Summary of Testimony by Joel Ivy, Lakeland Electric, on

"The 21st Century Electricity Challenge: Ensuring a Secure, Reliable, and Modern Electricity System"

The American Public Power Association (APPA), based in Washington, D.C., is the national service organization for the more than 2,000 not-for-profit community-owned electric utilities in the United States. Lakeland Electric, in Lakeland, Florida, is an APPA member serving 122,000 customer accounts in central Florida for the last 110 years. Like other public power utilities represented by APPA, Lakeland Electric was created to serve the needs of its local community by providing low-cost, reliable electric service on a not-for-profit basis.

In this testimony, I first give a brief overview of how the electricity production and delivery system works. I then discuss initiatives being undertaken nationwide by public power utilities related to "grid innovation," but focus the bulk of my testimony on what Lakeland Electric has done and why. For purposes of this testimony, I have defined "grid innovation" as including: deployment of smart meter technologies and the communications systems to support those and other technologies; deployment of distributed generation (or distributed energy resources), including storage; increased real- and near real-time monitoring of power systems, which enhances situational awareness; and management of the "big data" being accumulated through the use of smart grid technologies. In addition, I discuss some of the challenges to deploying these technologies, including the need to address cyber security.

The ability to use communications devices to connect to parts of both the bulk transmission grid and the distribution grid/individual customers (known as "smart grid") is providing electric utilities of all kinds greater opportunities to "optimize" use of the grid. This includes use of such devices to align electric power supply with actual demand from individual customers, thereby enabling smarter use of energy conservation techniques. Deployment of these technologies can also enable utilities to understand where outages are occurring on a real-time basis, which can minimize outage duration and impacts, thus improving reliability. At the same time, the use of such communications devices poses challenges related to customer privacy, data collection and security.

The deployment of a variety of distributed energy resources has been part of the electric utility landscape for decades. But as the economies of scale associated with large power plants and bulk transmission lines have diminished because of increased regulations, wholesale market failures, and environmental concerns, the cost-benefit calculation between DER and large-scale plants/transmission has changed. In addition, DER technologies such as solar photovoltaic (PV) have decreased in price in recent years, thus making their deployment more affordable in some areas of the country. While some of the price differentials are attributable to federal, state, and utility rate subsidies and other favorable policies, there have been substantial advances in technology that have brought prices down as well. The result has been an increased interest in deployment/use of such technologies.

APPA and Lakeland Electric firmly believe that decisions about deployment of smart grid technologies and DER should be made at the local level (for public power systems) and state level for investor-owned utilities (and rural electric cooperatives, where applicable).

The federal government can continue to provide/enhance crucial funding for research and development of these types of technologies, particularly storage. The federal government can also review business practices that may be leading to the provision of erroneous information to customers, including information provided by certain solar leasing companies related to the pay back on the leases, which are in turn being tied to unrealistically high assessments of annual electricity price increases. Access to good information that allows customers to make sound decisions without future regrets is our goal. Finally, the federal government can help to provide timely and actionable information related to cyber-security.

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On Behalf of the American Public Power Association (APPA)

Testimony before the House Energy and Commerce Committee's Subcommittee on Energy and Power on:

"The 21st Century Electricity Challenge: Ensuring a Secure, Reliable, and Modern Electricity System"

March 4, 2015

The American Public Power Association (APPA), based in Washington, D.C., and established in 1940, is the national service organization for the more than 2,000 not-for-profit community-owned electric utilities in the United States. Collectively, these utilities serve more than 48 million Americans in 49 states (all but Hawaii). Lakeland Electric, in Lakeland, Florida, is an APPA member serving 122,000 customer accounts in central Florida for the last 110 years. Lakeland Electric appreciates the opportunity to provide the following testimony on its own behalf and on behalf of APPA for the Subcommittee on Energy and Power's hearing regarding "The 21st Century Electricity Challenge: Ensuring a Secure, Reliable, and Modern Electricity System."

APPA was created in 1940 as a nonprofit, non-partisan organization to advance the public policy interests of its members and their customers, and to provide member services to ensure adequate, reliable electricity at a reasonable price with the proper protection of the environment. Most public power utilities are owned by municipalities, with others owned by counties, public utility districts, and states. APPA members also include joint action agencies (state and regional entities formed by public power utilities) and state, regional, and local associations that have purposes similar to APPA.

Like other public power utilities represented by APPA, Lakeland Electric was created to serve the needs of its local community by providing low-cost, reliable electric service on a not-for-profit basis. While much has changed in the intervening 110 years, the fundamental tenets of local decision-making and serving customers reliably and affordably have remained constant. The core value of local control has fostered Lakeland Electric's intrinsic relationship with its community and has enabled the utility to evolve over the decades as the community has evolved to take advantage of technological, environmental, and economic advances.

