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FutureReady

WHERE THE SMART GRID IS HEADING

Mining Meter Data

Load Shedding with Voltage Management

Real results. Right now.

Short Circuiting Power Thieves:

Using Smart Grid Technology to Protect Revenue

New IEEE Networking Standard

Moves industry toward interoperability

News from Landis+Gyr

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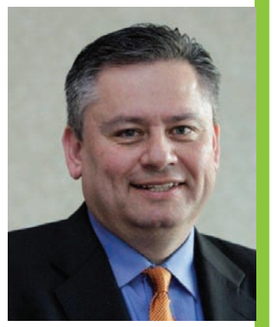

a message from Richard Mora

The pace of change in our industry is more rapid each year. As technology adoption continues to impact how utilities do business, it's important to stop and reflect on how our industry is beginning to leverage the full potential of smart grid innovation. That's what *FutureReady* is all about. Our current issue explores the ways in which some utilities and electricity suppliers are already deriving big business benefits from the data and process automation that smart grid solutions deliver.

With recent reports putting penetration of smart meter technology in North America at 50% by 2016 and 100% by 2020,[1] AMI systems are quickly moving to the mainstream. By mining the high volumes of data coming in from their smart meter installations, many large utilities are changing the way they do business.

Beyond frequent reads, this new influx of data also provides intelligence never before possible for improving network operations and planning. In "Mining Meter Data for Business Value," we explain how intelligence from a state-of-the-art meter data management system (MDMS) is enabling one Texas utility to better serve its customers by improving its response to outages. In "Load Shedding with Voltage Management," you can learn how a Tennessee utility is not only using Volt/VAR management to improve grid capacity, but also realizing tangible payoffs, right now.

This issue also explains how industry collaboration has shaped the new IEEE 802.15.4g radio standard, which is advancing new standard specifications for smart grid communications technology and helping to usher in a new era of interoperability.

In this ever-shifting landscape, it's essential to share knowledge and insights. At Landis+Gyr, we're pleased to be able to pass along what we've learned—from our own experts, partners and customers. We hope these perspectives provide the support that utilities are seeking as they prepare for the challenges ahead.

Above all else, *FutureReady* is meant to be a tool—one that helps you move forward in your journey toward a smarter tomorrow.

Richard Mora

President and CEO
Landis+Gyr North America

1 "Berg Insight: Worldwide installed smart meters to reach 602.7 million in 2016," http://www.elp.com/index/display/article-display.articles.electric-light-power.meetering.2011.10.berg-insight__worldwide.QP129867.dcmp=rss.page=1.htm

Mining Meter Data for business value:

HOW ONE TEXAS UTILITY LEVERAGES MDM DATA FOR IMPROVING OPERATIONS AND CUSTOMER SATISFACTION

Ever since Oncor—a Texas utility in the final stages of one of the largest, fastest and most advanced smart meter deployments in the U.S.—synced its meter data management system (MDMS) and its outage management system (OMS), it has been leveraging billions of pieces of interval data every day to improve outage management and customer service.

With today's advanced metering systems, utilities face new challenges and opportunities for leveraging the large volumes of interval data they collect daily. When advanced metering infrastructure (AMI) is integrated with MDMS, utilities can do more with that data and use it in many applications.

Oncor, the largest regulated transmission and distribution utility in Texas, has made inroads in leveraging AMI data and proving its value to utilities. It has demonstrated success in using AMI and MDMS in tandem with OMS to improve operational efficiency and the consumer experience.

Smart Texas

Oncor delivers power to approximately three million homes and businesses and operates approximately 117,000 miles of distribution and transmission line in Texas.

As part of its Smart Texas smart grid deployment, Oncor set out in 2008 to merge the functions of multiple information technology systems. Their goal: To collect and utilize 15-minute-interval electricity consumption data. Since then, Oncor has installed Landis+Gyr smart meters in most of North Texas—covering most of its customer base. Deployment of smart meters for all of its customers is scheduled for completion by the end of 2012.

