STATE OF NEW JERSEY BOARD OF PUBLIC UTILITIES

ADVANCED METERING INFRASTRUCTURE (AMI) WORKING SESSION	Docket No. EO20110716 December 7, 2020

UTILIDATA, INC.
AMI WORKING SESSION COMMENTS

I. Introduction

Utilidata is grateful for the opportunity to provide feedback to the New Jersey Board of Public Utilities (Board) regarding how advanced metering infrastructure (AMI), when designed correctly, is a crucial investment for achieving the goals of New Jersey's Energy Master Plan (EMP). We applaud the Board for taking a proactive approach to soliciting feedback from a wide variety of stakeholders and appreciate being offered an opportunity to present at the recent AMI Work Session.

Utilidata is a 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, integrate clean energy, 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.

Based on our experience, we know that if executed correctly, AMI can be an essential computation and communications platform for a modern and decarbonized grid; however, for AMI to reach its full potential, key capabilities and outcomes must be established in the initial approval order.

II. Summary

The Board's consideration of AMI will have a significant impact on customers, not only through the rate increases to pay for infrastructure upgrades, but in the State's ability to cost-effectively and equitably meet the strategies and goals outlined in the EMP. 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 Board, therefore, is not just *whether* to approve investments in AMI, but determining *what* AMI should be required to achieve in both the near-term and long-term.

Over the last decade, most AMI proposals across the country have been built around the benefits of reduced meter-reading costs, enhanced outage detection, and lowered peak demand via time-of-use (TOU) rates. We recognize the value of these benefits; however, while they may help satisfy a benefit-cost analysis, alone they reflect an outdated approach to utilizing AMI that does not capture the full potential of modern AMI capabilities.

While it was encouraging to hear panelists at the AMI Working Session agree on the potential of AMI, we aim to ensure that AMI is maximized as a tool for operating a modern and decarbonized grid, not just for customer engagement. Executed correctly, AMI can be an essential computational and communications platform to manage the increasingly dynamic nature of the grid. Realizing these additional benefits does not need to be expensive nor require the Board to imagine technology developments far in the future. The latest generation of smart meters can provide the capabilities we need today, so long as the AMI deployment is planned properly and meters are equipped with the necessary grid-edge computing.

Next-generation AMI with on-meter grid-edge computing (AMI 2.0) can:

- Process the hundreds of millions of data points captured by AMI and distill them into immediate, actionable insights for customers and the grid;
- Provide real-time system visibility to inform both planning and operations;
- Detect anomalies that are the precursors to outages and other system failures; and
- Enable localized optimization that can empower everything from demand management to self-islanding grids.

An AMI 2.0 system is essential to future-proofing an AMI investment and cost-effectively achieving the goals of the EMP. The initial order approving AMI roll-outs is the time to set requirements for the capabilities AMI must have and the outcomes it must enable. Leaving the discussion of additional benefits for later will lead to a procurement process that does not factor in future use cases; therefore, AMI will quickly become outdated, prematurely becoming a stranded asset unable to deliver key EMP benefits. However, if stakeholders engage in this discussion now, and the Board specifies the requirements it expects from AMI, this investment will deliver clean energy benefits far beyond what is currently quantified in the proposals before the Board.

Accordingly, Utilidata recommends that the Board establish minimum AMI system requirements that exceed those described in conventional AMI proposals to ensure New Jersey customers get appropriate value from this investment. Below we provide our insights into the key capabilities and outcomes that should be considered in an authorizing order, as well as recent actions other jurisdictions have taken to maximize the value of AMI.

III. Leveraging AMI as a Foundational Platform to Achieve Clean Energy Objectives

Across New Jersey, in the service territories of Public Service Electric & Gas (PSE&G), Jersey Central Power & Light (JCP&L), and Atlantic City Electric (ACE), the distribution grid is becoming more dynamic, due in large part to the growth of distributed energy resources (DERs) and transportation electrification. Moreover, the rapid scaling of wholesale renewables will require engaging flexible demand, starting with TOU rates and quickly evolving to much more dynamic load control.

