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Committee on Energy and Commerce
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"Facilitating the Transition to a Smart Electric Grid"

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Mr. Chairman and Members of the Committee, thank you for this opportunity to testify before you today on facilitating the transition to a smart electric grid.

Today, the availability of and access to electricity is something that most Americans take for granted, even though it is vital to nearly every aspect of our lives, from powering our electronics and heating our homes to supporting commerce, transportation, finance, food and water systems, and national security.

OE Mission

The mission of the Office of Electricity Delivery and Energy Reliability (OE) at the Department of Energy (DOE) is to lead national efforts to modernize the electricity delivery system, enhance the security and reliability of America's energy infrastructure, and facilitate recovery from disruptions to energy supply. These functions are vital to DOE's strategic goal of protecting our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally responsible energy.

Meeting our Future Electricity Needs

As our Nation's economy continues to grow, consumers' demand for more electricity will steadily increase as we move forward into the 21st Century. In fact, even when accounting for advances in energy efficiency, the Energy Information Administration estimates that by the year 2030, U.S. electricity consumption will increase by 43 percent from the 2005 level. Although this is a positive indicator of a growing economy, it is also a significant amount of new demand on an electricity infrastructure that is already stressed and aging. Our society and our economy require affordable, reliable, and clean electricity.

Meeting our future electricity needs will require new generation, transmission capacity and demand response programs, as well as more energy conservation and efficiency. Much of the new generation will need to be from cleaner sources of energy, as highlighted by the President's Advanced Energy Initiative. What's more, our increasing use and dependency on high technology electronics is creating the need for a much more reliable flow of electricity, to levels far beyond the design capabilities of our 20th Century grid.

Yet, despite increases in electricity consumption and in demand for electricity reliability, there has also been a period of under-investment in power generation, power transmission, demand-side investments, and infrastructure upkeep. This state of the grid can be linked to regulatory uncertainty, environmental concerns, changing market dynamics, and the difficulty of siting and permitting new transmission.

Modernizing the Grid

Innovations that modernize the grid system will pave the way for important new uses of electricity, such as plug-in hybrid electric vehicles. I am pleased that this hearing's previous panel was able to illuminate these many possibilities.

Now is the time to bring the enabling benefits of the IT revolution to our Nation's electricity system, thereby creating what many have dubbed a "smart grid." In general, a smart grid includes real-time visualization technologies on the transmission level and smart meter and communications technologies on the distribution level. These new technologies enable the advancement of demand response, distributed energy systems (generation, storage, thermal), consumer energy management systems, distributed automation systems, and smart appliances. I will note that we must not forget that implementing a "smart grid" also means maintaining strong cyber security practices.

DOE's Role

The DOE is leading national efforts to modernize the electric grid by researching, developing, and demonstrating next-generation technologies for the grid; the Department is also responsible for implementing various electricity-related provisions of the Energy Policy Act of 2005 (EPACT).

To advance grid modernization, our approach is to assess the grid from a systems perspective—taking into account electricity supply to electricity delivery and incorporating energy efficiency measures throughout the system, including demand response to reduce peak loads. We recognize that a change at one point in the system will affect the whole system.

OE Research & Development (R&D)

In my own office (OE), we sponsor a range of Research and Development for grid modernization in areas such as the development of advanced sensors (call phasor measurement units) that are GPS synchronized to monitor the health of the transmission system. Our researchers now have access to a wealth of technical data that we are translating to real-time information for grid operators. This will improve the overall reliability and efficiency of the system. Our vision for the future is to enable real-time monitoring of the electric system that optimizes the physical operation of the grid and integrates market operations.

OE has also made advances to the distribution system. Our office has developed technologies such as an autonomous storm detection system that detects and adjusts system default levels during thunderstorms and automatically resets them after the storm has passed.

Smart Technology Solicitation Announcement

I am also pleased to announce that, on April 26, 2007, the Department released a competitive solicitation to work with utilities to implement smart grid technologies that achieve a 15 percent peak load reduction on a feeder system. We are soliciting proposals that will implement smart meter and communications technologies that enable demand response, distributed energy systems (generation, storage, thermal), consumer energy management systems, and distributed automation systems or autonomous control systems.

Transition to a Smart Grid: Federal, State, and Consumer-Driven Mechanisms

I will now focus on the transition to a "smart grid." First, we need to recognize that grid modernization is a major undertaking for our Nation and that it will only be realized through the dedicated involvement and cooperation of Federal and State governments, industry partners, academia, and investment communities, for example.

