INTRODUCTION

Disruptions in the energy world are transforming the grid in ways that allow market needs to be met more efficiently than ever before. Today end users of power are taking on an unprecedented and expanding role in the energy supply chain: they are engaging more with their power suppliers, and they are participating in energy self-generation through various renewable sources. This transformation in the way utilities are required to manage energy at a more micro level and accommodate end user integration of distributed energy resources (DER) adds to the already challenging operational issues that electric utilities face.

Over the years, electric utilities have been driven to provide ever-improving power quality, accommodate new market entrants (entities that provide power formerly supplied by regulated utilities/generators), streamline operational processes, maintain aging assets and manage the thinning workforce of utility personnel. Though the challenges are not for the faint of heart, proactively preparing for further transformation reduces overall confusion and allows the power ecosystem to deliver at increased efficiency and customer satisfaction levels. These pervasive changes in grid operation require enhancements to overall situational awareness for the operator.
OPERATIONAL AWARENESS

In the military, situational awareness is one of the greatest advantages on the battlefield. Without it, immediate tactical goals can’t be met, and precious resources could be expended in the wrong way. Similarly, utilities need operational awareness for sensing grid events at more frequent intervals and achieving long-term goals.

Industry pressure is compounding the need for utilities to be hyperaware. This is particularly apparent with energy efficiency programs, which are fast becoming the norm. Despite the growth in energy demand, traditional sources of generation are being retired -- including 18 gigawatts of coal-fired generation capacity by 2020 — to meet the EPA’s Clean Power Plan goals, according to a recent Black & Veatch report. Demand growth, coupled with relatively flat centralized generation capacity, leads us to the conclusion that energy capacity will be addressed more and more at the edge of the network through renewables and micro generation.

New “up-to-the-meter” market entrants like large-scale storage providers and renewable electricity generators, combined with “behind-the-meter” technologies like solar-based self-generation, are driving the need to upgrade to intelligent grid sensing. Batch processing methods of the past and data pull approaches will no longer be enough to handle these new operational challenges and opportunities.

“Operational awareness is increasingly dependent on knowing what’s happening at the edge of the network. Changes in edge-based energy creation and consumption shift the operational dynamic,” said Jeff Tolnar, senior vice president of systems and products at Elster, offering his insight on the catalysts for grid transformation. “Now energy is being created and introduced to the grid all over the place— at the very edge of the network, and being used in a more intelligent way by consumers and businesses. Increases in distributed generation, including solar coupled with storage, as well as increasing growth of electric vehicles causes operational disruptions on the distribution side. Traditional delivery and protection methods were not designed for pervasive energy growth on the edge of the network. As the percentage of renewables has grown, this has created a disturbance in the operational flow and awareness requirements of utilities.”

Truly valuable operational awareness is achieved by striking a proper balance between grid edge intelligence and centralized operational data in a way that creates actionable intelligence over a robust and open communications network.

GRID EDGE INTELLIGENCE AND CENTRALIZED DATA MANAGEMENT

Deploying class-leading intelligent sensors to the edges of the grid is an effective way to both proactively pinpoint operational disturbances as well as to make the power network more reliable, efficient and open to a changing mix of distributed generation resources. It also opens the door for new opportunities and use cases that increase the ROI of smart grid investments.
As smart meters and other types of sensors play an increasingly more important role in operational and business effectiveness, the need for “an agile and rapid means to update software in edge devices over the air and push new and incremental feature sets and creative applications to these devices is important to a utility’s ability to keep up with changes in the industry,” according to Tolnar. “Evolving edge management requirements also drive us to ensure that we have sufficient processing power deployed to the right parts of the grid.”

The expanding number of sensors on the edges are only as valuable as the overall capability to process the incoming data. Tolnar described Elster’s Connexo® product as a platform designed to manage this incoming data in a way that sharpens a utility’s operational awareness and to handle growing smart grid data inflows centrally as a unified utility intelligence engine.

“We can pull data from many sensor types, over many communication protocols, and aggregate it in a common way, so when a utility becomes aware of what’s happening at the edges of the network, that data becomes valuable information. This information, in turn, enables action to occur on the operational side. That is actionable intelligence,” Tolnar explained. “For the transmission and distribution group — that’s their lifeblood.”

**ROBUST AND OPEN COMMUNICATIONS**

Robust, open standards-driven communications allow grid components and endpoints to speak to one another in support of core applications like meter data management (MDM), outage management systems (OMS) and consumer information systems (CIS). Robustness equates with more vendor choice and the ability to plug new components into the network with less fear of integration roadblocks.

“We've made the determination to focus on data, from multiple sources, and deliver it in a common way,” said Tolnar. “In this massive and rapidly changing environment, we can’t be all things to all people, so we’ve developed a path to effective companies pick and choose the parts of the specification they like and dismiss other parts. We believe in pursuing the whole spec. This is the approach that will support the inevitable grid transformation.”

