructure repair and modernization.

A comprehensive strategy for infrastructure modernization can create jobs for skilled workers. Skilled union workers, in particular, could help companies repair pipelines to high-quality standards, avoiding repeated short-term repairs that result from poor construction. The current workforce with the skills to replace

pipelines is nearing retirement, and unions can help provide worker training programs to prepare younger workers for these jobs. Job creation and training should be considered part of the investment in the asset base of natural gas infrastructure.

Academia, Nongovernmental Organizations, and Environmental Groups

May 20, 2014 – DOE Headquarters; Washington, D.C.

During the third methane roundtable session, participants discussed the research needed to improve methane sensing, reform state and Federal policies, and remove barriers to investments in infrastructure that is safer and lower emitting. One of the resounding themes of the discussion was the need for a more comprehensive system for calculating emissions and transparently providing the necessary data in an improved inventory. Although data for specific systems and locations has been calculated, there is not a complete picture of emissions from TS&D of the supply chain. There is a shared belief that sensor technology should be improved to accurately collect emissions data and that it would potentially require more funding for such improvements.

In addition, participants deliberated over which incentives need to be implemented to reduce methane emissions. Environmental groups expressed strong support for the Environmental Protection Agency taking steps to propose and finalize methane emissions performance standards for new and existing facilities across the natural gas supply chain. It was suggested that the costs of investments in infrastructure modernization should be borne more by shareholders instead of having the consumer pay out-of-pocket for all of the necessary repairs. Another theme was to amend state and Federal economic regulatory frameworks to reduce the economic disincentives to become safer and possibly encourage more investment in infrastructure. Finally, participants explored various ways for Federal and state economic regulators to treat lost- and unaccounted-for gas, which is a catch-all accounting mechanism used to reflect meter errors, theft, leakage, and other factors. Others pointed out that lost- and unaccounted-for gas is a poor metric for leakage. Participants suggested research and development to lower the cost of more accurate meters and limit the amount of lost- and unaccounted-for gas that companies are allowed to recover through rates (as some states have adopted).

Natural Gas Companies

June 11, 2014 – DOE Headquarters; Washington, D.C.

During the fourth methane roundtable session, participants discussed progress that the natural gas industry has made to reduce methane emissions and remaining barriers to emissions reductions. Companies have taken innovative approaches to reduce methane emissions and further their pipeline safety efforts, including the development of partnerships with government agencies, academic institutions, and industry to reduce emissions through programs such as the Environmental Protection Agency's Natural Gas STAR program and private sector efforts like the Downstream Initiative and the OneFuture Coalition. Some companies have undertaken in-house initiatives to reduce emissions using self-assessment of performance metrics. However, participants emphasized several barriers to accelerating investment in infrastructure. More cooperation within the natural gas industry and stronger relationships between state regulators and operators could help speed infrastructure modernization. Greater coordination between government agencies could allow for natural gas infrastructure improvements in conjunction with other public works projects (i.e., in conjunction with water and telecommunications infrastructure upgrades). Participants suggested implementing public education programs and sharing best practices between companies and regulators.

Participants also voiced concern over the lack of funding for researching and developing technologies that could facilitate infrastructure modernization. These technologies include less expensive and more accurate leak-detection equipment, innovative methods or materials that could reduce the cost of pipeline replacement, and data collection systems to monitor the entire natural gas supply chain.

Capstone Roundtable

July 29, 2014 – The White House; Washington, D.C.

The capstone roundtable included industry, labor, state regulators, and environmental and consumer groups that have been actively engaged in a range of efforts to modernize natural gas infrastructure and reduce leakage from transmission and distribution segments of natural gas systems. The focus of the roundtables was on reducing emissions from natural gas transmission and distribution systems. This meeting was the culmination of in-depth discussions with industry, unions, consumer and environmental groups, state regulators, and academics at the four previous roundtables. This series provided the opportunity for experts to provide input into the Administration's strategy. This complements efforts underway at the Environmental Protection Agency and served as one means to inform the interagency methane strategy and QER.

