White Paper

Emerging Trends in Analytics

Landis+Gyr
manage energy better

What new capabilities mean for distribution grid management

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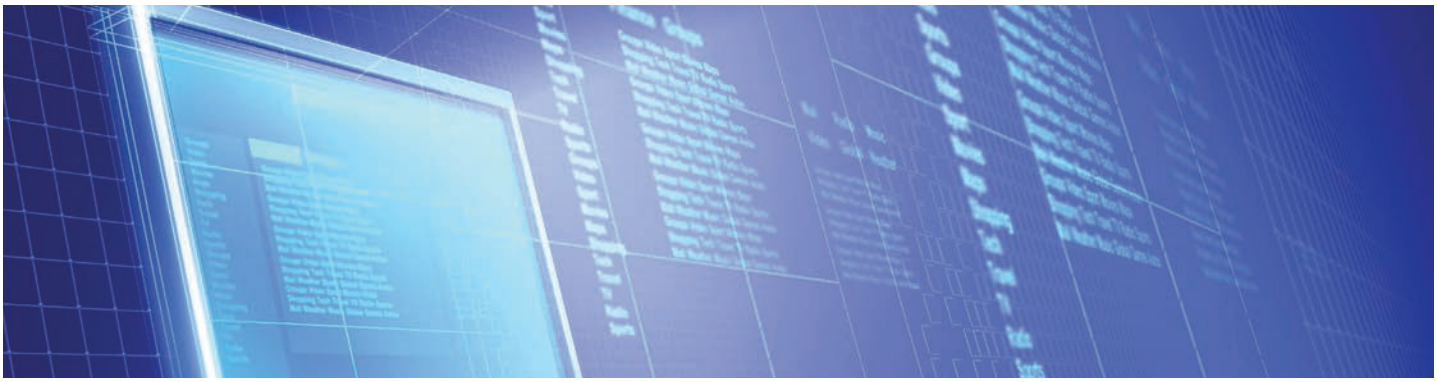
Emerging Trends in Analytics: What new capabilities mean for distribution grid management



Analytics enable organizations to extract business value from large data sets—information they can translate into improved operational processes, increased efficiencies and reduced costs.

Collecting and correlating multiple data sources allows organizations to gain insights that individual data alone does not provide.

In recent years, the almost exponential influx of data has made analytics essential for nearly every industry. Electric utilities are no exception. As smart meters and other intelligent grid devices provide more timely and in-depth data, utilities are using the data to drive operational efficiencies, improve reliability, enable renewable energy resource integration and enhance customer service.

Data Analysis: Where We Are Now

Today, many utilities collect data about energy usage, outages, voltage readings and power quality from their advanced metering systems and process it within a meter data management system. This application of technology enables utilities to quickly respond to outages, provide accurate power usage information to customers, help identify sources of energy theft and assess distribution asset health.

Utilities have experience in applying usage data for billing. More granular, time-stamped data increases the insights available to utilities and supports the implementation of more advanced pricing and marketing strategies. In addition, customer information system data outside of billing is used for customer segmentation and targeting, encompassing everything from conducting customer satisfaction research to developing energy efficiency programs and demand response (DR) offerings.

Distribution grid management systems provide instantaneous views into utility operations that enable real-time monitoring of circuit loading and system performance. Outage management systems make it possible for utilities to deploy crews to remedy outages even before customers call to report their power is out. Utilities are also using geographic information systems (GIS) to share critical information spatially, including providing field crews with information to pinpoint the locations of potentially damaged or malfunctioning assets.

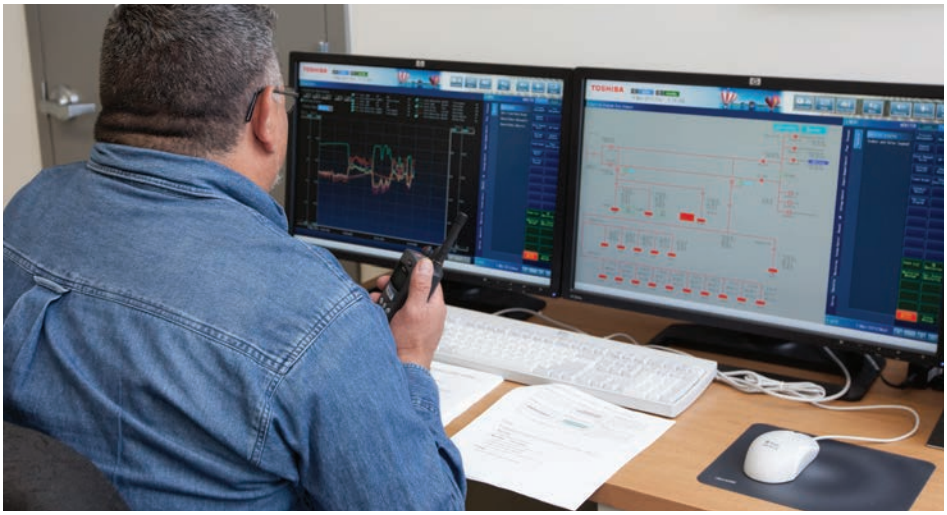
Analytics are used to derive metrics like key performance indicators (KPIs). In some cases, utilities have advanced from manual to automatic report production of outage history information that is submitted to public utilities commissions.

