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BEFORE THE SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
OF THE HOUSE COMMITTEE ON SCIENCE AND TECHNOLOGY

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Good morning Chairman Baird, Ranking Member Inglis, full Committee Chairman Gordon, Ranking Member Hall, and distinguished members of this Subcommittee. Thank you for the opportunity to testify at today's hearing. My name is Jeffrey L. Ross, and I am an Executive Vice President at GridPoint, a leading smart grid company that has developed an online energy management solution for consumers, as well as products and services that help utilities manage energy in the areas of electric vehicle charging, storage, integration of renewable energy, and demand response. We are a private company headquartered in Arlington, VA with approximately 130 employees. I would like to request that my full statement be entered into the record.

I appreciate the leadership you, the full Committee, and this Congress have demonstrated in supporting the Energy and Independence Security Act of 2007 (EISA) and the American Reinvestment and Recovery Act of 2009 (ARRA), the provisions of which have the potential to reshape positively the energy ecosystem in our country.

I am here to provide GridPoint's perspectives on the role of the federal government and industry in transforming the nation's electric grid from an over-burdened, outdated system into an interconnected, intelligent "smart grid."

I have three points I would like to leave you with today:

1. First, while the infrastructure of smart meters and advanced communications is important in transforming the nation's grid, we also need other new innovative technologies to realize the benefits of increased efficiency, reliability, and security.

2. Second, we need to realign the regulatory and economic policies and incentives pertaining to investor-owned utilities (IOUs), such that utilities are motivated to invest in smart grid technologies.

3. We must provide consumers with greater information on their energy use if we expect them to better manage their energy consumption.

An Historic Opportunity

The term "smart grid" refers to the means by which energy is delivered from generators to consumers using two-way communications and digital technology to improve efficiency, increase reliability, and add transparency. This generally involves enhancing the grid with sensing, communications, analysis, feedback, and control technologies to realize operational efficiencies and improve environmental impacts. Much of the attention around "smart grid" has focused on the distribution side of the electricity system, which is where GridPoint offers its solutions. While this area benefits from improvements in "smart" meters (often referred to as Advanced Metering Infrastructure (AMI)) and advanced communications systems, there needs to be a wider range of technologies adopted to realize the full benefits of the smart grid. These technologies will provide utilities and consumers with the ability to understand and better manage energy consumption. They also will help improve energy efficiency and/or reduce demand, and thereby help reduce greenhouse gas emissions.

EISA and the ARRA set forth the following goals and benefits for smart grid: create a modern electric grid, enhance security and reliability of energy infrastructure, and facilitate recovery from disruptions to the energy supply. The ARRA and EISA envision that there will be a variety of regional demonstration projects to develop advanced techniques for measuring peak load reductions and energy-efficiency savings from smart metering, demand response, distributed generation, and electricity storage systems; quantify costs and benefits; verify technology viability; and validate new business models and best practices for implementing advanced smart grid technologies that can be replicated throughout the country. These goals encourage the testing of new technologies, in addition to improvements in smart metering and advanced communications infrastructure.

The ARRA provides $4.5 billion in funding for the smart grid investment program. More than $2 billion of this funding will likely be spent on smart meters and advanced communications systems. While this new metering and communications infrastructure is important, it is critical to include applications that run on this infrastructure as new smart grid projects roll out. Without the applications to improve efficiency, reliability, security, and provide consumers and utilities with additional information, the true promise of the smart grid will not be realized.

The Promise of the Smart Grid

Our system for generating, transmitting, and producing electricity was developed more than a century ago when all we required of electricity was that it be cheap, ubiquitous, and reliable. Over the last century, we have constructed a complex network of power plants that are connected regionally via transmission lines to population centers, with electricity distributed to homes and businesses over power lines. Today, this system is experiencing issues with reliability, efficiency, and security. We are increasingly asking more from the electric grid – not just greater demand, but also that delivery of our energy be efficient and green. Without significant technological upgrades, our electric grid cannot meet these 21st century challenges.

If we take advantage of the historic opportunity presented to us today, with the policies set in place in EISA, to upgrade our grid and make it "smarter," the benefits are limitless. Imagine if you could access real-time information about how much energy you were consuming, and which appliances and devices in your home consumed the most energy. What if, armed with that information, you could make small changes in your behavior that would save significant amounts of energy and lower your monthly utility bill?

What if solar panels on peoples' roofs and electric vehicles in garages were networked together such that their capacity could be used to relieve areas of stress and high demand in the grid? What if your utility and your electric vehicle were smart enough to delay your charging until nighttime, when electric rates are less expensive, demand on the grid lower, and more renewable energy is available?

