Guest Editorial >

Making the Smart Grid Smart Again

How to Overcome Inertia and Keep Your Utility on a Path to Adaptive Energy Conservation

By Max Park and Scott Zajkowski

Dedicated Value

According to McKinsey & Company, smart grids are predicted to deliver $130 billion in value to utilities by 2019. This includes:

- $59 billion in customer applications
- $9 billion in advanced metering infrastructure
- $63 billion in grid applications; with $43 billion in volt-VAR value in particular[1]

The need to move to the smart grid is clear. Its value to utilities is predicted to reach US$130 billion annually by 2019.[2] But other research indicates that much of the potential of this market has yet to be tapped. An estimated total of 832 million smart meters will be deployed during the 2011-2020 timeframe.[3] This data implies that many utilities are not that far along the road to an advanced metering infrastructure. While it is expected that they will continue to move forward in the near future, what's the source of the holdup?

The fact is that many utilities want to move to the smart grid and have already made a significant investment in automatic meter reading (AMR). But there is confusion on where to go next. Some smart meters are in place and data id being been collected. But how does a utility translate that data into a strategic direction that will maximize the value they receive in cost savings, infrastructure improvements, and customer service – at the same time transforming into an adaptive organization that can meet the evolving energy demands of the future?

Take the High View

The problem is that utilities are getting caught in the weeds of meter deployment without taking a step back to develop a road map of their entire grid; where they are now and where they want to go. That's why they have no clear idea of what technology to deploy next. The answer to this challenge is distribution automation – the one technology that will provide utilities with the visibility they need to shape their smart grid as they move forward with a solid plan to meet their goals.

Distribution automation should be the primary focus of utilities from now until 2020. Why? Fault detection and fault isolation were considered separate issues in the past, but distribution automation takes a comprehensive view of these interrelated factors to enable volt/VAR optimization (VVO), fault isolation, system restoration and transformer monitoring – from large substations to even small or secondary transformers.

With this kind of asset management and analytics, a utility can move beyond simple monitoring. This is a predictive modeling solution that enables them to keep pace with their demand curve, maximizing their efficiency. They can conduct scenario modeling to really understand – and affect – what is happening with their grid at any given moment.

How to Keep Pace with a Fluctuating Workforce

Nearly 25-35% of the utility workforce is projected to retire in the period 2010-2015.[4] Distribution automation can help a utility maximize the performance of an aging workforce.

Distribution Automation Impacts Staffing

Distribution automation empowers a utility to make the most of their human resources as well. Most traditional utilities employ an annual maintenance schedule for their equipment, but with the enhanced monitoring capabilities of distribution automation, this type of schedule may no longer be necessary. A utility can now focus on the aspects of the grid that need it and apply resources in the most efficient and effective manner possible.

In terms of service interruptions, many utilities wait until consumer call volumes reach a certain level before dispatching a crew to look at a potential problem. Through distribution automation, a utility can more effectively monitor their feeder lines to pinpoint problems and know exactly where an outage has occurred. Through wireless SCADA, decision makers can receive an email or text notifying them of a problem to increase responsiveness. The outage is minimized reducing revenue loss and improving customer service as a result.

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Voltage Control

Through volt/VAR control (VVC) utilizing distribution automation, utilities drop their output from 123-125 volts to 116-117 volts with no noticeable impact to the consumer. The result is that consumers will get longer life out of their appliances and they will be able to stop paying for unneeded voltage. While the utility may see negative revenue impact up front, as customer loyalty increases and new customers come online, revenue will ultimately increase. As customers increase, the need to build additional facilities lessens with VVC. That means increased revenue also translates into increased profitability.

Advancements in Transformers Support Distribution Automation

Recent technology developments do not stop with distribution automation. There is an entirely new generation of transformers designed to support the smart grid. Traditional transformers may only enable the monitoring of load and external temperature. To gain real insight into the status of a transformer's condition and performance, a utility needs to monitor:

- The status of the load; is it normal, abnormal, or dangerous?
- The internal temperature of the transformer; is it over-or under-loaded, or does it need to be replaced?
- Total combustible gas measurement to provide a parts-per-million aspect on what the real issues are with the transformer.

Through this kind of data, a utility can perform predictive maintenance as opposed to reactive maintenance. The key is to evaluate the monitoring technology of the vendor. Some solutions use external monitoring and cost $100,000 plus to monitor a single transformer. With an internal monitoring solution, the cost can be as low as $1,000 to monitor one transformer.

