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Empowering Your **AMI 2.0** Strategy

Electric utilities are now exploring a new world of possibilities with the advent of next-generation Advanced Metering Infrastructure (AMI). These cutting-edge systems, also known as AMI 2.0, go beyond traditional smart metering (AMI 1.0), offering enhanced capabilities that drive operational efficiency, distribution grid management, customer satisfaction, and sustainability. Each AMI vendor's solution varies in terms of the capabilities, with some use cases requiring additional software, such as analytics and edge computing applications.

Power-Packed with Data

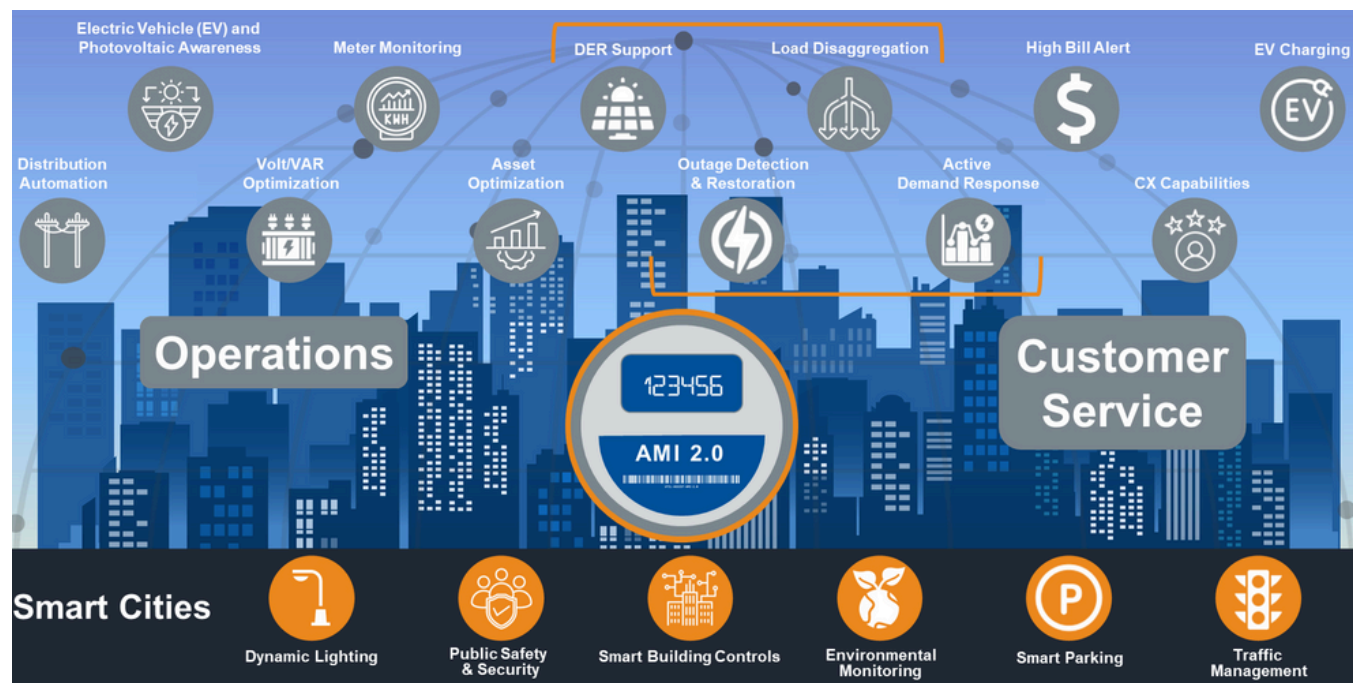
AMI 2.0 meters deliver high-resolution, low-latency data to surpass first-generation AMI capabilities. These advanced meters deliver granular insights into energy consumption patterns, voltage levels, and power quality, and can accurately detect anomalies, such as energy theft or equipment malfunction. This wealth of data helps optimize grid performance, predict maintenance needs to avoid unplanned outages, and respond swiftly to outages. Utility customers are empowered with detailed energy usage information, fostering energy conservation and enabling customized energy-saving recommendations from the utility. The comprehensive data also facilitates the seamless integration of renewable energy sources and electric vehicle charging stations, paving the way for a more resilient and sustainable energy future.

