TESTIMONY OF MR. MICHAEL ATKINSON, P.E.
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March 4, 2015

Twenty-First Century Electricity Challenge: Transformation of Our Nation's Electric System

- The United States (U.S.) electric system is undergoing a transformation unlike anything we have experienced in the past 100 years, with major implications for the reliability, resiliency, and security of the power grid.
- The future grid must continue to deliver affordable, reliable power, regardless of where it is generated, and will serve as the backbone of the nation's electric infrastructure, while enabling the innovation that is happening on the supply and demand sides of the electric system to flourish.
- Thus, the grid will become the critical enabling platform for the entire electricity value chain.

Grid Modernization Technologies are Transforming the Electricity System

- The future grid must optimize the management and operation(s) of the entire electric system value chain, which includes power generation, delivery, and consumption. The innovation advancing on the supply and demand sides of the power system must be matched with innovation on the transmission and distribution parts of the grid.
- Modernizing the grid will reduce costs in the long run, and increase reliability, resilience, and security in the near and long term.
    - New smart grid technologies prevent outages and enable the grid to better withstand outages when they do occur, due to an extreme weather event, such as Superstorm Sandy.
    - More technologies and capabilities, such as energy storage, will be forthcoming in the future to ensure we not only maintain, but improve the performance of the grid.
- The Electric Power Research Institute (EPRI) has estimated **the total benefit from the smart grid to be between $1.3-2 trillion from 2010-2030** and benefit-to-cost ratios are found to range from 2.8 to 6.0.[1]

Path to Accelerating the Transformation to the Twenty-First Century Electricity System

- Establish a shared vision and develop guidance and best practices through industry stakeholder collaboration.
- Maximize transparency for system operators and customers.
- Make adjustments to the utility business model and regulatory model.
- Educate and empower consumers so they can better manage their electricity consumption.
- Develop a more highly-skilled workforce.

Conclusion

- We have a historic opportunity to continue and accelerate the modernization and transformation of our Nation's electric grid.
- Action is needed now, because this is a complex issue, and the technology and policy changes required could take years to implement, even if they are put in place today.
- Congress can play a key leadership role in facilitating the acceleration of grid modernization and fostering more public-private collaboration.
- This transformation can help optimize the grid, spark economic growth and competitiveness, and create highly-skilled jobs.

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PRESIDENT
ALSTOM GRID INC.
BEFORE THE
SUBCOMMITTEE ON ENERGY AND POWER
OF THE
HOUSE ENERGY AND COMMERCE COMMITTEE
"THE TWENTY-FIRST CENTURY ELECTRICITY CHALLENGE: ENSURING A SECURE, RELIABLE, AND MODERN ELECTRICITY SYSTEM" HEARING
March 4, 2015

Introduction

Good morning Chairman Whitfield, Ranking Member Rush, full Committee Chairman Upton and Ranking Member Pallone, and distinguished Members of this Subcommittee. I am Michael Atkinson, President of Alstom Grid Inc. and here also on behalf of the GridWise Alliance (GWA). I appreciate the opportunity to testify at today's hearing.

New technology is changing the way Americans consume electricity. Innovations from electric vehicles to smarter appliances will require a smarter, more sophisticated electrical grid. **Alstom Grid** is meeting that requirement today with new equipment and solutions that are preparing the country's grid to meet the demands of tomorrow and incorporate a range of energy resources (both supply and demand). In other words, Alstom Grid is bringing more intelligence and increased communications to the grid; it is developing the technologies and services to integrate distributed, remote and intermittent power generation systems into the grid. And, in doing so, it is working in close collaboration with electric utilities, national laboratories, research universities, and other technology and research stakeholders to prevent outages, and to rapidly restore power when outages do occur.