Interoperability also means reduced operational and technical risk for the utility. In addition to the benefits of interoperability, a standards-driven approach to communications coupled with robust edge-based intelligence and central intelligence provides the three primary legs of managing the growing challenges in operational awareness.

**SMART PARTNER INTEGRATION**

A fundamental, yet often times overlooked, component of operational awareness is the consideration of partner integration.

Smart partner integration is being pursued by a growing number of utilities and vendors, including Elster.

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integration with our partners. This requires a full standards-driven approach whether integration occurs at the edge, on the network or on the central intelligence platform.”

Another aspect of smart partner integration is the importance of re-examining the relationships utilities have with the companies that supply them everything from smart meters to CRM packages. Grounded in traditional vendor-supplier contractual agreements, these relationships have tended to be more rigid, formulated at a time where grid transformations weren’t top of mind.

Strategic and open partnerships are the way to go, according to Erik Desrosiers, strategic advisor at Exelon, and former McKinsey consultant. These partnerships emphasize information sharing and “holistic incentives that focus the efforts of partners on joint value creation (i.e., profit sharing) rather than distributing value or guaranteeing performance.” Value creation for the utility is exhibited when the technical solutions enable business processes.

**BUSINESS PROCESS MANAGEMENT FOR EFFICIENCY**

Operational awareness opens the door to Business Process Management (BPM) systems that power providers can use to make successful grid transformations. Processes that originally resided within one application area are now expanding beyond those boundaries -- and advanced BPM can fill the gaps. CIS, for example, will need to integrate closely with meter data management and seamlessly accommodate information from social media channels, while also giving consumers and businesses more opportunities to engage intelligently with utilities.

BPM plays a lead role in grid transformation when it successfully interfaces with operational data coming in from around the grid and can unify how the data is handled internally at a utility.

“A lot of companies talk about integration and partnerships but then minimize the potential value by merely pulling data from sensors and devices,” said Tolnar. “If the data isn’t treated in the proper way as a flow through application, then it isn’t as useful, and you have to bounce between multiple systems or applications. This forces people to make decisions by mentally balancing many different inputs -- much like bouncing around among multiple PowerPoint presentations, Excel spreadsheets and websites to get what you need.”

When the most pertinent data is at a utility’s fingertips, it is easier to take action. Flow-through applications are an automated version of a response to a system need based upon a specific use case. When event “X” happens, a flow-through application can astutely assist an operator to initiate process “Y” or “Z” in response.

“Today’s smart grid demands this flow-through functionality,” said Tolnar.
“Let’s say I have solar deployments and distributed generation throughout a city. With smart sensors providing regular status and operating condition of the grid combined with energy utilization of high-profile businesses, we can proactively assess operating conditions and take corrective actions based on real-time information,” he said. “Today’s smart grid systems must enable utilities to make what-if decisions based on flow-through data — as opposed to uncoordinated data inputs from diverse sources such as distributed generation, solar systems, traditional SCADA, metering head end systems and distribution automation systems. A truly smart system leveraging edge intelligence, the network, central systems and integrated partner applications, enables utility operators to take action based upon very specific operational states. Flow through, based upon specific use cases, does that for them, and Elster applications and partner applications are designed from inception to do that.”

THINK SMALL TO SCALE BIG

Scale can be a staggering thing. Five years from now, a more intelligent grid can save $48 billion worth of energy, according to the United States Energy Information Administration. In 15 years, those savings are estimated to grow to $65 billion. An agile philosophy for growth enables small tactical changes that nurture larger transformation.

Utilities of all sizes, especially larger investor owned utilities (IOUs), may experience angst over the complexities of upgrades. But they can take solace in the fact that even large IOUs look like an aggregation of several small networks, according to Tolnar. Change doesn’t happen in every part of the grid at the same time.

Utilities and the applications they use need to be able to scale small in order to scale big. By setting expectations that change is the new constant in the energy world, grid operators will continue to leverage standards-based systems that can manage operational data from the grid edge to the middle.

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“Be more agile since change is happening fast,” said Tolnar. “Urge vendor partners to be standards compliant to drive deeper interoperability and minimize operational risk. Plus, the days of expecting one software upgrade every two years, are past. Our environment is changing too rapidly, so we need to work on internal process to respond more quickly as well.”

CONCLUSION

Grid transformation is made possible by a heightened awareness of grid events and a
Elster Solutions is the North American electricity business unit of Elster, a multi-national, 7500-person company providing electricity, gas and water meters and related communications, network and software solutions to customers in more than 130 countries. Headquartered in Raleigh, NC, Elster Solutions is focused on delivering the vital connections utilities need to achieve the greatest possible value from their meter data.

plan for managing disruption. Business process management, clever workflows and a philosophy on how to scale are important building blocks supporting transformation.

A fully closed loop system — where the network itself can sense an event, choose the best response and implement it automatically — may still be a number of years out. But confusion on how to best proceed continues to be replaced with clarity. Power providers and end users are entering an era of deeper understanding as they work to meet each other’s needs more precisely than ever before.