The Edge Effect

Next-generation AMI meters bring a new dimension to utility management with their ability to run apps at the edge. These advanced meters now have the capability to process data locally, allowing for immediate action and real-time analytics beyond just monitoring consumption and demand. Imagine detecting and isolating faults instantaneously, optimizing energy distribution on the fly, or even facilitating local energy trading among consumers. By running applications directly on the meters, utilities can enhance grid reliability, improve response times to outages, and provide dynamic pricing models that reflect real-time grid conditions. This edge computing capability transforms AMI meters into powerful, multifunctional devices that can handle a variety of tasks, driving efficiency and innovation right at the heart of the grid.

Incorporating edge computing into AMI 2.0 introduces new streams of data, necessitating careful consideration of the sources of this information and their integration into business processes. To operationalize the data effectively, utilities must establish robust data governance frameworks. This includes identifying the system of record and source of truth for each data point as well as the data stewards, custodians and owners, so that data quality policies and frameworks can be established.

A World of Possibilities: The Latest AMI 2.0 Use Cases



Use cases fall into two broad categories: **customer-side** use cases that provide better customer service or give customers insight into their consumption and **operational-side** use cases related to the operation and management of the distribution system.

Distribution Automation

AMI 2.0 communication networks enable near real-time data collection and transmission, providing utilities with detailed and timely insights into grid conditions and energy consumption.

With two-way communications to meters and devices, utilities can remotely control distribution network devices, such as switches, reclosers, and voltage regulators, enabling automated responses to grid conditions, such as voltage regulation, load balancing, and fault isolation, without the need for manual intervention.

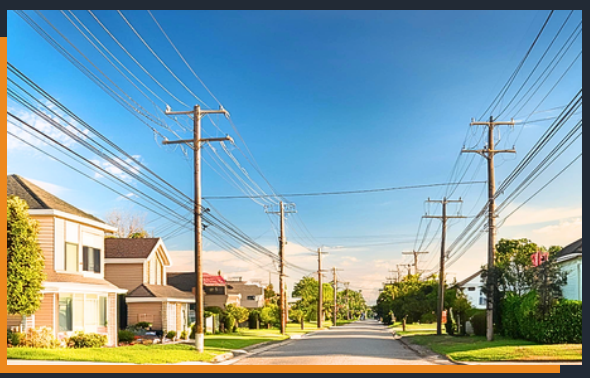
Asset Optimization

Utilities can predict and address asset failures before they occur by analyzing consumption and performance data, extending asset life and reducing emergency maintenance costs. Next-generation AMI meters collect detailed and frequent data on electricity consumption, voltage, and other parameters.

This real-time data provides valuable insights into the performance and condition of various utility assets, such as transformers, distribution lines, and substations. Advanced analytics and machine learning models analyze historical and real-time data to predict potential asset failures before they occur, and by identifying patterns that precede equipment failures, utilities can take proactive measures to address issues before they lead to outages or costly repairs.

Next-generation AMI significantly improves active transformer load management by providing detailed, real-time insights into transformer performance, load conditions, and operational status. AMI 2.0 enables the creation of detailed load profiles, showing how transformer loads vary throughout the day, week, and year, helping to understand peak load times and usage patterns. Using AMI data to identify underloaded and overloaded transformers, utilities can optimize asset utilization and defer unnecessary capital expenditures.

Volt/VAR Optimization



The goal of the volt/VAR optimization is to maintain voltage under tight thresholds to the end of the power line. This means reducing over voltages on the power grid (wasted energy) without allowing voltages to fall below minimum thresholds (conditions of service) that protect customer equipment from damages and potential failure.

While an edge computing application can push data into the ADMS for immediate action, storing historical volt/VAR data in an analytics solution allows for trend analysis and the identification of circuits and feeders that should be targeted with optimization devices.

By doing so, utilities can improve energy efficiency and reduce losses, enhancing grid performance, lowering costs, facilitating standards compliance and enhancing power quality for customers.

Meter Monitoring

Next-generation AMI meters are equipped with sophisticated capabilities that monitor various parameters related to electricity consumption, local conditions, and meter integrity.

Tamper and Theft Detection

AMI 2.0 meters can detect anomalies that will accurately indicate tampering or theft. Using data analytics, utilities can reduce the number of false positives and unnecessary field investigations.

High Temperature Detection

Utilities can detect meter base faults by correlating socket temperature with meter load – if the meter detects excessive heat, it can generate an alert to trigger remedial action, potentially preventing a fire or failure.