Alstom Grid is proud to be one of the founding members of the GridWise Alliance, which was established in 2003 to advance the modernization of the electric grid. I also serve on GridWise's

Board of Directors. GWA's members include electric utilities, information and communications equipment and service providers, Regional Transmission Organizations (RTOs) and Independent System Operators (ISOs), national laboratories, academic institutions, and more.

Twenty-First Century Electricity Challenge: Transforming Our Nation's Electric System

The United States (U.S.) electric system is undergoing a transformation unlike anything we have experienced in the past 100 years, with major implications for the reliability, resiliency, and security of the nation's transmission and distribution grids. At the same time, our nation has an increasingly digital economy and is, therefore, even more dependent on reliable, safe, secure, and affordable electricity. Going forward, the grid will need to be managed not only for daily operations that our digital economy requires, but also for increasing resiliency and reliability during natural- and human-caused events. Neither the threats nor the digital economy were factors on a scope or scale sufficient to warrant significant consideration when most of today's electric infrastructure was originally built.

The future grid must continue to deliver affordable, reliable power, regardless of where it is generated. It will serve as the backbone of the nation's electric infrastructure, while enabling the innovation that is happening on the supply and demand sides of the electric system to flourish. Thus, the grid will become the enabling platform that connects consumers and producers of electricity for a sustainable energy future. The future grid will enable electricity information to flow together in real time and in two or multiple directions, rather than the one-way flow of electrons from the utility to the consumer that historically has been the case.

By incorporating advanced information and communications technologies and capabilities, the grid will have increased flexibility, which will enable the integration of diverse energy resources, including: centralized and decentralized generation, energy storage, new controllable "smart" loads, microgrids, renewable or intermittent resources, and more. This underscores the need to take into account the entire electric system, from generator to consumer, as well as many of the innovations we are discussing today.

The Importance of Innovative Grid Modernization Technologies and Capabilities to Facilitate the Transformation of the Electricity System to the Twenty-First Century

New grid technologies and capabilities also will help ensure the grid operates both efficiently and effectively – dynamically balancing supply and demand in a much more complex system. That is, the future grid must be able to optimize the management and operation of the entire electric system value chain, which includes power generation, delivery, and consumption. Such optimization will occur not only by using "smart" meters, but also by deploying advanced energy management systems, digital sensors, and a range of other technologies that provide end-to-end visibility and control of the electric system.

In addition, some consumers already have started to interact with the grid very differently, a trend which will become the new normal in the future. As consumers, we already have more choices and greater control over the ways in which we meet our electricity needs, and these choices are growing. Consumers are becoming what we call "prosumers," that is, both producers and consumers of energy. Therefore, in the future, grid operators will have to be able to balance supply and demand, not only at the transmission level, but also all the way down to the distribution grid and to the end prosumer.

Consumers also will be able to better understand and manage their energy consumption. Not only will smart thermostats, lights, security systems, and other appliances further enhance energy management capabilities, but applications (apps) on mobile phones will enable consumers to activate these remotely, with additional attendant benefits.

This transformation of the electric grid already is advancing in different ways and at different speeds across the U.S., with some states moving more quickly than others – but all are moving in the same direction.

Grid Modernization Technologies and Capabilities Enhance System Resilience, Reliability, and Security

The innovation advancing the supply and demand sides must be matched with innovation on the grid. Modernizing the grid will reduce costs in the long run, and increase reliability, resilience, and security in the near and long term.

Let me turn to this point and focus on the need to enhance the **resilience, reliability, and security** of the grid for a moment: many "smart grid" technologies already exist and are making a difference in significantly enhancing electric system reliability and resilience. Based on a June 2013 Report published by the GridWise Alliance, in collaboration with the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability (DOE-OE), entitled, *Improving Electric Grid Reliability and Resilience: Lessons Learned from Superstorm Sandy and Other Extreme Events,* these technologies help prevent outages and enable the grid to better withstand outages when they do occur due to an extreme weather event such as Superstorm Sandy. More technologies and capabilities such as energy storage will be forthcoming in the future to ensure we not only maintain, but improve, resilience, reliability, and security.

