

AMI 2.0 Delivered: Transform Utility Operations and Customer Engagement

Real-time data and analytics enable proactive decisions from network operations to the grid edge

WHITE PAPER



Utilities today have some tough choices to make. In the early 2000s, companies began installing the first wave of advanced metering infrastructure (AMI). With a typical life span of approximately 20 years, many of these assets are approaching their “end-of-life” cycle, meaning utilities must modernize or risk service disruption. Indeed, smart metering is expected to go from [152.4 million in 2024 to a total of 180.9 million in 2030](#), with growth expected to reach about 91% penetration in North America by 2030. Combine that with estimates of U.S. electricity demand expected to grow [25% by 2030 and 78% by 2050](#) from 2023 levels, and you have a perfect storm. For utilities, it begs the question: How do you upgrade or install infrastructure to meet ever-increasing demand now and into the future?

The next wave of AMI, referred to as AMI 2.0, offers hope. Implementing AMI 2.0 provides the perfect innovation platform to transform utility operations and customer engagement using real-time data and analytics. AMI 2.0 leverages each meter as a grid-edge data hub that collects, stores and sends information. It delivers bi-directional data exchange on everything from voltage waveforms to appliance-level consumption.

This capability offers tremendous benefits, from faster outage response to optimized grid reliability and innovative customer services. The key to effectively deploying an enterprise AMI 2.0 solution involves knowing the challenges involved and how to overcome them, the data-driven insights and use cases available, combined with proper steps to begin implementation. With that understanding in place, utilities will have an AMI roadmap for success that improves service reliability and performance, while providing additional insights for solving the market’s most pressing demands, like capacity.



What Makes AMI 2.0 Different?

AMI 2.0 marks a significant surge in both capabilities and applications from its AMI 1.0 predecessor. Utilities transition from simple data collectors to scalable, agile and proactive decision makers, making smart, fast and accurate choices that create value for the organization and consumers.

First deployed widely in the early 2000s, AMI 1.0 systems automated monthly meter readings and billing functions, with one-way communication sending data from the meter back to the office. A boon over previous manual processes, still, many utilities investing in the infrastructure were disappointed in the granularity and frequency of data received from each device. And the overall benefits typically fell short as well. Indeed, according to one survey, [only 3%](#) of advanced meters supported by the 2009 stimulus bill brought customer savings.

Today, AMI 1.0 faces obsolescence with hardware life expectancy ending and overall capabilities falling short of today's needs, particularly data-driven services which handle the ever-increasing responsibilities and complexities of modern utility organizations.

What does this mean? Basic meter reading and periodic data capture fall short of managing today's grid operations, integrating renewable energy or supporting evolving customer demands for faster, more personalized services.

In contrast, AMI 2.0 brings a new class of smart meters that double as edge computing devices capable of bi-directional, real-time data exchange. These meters are built with advanced sensors that collect data on voltage quality, current waveforms, consumption patterns at the device or appliance level and even identify operational anomalies. AMI 2.0 systems leverage high-speed, secure cellular or private LTE networks for robust connectivity, supporting both utility and consumer access to timely insights. With this intelligence, utilities can consume data and make intelligent proactive decisions as well as provide customers greater detail into their own consumption patterns.

Differences Between AMI 2.0 and AMI 1.0

Data Frequency and Resolution

AMI 2.0 meters transmit data at intervals measured in seconds or minutes, versus hours or days. Utilities see consumption spikes, voltage anomalies or outages as they occur.

Bi-directional Communication

AMI 1.0 sent basic meter reading data one way for billing. AMI 2.0 supplies continuous, real-time data exchange. AMI 2.0 meters receive real-time utility commands, support remote disconnect/connect and enable demand response sequencing.

Edge Analytics

AMI 2.0 meters can host local applications that identify energy theft, send alerts to customers and automatically balance loads during peak events.

DER Integration

Modern AMI solutions help coordinate rooftop solar, batteries, electric vehicles and renewables. AMI 2.0 supplies precise net metering and local power quality management.