High Impedance Detection

Utilities can detect high impedance situations that can result when splicing, tapping, or connecting wires, when wires connect underground, when foliage touches a line, or when a conductor or powerline fails. Real-time data analysis at the endpoint is used to detect and send near-real-time alerts when high impedance connections are detected.

Broken Neutral Detection

The broken neutral detection use case prevents swings in voltage that can damage customer equipment. If the neutral is broken, the operating voltage for the loads on one line will rise while the operating voltage for the other line will drop. Voltage measurements can determine if the neutral is broken.

Connectivity Model Improvements

The goal of the connectivity model improvements is to track the connectivity of each meter (phase, feeder, transformer) using GIS coordinates. Utilities can create and maintain electricity distribution connectivity maps of assets to develop a thorough understanding of which customers are connected to which feeders/transformers, helping to pinpoint outages and plan distribution upgrades.

Phase Identification

Phase identification involves determining the specific phase (A, B, or C) to which each customer or device is connected in the distribution network. AMI 2.0 smart meters equipped with edge computing capabilities continuously collect real-time data on voltage, current, and power quality at each customer premise, enabling automated phase identification for more efficient and reliable grid management.

Electric Vehicle (EV) & Photovoltaic Awareness (PV)

With AMI 2.0, utilities can integrate and manage the growing number of EVs within the power grid. Utilities can gain insights into EV charging patterns, optimize grid performance, and support the broader adoption of electric vehicles. Knowing when and where EVs are interacting with the network helps utilities manage transformer overload scenarios and provide rate-friendly EV charging controls to optimize staggered charging. Identifying locations where solar panels (PV) have been installed can provide operational and safety benefits (for example, the potential islanding of a secondary transformer line that could liven the primary when crews are expecting a dead circuit).

DER Support

Distributed energy resources (DERs) include small-scale power generation or storage technologies located close to where electricity is used, such as solar panels, wind turbines, battery storage systems, and electric vehicles. Next-generation AMI meters collect high-resolution data on energy production and consumption from DERs, including tracking the output from solar panels, the charge/discharge cycles of battery storage, and the usage patterns of electric vehicles.

Real-time monitoring and control of DERs help maintain grid stability by balancing supply and demand, preventing outages and ensuring reliable electricity delivery while integrating higher levels of renewable energy into the grid to support sustainability goals. Customers with DERs can supply or draw power from the grid as needed with detailed insights and real-time feedback on their energy production and consumption. Utilities can use this data to offer rate-friendly charges to encourage sustainable green energy initiatives.

Outage Detection & Restoration

Outage detection and restoration are critical to maintaining reliable electricity service. While AMI 1.0 relies on “last gasp” messages from meters losing power to identify outage locations, AMI 2.0 significantly enhances these processes. By using still-powered meters to detect communication failures with meters that are offline, AMI 2.0 provides greater accuracy in determining the extent of an outage, leading to faster and more efficient restoration efforts.

System operators and dispatchers can also connect with the meter directly to determine if power issues, such as flickering lights, are on the line or load side, providing improved customer service and reducing the number of truck rolls.

Load Disaggregation

This use case leverages the high-resolution, granular data provided by next-generation AMI to gain detailed insights into energy usage patterns. Load disaggregation is a process where the total energy consumption is broken down by individual appliances or devices within a household or business.
Consumers gain detailed visibility into their energy usage, understanding which appliances are driving their consumption and costs, empowering them to make more informed decisions about energy efficiency and conservation.

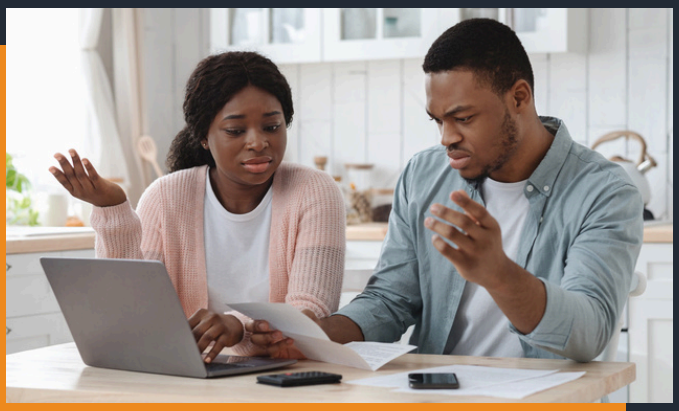
Load disaggregation can also help in early detection of appliance faults or inefficiencies. On the operational side, load disaggregation enables utilities to detect certain types of loads on the grid, such as EVs or PVs.

