October 6, 2014

The Honorable Ernest Moniz
Secretary, United States Department of Energy
1000 Independence Avenue, SW, Washington, DC 20585

Dr. John P. Holdren
Director, Office of Science and Technology Policy, The White House
1600 Pennsylvania Avenue, NW, Washington, DC 20500

Mr. Daniel G. Utech
Special Assistant to the President for Energy and Climate Change, The White House
1600 Pennsylvania Avenue, NW, Washington, DC 20500

Dear Secretary Moniz, Director Holdren and Mr. Utech:

On behalf of the Business Council for Sustainable Energy (BCSE), I am pleased to submit these comments on the first phase of the Quadrennial Energy Review (QER). The Council is a coalition of companies, trade associations and stakeholders from the energy efficiency, natural gas and renewable energy sectors. It also includes independent electric power producers, investor-owned utilities, public power, commercial end-users and environmental and energy market service providers. Founded in 1992, the Council advocates for policies at the state, national and international levels that increase the use of commercially-available clean energy technologies, products and services. The coalition's diverse business membership is united around the revitalization of the economy and the creation of a secure and sustainable US energy system.

The Council commends the Administration for undertaking this effort to look at the nation's transmission, storage and distribution infrastructure (TS&D). The BCSE comments focus largely on transmission, distribution, and storage pertaining to the electricity sector.

The Council looks forward to continuing to work with the Administration on the Quadrennial Energy Review process going forward. BCSE is especially interested in sharing its views as part of the drafting process for the second QER report on power generation and energy efficiency. We understand that it will be drafted in 2015 with an expected release in early 2016. For questions about this submission, please contact: Ruth McCormick, Director of State and Federal Affairs, at rmccormick@bcse.org.

Sincerely,

Lisa Jacobson
President, Business Council for Sustainable Energy

The Business Council for Sustainable Energy Comments for the First Phase of the Quadrennial Energy Review: Electric Transmission and Distribution Infrastructure and Storage

October 6, 2014

Executive Summary

The Business Council for Sustainable Energy (BCSE) is a trade group representing companies and trade associations in the energy efficiency, natural gas and renewable energy sectors. Its members are on the front lines of the dramatic and rapid changes that are impacting the US power sector and its transmission, distribution and storage infrastructure.

A revolution is transforming how the US produces, delivers, and consumes energy. The mix of energy supply is changing, with low-carbon sources gaining share, while consumption is declining.

New technologies – such as techniques for extracting natural gas from shale and vehicles fuelled by electricity are gaining traction. Investment in rooftop solar installations and building energy efficiency improvements are increasing. For some sectors, such as distributed generation and storage, policy is evolving to accommodate changing conditions and to accelerate deployment.

With these significant shifts underway, the US transmission, distribution and storage infrastructure will remain the backbone of the power system. However, modernization, expansion and optimization of these assets will be essential in the coming years and decades to ensure the delivery of clean, reliable and affordable energy to families and businesses.

The Council's comments offer perspectives and recommendations in several areas that will provide for the long-term strength, flexibility and resilience of the US electric transmission, distribution and storage systems. The Council would like to acknowledge the input received from numerous trade associations and partner organizations, including the Alliance to Save Energy, the American Gas Association, the American Wind Energy Association, the GridWise Alliance, the Gas Technology Institute, the Natural Gas Supply Association and the Solar Energy Industries Association.

When assessing the risks and needs of US energy infrastructure, several issues should be considered:

- **A holistic approach is required**. The Department of Energy (DOE) should give consideration to market trends, the evolving needs of energy infrastructure, regulatory issues and current financing practices and business models.
- **The electricity grid should function as an "enabling platform" for the evolving electric system**. Building on current trends, the coming years will likely require increased grid flexibility to integrate growing amounts of variable energy resources, distributed generation, and electric vehicles. Additionally, the grid will need to facilitate new services including demand response and enhanced energy management systems. Finally, the electric grid will need to become more resilient. It will need to be able to respond to unexpected events, including natural disasters, malevolent acts and unintentional failures and damage, both physical and cyber-related. It will also need to anticipate and mitigate impacts of a changing climate on energy demand and physical infrastructure.[1]
- **New grid functions and systems are using more information and communications technology (ICT)**. This creates opportunities for enhanced efficiency and automation, but also increases the importance of cyber-security protocols. Further, consumer engagement is paramount to address privacy issues and to support consumer involvement in energy management at homes and in the private sector.