Introduction

In this testimony, I first give a brief overview of how the electricity production and delivery system works. I will then discuss initiatives being undertaken nationwide by public power utilities related to "grid innovation," but will focus the bulk of my testimony on what Lakeland

Electric has done and why. For purposes of this testimony, I have defined "grid innovation" as including: deployment of smart meter technologies and the communications systems to support those and other technologies; deployment of distributed generation (or distributed energy resources), including storage; increased real- and near real-time monitoring of power systems, which enhances situational awareness; and management of the "big data" being accumulated through the use of smart grid technologies. In addition, I will discuss some of the challenges to deploying these technologies, including the need to address cyber security.

Electricity, the movement of electrons, occurs naturally. But to serve industrial, commercial and residential needs for lighting, heating, cooling, refrigeration, computers, and many other daily needs, large amounts of moving electrons must be generated from some other fuel or energy source. Electricity is created from the conversion of a fuel or other source of energy into electrons. When electricity is generated from a large power plant, it typically travels over high-voltage bulk power transmission lines to the lower voltage distribution systems where it will be delivered to homes and businesses and consumed. In the case of distributed generation, the power is generated on a smaller scale, sometimes directly at homes or businesses, and therefore does not have to access the bulk transmission system to be used. While distributed generation has long been available, and used for back-up power for times of peak usage (or "load") or in emergencies, the economies of scale created by large power plants drove down electricity costs for end-use customers and they were, therefore, the preferred generation option for many decades.

In recent years, environmental concerns and technological breakthroughs in certain areas have combined to cause utilities and their customers to revisit the use of distributed generation (DG) or distributed energy resources (DER) because the type of resource used to generate electricity varies, as it does in large power plants. Such DER include: solar photovoltaic, typically in the form of solar cells built into panels that absorb sunlight and convert it to electricity; cogeneration or combined heat and power, which uses natural gas-fired fuel cells, micro-turbines or reciprocating engines to turn generators, but then captures the excess heat generated for other uses such as water heating or air conditioning; small wind turbines; small hydropower or hydrokinetic technologies that do not need a dam to harness the power of moving water; waste-to-energy, which uses the methane gas released by decomposing human and animal waste to fuel microturbines; and the use of storage technologies, such as pumped storage, flywheels, or batteries. While still more expensive in most cases than traditional power plants, the use of these technologies to hedge against wholesale market volatility or to address environmental concerns can provide compelling reasons to spend the extra money. Public power utilities like Lakeland Electric must assess the availability, costs and benefits of DER technologies based on the characteristics and needs of the communities they serve.

In addition, and as discussed below in more detail, the ability to use communications devices to connect to parts of both the bulk transmission grid and the distribution grid/individual customers (known as "smart grid") is providing electric utilities of all kinds greater opportunities to "optimize" use of the grid. This includes use of such devices to align electric power supply with actual demand from individual customers, thereby enabling smarter use of energy conservation techniques. Deployment of these technologies can also enable utilities to understand where outages are occurring on a real-time basis, which can minimize outage duration and impacts, thus

improving reliability. At the same time, the use of such communications devices poses challenges related to customer privacy, data collection and security.

The Subcommittee has been active in exploring the cyber-security challenges faced by electric utilities. Those challenges are increased by the use of these smart grid technologies. Therefore, in addition to the greater efficiencies/benefits that can be gained over time through the use of smart grid technologies, public power utilities must assess the costs of deploying cyber-security measures and, where applicable, of complying with the regulations developed and enforced under the Federal Power Act Section 215 regime established in the Energy Policy Act of 2005 that apply to cyber-security as well as reliability. This "eyes wide open" approach is imperative when evaluating the deployment of innovative technologies so that policy makers and customers are not surprised by the associated security-related costs.

Use of Smart Grid Technologies

As public power utilities have undertaken assessments to deploy smart grid technologies, they have realized that they must assess the "core value" of such technologies, including the fiber-optic and wireless communications systems that will support items like advanced metering infrastructure (AMI, which encompasses both the smart meters and the infrastructure underpinning the meters), distributed automation and mobile data collection.

Many public power utilities throughout the country have deployed such technologies, and have seen benefits in the areas of: reduced truck rolls (how often utility employees have to drive to a remote location to assess damage, address a faulty meter reading, or terminate service); lowered costs of upgrading and adding new equipment because of the ability to monitor voltage and detect outages in near real-time, thereby enabling incremental investments rather than outright replacements of damaged infrastructure; and, empowered customers who can save energy and money on their bills. On the other hand, public power utilities have learned that customer concerns about privacy must be discussed with their communities in advance. In so doing, some public power utilities have chosen to allow customers to "opt out" of smart meter installations. Even in these circumstances, however, the vast majority of customers have chosen to deploy the smart meters.