What if a utility could sense an overheating transformer, and divert its load by shifting it to other resources in the system? Imagine if a utility could make wind reliable and predictable by

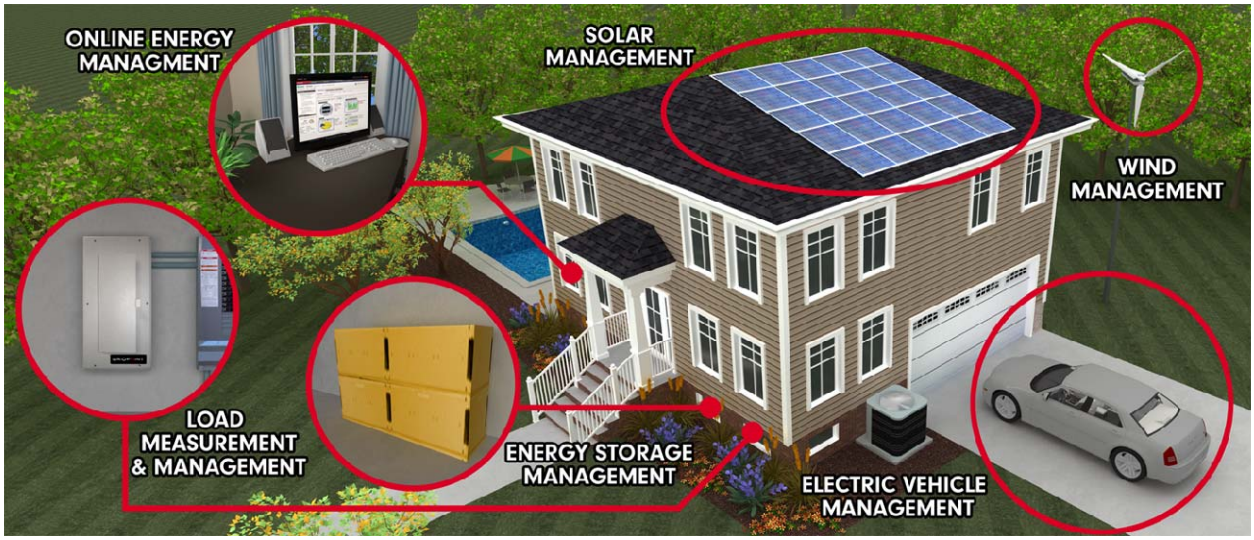
storing electricity in the form of a battery to back up the intermittent renewable power so, together, these became a continuous, reliable source of energy? That is, the wind could be used to charge a large battery. When the wind blew at night the battery would charge, and when the wind died down, the battery would discharge to keep a constant amount of power available.

Smart grid technologies exist today to enable all of these benefits. Just imagine if utilities and consumers were to implement them. How many power plants could we avoid building? How much money would we save? How much carbon dioxide would we prevent from entering the atmosphere?

The technologies that can make the "smart grid" a reality offer consumers greater insight and control over their energy usage and improved environmental benefits, while utilities gain greater efficiency in their operations, improved reliability, and increased security.

GridPoint's Technology and the Benefits of a Modern Grid

GridPoint has developed a software platform (i.e., management system) that enables utilities to have visibility into, and manage, their distributed energy assets. The platform seamlessly integrates five solutions: online energy management, load management, electric vehicle management, storage, and integration of renewable energy. With GridPoint's platform, utilities efficiently balance supply and demand in an economical, scalable and environmentally beneficial manner.

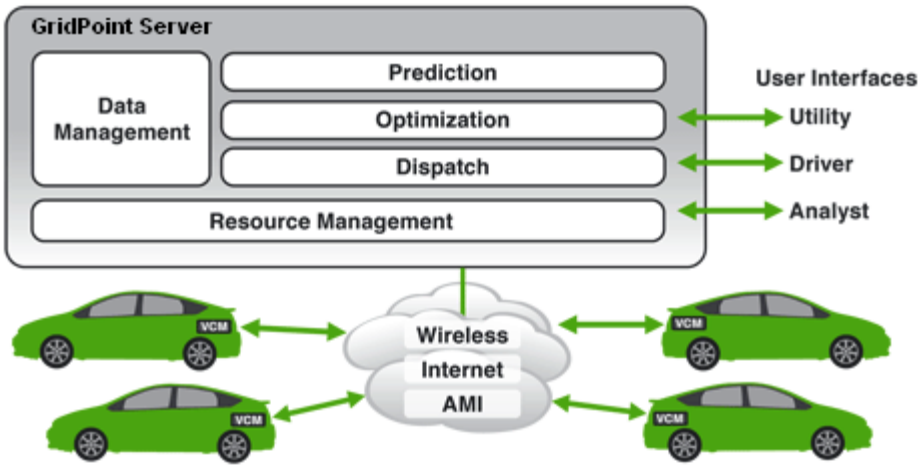


In online energy management, the GridPoint solution offers utilities a portal to provide their customers far greater awareness of their energy consumption. It also provides consumers with insight into their energy usage with features such as carbon calculators, comparisons to their bill from a previous month or year, and energy savings tips based on their consumption patterns. Consumers benefit by having control over, and being able to reduce, their energy usage. Studies have shown that simply providing consumers information about their energy use can lead to reductions in consumption of between 10 to 20 percent. Providing consumers with information about their energy use is an important first step in empowering them to control their energy consumption.