This dynamism poses new challenges and opportunities for managing the electric grid, much of which will need to be addressed at the edge of the system, where supply meets demand, and where the grid meets customers and their DERs. Grid-edge visibility and control are necessary to manage the emerging complexity of a modern, decarbonized grid. The lack of grid-edge visibility and control is a driving factor for many problems today, including slow interconnection times for DERs, low hosting capacity, and a lack of flexible demand or grid services. As New Jersey executes its EMP and there is an exponential increase in renewable energy, DERs, and electric transportation, those problems will become even more substantial, and could lead to reliability issues, moratoriums on solar and electric vehicles, and drastic increases in grid costs.

AMI with grid-edge computing is uniquely positioned to be the foundational platform for managing this emerging complexity at the grid-edge and driving more value for customers. Each meter records about 25 million data points per month, including demand, voltage, power flow, and DER operational characteristics. With on-meter computing, that data can be analyzed to determine grid-edge conditions at any customer location, operate the grid more efficiently, and enable the grid and DERs to seamlessly communicate and coordinate operations.

The kind of distributed, on-meter grid-edge computing that is possible with next-generation AMI enables far more granular, accurate, and real-time planning and operational insights than existing centralized systems.

IV. Lessons Learned from Past AMI Deployments

The business cases for the first wave of AMI deployments (AMI 1.0) were built almost entirely on meter-to-cash functionality and basic outage management. While many utilities described and promised additional grid and customer use cases in their proposals, they did not include commitments to achieve those use cases, nor did regulators set clear expectations for those future use cases.

As a result, most utilities designed and procured AMI rollouts only around the capabilities and use cases that were committed to in the benefit-cost analysis, not around future use cases. Therefore, AMI 1.0 systems were often unable to support future use cases, leaving tremendous value untapped.

For example, most utilities did not design AMI 1.0 rollouts with the use case of voltage optimization in mind. Utilidata has worked with many such utilities seeking to pursue AMI-enabled voltage optimization that find their deployed AMI systems lack necessary capabilities to execute that use case, including: the ability to capture the right voltage data; the ability to host on-meter software to generate voltage insights locally; and the communications bandwidth to efficiently update on-meter software and/or transmit useful voltage data back to central systems in a timely manner.

AMI 1.0 deployments have shown that without clear requirements, AMI systems will be designed and procured with a limited scope, greatly increasing the chance that the investment will not be future-proof or maximize customer benefits. Given that the next decade is expected to be a period of unprecedented grid transformation, the risks of failing to plan for the future are greater than they've ever been.

V. Unlocking the Full Potential of AMI 2.0 for Grid-Edge Visibility and Control

The success of AMI is heavily dependent on an authorizing regulatory order that sets clear expectations and requirements for what AMI will deliver, including specific capabilities and outcomes. Regulators should establish what minimum capabilities are required for any procured AMI hardware, software, and communications network to support near-term and future use cases. For example, PSE&G has proposed 70 use cases covering a broad range of clean energy outcomes but has not specified the supporting capabilities.

Regulators should also establish what clean energy outcomes or use cases are expected to be enabled by AMI in the short- and long-term, and require utilities to develop a corresponding implementation plan including a prioritized list of use cases and clear timeline for executing use cases. Leaving the discussion of future use cases for later will make it likely that procured AMI capabilities will not support those use cases, and thus quickly exceed its useful life and prematurely become a stranded asset that fails to deliver key EMP benefits.

The following five grid-edge computing capabilities should be required to ensure that the AMI system can deliver its full potential:

1. **Real-time data insights:** Real-time, on-meter calculations are essential for transforming billions of data points into actionable grid-edge insights. Such grid-edge calculations are also critical for enabling market operations for DERs. The utility should be required to demonstrate the ability to conduct real-time, on-meter processing of voltage and power quality data. Insights derived from this capability should be used to achieve a minimum incremental customer savings from voltage optimization over existing programs in the range of 1% of total energy, increasing to 2% as utilities gain experience leveraging AMI data for system optimization.

