STATE OF CONNECTICUTPUBLIC UTILITIES REGULATORY AUTHORITY

PURA INVESTIGATION INTO DISTRIBUTION SYSTEM PLANNING OF THE ELECTRIC DISTRIBUTION COMPANIES – AMI

Docket No. 17-12-03RE02

June 5, 2020

UTILIDATA, INC.

PRELIMINARY COMMENTS

Introduction

Utilidata is grateful for this opportunity to submit preliminary comments in response to the Public Utility Regulatory Authority's (Authority) *Notice of Requests for Program Design and Proposals for Advanced Metering Infrastructure (AMI).* We look forward to the opportunity to collaborate with the other parties and present a more detailed proposal on July 31.

Utilidata is a New England-based software company with over a decade of operational experience on the electric distribution grid. We work with utilities like National Grid and American Electric Power to optimize grid operations to make the grid more efficient and reliable. In this capacity, we currently have supervisory control over hundreds of distribution circuits across the country. Our most widely deployed solution, Volt/VAR optimization (VVO), has demonstrated 3-5% energy savings, an industry-leading standard. In recent years, Utilidata has focused our operational experience on grid-edge software that empowers AMI to reduce system costs and drive more value for customers. Utilidata is the market leader in meter-based software – we developed the first third party application for Itron's meter platform and are building the core operational intelligence software for Landis & Gyr's next generation meter.

Summary

The Authority's consideration of AMI will be a momentous decision for the future of the electric grid. The scale of an AMI investment is massive; AMI assets will last for decades; and the specific requirements, or lack thereof, will impact a range of other grid modernization investments. The key decision before the Authority is not just *whether* to approve investment in AMI, but what the AMI system should be *required* to do in both the near term and long term.

Over the last decade, most AMI proposals have promised benefits of reduced meter-reading costs, enhanced outage detection and shift demand via time-of-use (TOU) rates. We recognize the value of these benefits; however, while they may help satisfy a benefit-cost analysis, they do not begin to capture the full potential of an AMI rollout in 2020.

Virtually all stakeholders would agree that the grid is becoming more dynamic, and that much of that dynamism will be managed at the edge of the system, where supply meets demand, and where customers and their Distributed Energy Resources (DERs) meet the grid. AMI can, and should, be a foundational platform for managing this emerging complexity and driving more value for customers, but it will not happen unless regulators and utilities dig into the technical specifications, capabilities and outcomes we should expect from AMI beyond the traditional benefit categories that AMI business plans have relied upon for 15 years. Leaving the discussion of additional benefits for later will virtually ensure that AMI is underutilized; however, if stakeholders engage in this discussion now, AMI will be able to deliver benefits far beyond what is currently quantified in most AMI proposals.

Realizing these additional benefits need not be expensive nor require that the Authority imagine technology developments far in the future. To the contrary, new meters should come with a grid edge operating system for which the foundation has already been built. This system

would: process the hundreds of millions of data points captured by each AMI meter and distill them into actionable insights for customers and the grid; provide real-time system visibility to enable both planning and operations; detect anomalies that are the precursor to outages and other system failures, and enable localized optimization decisions that can empower everything from demand management to a self-islanding grid. These basic capabilities are essential to future-proofing an AMI investment, and cost-effectively ushering in the clean, distributed electric grid. Buying a laptop in 2020 without a modern operating system like Windows would be unthinkable, and so should buying AMI without a grid edge operating system.

The Potential Role of Meters in a Changing Electric Distribution Grid: The Grid-Edge Operating System

This docket, like the related grid modernization dockets, seeks to address the challenges and opportunities created by an electric system that is evolving from a centralized grid with one-way power flow to a decentralized grid with two-way power flow. The decisions Connecticut makes in these proceedings will impact how we adapt to these changes for decades to come.

Adequately preparing for these changes and capturing AMI's full potential requires a fundamental shift in how AMI is conceived. Utilities and the Authority must decide whether AMI will be a remote cash register with some additional benefits, or a powerful grid-edge sensor and distributed computing platform that is also a reliable billing tool. These distinctions matter, as they dictate the way AMI will be developed, procured, deployed and utilized. We have seen this dynamic in telecommunications, where viewing the smart phone as a mini-computer that could also make phone calls completely shifted its potential. Other industries illustrate cautionary tales of this dynamic, such as how the Electronic Medical Records system was

conceived of first as a billing platform, which has undermined its effectiveness as a tool for patient care.