The power of analytics is being leveraged around the broad category of revenue protection, which can help utilities identify system issues involving energy loss from faulty equipment or theft. In the past, utilities relied on word of mouth or other manual processes to identify and to act on these issues. By applying analytics, utilities are able to create suspect lists for targeted further investigation.

Historic records of known causes of outages, such as tree limbs blown onto electric lines, are used as benchmarks for outage prevention planning. This type of analysis can help pinpoint locations where tree trimming and line repair efforts will be needed.

by Kent Hedrick

New Trends in Utility Analytics



With more higher-quality data available in both historic and real time, utilities are searching for ways to better use this data to inform decision-making. Reports from recent utility conferences, such as GridEdge Live, indicate that as utilities begin to understand the value of data from smart meters and distribution automation, they are taking steps to leverage that data to gain insights for addressing specific business challenges. There is an understanding that correlating the data across various systems will only increase the insights and benefits available to utilities.

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In fact, according to a recent "U.S. Grid Automation Report[1]," 73 percent of U.S. utilities plan to procure advanced grid analytics software to leverage the wave of data from their electric systems to "enable faster and more accurate decisions around wholesale peak power purchases, renewable and distributed energy resource integration, customer billing, outages, preventing energy losses, and emergency response planning." This will result in "lower operating costs, higher customer satisfaction, and reducing unnecessary strain on grid equipment," leading to a more resilient distribution grid.

Advanced grid analytics are already delivering significant business value for utility operations, especially in the areas of improved grid resiliency and hardening, asset management, outage restoration, theft prevention and customer segmentation. And, with the fast-paced growth of distributed generation implementation, storage technologies and solar power expected in the coming years, the role of distribution grid analytics will only grow in importance.

Advanced analytics are now providing utilities with new capabilities, including spatial visualization of the distribution grid, more accurate and sophisticated planning, better operational performance and improved asset management. These capabilities enable utilities to leverage historical or stored data ("data at rest") to automate formerly manual processes for grid planning purposes.

The new intelligent network opens the door for utilities to extract the value from real-time data flowing through the organization ("data in motion"). This leads to more intelligent decision-making in support of improving grid operations, optimizing management of distribution generation, and leveraging demand response for overall grid management benefits.

Business Drivers for Advanced Grid Analytics

What are the most important business reasons to apply advanced grid analytics?

1 BUSINESS CASE: REDUCING ENERGY LOSS

Annual potential losses from unbilled power can reach the hundreds of millions of dollars. By minimizing energy loss caused by both technical and nontechnical issues, utilities are able to operate more efficiently and keep rates as low as possible for their customers. Advanced metering data combined with grid analytics make a powerful tool for tracking these losses.

Technical losses, while inherent to the transport of energy and operation of the distribution system, represent a real cost to the utility. Keeping technical loss to a minimum is the goal. Excessive technical losses occur as a result of underperforming distribution assets, such as oversized transformers, non-optimized voltage regulation efforts and nonoptimal circuit configurations. By leveraging data from advanced metering systems with feeder-level usage data, operators can use analytics to pinpoint areas of the distribution system to take actions that improve grid efficiency.

Nontechnical losses occur when internal and external influences impede the accurate accounting of kilowatt hours sold by a utility. Ideally, utilities would not lose any power to nontechnical losses. These losses may result from stopped or slowing meters, theft, or errors in meter programming or the billing system. The overall amount of nontechnical loss is easy to quantify (energy delivered minus energy billed). However, it is difficult to pinpoint without analytics. Comparing usage data from demographically similar premises, and analyzing changes in historical data for a single premise are just two examples of ways in which analytics can help utilities detect nontechnical losses.