In Lakeland, full deployment of AMI was achieved in February 2013. Lakeland was awarded a smart grid investment grant from the Department of Energy (DOE) in 2009 specifically for this purpose. Since the initial deployment, Lakeland has been working to add data management tools and processes to best leverage the new information we are receiving through the AMI technology. We have integrated information into our grid monitoring program, often referred to as SCADA (system control and data acquisition). Using new graphic-based tools, our system operators are able to spot problems on our circuits well before our customers notify us of outages, and more effectively determine the number of utility employees needed to remedy the problem. Another enhancement that this has allowed is our "integrated systems" team to automatically notify customers by text messages if their residences or businesses have power outages. This is an "opt in" program for our customers, and has been very well received by those who have chosen to take advantage of the service.

Other benefits of deployment of AMI include Lakeland Electric's ability to locate overloaded transformers, and even those transformers with wiring issues. Previously, we would have to wait

until a transformer had blown a fuse or failed in some way, but now we can assess the situation in advance and do repairs when most convenient and cost-effective. Other areas of improved service include: improved customer access to their own information via our web portal; lower rates of illegal meter tampering; and ability of our customer service representatives to remotely read a customer's meter to verify whether a meter reading is correct on request.

In addition to AMI devices deployed directly at our customers' homes and businesses, Lakeland has also deployed smart devices on our distribution and transmission systems over the last several years. These devices have provided a higher level of oversight to our system operators, who are in charge of grid integrity. One such device is a digital relay. Prior to these relays becoming commercially viable, we were not able to effectively capture events such as short circuits without using other, very expensive, recording equipment. Now, in one or two generations of upgrades to our system, we have the ability to see and record whatever information we deem necessary to enable us to troubleshoot more quickly and have access to data for R&D purposes.

Lakeland is leveraging its over 300 miles of fiber optic lines to start deploying equipment that can detect and isolate short circuit events in seconds. This is another evolution into the area of "self-healing" grids. Other utilities are at different stages of this evolution and are seeing great improvements in reliability for their customers.

Distributed Energy Resources

As discussed above, the deployment of a variety of distributed energy resources has been part of the electric utility landscape for decades. But as the economies of scale associated with large power plants and bulk transmission lines have diminished because of increased regulations, wholesale market failures, and environmental concerns, the cost-benefit calculation between DER and large-scale plants/transmission has changed. In addition, DER technologies such as solar photovoltaic (PV) have decreased in price in recent years, thus making their deployment more affordable in some areas of the country. While some of the price differentials are attributable to federal, state, and utility rate subsidies and other favorable policies, there have been substantial advances in technology that have brought prices down as well. The result has been an increased interest in deployment/use of such technologies, particularly rooftop solar.

Although Lakeland, as a municipal utility, is not obligated to do so, it has adopted the state of Florida's net metering rules and we are facilitating roof top solar projects at a moderate pace. Lakeland currently has over 100 customer-owned systems connected, with a capacity of over 415 kW (kilowatts) and a 2013 production rate of 587,000 kWh (kilowatt hours). Lakeland's current policy allows the consumption and generation to be netted out at the full retail rate. This, in many cases, provides the customer a "net-zero" or significantly reduced bill on an annual basis. Customers with roof top systems are also able to see their billing information via our updated web portal.

In addition to facilitating rooftop solar for residential customers, Lakeland has sought to deploy larger scale solar projects for commercial customers, and has partnered with SunEdison under a master agreement to build up to 24 MW (megawatts) of solar photovoltaic systems. The original thought was to offer this option to larger commercial facilities as a roof mounted option. While

the plan was favorably received, we actually had only one project mature to completion. For various reasons, building owners were reluctant to allow the roof space for this purpose. In true partnership fashion, Lakeland negotiated with SunEdison to alter the program to build larger ground mounted installations around our service area. To date we have installed about 5.5 MW and are looking forward to another 6 MW coming online in July 2015. By the end of 2016, we anticipate having a total solar generation output of over 20 MW. Using larger solar ground mounted systems will lower the originally negotiated energy rate charged by SunEdison by 10%-15%.