System Integration and Flexibility

AMI 2.0 solutions integrate seamlessly with enterprise systems and energy management platforms, connecting data for more comprehensive analysis and shared understanding.

The Road to AMI 2.0 Transformation

While the path to AMI 2.0 leads to unmatched advantages for modern utilities, obstacles do exist. Large utilities must do their due diligence up front, know the right questions to ask before the proverbial pen sets to paper and plan strategically to overcome technical, operational, financial and organizational roadblocks.

For starters, utilities must **build the business case for AMI 2.0 investment** to regulators and stakeholders by guiding them in creating detailed, evidence-based ROI analyses. This involves showing exactly how new metering infrastructure delivers measurable benefits in cost savings, customer satisfaction, grid management, reliability and resiliency. It includes collecting and analyzing baseline operational and reliability metrics before AMI 2.0 installation. Organizations will need to quantify direct cost savings, such as labor, field operations, maintenance and theft reduction, and document improvements in outage management, service restoration and customer engagement.

Pilot programs and case studies that model and validate projected benefits can help, as well as presenting data in regulator-ready formats using industry-standard methodologies. Outside partners (like TRC) offer proven practices and patterns for assessment and analysis.

In addition, due to the nature of proprietary software and closed systems involved in AMI 1.0, utilities often lacked unified systems. When planned appropriately and executed using best practices, utilities will achieve **interoperability through seamless integrations**, which includes connecting customer information (CIS), outage management (OMS), geographic information (GIS) and supervisory control (SCADA) platforms.

Understanding how to design and implement open systems architecture including leveraging APIs, communications protocols, data schemas and analytics will guide the design and integration of a **unified head-end system** more efficiently with fewer risks. It also results in robust interoperability and lasting value. A critical component of systems integration will be security control, restricting access to sensitive data and the ability to monitor users and provide and maintain audit trails.

Network connectivity and cybersecurity also pose serious risks. AMI 2.0 relies on real-time, secure communications, demanding robust cellular or LTE networks, especially in remote or urban areas. Cyber threats such as meter hacking and unauthorized access to sensitive customer data may jeopardize consumer data as well and put regulatory compliance at risk.

Beyond connecting systems and ensuring security, utilities must address the potential impact of technology on the way their staff will work. This **requires change management, user adoption and shifting operational culture** through proven best practices. Changing from reactive to proactive, data-driven operations often requires new skills, processes and attitudes where education, communication and feedback loops make a difference.



AMI 2.0: Capabilities That Drive Insight

The transformative value of AMI 2.0 lies in its ability to deliver granular, real-time data on energy consumption, voltage levels and system health and then process this massive amount of raw data into actionable intelligence for preventing service failure, reducing outage time and lowering costs. Utilities with AMI 2.0 can generate information and insights using numerous capabilities, from real-time monitoring to edge analytics and predictive maintenance. Data becomes the digital lifeline for healthy, thriving service, reliability and safety. These technical functions include:

Real-Time Data

AMI 2.0 meters capture energy consumption, voltage quality, and waveform signatures at granular intervals, often every few seconds rather than hours or days. This high-frequency, high-resolution data creates a live operational picture of the grid, enabling utilities to detect anomalies the instant they occur. This immediacy allows for faster outage identification, early warning of equipment stress and more refined operational predictive analytics. Operations shift from reactive to proactive, enabling issues to be addressed before they escalate, improving reliability and reducing downtime.

Enhanced Integration

By developing interoperability between AMI 2.0 and other enterprise systems, utilities can finally unify their data into a cohesive enterprise environment. When supported by a well-designed systems architecture and integration strategy, AMI 2.0 can interface with GIS for location intelligence and analytics, SCADA systems for real-time remote grid control, OMS for rapid incident triage and CIS for accurate billing and improved customer engagement. This interconnected ecosystem ensures that data flows securely and efficiently between departments, breaking down silos and enhancing situational awareness. The result is faster decision-making and better resource allocation.