In 2009, Oncor deployed Ecologic Analytics' MDM software integrated with a Landis+Gyr smart meter system. At the same time, the utility deployed Intergraph's OMS. While these tools were originally designed for future integration with each other, they were owned by different internal teams and used independently. "There was a lot of siloed thinking at the time," says Mark Carpenter, senior vice president, T&D system operations and measurement services at Oncor.

Importance of Integration

The utility recognized the importance of leveraging meter information from its MDMS to augment utility OMS data so that it could more accurately pinpoint areas experiencing outages.

But, with widely varying opinions swirling around the company about the value of AMI data, would they be able to integrate systems and meet their objectives? Oncor's distribution operators were skeptical. They, like many others in the industry, were under the impression that AMI generated too many false positives.

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The focus of the integration team was to design a system that would eliminate false positives, optimize the number and quality of alarms, prioritize system messages, and reconcile AMI and OMS data.

Working with IBM as system integrator, Oncor developed a plan to more closely link its MDMS and OMS. Working with all the players involved, IBM helped them understand the commonalities of the systems and establish consistency. The result was a "system of systems," with each component designed to derive valuable data.

Now, Oncor dispatchers have the ability to use push-reads to validate power restoration after large storms and to perform verifications with a single click.

A New Approach to Outage Management

Between March and April 2012—within the first six weeks of completion of the system integration project—the AMI system generated more than 1,400 notifications signaling unusual events at smart meter locations. Of those issues that were outages, more than half were restored before they were reported by customers. In addition, a number of notifications identified failing distribution equipment, providing the utility with the opportunity to initiate repairs before an outage occurred.

While 100% of these events were validated as actual, only 35% resulted in customer calls or complaints. It was determined that the majority of the issues were actual outages and that others were power quality issues created by bad connections or opened neutrals. (In many cases, repair technicians had visited the locations of the issues in the past, but had not identified the problem.)

"This is a game-changer for our customers," says Jim Greer, Oncor Chief Operating Officer.

> ***"In the past, we didn't know about an outage until a customer reported it. Now, we are able to use the information from our advanced meters to diagnose and fix many issues on our system before they cause problems."***[2]

Today, Oncor is beginning to recognize clear patterns in its data—patterns that help it address problems before they occur.

There is no longer a need to wait until a customer discovers a power outage, so the utility is able to provide customers with significant improvements in service restoration for customers.

Moving to the Next Level

Oncor's Mark Carpenter describes the progress made by the utility since the integration of the two systems as "just the tip of the iceberg" of the efficiencies and service improvements possible from the use of AMI data.

'Using this new information, we can continue to make adjustments and address issues on our grid as needed to ensure that our customers are receiving the quality of service they demand and deserve," says Greer, "and our advanced meters are helping us deliver on that promise."[3] ■

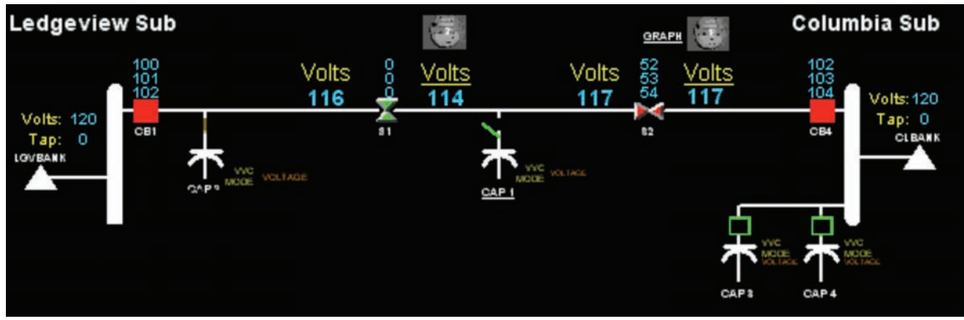
2, 3 "Advanced Meters Allow Oncor to Respond to Outages Before Customers Contact Us," Oncor Press Release, May 3, 2012, http://www.oncor.com/news/newsrel/detail.aspx?prid=1324

Today, Oncor is beginning to recognize clear patterns in its data—patterns that help it address problems before they occur.