Over and above what Lakeland has undertaken, public power utilities have long been leaders in the area of distributed energy resources. In fact, the relatively small service territories of most public power utilities and their affiliation with local governments have made deployment of such technologies more feasible. For example, many public power utilities have long used the methane released from municipal landfills to power "landfill-gas-to-energy" projects. While not large enough in scale to provide significant amounts of generation, these projects have reduced methane emissions in a productive way for these communities.

Public power utilities must assess deployment of DER technologies based on their costs and benefits, as mentioned previously. This calculation can vary widely, not only from state to state, but from locality to locality. Fundamentally, these technologies are being deployed at the distribution level, which in both practical terms and from a legal standpoint, should be managed at the local and state levels. From a practical standpoint, the characteristics of an individual utility's distribution system are unique to that system. Just like all humans share common features, but have individual traits, so do individual distribution systems. Utility distribution systems vary by size, types of equipment, age of equipment, whether or not all or parts of the system are above ground or underground, what types of weather are common, what types of power generation are being used, what levels of voltage are being deployed, and whether or not smart grid technologies have been deployed, among other variables. This variability was acknowledged many years ago when the Federal Power Act was first enacted in the 1930s, and regulation of distribution systems was left to the states (in the case of the investor-owned utilities and some rural electric cooperatives) and localities (in the case of public power and some cooperative utilities).

Therefore, APPA and Lakeland Electric firmly believe that decisions about deployment of smart grid technologies and DER should be made at the local level (for public power systems) and state level for investor-owned utilities (and rural electric cooperatives, where applicable). For example, the net-metering option for rooftop solar for residential customers that Lakeland Electric has deployed, and that reimburses these customers at the retail rate for their solar generation, might not be the optimal approach in other communities.

The federal government can continue to provide/enhance crucial funding for research and development of these types of technologies, particularly storage. While the electric sector has its own R&D program through the Electric Power Research Institute (EPRI) and public power utilities have their own R&D grant program called Demonstration of Energy & Efficiency Development (DEED), more can be done to facilitate affordable commercial scale deployment of storage technologies, among others. The federal government can also review business practices

that may be leading to the provision of erroneous information to customers, including information provided by certain solar leasing companies related to the pay back on the leases, which are in turn being tied to unrealistically high assessments of annual electricity price increases. Access to good information that allows customers to make sound decisions without future regrets is our goal. Finally, the federal government can help to provide timely and actionable information related to cyber-security (as discussed below).

Big Data

Rapid advancements in smart grid deployment have resulted in enormous amounts of data that public power utilities are still assessing how to manage and apply to create more grid efficiencies. Contracting with third-party businesses to help us manage the data is an added cost in the short-term that also needs to be assessed as utilities deploy smart grid technologies. In addition, the cyber-security practices of those third party entities is a factor that must be considered.

Lakeland has considered various ways to manage this big data. We have contracts in place with third parties, and we have our own meter data management database, so we have undertaken the options that work best for us. Given the relatively new arrival of big data, finding and keeping employees with existing and adequate skill sets is an ongoing challenge for us. This issue may be addressed over time as educational institutions provide the appropriate training, but public power utilities, as units of local and state government, are limited in terms of salaries and other incentives that help us attract skilled workers such as those required for managing big data. This is another ongoing challenge for us.

In terms of allowing our customers access to the data we are collecting, Lakeland has enabled visualization tools through its web portal (mentioned earlier) for customers to access their own information. The tools have been formatted and are available for all types of smart devices, such as computers, tablets and smartphones with internet access capabilities. We will continue to enhance this customer experience as we get more feedback and as technologies allow. Our customers are quickly adopting modern methods for accessing their data and making other transactions. Electronic access methods account for over 40% of all of our customer interactions. As our applications mature, we anticipate this number increasing dramatically, although we do still have "real" people ready to answer phones at high performing answer rates.

In the past, Lakeland and other utilities would conduct analyses using strategically placed recording meters. Load research is a process used to analyze customer consumption patterns of various customer groups (residential, commercial and industrial), which contributes to assessing the utility's cost to serve each specific group. Using our AMI and data capturing capabilities, every metering point and smart grid enabled device potentially contributes to this research. Lakeland recently completed an examination of our cost of providing electric service using these new technologies. Besides addressing the need for additional revenue, we were able to design alternative rates from which customers can choose. Early adopters may be able to leverage our new residential demand rate to both help reduce our peak demand and save money in the process.

During the deployment of AMI, Lakeland posted a pilot "Shift to Save" rate. Shift to Save is a three tiered rate structure whereby the price increases during the time of day that the electric consumption is at its peak. Off-peak time period rates are very attractive and are intended to incentivize customers to shift their consumption from the peak periods. After reviewing this rate offering in the cost of service study, Lakeland decided to make it a permanent, non-mandatory offering. As we continue to mature in managing big data, we anticipate having on-line video guides to assist customers in selecting their most favorable pricing program based both on their consumption patterns and their ability to change their habits. These new rates are also offered in the commercial arena.