To maximize the value of an AMI deployment and guard against an investment that will soon become obsolete, utilities and regulators should view AMI first and foremost as a powerful distributed computing platform that is essential to operating the complex, decentralized grid that is rapidly emerging. Despite broad acceptance of a changing grid, the vast majority of grid modernization and AMI proposals remain rooted in a traditional view of the electric distribution system. The traditional view is based on foundational assumptions about the operating conditions on the grid:

- Limited visibility – Little or no real-time data is available, and therefore operational decisions must be based on physical maps of the system and the assumption of worst-case operating conditions.
- One-way power flow based on centralized decision making – Operational decisions are made centrally and power flows from central generation to the customer.
- Command and control operations – Generation resources are fully visible and controllable.
- Predictable demand and grid-edge conditions – Electricity demand is predictable, and DERs do not exist in large quantities.

These assumptions have, appropriately, dictated how the grid is planned and operated, and how operational software platforms are built; however, the rise of DERs and variable utility-scale generation creates a new world for the distribution system, in which the system characteristics, particularly at the grid-edge, are the opposite of those we are accustomed to:

- Robust real-time data all the way to the grid edge is now available, enabling complete, real-time system visibility.
- Power flows both ways and often with rapid change in direction.
- DERs and customer demand must be engaged to maintain reliability and keep system costs low in the face of high penetrations of variable resources. Yet DERs and demand usually cannot be directly controlled by the utility, and instead, the system must learn, predict, respond to, and influence their behavior.
- There is exponential complexity at the grid edge. As we continue to electrify end uses, particularly transportation, the number of large, unpredictable and/or mobile electric loads will have massive systemic impacts.
- The system faces new reliability and resiliency challenges in the form of stronger and more frequent storms and fires, which can be confronted, in part, by utilizing local islanding capabilities.

These system conditions at the grid-edge require an operating system built with a different foundation, capable of managing immense amounts of data and complexity in real time. This grid-edge platform need not replace legacy centralized operating systems, but it should complement and communicate with those systems. Implemented properly, it will help avoid a tremendous amount of future costs that are driven by applying the wrong operating principles to the grid edge, including both unnecessary hardware upgrades and software systems, such as a dedicated DERMS platform.

Outcomes, Capabilities and Technical Requirements

Realizing the full potential of AMI will require that regulators go beyond scrutinizing the benefit-cost analysis submitted by utilities and engage in a proactive discussion about additional required outcomes for customers and the grid; the capabilities necessary to drive those outcomes; and the technical requirements required to enable those capabilities.

Fully-enabled AMI is capable of driving a range of impactful outcomes, such as defined commitments to:

- Deliver 3-5% direct customer savings via rolling out voltage optimization, including meter-based voltage optimization software, in conjunction with meters;
- Enable flexible demand by using the meter to communicate TOU rates and more complex load management signals to service providers, devices and customers;
- Achieve quicker and lower-cost distributed resource interconnection decisions based on real-time grid-edge data;
- Reduce future distribution system capital costs with improved system modeling and grid optimization, and tools that increase transparency for regulators;
- Reduce outages and system O&M via anomaly detection that identifies pre-fault conditions and security breaches;
- Increase resiliency by leveraging localized optimization logic to enable system islanding.

Delivering such outcomes requires that meters are deployed with basic software capabilities:

- **Visibility and Awareness**: AMI should enable full operational visibility with a real-time power flow model that includes the secondary system and can accurately map system topology and reconfiguration. Specific requirements could include:
    - Mapping meters to feeders, meters to phase, and meters to secondary transformer with 95%+ accuracy, and updating that mapping based on changes to grid operating conditions;
    - Forecasting demand and voltage at primary and secondary nodes, as well as at each meter, with 95%+ accuracy; and
    - Monitoring power quality, frequency and other grid conditions based on real-time signal processing, with >95% of events analyzed within a second of occurrence.