2. **System visibility to the grid-edge:** AMI should enable real-time power flow mapping all the way to the meter. The utility must develop plans to use this system visibility to improve grid planning, operations and interconnection requests, and the system modeling must meet the following minimum standards:
    a. Mapping meters to feeders, meters to phase, and meters to secondary transformers with >95% accuracy, and updating that mapping in real-time based on grid operating conditions;
    b. Forecasting demand and voltage at primary and secondary nodes, and each meter, with >95% accuracy; and
    c. Monitoring power quality, frequency and other grid conditions based on real-time signal processing with >95% accuracy.

3. **Price signaling:** AMI should be able to translate TOU rates and other locational operational values into simplified signals that can be locally communicated to devices in the home, service providers and/or customers. The utility should be required to

demonstrate that its AMI has these capabilities, and utilities must develop programs to utilize these capabilities.

4. **Local optimization:** AMI should be deployed with distributed algorithms that can identify the value of 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. The utility should be required to submit a plan to leverage these local optimization capabilities to:
   a. Decrease the cost and increase the value of DER integration, including mechanisms to aggregate DER to provide distribution-level and wholesale market services; and
   b. Enhance system resiliency, working collaboratively with hospitals and other critical infrastructure owners.

5. **Anomaly detection:** AMI should enable the detection of anomalies on the distribution system to prevent 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. The utility must develop pilot projects to leverage these capabilities to reduce outage rates, with plans to scale such projects where appropriate.

The grid-edge computing capabilities described above are essential to achieving a number of high-value outcomes, many of which are reflected in the Release 1 and future release use cases identified by PSE&G:

1. **Grid planning and reliability modeling:** AMI with grid-edge computing allows visibility and control to the very edge of the distribution system. Real-time grid-edge data enables the creation of a "digital twin," or a fully data-driven power flow model to the edge of the system, allowing much more precise topographical and temporal distribution system planning. Planning based only on probabilistic forecasts using physical models that stop at the end of the primary and do not reach the secondary system will quickly become insufficient for a dynamic grid with meaningful penetration of electric vehicles and other DERs. The grid-edge computing capabilities that enable grid planning and reliability modeling will be necessary to meet at least two of PSE&G's Release 1 use cases (Network Connectivity Analysis and Load Profiling and Forecasting) and future use cases, such as PV/DER Output Forecasting.

2. **Interconnection and hosting capacity:** AMI with grid-edge computing provides real-time system visibility and controls that can greatly increase the distribution system's hosting capacity and reduce the complexity and length of interconnection studies, reducing the cost and timeline for renewable energy interconnection. Using grid-edge computing capabilities in this way will be necessary to meet at least one Release 1 use case (Customer DER/PV/EV) and future use cases, such as Advanced DER Planning & Management.

3. **Voltage optimization:** AMI with grid-edge computing can provide real-time, distributed voltage control to improve system efficiency and support increasing amounts of DERs. Using grid-edge computing capabilities in this way will be necessary to meet at least one Release 1 use case (Voltage Monitoring & Analysis) and future use cases, such as Volt/VAR Optimization & Control.

4. **Distribution system operations:** AMI with grid-edge computing can provide the visibility and control needed to make distribution system operations more precise and efficient, and therefore less costly to consumers. Using grid-edge computing capabilities in this way will be necessary to meet at least two Release 1 use cases (Outage Detection & Analysis; Asset Load/Phase Management, Balancing & Power Analysis) and future use cases, such as Load Control, Adjustment, Optimization & Contingency.

5. **Resiliency:** AMI with grid-edge computing can predict and identify voltage anomalies in the distribution system and highlight them as areas for maintenance. At the same time, on-the-meter computation and communication with the grid and behind-the-meter devices can enable local power flow resiliency, including greatly expanded islanding capabilities. Using grid-edge computing capabilities in this way will be necessary to meet future use cases such as Microgrids and Automated Fault Isolation & Restoration (FLISR) - Self Healing.