Load Shedding with Voltage Management:

Real results, Right now

With the proliferation of smart meters and the granular data they provide about customer usage, utilities are taking a new look at distribution voltage management—or voltage control—as a strategy for load shedding.



Dynamic voltage management is based on maintaining customer voltage at the lower half of the 10% voltage band required by ANSI equipment standards. It offers the ability to deliver significant cost and energy savings and has proven value as a load shedding tool. Generally, for every 1% of reduction in circuit voltage, there is a corresponding energy savings of roughly .8%.

Yet, until recently, utilities faced two major obstacles when considering the implementation of wide-scale voltage management. First, they needed a practical method for controlling voltage that is adaptive to the dynamic changes that typical distribution circuits undergo. They also needed the ability to quantify the energy saved when the circuit is operating in the more precise lower or upper voltage band.

New potential for energy and cost savings

Advanced metering technology makes it possible to use timely voltage data from every meter and to monitor and control voltage levels with greater precision than ever before—reaping significant energy and cost savings. Reducing voltage from 120 volts to 118, for example, could reduce the power a utility delivers by nearly 2%—a gain that could add up to gigawatt-hours of energy savings over a single year.

Nashville Electric Service (NES)—the country's twelfth largest municipally-owned power company serving approximately 360,000 customers in central Tennessee—is one of many utilities that has realized significant savings from a voltage management implementation.

Because all the power that NES distributes is purchased from the Tennessee Valley Authority (TVA), the decision by TVA in 2010 to begin billing a monthly demand charge, based on the combined peak usage for all residential customers, was direct and immediate. It meant that, while NES was being charged for peak demand, there was no way for them to recover the costs from their customers.

"Solution on a shoestring"

Without the financial resources to install smart meters at every home so that it could bill customers based on their peak usage, NES made

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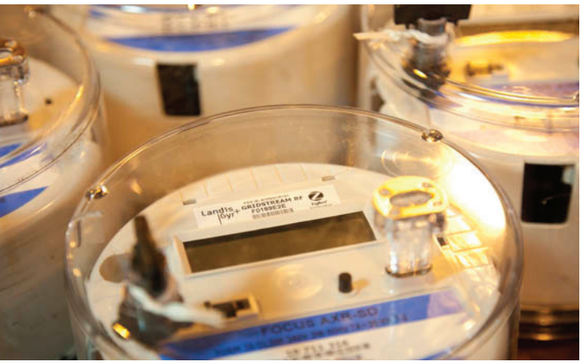
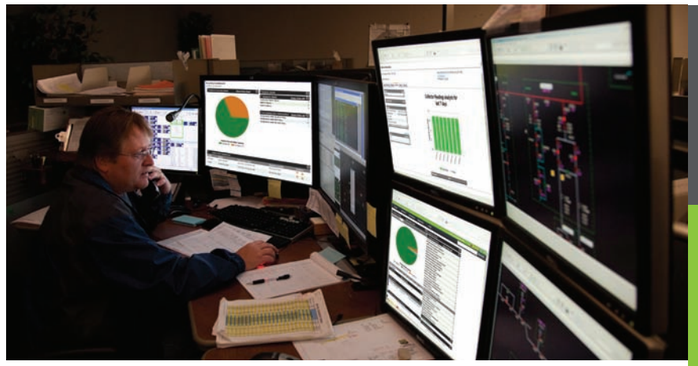




the decision to reduce peak demand by implementing a dynamic voltage management program on a system-wide basis, thereby reducing the impact of demand-based wholesale rates on its residential customers. Vic Hatridge, vice president and CIO at NES, calls this a "solution on a shoestring."[4]

At the outset of the pilot, NES set a range for peak load periods based on an algorithm using the ANSI standard for voltage variation. NES set its range at narrower than the ANSI range of 114 to 126 volts in order to reduce the cost of peak energy use. The utility installed 30,000 new smart meters at key locations—700 of which will serve as "continuous voltage sensors" on each circuit.

Now, in order to shed load, NES uses five years' worth of data about weather and power use to forecast peak demand 10 days out and drops voltage based on that data.