- **Optimize Power Flow and DERs**: AMI should have the capability to distill locational operational value over time; communicate that locational value to devices, service providers and customers (starting with basic TOU rates); and inform both grid and DER optimization schemes. This could include requiring distributed algorithms that can identify and value various loads, storage and generation behind-the-meter, and leverage meter-to-meter communication to determine local needs and optimize power flow in service of lowest-cost grid operations and maintaining service during a system outage.
- **Anomaly Detection:** AMI should enable the predictive detection of anomalies on the distribution system to improve resilience to power outages, fire hazards or security breaches. This could include the analysis of high-resolution waveform data at the meter, combined with comparisons of measurements across meters and other circuit elements, to yield identification and triangulation of short-circuit, open-circuit, and high-impedance faults.

Technical meter requirements are very closely related to these capabilities. Meters must have adequate data capture, computational power and communications capabilities to enable these functions.

In the past, regulatory commissions have concluded that additional outcomes can be determined at a later date, but the intended uses of an asset determine how it will be procured and deployed. Given that AMI is designed to last 20 years, the initial regulatory deliberation must include extensive discussion about how it will meet customer and system needs as the grid evolves. Moreover, requiring open access to data is an important regulatory goal that many commissions are tackling, but that is not a replacement for a discussion about what data and insights AMI should capture and make available to the utility and/or third parties. Each modern smart meter captures well over 25 million data points per month. It is neither possible nor necessary to utilize all of that data in real time. Basic software applications on the meter can analyze all that data, identify insights, and serve up those insights in real time, thereby enabling access to *actionable* information that will likely not be possible otherwise.

Conclusion

A successful AMI rollout requires collaboration among regulators, utilities, meter companies, software companies, and the wide range of consumer and other stakeholder groups. Utilidata prides itself on successful collaboration with all of these parties, and we greatly appreciate that the Authority has established a process so conducive to fostering that cooperation.

We believe such discussions are best focused on delivering outcomes customers want, and associated performance metrics that regulators can measure. When it comes to electricity,

customers have made their desires clear – they want it to be affordable and reliable. If those requirements are met, they'd also like it clean. And as new products emerge and mature – like solar panels, electric vehicles, smart thermostats or batteries – that can save them money, give them more control, reduce their environmental impact and give them a better customer experience, they want to be able to buy and use those things, cheaply and easily.

Executed correctly, AMI can greatly improve these outcomes for customers. We encourage regulators to broaden the focus of AMI deliberations by pressing stakeholders to answer questions about how AMI can deliver even more customer benefits:

- Will this large investment in grid-edge computing help us avoid future system costs that we would otherwise ask customers to pay for?
- Can we directly save customers money, even without them needing to more deeply engage in energy management or commit meaningful out-of-pocket expenses to efficiency upgrades?
- How will new meters make it faster, cheaper and easier for customers to buy DERs?
- How can new meters help customers easily manage TOU rates, and allow a smooth transition to more complex price signals that the system will demand, which can be sent directly to devices, sparing the customer from having to respond to complex rates?
- Can the meter be used not just to know when the power is out, but to keep power on in the first place by detecting faults before they happen?
- How can the meter support system resiliency, laying the groundwork for customers to maintain service even in the face of increasing floods, storms and fires?

Utilidata believes the answers to all of these questions should be positive. There are not technical barriers to achieving these goals. New AMI meters can be deployed with robust data capture, computing power and communications capabilities. The core elements of a grid edge operating system have already been developed by Utilidata and other software developers. Forward-looking utilities share this vision for a fully-enabled smart meter, but are looking for guidance from regulators that they should pursue this path, as it is not the path traditionally taken with AMI deployments. We have a great opportunity in front of us, but it must be seized at the point of AMI approval.

The AMI decision that will soon be in front of the Authority, like many other public utility commissions throughout the country, is a fork-in-the-road decision. Failure to engage in a proactive discussion about the additional benefits AMI should drive, and the software capabilities and technical specs necessary to deliver those benefits, will lead to underutilized assets that will cost us significant time and money on the path to modernize the grid. The experience of the first wave of AMI rollouts validates concerns about not realizing unspecified future benefits, and we applaud the Authority for initiating this discussion. This proceeding can inform regulators about reasonable, forward-looking AMI requirements that will ensure that Connecticut makes an investment that creates great value for customers, unlocks DER growth and associated job creation, and serves as a foundation for effectively operating the modern, clean electric grid.

Respectfully submitted,

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