Public power utilities are increasingly faced with difficult decisions regarding revenue protection. Modern appliances are increasingly more energy efficient than previous models. Lakeland and other utilities are strongly encouraged to offer programs that actually facilitate lower sales, but we still have to maintain the same level of infrastructure and capital investments needed to keep our systems safe and reliable. While currently manageable, we are at, or approaching, the point of saturation. This is primarily a local and state level concern, but the ability to recover fixed costs must be considered when developing future energy efficiency, DER and other programs.

Cyber-Security

One of APPA's top priorities is the safety, security, and reliability of the U.S. electric grid. By protecting the facilities they own and operate and by following increasingly robust cyber- and physical-security protocols, public power utilities play an important role in the safety and reliability of the grid. APPA's commitment to safety and reliability is not unique in the electric sector—cooperatively and investor-owned electric utilities all share this commitment. That is why our industry collaborated on the mandatory reliability regime spelled out in the Energy Policy Act of 2005, and now incorporated in Section 215 of the Federal Power Act, as mentioned above.

As smart grid technologies are deployed on bulk transmission lines and on the operating systems (SCADA systems) of utilities that are part of the bulk power system, those utilities are subject to mandatory and enforceable reliability standards promulgated by the North American Electric Reliability Corporation (NERC) and approved by the Federal Energy Regulatory Commission (FERC). If utilities subject to the relevant "critical infrastructure protection" (CIP) standards that NERC sets and FERC approves are found to be in violation of such standards, they can be fined up to $1 million/day.

Many distribution utilities can have no material impact on the bulk power grid, and therefore are not subject to this federal regime. However, public power utilities that have deployed smart grid technologies at the distribution level are very cognizant of the cyber-security challenges associated with such deployment. Lakeland Electric has taken this as a business challenge and created an internal compliance program. Our program comes at an annual cost of over $1 million. Lakeland's strategy is to incorporate this culture into our utility as another way of doing business. Cyber based attacks, attempts and threats are all too common in the information age.

Lakeland is obviously taking this risk seriously and is working and collaborating at the state and federal levels to continuously improve our system's security.

One of the challenges public power utilities face in ensuring the cyber-security of smart meter technologies is that they must rely on the vendors of such technologies to guarantee the security of their products. Some of the concern stems from where these vendors are manufacturing or purchasing components of their products. Some vendors may purchase components from other countries, such as China, that are known adversaries when it comes to cyber-warfare. But if utilities are not aware of the potential vulnerabilities with such supply chain purchases, then we could also be vulnerable to attack or even penetration of our facilities. We believe that this issue bears additional scrutiny from this Subcommittee and full Committee, and APPA and Lakeland would welcome the opportunity to work with you on such potential initiatives as part of the energy infrastructure bill you are developing.

APPA believes one of the best ways to support these ongoing efforts and enhance security in the electric sector and across other critical infrastructure sectors is by improving information sharing between the federal government and such sectors, and vice versa. This will help at both levels of the electric system – bulk power and distribution. APPA supported the Cyber Intelligence Sharing and Protection Act (CISPA) bills that have passed the House in previous Congresses, and is reviewing the newly released draft of the Senate Cyber Information Sharing Act (CISA) bill, but expects to support it as well. APPA and Lakeland are heartened that Congress may be poised to pass such needed legislation in the near future.

As the grid evolves, unfortunately, so do threats to its integrity. Thus, APPA recognizes that new -- but narrowly crafted and limited -- authority may be necessary to fully address emergency threats. The threat of cyber attack is relatively new compared to long-known physical threats, but an attack with operational consequences could occur and cause disruptions in the flow of power if malicious actors are able to hack into data overlays used in some electric generation and transmission infrastructure. While APPA believes that the industry itself, with NERC, has made great strides in addressing cyber-security threats, vulnerabilities, and potential emergencies, we recognize that any true national emergency will warrant involvement from many federal entities.

Conclusion

Thank you for the opportunity to testify on behalf of APPA and Lakeland Electric. The opportunities afforded to electric utilities, including public power utilities, to use evolving technology to enhance operational efficiencies and improve reliability are myriad, and we are and will continue to work with our customers directly to evaluate the costs of benefits of doing so. We believe that one-size-fits all approaches would stymie the innovation and flexibility we are undertaking across the country and at Lakeland Electric, in particular, and hope that this Subcommittee would not entertain such initiatives as it develops its energy infrastructure bill.