The GridPoint load management solution assists utilities in managing capacity-strained areas by providing visibility and control of devices in the home or business to address peak loads. This increases reliability in the electric grid. The solution provides utilities detailed measurement and verification of achieved reductions against a projected baseline, which enables carbon measurement. It allows the utility to shift load and reduce peak demand through demand

response programs with circuit-level visibility and control of large load classes by type (e.g. Air conditioners) either in aggregate or by substation, feeder or individual customer.

By market share, 70 percent of automobile manufacturers have announced plans to launch electric vehicle models, the first of which will hit the road, and the electric grid, in 2010. The GridPoint smart charging solution controls the flow of electricity to plug-in electric vehicles, allowing utilities to balance real-time grid conditions with the needs of individual drivers. During peak periods, the flow of energy can be delayed or slowed to shift the charging load into an off-peak period – minimizing grid stress and ensuring service reliability. When wind or solar power is available, the charging rate can be increased to expand the use of renewable energy in the grid. The solution enables smart charging at every charging level and from any point on the grid, whether the driver is at home, work, or a public charging station.



The GridPoint storage management solution provides aggregated, real-time control over the charging and discharging of distributed storage assets located in the utility's transmission and distribution systems. Its software algorithms allow energy storage devices to be managed in isolation or aggregated at various levels of the system and dynamically dispatched in a coordinated fashion. Charging and discharging scenarios include: load leveling, load shaping, integrating renewable energy, economic dispatch based on price signals, system regulation, and spinning reserves to respond to an unexpected power disruption. These capabilities allow utilities to manage the grid more cost effectively; increase predictability, availability and

optimization of renewable energy sources; and improve the efficiency of transmission and distribution resources.

Finally, the GridPoint renewable integration solution predicts and precisely monitors the production of distributed renewable power systems, like a solar panel array, to allocate the associated energy, renewable credit, and carbon credit value streams. It also maximizes the value of grid-connected renewable power sources, both residential and utility-scale, by balancing output variability via automated dispatch of other distributed energy assets, including demand response, storage, and plug-in hybrid vehicles. Utilities benefit from the monitoring and prediction of residential and commercial grid-connected renewable systems. Consumers benefit by having insight into their personal solar production and consumption, reductions in their carbon footprint due to environmental data based on renewable production and consumption, and weather information to help predict their future solar energy production.

Challenges to Realizing a Truly "Smart" Smart Grid

With all of the tremendous benefits inherent in a "smart grid," one might ask why the technologies are not being adopted more widely by utilities. There are several reasons, but perhaps the most important is that the regulatory model for investor-owned utilities (IOUs) does not incent those utilities to make investments in smart grid technologies.

IOUs make money for their investors by receiving a guaranteed rate of return on capital to deploy generation, transmission and distribution assets and to ensure system reliability. The more energy IOUs need to produce, the more capital they can deploy to purchase these assets. This, in turn, allows them to include those assets into the rate base and receive a return on their investment. Therefore, the more power an IOUs produces, transmits, or distributes, the more money that IOU will earn.

One of the benefits of smart grid technologies is that they create efficiencies in the electric grid, thereby reducing the amount of energy needed to serve the same population. If an IOU deploys smart grid technologies, it could serve its customer base while producing less energy. This would benefit ratepayers, who would not face an increase in rates, and the environment, by reducing the need for additional power generation assets. However, this scenario – under

the current regulatory structure – would leave the IOU without the need to deploy new generation, transmission or distribution assets and would reduce the IOU's ability to receive a return on investment. IOUs may actually risk losing money if they deploy smart grid technologies that serve their customers more efficiently and improve environmental impacts. Not all IOUs face this economic deterrent all of the time; however, the challenge of this economic and regulatory model is prevalent enough to dampen IOUs investment in smart grid technologies.

Xcel Energy's SmartGridCity (Boulder, CO)

SmartGridCity is the U.S.'s first and largest full-scale pilot project designed to test smart grid technologies and the new business models they enable. It is sponsored by Xcel Energy Corporation, a fully-integrated power utility, headquartered in Minnesota, with a service territory extending into eight states, including Colorado, and a total of 3.3 million electric and 1.8 million gas customers. Xcel is a leading utility in the use of wind power, with nearly 3,000 MW of capacity installed. SmartGridCity is a demonstration project designed to understand how the utility and its customers collectively manage power generation, delivery, and energy consumption.