Advanced Edge Analytics

With AMI 2.0, meters act as intelligent grid-edge computing devices. Equipped with faster computing and more memory, they provide the ability to act on data locally, delivering real-time event notifications, executing instant voltage regulation commands and breaking down consumption usage to individual devices or appliances. This localized intelligence facilitates precise balancing of supply and demand. It also lays the groundwork for advanced applications such as virtual power plants and microgrid orchestration, in which distributed resources like solar panels, batteries and electric vehicles can be aggregated and managed to support grid stability and resilience.



AMI 2.0: Use Cases That Deliver Value

With real-time data and powerful analytics tools that extend to the grid edge, the power of data-driven decision-making can be unleashed. Utilities transform how they manage and upgrade their networks and better serve customers, with greater accuracy and lower costs. They can extract value and meaning from large volumes of data that provide a detailed picture that helps predict and prevent problems before they occur, as well as find the fastest resolution possible for unexpected obstacles. Discover how AMI 2.0 capabilities fuel innovation, efficiency and impact across the business.

Wildfire Mitigation

AMI 2.0 can act as a crucial sensor network for detecting high-impedance faults (HIFs), which are often caused by downed power lines or tree-limb contact. Traditional protection can't always detect these faults because the current flow is too low to trigger a breaker. By capturing granular data and measuring minute changes in voltage and impedance at the grid edge, AMI 2.0 can pinpoint these dangerous, low-current faults that could otherwise go unnoticed and potentially cause a fire.

Outage Detection and Response

AMI 2.0 meters provide continuous, real-time monitoring of voltage and current across the grid, enabling utilities to detect outages almost instantly. Advanced outage detection algorithms can pinpoint fault locations, allowing field crews to be dispatched directly to the problem area. This targeted approach minimizes restoration times, limits the number of impacted customers, and triggers preemptive restoration activities before customers report the issue. As a result, reliability metrics and customer confidence both see measurable improvements.

Predictive Asset Maintenance

Continuous tracking of asset performance—such as transformer loading, feeder voltage stability, and breaker activity—allows AMI 2.0 to flag equipment deterioration before it leads to failure. By applying advanced analytics to this data, utilities can forecast and schedule maintenance needs and prevent costly emergency outages. This proactive model reduces operational costs and extends equipment lifespans.

DER, Solar and Storage Integration

AMI 2.0 supports the identification of solar, battery storage, electric vehicles and other distributed energy resources. Through bi-directional communication and accurate net metering, utilities can monitor generation, manage voltage fluctuations and integrate DERs into demand management programs. They maximize the value of distributed resources through participation in dynamic pricing, prepaid energy models and virtual power plant operations.

Operational Efficiency

Real-time voltage and load measurements from AMI 2.0 allow utilities to actively balance loads, fine-tune voltage regulation and optimize network efficiency. These capabilities prevent overload events and ensure a more stable grid during peak demand or adverse weather conditions. Utilities and customers benefit from more reliable, cost-effective operations.

Energy Efficiency and Rate Innovation

With detailed interval usage data, utilities can design precision-targeted energy efficiency programs, streamline demand response initiatives and create tailored pricing plans such as time-of-use or real-time rates. Customers receive actionable insights and incentives to shift their energy use to non-peak periods, lowering their bills while reducing peak demand stress on the grid.

Regulatory Compliance and Reporting

Automatically captured, time-stamped data from AMI 2.0 provides utilities with an auditable trail of consumption activity. They can streamline compliance reporting for reliability standards, renewable integration requirements and environmental mandates. By eliminating manual data aggregation, utilities save time and reduce errors when communicating with regulators and stakeholders.

Customer Engagement

Through intuitive web portals and mobile apps powered by AMI 2.0 data, customers can access their real-time energy use, receive alerts for unusual patterns and get customized energy-saving recommendations. Enhances customer satisfaction with real-time data that encourages informed energy decisions and increases participation in efficiency programs.

How to Begin AMI 2.0 Planning and Deployment

To minimize risk and disruption, organizations must perform proper planning. The digital journey begins with strategic leadership, cross-functional expertise and a plan developed around desired business outcomes. With TRC's background in successful AMI installations, we have seven simple steps to help take a structured approach that aligns modernization goals with business and customer value.

