Itron

Data Management for the Active Grid

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WHITE PAPER

OVERVIEW

The needs of our customers are changing as rapidly as the technology they are deploying. The emergence of meters with network connectivity, more technology being packed into the meter, and the evolution of smarter and smaller devices creates significantly more complexity. As your systems become more and more complex, the concept of centralized analysis and decision making becomes archaic and unimplementable. Your systems can perform sub-interval measurements—meters and sensors are providing five-minute data, soon to be one-minute data. This creates a tidal wave of data being ingested by centralized back office systems. Analyzing massive data farms to develop corrective actions in a timely manner becomes impossible. The changes in technology, quantity of data and effective operations of your utility distribution network have created an imperative to move decision making out toward the edge. You can use the data at the edge to produce information that is moved upstream to intelligent systems.

Analysis and action can take place at every level of your network, from the meter to the field area network and upwards, to the Network Operations Center and back-office systems that report status and health of your distribution systems.

Our vision for these emerging utility needs is simple: 1) create the tools, systems and solutions to support the evolving complexities of your networks and business models, 2) move intelligence toward the edge and 3) use that intelligence to create credible information and actionable events at the source.

This begins by creating technology at the edge of your distribution system that supports analysis and builds data into information. Our intelligent network, combined with Distributed Intelligence (DI) capabilities, uses smart meters and smart sensors to create and send information to upstream systems. This is the next step in grid modernization that optimizes assets and resourcefully delivers electric, gas and water services to your customers.

THE ACTIVE GRID

Deploying an AMI solution is the first step toward grid modernization. AMI provides the framework for motivation and inclusion of the customer—one of the first goals of a modernized grid. It's important to understand that AMI is not a single technology. It's an integration of multiple technologies that provide a connection between the customer and you. It drives your SAIDI and MAIFI metrics and is the cornerstone of increased customer satisfaction and efficient asset utilization. *Figure 1* illustrates functional capabilities at key points in the modern smart grid. As stated earlier, a smart grid creates volumes of data to be ingested by back office systems. In a modern smart grid, back office-heavy systems, where analysis and operational impacts are determined, are not efficient in providing timely results to increase grid efficiency. Quickly analyzing terabytes of information to find operational anomalies requires massive compute capabilities and data storage. For most utilities, this is impractical and economically unfeasible.

Moving intelligence and actions closer to the edge provides timely information that can be passed to back office systems for reporting, observation, distribution and analysis for future operational and business improvements.

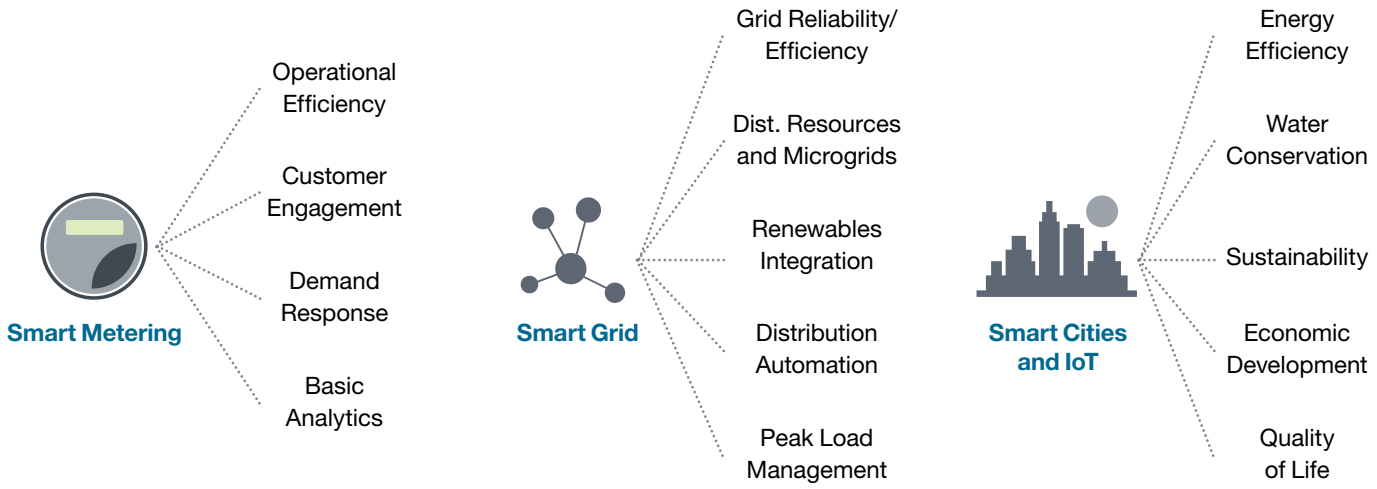

Figure 1 - Smart Grid Capabilities

In a 2008 study[1], The National Energy and Technology Laboratory defines a vision of seven principles for your modern utility grid:

1. Motivation and inclusion of the consumer is enabled by AMI technologies that provide the fundamental link between the consumer and the grid.
2. Generation and storage options distributed at consumer locations can be monitored and controlled through AMI technologies.
3. Markets are enabled by connecting the consumer to the grid through AMI and permitting them to actively participate, either as load that is directly responsive to price signals or as part of load resources that can be bid into various types of markets.
4. AMI smart meters equipped with Power Quality (PQ) monitoring capabilities enable more rapid detection, diagnosis and resolution of PQ problems.
5. AMI enables a more distributed operating model that reduces the vulnerability of the grid to terrorist attacks.
6. AMI provides for self-healing by helping outage management systems detect and locate failures more quickly and accurately. It can also provide a ubiquitous distributed communications infrastructure having excess capacity that can be used to accelerate the deployment of advanced distribution operations equipment and applications.
7. AMI data provides the granularity and timeliness of information needed to greatly improve asset management and operations.