6. **DER optimization and management:** AMI with grid-edge computing can act as a real-time management system of a DER-heavy distribution grid, reducing wear and tear on the system and replacing hundreds of millions of dollars of grid investments, while enabling DERs to respond to dynamic rate signals and provide valuable services such as fast frequency response, and wholesale and retail-level demand response. Using grid-edge computing capabilities in this way will be necessary to meet future use cases such as Battery Aggregation & Control and DER Operations & Control.

Once the necessary capabilities and desired outcomes for AMI have been established, the Board should engage utilities and other stakeholders to help the Board establish metrics that can be used to evaluate the achievement of those outcomes.

V. Examples of Regulatory Actions that Help Unlock the Full Potential of AMI 2.0

Recent AMI developments in other jurisdictions can inform the Board's consideration of methods to ensure that AMI investments deliver appropriate benefits for customers.

On November 20, 2020, the New York Public Service Commission issued an order authorizing an AMI deployment for National Grid. The order identifies grid-edge computing as a core AMI capability, and requires that within 60 days of approval National Grid shall develop a benefit implementation plan, explaining in detail how it would pursue future use cases to ensure the AMI investment is able to deliver a wide range of future benefits to customers.

The order states:

> *The Benefit Implementation Plan shall include: (1) a description of the quantified and unquantified benefits that AMI can enable; (2) a prioritized list of the quantified and unquantified benefits that the Company intends to pursue, together with specific implementation action steps and schedules with specific interim milestones……The phrase "quantified and unquantified benefits that AMI can enable" includes: all quantified benefits identified in the October 2020 Updated BCA; all benefits that the Company identified in its AMI Business Case and other related and subsequent filings that may be unquantifiable or not yet quantified by the Company, including but not limited to, grid-edge computing capabilities, value-added access to useful data for customers and distributed energy resource providers, and other benefits that the Company can identify prior to the deadline for filing the Benefit Implementation Plan.*

A benefit implementation plan is an effective way to set clear expectations for outcomes and metrics, and to ensure that utility delivers as much value from AMI as possible.

On May 6, 2020, the Connecticut Public Utilities Regulatory Authority (PURA), initiated a proceeding to proactively solicit proposals from a range of stakeholders regarding how AMI can be used to drive clean energy outcomes. In addition to receiving draft proposals from the utilities, the Authority received input from other experts, including Utilidata, regarding the necessary requirements for AMI. On November 13, 2020, the Authority issued a request for supplemental information to ensure that the utilities' proposed AMI business cases adequately capture all relevant costs and benefits, and ensure that the utilities' proposed AMI implementation plans are sufficient to realize those benefits. It is expected that at the end of this process, the Authority will issue an order that establishes guidelines and parameters for how the utilities should develop their final AMI proposals. This process not only ensures the Authority receives technical and market input from a range of stakeholders, but also ensures a consistent statewide approach across several utilities for leveraging AMI to meet statewide clean energy goals.

VI. Conclusion

Collectively, New Jersey's utilities are seeking to invest nearly $1.5 billion in AMI that will last for 20 years. In that time, the state is also expecting to decarbonize and modernize its energy system, electrify its transportation sector, maximize energy efficiency, and expand the clean energy innovation economy. Executed correctly with grid-edge computing, AMI could be the technical foundation for achieving all of those outcomes. However, if executed incorrectly AMI will quickly become a stranded asset.

The Board is approaching a critical moment for the future of AMI. An initial order approval can set clear expectations for AMI capabilities and outcomes, which will influence a wide range of subsequent technical and commercial decisions. Any approval of AMI expenditures should be conditioned on compliance filings that demonstrate achievement of the capabilities and outcomes described in the authorizing order. Without specifying these requirements, a conventional AMI procurement runs the risk of repeating the AMI 1.0 experience of many jurisdictions and yielding an underutilized investment that delivers improved meter-to-cash functionality, but little else.

AMI with grid-edge computing has tremendous potential to help New Jersey achieve its clean energy and environmental objectives. We appreciate the opportunity to provide our input and expertise as the Board and all stakeholders work to realize this vision for New Jersey.