Active Demand Response

Demand response is a strategy to manage and reduce electricity demand during peak periods or in response to supply constraints. Next-generation AMI enhances demand response programs by providing real-time data, enabling more precise control, and fostering better customer engagement for more effective load shedding and shifting during peak periods. This use case not only enhances grid stability and reduces costs but also engages consumers in active energy management, leading to a more efficient and sustainable energy system. Purchasing an edge computing application enables automation of this valuable concept.

High Bill Alert

AMI 2.0 meters continuously monitor and record energy usage at granular intervals (e.g., every 15 minutes). This real-time data collection allows for the immediate detection of unusual spikes or patterns in energy consumption. Utilities can use the data to proactively contact customers with high usage patterns and offer energy audits or personalized energy-saving recommendations.



Utilities benefit from improved load management, reduced peak demand pressures, and enhanced customer satisfaction through proactive engagement.

This use case requires an analytics platform to track consumption trends and identify if usage is higher-than-normal over a given period.

CX Capabilities

With granular data (at 5- or 15-minute intervals, instead of hourly) and additional units of measure, customers have more precise data to understand their consumption patterns, including peak usage times. This enables utilities to more accurately assess which rate plans are best for their customers while also ensuring operational benefits are realized.

EV Charging

The integration of electric vehicle (EV) charging infrastructure is a crucial aspect of the modern grid. AMI facilitates real-time communication with EV owners, providing them with information about their charging habits, costs, and environmental impact. Utilities can also send notifications about the best times to charge and updates on charging rates. Next-generation AMI supports the design and management of efficient, reliable, and user-friendly EV charging solutions.

Smart Cities

Next-generation communications networks are a cornerstone for the development of smart cities, enabling numerous use cases that enhance efficiency, sustainability, and quality of life.

Dynamic Lighting

AMI enables continuous data collection on energy usage and streetlight performance to detect patterns, predict failures, and schedule maintenance more effectively. Streetlights equipped with communications protocols that can be shared with AMI allow remote management and dynamic lighting adjustments in response to traffic or pedestrian activity. Improved lighting control also allows for better illumination of public spaces, which can deter crime and increase the sense of security among residents.

Public Safety and Security

AMI 2.0 networks can potentially be leveraged to support the integration of surveillance cameras and sensors across a city, providing real-time data for monitoring public spaces, helping in quick incident detection and response.

Smart Building Controls

Smart building systems can use data from next-generation AMI to automatically adjust lighting, HVAC, and other energy-consuming systems based on real-time occupancy and environmental conditions. Monitoring the performance and health of building systems in real-time can support early detection of potential issues and timely maintenance, reducing downtime and repair costs.

Environmental Monitoring

Sensors integrated with modern communication protocols supported by AMI can monitor air quality and noise levels in real time, providing valuable data for environmental management and policy making. AMI 2.0 networks can also support weather sensors to provide real-time data on local weather conditions, aiding in better urban planning and disaster preparedness.

Smart Parking

Smart parking systems equipped with sensors can detect the presence of vehicles in parking spots. These sensors relay real-time data to the AMI 2.0 communications network, providing accurate information about parking space occupancy and parking space usage over time, helping city planners understand peak usage times, durations, and turnover rates.

Traffic and Transportation Management

Next-generation AMI networks can be leveraged as a communications pathway to optimize traffic light operations based on real-time traffic data, reducing congestion and improving traffic flow, contributing to reduced fuel consumption and emissions. The infrastructure can also be used to manage and coordinate emergency response efforts by providing real-time data and communication channels for first responders.

Ready to take the next step?

Transitioning to AMI 2.0 is not as simple as pressing a button. To fully harness the benefits of these sophisticated systems, utilities need to develop a strategic roadmap that outlines how the latest AMI platforms can be translated into new business benefits. Contact Util-Assist to help unlock the full potential of this groundbreaking technology.

Contact Us

John Forsyth
Director, Business Development

jforsyth@util-assist.com

[c] 416-662-1945

https://utilassist.com/

470 Harry Walker Parkway S., Newmarket, ON, L3Y 0B3

About Util-Assist

Util-Assist's solutions merge technology with strategy to streamline processes, boost productivity, enable data-driven business decisions, and deliver enhanced customer experiences, transforming how utilities operate and deliver value to their customers. Driving digital innovation with professional services and managed services for electric, water, and gas, Util-Assist is shaping the utility of the future.

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