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DEFINING A PRACTICAL AND RESPONSIBLE PATH TO AMI 2.0

Starting in the mid-2000s, many electric utilities deployed Advanced Metering Infrastructure (AMI) solutions to modernize metering, expand access to critical grid-based data elements, reduce operational costs and improve customer service. These solutions consisted of solid-state electricity meters, an extensive field area network, headend management software, integration into utility enterprise software systems, substantive business process change and customer engagement initiatives. Over the last 20 years, these AMI systems have delivered and continue to deliver significant value to the utilities that deployed them.

Recently, the electric utility industry has started undergoing a "once-in-a-generation" structural shift, moving away from a decade of stagnant energy load growth toward a period of rapid expansion driven by massive artificial intelligence (AI) data center development and the electrification of transportation and heating. This evolution is characterized by a "new normal" that prioritizes balancing this unprecedented demand with grid reliability, affordability and a transition to cleaner, lower cost energy sources. Utilities must meet these challenges with aging infrastructure that needs to be more resilient to regional environmental risks like winter storms and wildfires.

In the face of these challenges, utilities recognize the need to quickly adapt and evolve. Newer technologies offer paths to address the challenges described above cost effectively, flexibly and with a faster time to value. However, the simultaneous need to update generation, transmission and distribution infrastructure and to address rapid demand growth have created a “target rich” environment from a capital investment perspective – all at a time when the public and economic regulators are justifiably concerned about energy affordability. Within this environment, the prospect of utilities investing substantial capital in the refresh of AMI systems with no clear new benefit to

the consumer, through new high value services and cost savings, is a deeply challenging one.

Drilling in a little more closely, utilities with AMI systems have built billing and other critical business processes around these solutions. Tearing them down as part of a replacement could be detrimental to day-to-day operations. Furthermore, AMI assets have not had a chance to live their full 20-year life in the field. Taken together, economic regulators sensitive to consumer affordability concerns, are not anxious to approve new capital programs to fund such replacement initiatives — not without clearly defined new benefits for consumers. The original AMI 1.0 rate case pillars of reduced revenue meter reading and service switching costs have already been realized. As a result, utilities are struggling to define a compelling business case for an AMI solution refresh, even though many of those systems will be coming to the end of their useful life within the next several years.

Why AMI 2.0?

AMI 2.0 solutions available today deliver a flexible platform for grid modernization. AMI 2.0 meters are extremely effective grid sensors able to proactively identify emerging faults on the distribution network and to enable utilities to dispatch load and generation behind the meter.These more advanced meters continue to provide the functionality that serves a utility's core AMI 1.0 business needs, but the following incremental technology innovations provide new and exciting capabilities to solve today's challenges:

- Increased processing power at the edge of the low voltage network
- Unleashing that processing power on the high granularity, sub-second data in the meter
- Peer-to-peer communication for location determination and early fault detection
- Autonomous decision-making and action at the edge to enable real-time grid adjustments.

Of greatest value, meters are situated at the very edge of the grid, providing utilities with operational control at a level of their network previously invisible to them. This approach unlocks compelling benefits without the latency and cost involved with pulling all this high granularity data into the back office.

Next generation smart metering infrastructure must play a central role in addressing the resiliency, reliability and demand capacity challenges noted above. AMI 2.0 solutions must create value for consumers by proactively preventing disruption and outages, enable meaningful engagement of consumer-owned energy assets, and be at least partially funded by utility grid reliability capital budgets to enable utilities to upgrade mission critical AMI infrastructure at a cost that is fair to consumers.

Defining a Practical and Responsible AMI 2.0 Transition Path

An AMI transition raises critical questions:

- How do we move forward without discarding millions of dollars of unamortized, mission-critical infrastructure?
- How do I move from an AMI 1.0 solution to AMI 2.0 without disrupting my existing billing processes that are dependent on AMI 1.0 data?
- How can I leverage my existing assets and integration to facilitate a transition?
- Can we transition in a phased fashion that avoids another big-bang deployment yet still derives new value from incremental components along the way?