These principles still hold true today. A key component related to the seven points of AMI engagement is that the level of sophistication and technology capability for end devices and sensors has changed drastically, enabling you to start building toward the next milestone of a modern active grid. You and your consumers benefit from a modern active grid through:

- More efficient transmission of electricity
- More timely and accurate communications of the scope and duration of outages
- Reduced operations and management costs for you, and ultimately lower power costs for your consumers
- Reduced peak demand, which will also help lower electricity rates
- Increased integration of large-scale renewable energy systems
- Integration of IoT devices such as streetlights, leak detection and gas quality sensors
- Better integration of customer-owned power generation systems, including renewable energy systems
- Improved security and increased safety for consumers and your employees

[1] **"Advanced Metering Infrastructure"**, National Energy and Technology Laboratory, February 2008. https://www.smartgrid.gov/files/NIST_SG_Interop_Report_Postcommentperiod_version_200808.pdf

Electrical disruptions can have a domino effect, creating a series of failures that effect communications, banking, traffic control, hospitals—almost every aspect of daily life. Gas failures can be catastrophic, causing death and destruction. Effective implementation of a modern active grid is not just about technology, it's also about providing your consumers safety, security and peace of mind.

The penetration of smart meters, intelligent streetlights, IoT sensors, renewable solar generation and electric vehicles is increasing daily on a global scale. Using a solution from 10 years ago cannot provide an adequate level of understanding, economic savings, operational capability and customer service to support the evolution of this new market paradigm.

As technology enables more functionality and you begin to deploy the next generation of smart devices in your network, the business and regulatory model changes to reflect more sophisticated and complex capabilities. The result is new requirements for data and analysis.

As technology makes a broader spectrum of data available, it's critical that your systems can consume the new information. Using disparate vendors that have no insight into the spectrum of data coming from the modern smart grid creates incompatibilities that drive further expenditures to build homogeneous data flows to back office systems. *Figure 2* represents the changing business needs of the utility marketplace today. These capabilities cannot be achieved efficiently using 10-year-old solutions.

Adapting to the changing market and consumer need is vital. You must avoid obsolescence and financial disaster. The 2019 wildfire disasters in California are an example that was created by aging infrastructure, and operational systems and solutions that did not have the capability to predict asset failure and the potential results of those failures.

WHAT UTILITIES WANT TODAY

Aggregate data across operational, transactional and financial silos to garner a better, more intelligent understanding of the business

Identify anomalies in order to automatically reroute electric paths away from failed devices or links

Measure and predict real-time loads so that energy grids can react intelligently to variations in supply and demand

Reduce the need for site visits through automated, remote meter reading and billing

Leverage operational and customer-facing data to reduce the number of customers that leave

Accurately predict energy usage in order to improve the performance on settlement markets

Figure 2 - The Changing Utility Business Paradigm

DATA MANAGEMENT VISION FOR THE ACTIVE GRID

A recent report by the American Council for an Energy-Efficient Economy (ACEEE)[2] highlights that very few utilities are utilizing the data collected by their AMI investments. Out of 26 utilities with AMI deployed, only one was engaging in all six ACEEE business cases defined in 2018. The unfortunate by-product of this is missed opportunities to benefit from operational improvements and proven consumer safety and savings opportunities.

Extracting more efficiency and capability out of your existing AMI deployments is imperative. While industry-wide adoption of using AMI data for analysis is slow, you are making major changes to your business plans and regulatory filings by updating and morphing your networks, adding more sophistication to your back-office systems to improve operations and customer service, replacing AMI meters and adjusting your operations to include new demands from your customers and regulators. Meeting this demand requires comprehensive insight of events at the edge of the grid, with the ability to bring long-term analysis and improve operations, asset utilization, customer satisfaction and innovative services to consumers using back-office systems. Traditional meter-to-cash MDM systems are a small, important piece of the overall active grid solution.

[2] "**Leveraging Advanced Metering Infrastructure to Save Energy**", ©American Council for an Energy-Efficient Economy, Rachel Gold, Corri Waters, and Dan York, January 2020, Report U2001

We are committed to helping you prepare for the future with today's products that have tomorrow's capabilities. Combined with intelligent connectivity, our distributed intelligence applications and our industry-leading Itron Enterprise Edition (IEE) data management solution, create a solution path for the active grid.