I am not suggesting that technology alone will solve all outage-related problems; they will not. Nor will we prevent ***all*** outages. Yet "smart grid" technologies and capabilities help reduce power outages and restore power more quickly when outages do occur, for example, by helping to facilitate increased automation and situational awareness of conditions on the ground. For example, during extreme events such technologies will allow for the isolation and continued service to limited portions of the grid, as needed, to prevent larger outages or provide for localized grid recovery from such events.

Grid Modernization Technologies and Capabilities Help Create Jobs, Enhance Economic Growth and Competitiveness, and are Cost Effective

Consequently, these types of technologies allow control room operators to gain better and faster visibility of faults on the grid, which can facilitate faster outage restorations. These dramatic technological developments also provide utility crews with greater situational awareness in often dangerous situations, which allows them to do their jobs more safely and efficiently. Homes and businesses can continue operating electricity and heat or air conditioning, depending on the locale, thus ensuring continued safety, health, and economic productivity. Thus, investing in and deploying these technologies, and improving our grid infrastructure on the front end, will substantially reduce the economic impacts from outages and power quality disturbances down the road, thereby resulting in dramatic cost savings to society as a whole.

Cybersecurity threats, extreme weather events, and other hazards present challenges and strong incentives for prompt action to proactively facilitate the transition to our twenty-first century electric system. The above technologies and capabilities will improve daily operations as well as

emergency situations. They also will help balance load and optimize the management and operation of the grid.

Moreover, the adoption of new technology and further innovation in these fields also will lead to the creation of highly-skilled jobs and will enhance our nation's economic growth and competitiveness.

The GridWise Alliance found through collaborative efforts with DOE-OE and over 400 public and private sector stakeholders over the past year on "The Future of the Grid" (referenced above), that today's regulatory rules are not designed to facilitate or promote the types of investments that utilities need to make in their systems, largely because many of the benefits are realized outside the utility.[1]

The Electric Power Research Institute (EPRI) has estimated **the total benefit from the smart grid to be between $1.3-2 trillion from 2010-2030** and benefit-to-cost ratios are found to range from 2.8 to 6.0.[2] Some additional examples of the types of cost savings and benefits these technologies can provide may be found in the ***Appendix.***

[1] GridWise Alliance-DOE-OE, *The Future of the Grid: Evolving to Meet America's Energy Needs*, Final Report, An Industry-Driven Vision of the 2030 Grid and Recommendations for a Path Forward, December 2014.
[2] EPRI, *Estimating the Costs and Benefits of Smart Grid: A Preliminary Estimate of the Investment Requirements and the Resultant Benefits of a Fully Functioning Smart Grid, 2011 Technical Report*, Final Report, March 2011 (March 2011 Final Report), p. 1-4, available at: http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=000000000001022519&Mode=download.

Solutions to Ensure and Accelerate the Transformation to the Twenty-First Century Electricity System

I am not talking here about deploying technology for technology's sake. I do not think any of us ever could have imagined the dramatic changes we have experienced on the telecommunications front. By unleashing innovation, we can experience the transformation that we will and must undergo in the electricity sector. And, the convergence of our information and communications technologies with our electric grid translates to our twenty-first century "smart" electric system.

I offer the following initial recommendations to help catalyze grid modernization.

- Achieve a twenty-first century electric system, by further enhancing the grid infrastructure and enabling related policy, economic, technological innovation, and other mechanisms. Adjustments to the utility business model and the regulatory model, as well as shifts in consumer engagement are critical components of this process. Because of the significant complexities involved in the transformation of the electric system, and to avoid unintended consequences, it is critical to ensure the markets, regulations, and new technologies all are aligned. This can be accomplished most successfully through collaboration among all stakeholders.