[1] *The GridWise Alliance's Comments for the First Phase of the Quadrennial Energy Review: Electric Transmission and Distribution Infrastructure and Storage*. GridWise Alliance. August 11, 2014. http://www.gridwise.org/uploads/news/GWA_QER%20Comments_August_2014_Final.pdf

- **Consideration should be given to the distinct and valuable roles that the government, the private sector and other stakeholders play in planning, managing and financing energy infrastructure**.

A Changing US Energy Landscape

The Council, in partnership with Bloomberg New Energy Finance (BNEF), produces an annual Sustainable Energy in America Factbook to track the investment and market trends in the US energy sector.[2] The 2014 edition documents the continued transformation of how the US produces and consumes energy. Key points from the 2014 Factbook include:

- The country's total annual energy consumption in 2013 was 5.0% below 2007 levels, due in large part to advances in energy efficiency. This trend was in part prompted by the economic downturn of 2008-09, but as economic growth has returned energy use has not grown at a commensurate rate. The net result is a more energy-efficient and energy productive economy (i.e., higher GPD per unit of energy consumed).

- Over that same period (2007-13), use of lower- and zero-carbon energy sources has grown, while other major energy sources such as coal and oil have experienced significant declines. Natural gas production and consumption hit all-time highs in 2013, and natural gas-fired power plants provided 28% of US electricity in 2013, up from just 22% in 2007. Renewable electricity generation, including power from large hydro projects, grew from 8.3% to 12.9% over that period. Since 1997, 94% of new power generation capacity built in the US has come in the form of natural gas plants or renewable energy facilities.

- Transportation is being revolutionized by new policies, technologies, and fuels. Federal corporate average fuel economy (CAFE) standards for cars are set to double by 2025, relative to 2011 levels. Medium- and heavy-duty vehicle fuel economy standards have been implemented with more stringent ones in the works, while fleets have adopted numerous voluntary measures. Sales of hybrids and plug-in electric vehicles are rising and totalled nearly 600,000 vehicles in 2013 (3.8% of U.S. passenger vehicle sales). Fuel Cell Electric Vehicles (FCEVs) are coming to market and hydrogen infrastructure investments are being made. Additionally, eight states recently signed a MOU to deploy more than 3 million zero emission vehicles by 2025. Natural gas use in the transport sector is up 33% since 2007. These developments, along with a growing role for biofuels, have driven gasoline consumption down 7.7% since 2005. ICT advances have been critical from individual vehicle efficiency to logistics software and GPS applications to elements of evolving intelligent transportation systems, which should be viewed as integral components of our energy infrastructure.

- These trends have combined to put US carbon dioxide emissions on a long-term downward trajectory. In 2009, President Obama announced a goal of achieving a 17% reduction in greenhouse gas (GHG) emissions by 2020 relative to 2005 levels. Total GHG emissions peaked in 2007 at 7.26Gt and have dropped by an estimated 9.8% since 2005, putting the US more than halfway to its goal.

Government's Role in Energy Infrastructure Planning

Government bodies at all levels have influence over energy infrastructure planning and investment decisions. Specifically, government bodies establish market rules, provide regulatory oversight, grant permits, fund research, development and deployment programs and offer incentives to spur investments. In addition, local, state and federal government bodies have leading roles to play in planning and coordinating responses to threats or damage to energy infrastructure. Furthermore, in various parts of the country, government entities are directly responsible for power generation and energy distribution.

[2] *Sustainable Energy in America Factbook*. Business Council for Sustainable Energy, Bloomberg New Energy Finance. February 2014. http://www.bcse.org/sustainableenergyfactbook.html

Efficient and consistent polices and approval processes that can adapt to changing dynamics are needed. Decisions on infrastructure planning involve many public and private sector actors and these investments are long-lived. As such, the Department of Energy (DOE) and other federal agencies should utilize their collective technical capacity and convening resources to educate and exchange information among these entities on a consistent basis.