At this meeting, Secretary Moniz announced a number of actions that DOE will take to address methane emissions from natural gas systems. Participating stakeholders also announced several new initiatives, including significant new investments in infrastructure. While natural gas companies have made significant progress in reducing methane emissions, many expressed strong commitments to play leadership roles and do more to modernize infrastructure to help realize the safety, economic, environmental, and health benefits that natural gas provides to customers. A group of five labor unions announced an expansion of apprenticeship and training programs, while the Interstate Natural Gas Association of America committed to developing guidelines for directed inspection and maintenance at natural gas transmission facilities. A more detailed description of actions can be found on DOE's website at www.energy.gov/articles/factsheet-initiative-help-modernize-natural-gas-transmission-and-distribution.

QER Interagency Engagement

In the QER Presidential Memorandum, the President established the QER Interagency Task Force, which is co-chaired by the Director of the Office of Science and Technology Policy and the Director of the Domestic Policy Council and more than 20 executive departments and agencies^d that play key roles in developing and implementing policies governing energy resources and consumption, as well as associated environmental impacts. The President directed the Task Force to develop a comprehensive and integrated review of energy policy resulting from interagency dialogue and active engagement of external stakeholders, as well as offer recommendations on what additional actions it believes would be appropriate. As set forth above, the final QER was developed by the Task Force in response to the President's direction. The findings and recommendations are based on Task Force deliberations, meetings with staff-level agency representatives and experts, and information provided to the secretariat and Task Force members by external stakeholders.

Since issuance of the Presidential Memorandum, the White House (supported by DOE, serving as executive secretariat of the Task Force) convened regular meetings of the Task Force and worked closely with the agencies' leadership and staff on the QER. Member agencies have collaborated with the Task Force to develop the QER by providing information on topics within their statutory and regulatory jurisdiction, or areas of particular expertise related to energy infrastructure TS&D. Agencies have delivered studies, data, and other

^d The members of the Task Force include: (1) the Department of State; (2) the Department of the Treasury; (3) the Department of Defense; (4) the Department of the Interior; (5) the Department of Agriculture; (6) the Department of Commerce; (7) the Department of Labor; (8) the Department of Health and Human Services; (9) the Department of Housing and Urban Development; (10) the Department of Transportation; (11) the Department of Energy; (12) the Department of Veterans Affairs; (13) the Department of Homeland Security; (14) the Office of Management and Budget; (15) the National Economic Council; (16) the National Security Staff; (17) the Council on Environmental Quality; (18) the Council of Economic Advisers; (19) the Environmental Protection Agency; (20) the Small Business Administration; (21) the Army Corps of Engineers; (22) the National Science Foundation; and (23) such agencies and offices as the President may designate.

information to the Task Force for consideration in policy analysis and modeling; reviewed analysis and findings; leveraged the work of other relevant Administration initiatives;^e and, led by the Office of Science and Technology Policy and Domestic Policy Council, collaboratively developed policy recommendations.

Task Force members also partnered with the secretariat on a series of 13 formal public stakeholder meetings, scheduled at venues around the country from April 2014 to October 2014, with themes of a regional, sector-specific, or stakeholder-group-specific nature. At each of the meetings, Administration representatives, including Cabinet secretaries, senior White House personnel, and other senior officials, often joined by Members of Congress, governors, or mayors, opened the events and set the focus for the expert panels that followed.

^e The Task Force leveraged the work of related initiatives, including, among others, the Interagency Climate Change Adaptation Task Force, the Task Force on Climate Preparedness and Resilience, the Build America Infrastructure Initiative Working Group, the Interagency Methane Strategy, the Federal Interagency Floodplain Management Task Force, the Hurricane Sandy Building Task Force, the Arctic Council, the Mitigation Framework Leadership Group, the Committee on the Marine Transportation System, the Interagency Steering Committee on Federal Infrastructure Permitting and Review Process Improvement, the Rapid Response Team for Transmission, and the Unified Federal Environmental and Historic Preservation Review.

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