1. Assess Current Infrastructure and Data Readiness

Perform a comprehensive assessment of current metering systems and data management platforms. Identify technological and operational limitations, such as outdated hardware, insufficient bandwidth or integration barriers. This "current state" mapping ensures data-driven priorities target the right digital pain points and drive correct modernization goals.

2. Unify Leadership Vision and Change Management

Develop a change management program that equips staff at all levels with the skills, knowledge and processes for a data-driven utility environment. Include clear communication, training and engagement to help users adopt and thrive in their new tech environment. Contiguously receive and share feedback. And don't forget to secure leadership commitment from the onset.

3. Advance Analytics Capabilities and System Integration

Invest in scalable analytics platforms capable of processing the large data volumes AMI 2.0 will generate. Plan for seamless integration of meter data with existing enterprise systems so that insights are accessible across the organization and immediately usable for both operational and strategic decisions.

4. Implement a Strategic, Phased Rollout Plan

Implement AMI 2.0 in stages, beginning with high-value pilot projects targeting use cases such as outage detection, demand response, or voltage optimization. Each phase should include performance measurement, lessons learned, and iterative refinements before expanding to the next service area or application—minimizing risk and shortening time to value.

5. Define Success Metrics and ROI Benchmarks

Establish success criteria and performance metrics that are directly tied to organizational goals. These could include outage duration reduction, operational cost savings, voltage stability improvements, customer engagement levels, or emissions reductions. Continuously monitor results, report progress to stakeholders, and refine strategies to maximize ROI and sustain investment confidence.

6. Embed Cybersecurity and Privacy from the Start

From meter hardware and field networks to data storage and analytics, integrate robust cybersecurity protocols and privacy safeguards into every layer of the AMI 2.0 program. Early integration of security protects customer trust and regulatory compliance while preventing costly retrofits later.

7. Plan for Long-Term Scalability and Innovation

Seamlessly integrate advanced applications such as virtual power plants, EV charging coordination and grid-edge analytics without overhauling the enterprise IT ecosystem. Design the AMI 2.0 architecture and processes with future growth in mind, ensuring that the system can accommodate new technologies, regulatory requirements and customer services.



TRC: Your Trusted Partner for AMI 2.0

TRC sets the standard for AMI 2.0 delivery with deep expertise in metering, analytics and integration and a culture of innovation driving creative, cutting-edge solutions that deliver real results. Our teams have successfully partnered with clients and software vendors to supply strategic guidance and precise technical execution.

We cover the full scope of AMI deployment, from meter hardware and communication networks to sophisticated analytics, cybersecurity and seamless system integration to help utilities harness secure, scalable infrastructures that deliver reliable performance and future-ready agility.

Our track record spans some of the largest and most complex AMI deployments in North America, including [Salt River Project's](#) rollout of Gridscale X Meter Data Management at scale. We have pioneered advancements in edge analytics, distributed intelligence and the application of digital optimization to utility operations.

Every AMI 2.0 engagement with TRC involves a holistic approach. Our team guides utilities through each phase: building robust business cases, selecting the right partners, ensuring effective system integration, empowering staff and achieving post-deployment optimization. Our integrated methodology reduces risk and provides on-time, on-budget project delivery that meets intended goals.

With more than 25 years of providing cutting-edge digital solutions, TRC couples proven delivery models with strategic foresight, ensuring every AMI 2.0 deployment becomes a foundation for future growth, customer success and grid innovation. Utilities gain not just a technology solution, but a transformational asset empowering excellence for today and tomorrow.

Author



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Arsen Oganessian has over two decades of combined experience leading utility modernization efforts and supporting senior leadership in successfully bridging the IT and OT. His career is founded in technology engineering practices and supporting business initiatives in a complex and dynamic environment. His industry and domain experience, combined with his leadership involvement in utility boards and cybersecurity groups, drives transformative results. He has successfully shepherded large, complex programs into meaningful and valuable business outcomes.