Government bodies should undertake the following actions informed by the experiences and expertise of the private sector and stakeholders:

--Update market rules to efficiently meet the needs of the changing power system
--Provide appropriate value and pricing mechanisms that recognize flexible resources and ancillary services
--Provide technical assistance and share best practices among government, private sector and stakeholder representatives
--Fund research development and deployment programs that reduce costs and speed innovation in the design and operation of the power system

Planning for Current and Future Infrastructure Needs

There are several types of energy infrastructure investment. For example, investment may be needed to support existing operations, modernize the system and/or to expand the system we have in place. Each of these are important functions and should be part of current planning processes. For example:

- Energy infrastructure that is aging requires investment to ensure safe and reliable service.
- The increased deployment of new technologies and services may also require new grid functionality.
- Expanding service and connecting generation load and/or natural gas supplies from their sources to end-users requires funding.

In all cases, new investments are being considered under changing regulatory and market conditions. Therefore, policymakers and the private sector should coordinate and engage in planning processes that take into account current as well as future infrastructure needs.

Utilities are responsible for keeping the lights on at all times and today's grid must be managed to ensure electric supply sufficiently meets customer demands. Traditional reliability challenges such as load variability and downed power lines persist and grid operators are also integrating growing amounts of renewable energy resources. Therefore we recommend that DOE continue its collaborative work, sharing of best practices and providing technical assistance to assess the need for new energy resources, ensure electric reliability, and address investment and cost impacts.

Natural Gas Infrastructure and Markets

The United States possesses abundant natural gas supplies capable of meeting greater demand from the electric sector as well as other sectors of the economy. According to IHS Cera, there are between 90 to 150 years of natural gas supply available in the US, based on current consumption levels.[3] In order to facilitate the greater use of natural gas, and realize its economic, efficiency and emissions benefits, competitive natural gas markets must remain liquid to ensure the efficient delivery of natural gas to customers.

A critical component of a healthy and liquid natural gas market is adequate infrastructure. A recent study released by the INGAA Foundation found that new pipelines will need to accommodate an additional 43 billion cubic feet of gas per

[3] *Fueling the Future with Natural Gas: Brining it Home.* The American Gas Foundation. January 2014. http://www.fuelingthefuture.org/

day by 2035 and annual capital expenditures of $14 billion are necessary over the same time frame to support this growth. These investments encompass distribution company investments as well as expansion of natural gas transmission and storage facilities that underpin the ability for natural gas consumers of all types to be served during periods of peak demand. The need to invest in natural gas infrastructure was evident in the Northeast during the extreme cold of the 2013/2014 winter season, where capacity constraints resulted in higher than expected delivered natural gas prices during peak demand periods of use and also led to higher prices for customers relying on the spot market.

These investments will also allow more homes and businesses the option to use natural gas when it is economically feasible and environmentally preferable. Regulators, including the Federal Energy Regulatory Commission (FERC), should ensure adequate and timely infrastructure is in place to support the greater use of natural gas and remove any structural barriers that inhibit the construction of new natural gas pipelines.

The natural gas market features a wide array of contracting tools that facilitate efficient and timely natural gas procurement and delivery. Asset management agreements, pipeline park and loan services, storage contracts and no notice service are just a few options at the disposal of customers. These tools when secured in advance as part of a diverse procurement strategy can assist customers in reliably meeting their obligations. Further, physical and financial hedging tools can help mitigate price swings and exposure to the spot market.

Natural Gas Infrastructure

The US natural gas infrastructure consists of over 300,000 miles of gathering lines and transmission pipelines, over 1.2 million miles of gas mains, and over 65 million gas service lines. While much of the system has been installed since the 1950's, parts of the system are over 100 years old, going back to the manufactured gas plant and gas light era. In addition to providing 65 million residential customers with critical space heating, water heating and cooking needs, the commercial and industrial sectors depend on natural gas for space and water heating, process heating, combined heat and power (CHP), and, more recently, gas cooling and natural gas vehicles (NGVs).

The shale gas revolution (assisted by DOE and GTI R&D) has revitalized American industry, with chemicals, feedstock, and fertilizer plants moving back to the US because of this abundant, low-cost, and stable energy source.

Additionally, natural gas provided 30% of the primary energy for our nation's electricity generation in 2012, and is projected to grow to over 35% by 2040, according to the EIA's Annual Energy Outlook reference case (April 2014). This lowest carbon emitting fossil fuel is critical to the power sector being able to meet new EPA requirements for new and existing power plants. So the natural gas infrastructure is critical to the direct use of natural gas and to electricity generation.