2 BUSINESS CASE: IMPROVING GRID RELIABILITY

There are many challenges to maintaining or improving distribution grid reliability — including peak load management, minimizing the impact of outages on customers and hardening the grid against major weather-related disruptions.

When a circuit is at peak load, power losses experienced across a utility grid can be as high as 30 percent. In this scenario, analytics can support utility peak load management efforts by providing intelligence about overloaded circuits and assets and the ways in which customers are contributing to the overload conditions. This intelligence can be used to develop demand response programs and battery storage solutions designed to prevent peak overload conditions and improve power quality and reliability.

Whether a utility has a fixed dollar amount to spend on upgrades or is looking to improve SAIFI (System Average Interruption Frequency Index), SAIDI (System Average Interruption Duration Index) or other KPIs by specified levels, analysis can lead to defined project plans that maximize performance improvements at the lowest total cost. These plans can become key components of a utility's regulatory strategy — one that will stand up to scrutiny and help mitigate risk to its financial health.

In the case of planning for weather-related disruptions, use of advanced modeling and more granular data about critical assets has increased.

- *Before a storm, advanced analytics help predict the storm's impact on the grid and provide intelligence for proactive staffing plans.*
- *During a storm, advanced analytics can identify the number, locations and types of outages to aid in planning power restoration efforts.*
- *After the storm, advanced analytics provide real-time information for staff and customers, and for scheduling restoration crews in the most efficient manner.*

These capabilities can help utilities address the growing need to predict how assets will weather storms.

3 BUSINESS CASE: PROTECTING CRITICAL ASSETS

In order to protect critical asset investments, utilities must be able to identify potential problems in the distribution grid and power supply. Having invested millions or even billions in grid infrastructure, utilities need solutions that maximize value from these assets and support the continued delivery of the reliability that customers and regulators expect. As utilities receive more data about the performance of their distribution grid from intelligent devices, they are better positioned to protect their investments.

Advanced asset management analytics provides comprehensive views of asset health that enable utilities to extend their life, perform risk analyses and calculate the return on investment on potential repairs and upgrades. For example, visualization of overloaded and underloaded transformers enables utilities to resize transformers first in the most highly impacted areas. This type of asset management can also reduce the risk of disruptions to energy delivery and avoid environmental impacts caused by failed equipments.

The intelligence that analytics provide also helps utilities improve asset management by identifying potential equipment breakdowns before they occur and evaluating current operating conditions to prevent long-term problems.

4 BUSINESS CASE: INTEGRATING RENEWABLE ENERGY AT THE DISTRIBUTION LEVEL

Many U.S. utilities are charged with meeting new initiatives, mandates and deadlines for integrating renewable energy at the distribution level of the grid. Yet the aging distribution grid was not designed to manage that level of integration. Among the challenges and costs involved are the need to balance renewables with conventional energy sources, deal with the intermittency of renewable generation and maintain distribution grid power quality and reliability in this new environment.

Analytics can wield a powerful influence on the development of a renewable integration plan. To aide planners' and operators' understanding of the implications of adding solar and other renewable energy resources to the distribution grid, analytics can help quantify the potential load balancing and power quality issues these additions will create for the circuits, as well as the amount and type of grid investments needed to support them.

Analytics enable circuit-by-circuit and total system analyses of grid activity that help utilities visualize voltage levels over time, assess the impact of photovoltaic or other microgeneration additions to the system, and, most importantly, gain an understanding of what adjustments can be made to the distribution system in order to deliver optimum reliability.

Implementing Advanced Grid Analytics

To realize the promise of distribution grid analytics, utilities need a focused strategy, beginning with defining the business and regulatory initiatives to address.

Partnering with a vendor that can deliver a comprehensive package of advanced metering data management and distribution grid solutions that will enable the utility to meet those challenges is the first step in unlocking the potential of advanced grid analytics.

In addition to offering sensing devices, a multipurpose AMI/DA communications platform and a broad applications suite, Landis+Gyr offers a unique approach that is completely focused on deriving intelligence from activities occurring on the distribution grid — from the edge of the grid to the distribution substation. Our operation-ready solutions range from a single project to a system solution that can be easily integrated across the enterprise.

[1] New Trends in Utility Analytics: http://zpryme.com/work/2013-u-s-utility-grid-automation-survey-part-1/