Addressing these questions requires strict adherence to two key tenets:

1) The cost and risk of a transition from a first generation to next generation technology must be managed extremely carefully to avoid operational disruption and eliminate "double dip" costs to the consumer of overlapping solution investments
2) Next-generation AMI solutions must deliver substantial value beyond their legacy "meter-to-cash" benefits.

As utilities transition to next generation AMI solutions, they should seek paths that avoid transitional pain-points and progress at a measured pace, one that fits their business needs and transition comfort level.

Some AMI 2.0 strategies jump straight to a wholesale "rip and replace" of the existing AMI solution. A hard switch may appear to promise a clean slate, but that approach comes with challenges and additional costs of its own. A wholesale change of solutions would likely require a full rebuilding of all upstream integrations that connect the AMI data with a utility's back-office systems. Doing so would require millions of dollars to get the business back to an "as-is" state with a new solution. In addition, utility operations teams typically have several years' worth of built-in expertise supporting the existing solution. It's important to consider how to best leverage that risk-mitigating expertise as part of a transition to new technology.

Utilities are encouraged to work with their existing solution vendors to extend the life of their AMI 1.0 investment and build a non-disruptive, least-cost path to the next generation of solutions. This can be achieved in a few ways:

- Leverage existing solution hardware where possible — This could be with electric meters or with network-enabled take-out points. While this may not be possible on older hardware that does not have the computing power or resources to handle more advanced grid modernization use cases, more recently deployed assets could potentially be upgraded over-the-air via a firmware upgrade.
- Reuse integration wherever possible – Integration Application Programming Interfaces (APIs) are either based on recognized industry standards (e.g., CIM, MultiSpeak) or vendor-proprietary. In either case, the solution vendor should either continue to support the standards, provide out-of-box adapters for their proprietary APIs to transition to the new solution, or continue to maintain the proprietary APIs within the context of the AMI 2.0 solution. No matter the path, utilities should not be forced to rewrite all of their back-office integration.
- Strategic deployment of new technology – AMI 2.0 solutions should be evaluated to ensure they can provide more advanced, grid modernization value from day one, without the need to have them ubiquitously deployed throughout the service territory. For instance, if a utility has one advanced meter under a transformer, can that single endpoint provide advanced capabilities on behalf of the other less advanced endpoints around it? Can it act as an advanced bellwether meter? If yes, then such an approach can help justify a pivot and can help allow a slower, more measured roll out.

- Transitioning annual maintenance spend to new technology — Every utility with an AMI 1.0 solution reserves a certain amount of budget annually to account for natural service territory expansion and devices that need to be replaced. By applying a more gradual, measured rollout approach, a utility could pivot this annual spend to newer AMI 2.0 technology and slowly transition to a newer solution over time.
- Component interoperability and solution flexibility to empower a utility — AMI 2.0 is not a destination, but rather it is a platform for continuous grid evolution. Future AMI solutions should be evaluated in their capacity to support the interoperability needed to support that evolution. Vendors that embrace interoperability and mature standards put utilities in a better position moving forward when it comes to evolving their AMI system in the future. These standards should be applied at all levels of the solution including the meter (e.g., DLMS COSEM with Generic Companion Profile (GCP)), network (e.g., 3GPP, IPV6, IEEE 802.15, Wi-SUN), Home Area Network (e.g., 2030.5, MATTER, headend software (universal headend applications that support multiple commodities, multiple vendors and multiple network types), and grid edge intelligence (e.g., GEISA).

For utilities with AMI 1.0 solutions, the question is no longer whether to modernize but how to ensure that modernization minimizes operational risk, creates new value and avoids undue cost to the consumer. By applying these principles and working closely with their solution vendor, utilities can move forward with confidence and define their own practical and responsible path to AMI 2.0 in a way that leverages previous investments; reduces risk, cost and complexity; and provides faster access to grid modernization benefits.

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