As more renewable energy comes into play for electricity generation and coal plants retire, natural gas combined cycle plants will play a key role in balancing electricity supplies. These changes argue for increased flexibility in natural gas markets and improved coordination between gas and electricity markets.

Pipeline and distribution system safety and integrity are of paramount importance to the gas industry. R&D in this area to develop sensors, instrumentation, analysis and risk assessment programs, must be supported. While DOT PHMSA funds some of this R&D, as does the gas industry through GTI and other organizations, additional funds are needed. Accelerated replacement programs to replace bare steel, cast iron, and vintage plastic are already underway in many jurisdictions. Advanced equipment to more accurately locate (via GPS) the new pipe being put in the ground, automatically characterize the new pipe and other components and devices and enter them into company databases, and to ensure that the new pipe is "piggable" and has the latest sensors and devices for safe delivery of the natural gas while minimizing methane emissions, is required.

Methane emissions from the natural gas value chain (wellhead to burner tip) are very low at 1.3% and have been declining steadily for the past decade, according to the US Environmental Protection Agency. These declines can be further enhanced through R&D in areas such as sensors, repair techniques, in-line inspection, and above-ground inspect devices.

Electric Infrastructure

Long-term planning and consistent coordination between government and the private sector are needed to enhance security and modernize the electricity grid. This involves consideration of investments to integrate variable energy resources and support increased distributed generation, demand response and energy efficiency. Prospectively, though perhaps less certain, there may be a need to accommodate electric vehicle deployment. These shifts involve increased use of information and communications technology and automation to improve operations, maintenance and safety as well as to respond to unexpected events. The federal government can facilitate the long-term planning and funding of infrastructure through its engagement with state and local policymakers that approve the expenditures through rate-recovery mechanisms or other means. The demands on energy infrastructure are growing and information exchange and technical support can be effective in securing the commitment to make the needed investments during tight fiscal and economic times.

Integration of Renewable Energy Generation

Building on current trends, the US electricity system will integrate a growing amount of renewable energy generation in the years and decades ahead. The Department of Energy's *Renewable Electricity Futures Study* noted that the abundance and diversity of US renewable energy resources can support multiple combinations of renewable technologies that result in deep reductions in electric sector greenhouse gas emissions and water use.[4]

Further, DOE found that the increased electric system flexibility needed to enable electricity supply and demand balance with high levels of renewable generation could come from a portfolio of supply- and demand-side options many of which exist on the grid today, but are not fully utilized due to inefficient grid operating practices or market design. These include flexible conventional generation, grid storage, new transmission, more responsive loads, and changes in power system operations.

Related to this, two recent renewable energy integration studies released by the National Renewable Energy Lab stated that high penetration of renewable energy could be managed in the PJM and Western regions without significant operating issues. They also concurred that any increased costs associated with the increased cycling of conventional generators were dwarfed by the savings in fuel costs.[5] [6]

Information and Communications Technology Infrastructure

In an increasingly complex energy system, ICT can be used to improve the reliability, resiliency and efficiency of the grid's transmission, storage and distribution infrastructure, and to help reduce pollutant emissions through better real-time monitoring and control of grid systems.[7] Further ICT applications to enhance end-use energy efficiency and facilitate demand response strengthen grid efficiency and reliability by reducing peak load stresses and line losses and by allowing better grid management in case of generation outages or transmission anomalies.

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[4] *Renewable Electricity Futures Study*. National Renewable Energy Laboratory. http://www.nrel.gov/analysis/re_futures/

[5] *Western Wind and Solar Integration Study*. National Renewable Energy Laboratory. http://www.nrel.gov/electricity/transmission/western_wind.html

[6] *PJM Renewable Integration Study. GE Energy Consulting*. February 28.2014. http://www.pjm.com/~/media/committees-groups/committees/mic/20140303/20140303-pris-executive-summary.ashx

[7] *The Role of ICT in Energy Consumption and Energy Efficiency*, 9. EMPA Technology and Society Lab. E. Lorenz M. Hilty et al. http://www.academia.edu/2686550/The_Role_of_ICT_in_Energy_Consumption_and_Energy_Efficiency

In the past, transmission, storage and delivery in the energy grid historically was a relatively straightforward, linear system of generation to transmission to distribution. Dispatching was generally local and based on marginal cost considerations. Margins of safety were large because of limited real-time information and limited options for replacement of power generation sources in an emergency.