Defining the Bottom Line

The impact of VVC through distribution automation is lower operating costs, higher operational efficiency, less service interruption/less duration of interruptions resulting in higher customer satisfaction and higher revenue. In fact, a recent study concluded that the ability to operate a distribution system within tight voltage levels in the lower half of the acceptable range could yield a 1 to 3 percent total energy reduction, a 2 to 4 percent reduction in kW demand, and a 4 to 10 percent reduction in kVAR demand without any negative impact to the customer.[6]

Looking Ahead

Distribution automation can help utilities keep pace with the evolving demand of the future. There has been a dramatic rise in reactive loads in the last two decades and this demand is only increasing. For example, in the United States before the 1980s, reactive loads from electronic devices were insignificant. In 2010, the load from electronic devices has increased to 40 percent, and by 2015 it is expected to exceed 60 percent.[7]

Add to this stress on the system the development of electric cars. In 2012, approximately 50,000 plug-in electric vehicles (PEVs) were sold in the United States, and the market is expected to grow by more than 50 percent in 2013. When primarily charged at home, these vehicles can become the single largest power consumer of any device connected at a residence[8]. These vehicles are also unique in that they are typically sold in much greater concentrations in major population centers, magnifying demand spikes and their impact on power distribution equipment. With electric vehicles and distributed generation coming online, you need to have the right technology to make the right decisions at the edge of the grid. With distribution automation, you can get instantaneous information to energize your decision making process.

Benefits to Low Income Populations

Low income energy consumers are less aware of the smart grid than the general population but they still find its benefits appealing, according to a Smart Grid Consumer Collaborative (SGCC) research study.

"Every consumer, regardless of socioeconomic status, should be aware of the benefits of smart grid," said Patty Durand, SGCC Executive Director. "By educating low income consumers about these benefits and acknowledging their preferences, utilities have an opportunity to capitalize on untapped potential for demand reduction across the grid."[5]

The Smart Grid Goes Global

According to The Northeast Group:

"These 35 emerging market countries were active in deploying smart meters and associated smart grid infrastructure in 2012, with over 1.3 million AMI meters deployed. This activity does not even include the mega-markets of China and India, which are not covered in this forecast. A number of emerging market utilities have already announced large projects for 2013, fueling our expectations that the number of smart meter deployments will more than double next year."

All 35 countries analyzed in the study by Northeast Group are projected to begin smart grid deployments in the coming decade. In fact, 14 of the 35 countries are well positioned to begin large-scale smart grid deployments within the next 1 to 3 years.[9]

Acting globally

A recent analysis showed that the number of smart meter deployments across 35 emerging market countries in 2013 will be more than double the number of deployments in 2012. The global advanced metering infrastructure (AMI) market is projected to reach $56 billion by 2022.[10]

In the U.S. alone, estimates show that if the U.S. grid were just 5 percent more efficient, the energy savings and benefits to society would be equivalent to permanently eliminating the fuel and greenhouse gas emissions from 53 million cars.[11]

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[1] Adrain Booth, Mike Green, and Humayun Tai, "U.S. Smart Grid Value at Stake: The $130 Billion Question," McKinsey & Company, (Summer 2010), http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/mckinsey_on_smart_grid

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[3] "Smart Grid Technology Market To Total $494 Billion in Cumulative Revenue from 2012 to 2020," Pike Research, The Smart Grid Observer, (March 6, 2013), http://www.smartgridobserver.com/n3-6-13-1.htm

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[7] "Improving Volt/VAR Control: Tighter Control Reduces Waste and Increases Grid Capacity," Echelon Corporation, The Smart Grid Observer, (2010) http://www.smartgridnews.com/artman/uploads/1/Volt_VAR_Solution.pdf

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[9] "Emerging Markets To More Than Double Smart Meter Growth In 2013, $56bn Market By 2022," The Northeast Group, The Smart Grid Observer, (December 10, 2012), http://www.smartgridobserver.com/n12-10-12-1.htm

[10] "Emerging Markets To More Than Double Smart Meter Growth In 2013, $56bn Market By 2022," The Northeast Group, The Smart Grid Observer, (December 10, 2012), http://www.smartgridobserver.com/n12-10-12-1.htm

[11] "Improving Volt/VAR Control: Tighter Control Reduces Waste and Increases Grid Capacity," Echelon Corporation, The Smart Grid Observer, (2010) http://www.smartgridnews.com/artman/uploads/1/Volt_VAR_Solution.pdf

ABOUT THE AUTHORS

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Scott Zajkowski is part of the North American Business Development group with IUS Technologies who develops end of line devices for the smart grid including their Born Smart TM series of sensors. With an MBA from Indiana University Kelley School of Business, Scott is an ambitious and driven marketing professional with proven success in developing and executing strategic marketing and advertising campaigns with companies such as Lakeshore Energy and HP Products. Previous to IUS, Scott worked at International Truck & Burger King in Packaging Engineering and Management utilizing his undergraduate degree in Packaging Engineering from Michigan State University.