IEE brings an industry-leading meter-to-cash process to ensure quality billing. Using highly flexible, state-of-the-art industry validation, estimation and editing algorithms in conjunction with our universal calculation engine (UCE), IEE MDM ensures you have the highest quality meter and sensor data available for billing and analysis. In addition, our UCE allows for creation of innovative tariff rates and models that complement the evolving active grid. IEE MDM is a multi-commodity data management system for your endpoints.

While Meter Data Management is an essential part of the overall value proposition for traditional AMI deployments, your business needs are evolving. It's clear through the evolution of the market that you are moving toward a new paradigm. To meet that challenge, it is essential that we evolve our product and services capabilities to meet the emerging market requirements and support your future needs.

Collecting data from meters through a head-end system (HES) is a commodity service in the current market. While it serves your core function of delivering meter reads, events and data for energy and water, the change in the market and your customer's needs dictates the need for new and innovate offerings from utilities. Singular management of meter data is becoming an antiquated need. You need to adapt to a new strategy that includes collection, storage and correlation of IoT data, streetlights, conservation voltage reduction (CVR), demand response (DR), distributed energy resource management system (DERMS) and many other strategies that optimize grid assets and provide your customers with new options. Meter Data Management is evolving the management and analysis of the tidal wave of data and information generated by the active grid.

We have a vision for the long-term evolution of device and sensor data management strategy and solutions. We envision growing from a single-focused product to a highly flexible system of interconnected products that support your future business needs. At the center is our data management capability that supports the creation of quality data, complex data storage and analysis functionality that enables this capability and flexibility. The evolution of IEE creates a platform that is flexible, extensible and enables you to evolve your operational and business capabilities.

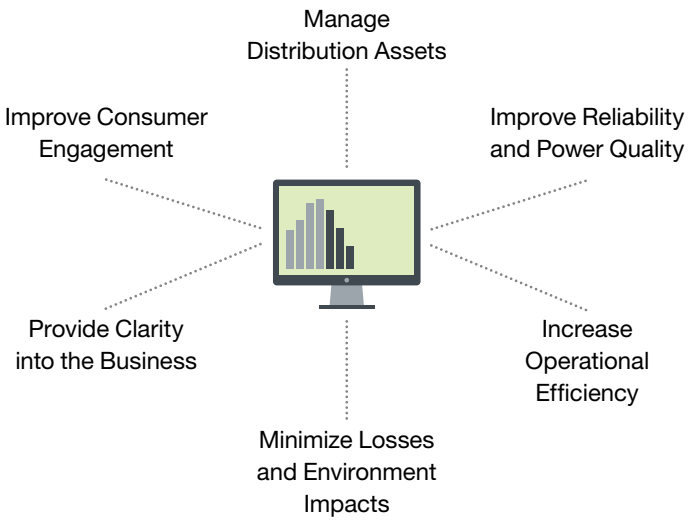

Figure 3 - The Data Management Value Proposition

Figure 3 shows key business areas where the new data management platform contributes to your business model. Further understanding of your grid operations is enabled by data management using insights from our DI capabilities. DI uses specific applications such as High Impedance Detection and Residential Neutral Fault Detection data that are loaded into a meter to detect potential catastrophic safety faults. IEE provides awareness into specific events at the edge of your grid and passes that information to our Grid Reliability applications to create actionable events for you. This action reduces truck rolls, increases consumer safety and improves revenue by identifying hard-to-find and abnormal load usage.

Successfully building out a meter data management platform that has the capability to support your customers today while providing the ability to extend into the future requires a vision that is supported by the growth of technology, market conditions and customer feedback. We believe the vision for today and the future is building a platform that is economically extensible for you.

Migration to an integrated platform requires adaptation to our current and future product set. Successful implementation of this vision will require new technologies and software. Our MDMS scales beyond 10M endpoints. This provides you with the flexibility to support and monetize the outcomes without being constrained by your server infrastructure. Using Distributed Intelligence to gain immediate insight at the edge of the grid, combined with a powerful data management platform, provides you with a solution that meets your needs for the foreseeable future.

PROVEN LEADERSHIP

The adoption of our technology, software and vision have made us a leader in critical infrastructure and networks. Our customers believe in our vision. The facts validate our approach:

- 8,000+ customers in 100 countries
- Over 200 million smart communication devices deployed
- 75% of the power in the US touches our technology
- Over 45 million meters globally at 92 energy companies across six continents are in production using IEE MDM
- Gartner Magic Quadrant leader for MDMS systems for six consecutive years
- >80% of electricity in North America is forecast by our software
- ~3 million streetlights managed globally
- Over 1,400 issued patents and pending applications
- Leading provider of revenue-grade solar products and services
- Broadest ecosystem with over 200+ partners providing goods and services to our customers
- >60 million endpoints on managed services across 1,000 utilities
- We can provide SaaS and/or on-premise capabilities depending on your needs

We are a leader in the Gartner Magic Quadrant for data management and are identified by Navigant as a top provider for data management solutions. Our goal is to provide solutions that allow you to achieve today's business goals and tomorrow's vision.

Itron

Join us in creating a more **resourceful world**.
To learn more visit **itron.com**

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