SmartGridCity is a multi-phase project that began in the spring of 2008. The first phase, over 18 months, was designed to test capabilities and gauge customer reaction. It involves upgrades to two substations and five feeders, as well as 15,000 residential and commercial premises. The second phase will be a full deployment with a larger reach to a broader customer base, and includes an additional two substations, 20 feeders, and 35,000 premises. Grid Point is providing demand and supply side management, solar integration, plug-in hybrid electric vehicle support, online energy management and integration services to the SmartGridCity project.

Xcel Energy conceived of this project as a way to test a number of business, customer and social issues. The principal benefits centered on the following:

1. **Peak Energy Consumption**: Can real-time pricing and environmental signals, in conjunction with advanced in-home energy management systems reduce residential peak energy consumption?
2. **Grid Reliability**: Will there be a reduction in the number and duration of customer outages as a result of the technology installed in the distribution network?
3. **Capital Expenses**: Will the reduction in peak load demand result in a deferral of capital spent on distribution and transmission infrastructure?
4. **Operating Expenses**: Will there be cost savings to Xcel from the implementation of smart meters, distribution automation and home energy automation?
5. **Carbon Footprint**: Will there be a meaningful and measurable reduction in carbon emissions as a result of the lowered residential peak demand and other efficiency programs?

Xcel's vision is to make SmartGridCity a fully-connected and horizontally-integrated system that would require real-time and automated decision making across all parts of the network. The project includes:

1. High-speed communications network (broadband over power line and wireless) and sensing equipment.
2. Smart meters with the ability to provide near real-time data on consumption.
3. Improved intelligence at the substations.
4. A feeder distribution system with communications-enabled reclosers and switches, and other assets to provide power system information.
5. Power analyzers at each transformer to provide real-time data on power consumption, outages, restorations and fault locations.
6. Integration of renewable energy generation and distributed storage, including a large scale wind-to-battery project.
7. Integration and optimization, or smart charging, of plug-in hybrid electric vehicles within the grid.
8. Customer programs and incentives that help them save energy, track energy usage, and manage demand in response to real-time price signals, all through a custom web portal interface that provides: (a) control to set energy preferences; (b) analysis of information, billing history and a means for helping customers discover how to best

manage energy; and (c) information to effectively educate customers about how their energy is produced and how to lower their carbon footprint.

The SmartGridCity project is about half way through its duration. Since construction began in 2008, Xcel Energy and its partners have:

- Installed nearly 15,000 smart meters with another 10,000 more "opt-in" customers;
- Launched the SmartGridCity Control Room and Operations Center;
- Implemented over 327 network elements for grid communication and monitoring;
- Developed a website portal for customers to better manage their energy use;
- Launched the nation's first test of plug-in hybrid electric cars with vehicle-to-grid capability;
- Turned the Chancellor's residence at the University of Colorado into the nation's first fully-integrated "smart house", with solar, back-up power, PHEV smart charging and consumer control; and
- Implemented Xcel Energy's wind-to-battery program to test the control and firming quality of an integrated wind and storage system.

Although we are still at an early stage in the project, Grid Point, as a participant, has learned some valuable lessons about demonstrating and deploying "smart grid" technologies as we move forward with the SmartGridCity team to create a more resilient and responsive grid. There is real value in demonstration projects such as SmartGridCity that can provide a test bed for new and innovative smart grid technologies. Consumers must be able to understand their energy consumption and usage with greater frequency and granularity than the information in their bill at the end of the month. Near real-time information on energy usage can influence positively consumers' behavior and provide them with the means to control their energy consumption.

Importance of Smart Grid Demonstration Projects and Innovation

Other cities have begun to follow Xcel's SmartGridCity project with their own demonstration projects. The city of Austin, Texas announced late last year a new smart grid deployment called the Pecan Street Project that would create a virtual 300MW clean power plant through a

combination of efficiency and clean power. The City of Miami, Florida likewise has announced a high-profile project. These efforts will likely increase as funding under the ARRA is awarded. It is important that smart grid demonstration projects test a broad range of new technologies and measure and verify the costs and benefits of the technologies. Only by doing this, can the best technologies gain recognition and acceptance to improve the grid.

Conclusion

In conclusion, we face an historic opportunity today to transform our nation's electric grid. To do so, we need to leverage the funding Congress has made available. While we need the advanced infrastructure of meters and communications, we also need the applications that reside on top of the infrastructure to make the grid more efficient, reliable, and secure. We need to continue to work toward regulatory and economic structures that incent utilities to make smart grid investments. Finally, we need to provide consumers with information about their own energy use to empower them to control their energy consumption.

Thank you for this opportunity to testify here today.