As DOE points out, today's grid "must adapt to emerging challenges and opportunities: fluctuating energy prices, an increasingly transactive role for customers, integration of distributed energy resources, the need for improved resilience, and the need… to reduce greenhouse gas emissions."[8] In order to meet these challenges, a vastly increased role for ICT is essential. Without continually enhanced ICT in the TS&D infrastructure, the grid cannot achieve these 21st century goals. ICT will allow real-time monitoring of actual conditions throughout the system, and provide the ability to control TS&D system functions so as to maximize efficiencies and ensure reliability with less additional costly excess capacity.

One study showed that effective use of ICT has the potential to reduce America's total energy consumption by 12-22% by 2020,[9] and another showed that "for every kilowatt-hour consumed by ICT systems, a savings of 10 kilowatt-hours were enabled elsewhere in the economy."[10] Simply put, grid-related investment in ICT provides enormous benefits for energy efficiency, economic growth and maximum use of non-polluting energy sources.

The QER initiative recognizes the importance of DOE working across the Executive Branch to identify a set of common goals, improve communication, and coordinate actions of all federal agencies towards those goals. Failure to do so can result in policies and actions by one federal agency that, at best, do not mesh well with those of another agency, and at worst could be counterproductive to the aims of both.

Coordination to Ensure Grid Reliability

The utility industry, the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) are currently trying to grapple with the electric reliability impacts of EPA's recently proposed greenhouse gas (GHG) regulations for existing power plants. As described in testimony at a July 29 hearing of the Subcommittee on Energy and Power, FERC staff was involved in discussions with EPA staff and others as part of the Administration's inter-agency review process. There was little if any consultation between EPA and FERC beyond that process. Yet, if estimates of the number of coal-fired power plants that will close in response to the final rule are correct, and the projected increase in generation from gas-fired power plants materializes, there could be significant impacts on electric reliability in certain regions. All Commissioners agreed that it was too early to tell with any specificity what the reliability challenges will be, and all agreed that better communication and coordination among EPA, FERC and entities like NERC will be required.

Another example of the need for better agency-to-agency coordination also stems from EPA's proposed Clean Power Plan. The proposal does not give full recognition to the contribution of existing hydropower or existing nuclear power to reducing carbon emissions, yet these assets are essential to the success of the President's Climate Change Plan and are actively promoted by DOE and other federal agencies.

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[8] Press Release, *Stakeholder Meeting on Electricity Transmission, Storage, and Distribution,* 1. US Department of Energy. July 7, 2014. http://energy.gov/sites/prod/files/2014/07/f17/portland_backgroundmemo_qer.pdf

[9] *Leading By Example 2.0: How Information and Communication Technologies Help Achieve Federal Sustainability Goals*, iv. Stephen Seidel & Jason Ye. Center for Climate and Energy Solutions. June 2013. http://www.c2es.org/publications/leading-by-example-2-how-ict-help-achieve-federal-sustainability

[10] *A Defining Framework for Intelligent Efficiency*. 25. Neal Elliot, Maggie Molina & Dan Trombley. American Council for an Energy-Efficiency Economy. June 2012. http://www.qualityattributes.com/wp-content/uploads/2012/12/Inteligent-Efficiency-ACEEE-Report.pdf

Conclusion

The nation's transmission, storage and distribution infrastructure is critical to the productivity of US economy and the safety and security of US citizens. With significant change underway in the US energy system, government bodies, the private sector and stakeholders must work together to update market rules and establish the policy framework and incentive structures to spur the long-term planning and investments needed to provide consumers with affordable, reliable and clean energy products and services. Integration of new technologies requires new grid functionality and US energy infrastructure will need to become more dynamic over time. Utilities, technology and service providers, government bodies and stakeholders all have a role to play in designing and implementing the changes needed to the power grid. Council members thank DOE for the opportunity to share views on the first phase of the Quadrennial Energy Review and looks forward to working with the Department as it begins its phase two assessment on US power generation in 2015.