Much of the smart grid concept involves automating the distribution grid. This is achieved by outfitting the grid with smart controls, communications, and sensors that connect to the homes and businesses (commercial and industrial) of the end users of electricity.

Non-Federal Authority with Respect to the Grid

It is important to note that much of the actual operation of the grid as well as decisions on investments to the grid with respect to generation, transmission, and especially on the local distribution grid, are under the jurisdiction of the States – typically State legislatures and/or public utility commissions – and not the Federal Government. These decision-making bodies have authority over generation, transmission, distribution, and demand-side (energy efficiency and demand response) management. Generally speaking, publicly-owned and cooperatively-owned electric utilities are regulated by their own elected or appointed boards.

The Federal Role for Implementing "Smart Grids"

Historically, the Federal Government has had few tools, when compared to those of the fifty States and the District of Columbia, available to help with a transition to a "smart grid." Yet, one mechanism to facilitate the transition to a "smart grid" lies within the scope of the Federal Government – it is leadership. The leadership we can provide is not insignificant—this hearing demonstrates that fact, as have the efforts of the DOE and the Federal Energy Regulatory Commission to sponsor needed R&D and related efforts that encourage voluntary and market-based efforts toward building a "smart grid."

Increasing Coordination among Federal and State Authorities

Notwithstanding historical State primacy in regulation of electric distribution, the Federal Government can be active in encouraging the needed transition to a 21st Century smart grid. A uniform and timely transition to a "smart grid" is made much more challenging when one considers the implications of fifty-one different jurisdictions taking action. Consider, for example, the difficulty of having fifty-one sets of standards as we work to achieve widespread use of smart appliances, plug-in hybrids, and other advanced electric vehicles, or the use of the grid to enable extensive energy efficiencies and demand response management. Put simply, the Federal and State governments need to work together to address the challenges before us.

I'm pleased to report that we already see positive movement toward collaboration. Some State regulatory commissions are engaging in the "smart grid" issue, in part as a result of the several provisions such as EPACT section 1252 on smart metering. A handful of States are or will be considering deploying smart and advanced electric meters in residential and small commercial sectors. Although small in unit costs, these technologies are an important necessary first step to automating the distribution, or end-use, part of the grid. Many large commercial and industrial customers already use advanced metering, which enables them to take advantage of time-varying electric rates. Given time, some States will undoubtedly enact laws and regulations to facilitate smart grid investments.

Achieving a "smart grid" may require regulators to realign utility incentives. For example, components of a "smart grid" that enable greater energy efficiency may result in reduced utility sales, thus reducing profits for investor-owned utilities. Alternative regulatory structures can reduce the "throughput incentive," by creating a "conservation incentive" that either makes the utility neutral or motivated to earn a return on selling less electricity (in essence, "selling" more energy efficiency).

Some State commissions are already pursuing this path. Under the President's National Action Plan for Energy Efficiency, DOE and its partner in this joint effort, the Environmental Protection Agency, provide State commissions upon request with best-practices-based assistance. The Department is also helping States across the country explore how to better coordinate and change regulations on a regional basis to better enable a demand response from electric customers. Specifically, DOE provides technical assistance and facilitation to States (utility commissions) and to bodies representing non-State jurisdictional utilities *on a regional basis* to discuss/learn about their roles on transition to a smart grid.

And finally, the FERC and the National Association of Regulated Utility Commissioners (NARUC) have jointly established a collaborative, informal working group co-chaired by Commissioner Wellinghoff of the FERC and State Commissioners Ervin (NC) and Reha (MN) to consider all aspects of integrating demand response between retail and wholesale markets. This kind of activity needs to continue and grow if we are to effectively identify the types of practices to be undertaken by the Federal and State governments that will

complement one another to facilitate the development of an intelligent, resilient and reliable 21st century grid.

Conclusion

I will conclude my statement by reflecting on an event that amply demonstrated that the energy behind or momentum developing behind development of a "smart grid." Last week, the DOE was a partner in hosting a four-day national conference dedicated to advancing grid modernization, entitled "GridWeek." This event provided a forum for the individuals and organizations that are already working on various aspects of the "smart grid" concept to network and catapult the electricity grid into the 21st century. It is extremely promising that these key participants are now united in the vision of bringing about a "smart grid." It is incumbent upon all levels of the government to work together to develop and implement this vision.

This concludes my statement, Mr. Chairman. I look forward to answering any questions you and your colleagues may have.