- Foster ongoing public-private collaboration, which is essential to facilitating this transformation. For example, utilities, technology companies, and other stakeholders already are partnering with national laboratories to help determine and simulate potential threats to the electric system, and demonstrate technologies and capabilities that improve situational awareness, and reduce major outages.

- Maximize transparency and educate and empower consumers so they can better manage their electricity consumption, especially as they become "prosumers."

- Establish a shared vision. We need to work collaboratively to develop guidance for states and leverage best practices in a way that offers tools for states to undergo the transition to a twenty-first century electricity system. During this transition, it will be important to take into consideration regional, state, and local geographic and other key differences. Over the past year, GridWise members have been working collaboratively with utilities and other stakeholders to further define these recommendations.

Conclusion

In conclusion, we have a historic opportunity to continue and accelerate the modernization and transformation of our Nation's electric grid. Action is needed now because this is a complex issue and the technology and policy changes required will take years to implement.

- We must build the momentum to enhance and ensure the resilience, reliability, and security of the electricity system.
- We must increase the visibility and awareness of what is occurring across our transmission and distribution systems.
- We must manage and operate the electric system in a way that balances loads effectively and strategically and integrates diverse resources.

This transformation can help optimize the grid, spark economic growth and competitiveness, and create jobs.

There is a broad consensus that it is a national imperative to modernize our nation's electric system. We are facing an unprecedented period in which we are encountering a range of driving forces that are affecting our grid, including an increasingly digital economy and a convergence of new technologies, as well as cybersecurity and other threats to our grid system. Unless we prepare now, our system could be vulnerable and might not adequately cope with challenges that already are being experienced. Additionally, we could lose significant economic opportunities and benefits.

Congress can play a leadership role in helping to set the stage for ensuring and accelerating this transformation by fostering even greater collaboration between federal, state, and local governments, the private sector, and the entire ecosystem of stakeholders. To this end, I applaud your efforts to develop bipartisan energy legislation. I urge you to consider grid modernization as an essential component of our shared objective of moving the country toward a more resilient, secure, and sustainable electric system. We want to be a part of this effort and offer to be a resource to you and your colleagues as you proceed.

Mr. Chairman, thank you for this opportunity to testify today. I look forward to answering any questions.

Appendix: Key Statistics Pertaining to Some of the Benefits of Various Advanced Grid Technologies

It has been found that:

- *Integrating AMI with restoration processes **shaved 2–3 days** off the time it otherwise would have taken to completely restore power during a VLSE; a 10–15 percent improvement in the speed of power restoration.*[3]

According to a Report entitled "Innovations Across the Grid" by the Edison Foundation's Institute for Electric Innovation, U.S. utilities are investing in grid modernization technologies. A few brief examples from this report include the following:

- "Duke Energy is actively engaged in an ongoing transformation of the electric distribution system with the goal of enhancing system performance to deliver better customer service, improve efficiency, and reduce operating cost. While Duke Energy has long focused on demand management, it has recently implemented an effort targeted at providing better management on the energy supply side." This project:
  - "Created a Distributed Energy Resource Management System (DERMS) to integrate distributed energy resources into the electrical grid more efficiently.
  - Enhanced abilities to model, forecast, and control the utility's portfolio of distributed energy resources, including solar generation, energy storage, demand response and electric vehicles."

- NV Energy, using remote connect and disconnect, experienced a net operational savings of about $25 million annually.

[3] GridWise Alliance, *Improving Electric Grid Reliability and Resilience: Lessons Learned from Superstorm Sandy and Other Extreme Events*, Workshop Summary and Recommendations, June 2013, p. 13.

- PG&E in its synchrophasor project is installing or upgrading "160 Phasor Measurement Units at 27 key PG&E substations, including communications, and data management infrastructure to improve wide-area situational awareness."
    - "This provides unprecedented visibility into power system dynamics and wide-area grid stress indicators across PG&E's footprint. The solution is akin to using MRI technology in addition to traditional X-rays."