Powerful Results

The NES voltage management program has achieved impressive results, having reduced load by 40 MW, with an estimated savings of more than $1 million in less than six months. Their long-term goal is to increase capacity to reach greater than 3% of peak demand.

For years, the industry has realized that Volt/VAR management can be a truly effective way to manage loads during peak demand. For utilities with AMI systems looking to control peak load, volt/VAR programs can be a smart place to start. Not only are the charges virtually "invisible" to energy consumers, the potential payoffs are impressive. ■

4 "Nashville Electric Service pursues voltage conservation," Intelligent Utility, July/Aug. 2011, http://www.intelligentutility.com/magazine/article/230735/nashville-electric-service-pursues-voltage-conservation

New FERC Order—

BOON OR BANE FOR DEMAND RESPONSE

In March 2011, the Federal Energy Regulatory Commission issued FERC Order 745 to maintain the competitiveness of organized wholesale energy markets and to ensure equitable compensation of demand response (DR) program participants.

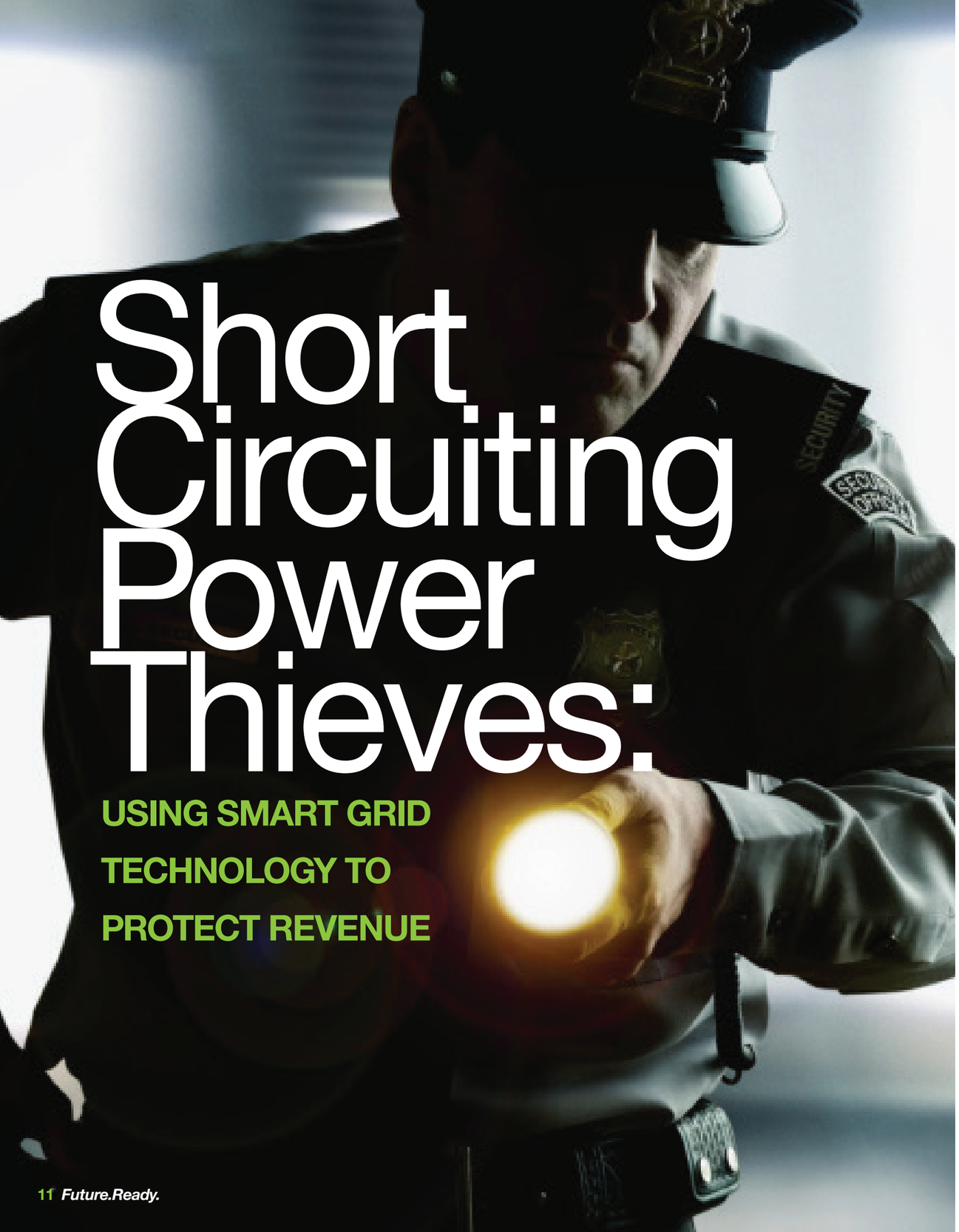
Because the FERC Order entitles program participants to the full locational marginal price (LMP) of the load it sheds—up to 10 times more than the price that applies during peak demand hours—it represents a "win" for consumers. The order also provides a powerful marketing tool for distributors looking to increase participation in DR programs.

However, Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) charged with filing plans for compliance with the order are finding that it's not exactly a "win-win."

A proposal recently filed by California Independent System Operator, for example, was denied because its proposed plan did not follow FERC's prescribed cost allocation methodology and, as a result, could actually hurt utility customers and ratepayers in the future.[5] Plus, a number of industry trade associations are going so far as to argue against FERC's jurisdiction in the matter, citing the Federal Power Act. In the meantime, refilings by ISOs and RTOs continue.

While DR is generally considered to be an essential tool for controlling load, there are still widely varying opinions about its relative monetary value. Indications are, the arguments will continue, at least in the near term. ■

5 "FERC, CAISO at odds over proposed demand response plan," North America Power Partners http://www.nappartners.com/news/ferc-caiso-at-odds-over-proposed-demand-response-plan



Short Circuiting Power Thieves:

USING SMART GRID TECHNOLOGY TO PROTECT REVENUE

One of the many downsides of a tough economy is an uptick in theft. During the recent recession, electric utilities have certainly seen their share. Take American Electric Power, for example. Between 2008 and 2009, this Ohio-based generation, transmission and distribution utility saw a 27% jump in suspected power theft, or nearly 4,000 separate cases.[6]

Theft on this scale has considerable financial implications. For many utilities, lost revenue can quickly amount to hundreds of thousands of dollars every year. Yet the problem goes far beyond bookkeeping.

Attempts by consumers to bypass meters or tap directly into distribution lines can create serious safety hazards. Power theft can also be an indication of other criminal activity, such as marijuana growing. Plus, utilities that suspect power theft—but do nothing—can be held liable in some states for resulting injuries and property damage.

A Smart Approach to Spotting Theft

Fortunately, today's smart grid systems give utilities a powerful new set of tools to stop power theft. That's because advanced metering infrastructure (AMI) and head-end management software deliver a wealth of usage, performance and operation data, in near real time. In addition, utilities using a meter data management system (MDMS) can obtain even more information through analytics.

But data itself isn't the solution. The key lies in using data to recognize certain patterns—the power fluctuations and usage irregularities—that often point to suspicious behavior.

The following are examples of common types of power theft, and how they can be identified using Landis+Gyr advanced metering technology—the FOCUS® AX family of electrical meters, the Gridstream network, Command Center software and Ecologic Analytics' MDMS software.

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6 "Electricity Thefts Surge in Bad Times," USA Today, March 13, 2009, http://www.usatoday.com/money/industries/energy/2009-03-16-electricity-thefts_N.htm

Theft Scenario #1 | Disabling the Current Transformer (CT) Lead

This is a type of tampering in which an energy consumer cuts or otherwise disables the Current Transformer (CT) lead at the meter, interrupting the flow of electricity through the metering circuit. To spot this type of theft, look for:

- A lack of registration at the meter level
- A dashboard alert in Command Center showing unexpectedly high/low or zero consumption; an exception report may also be generated showing irregular kWh consumption across several days
- Rules-based alerts at the MDMS level that show extended periods of low or zero usage
- A Network Performance Monitor (NPM) zero current flag may also occur at the MDMS level

If you notice patterns like these, the best course of action is to dispatch a technician to the premises to perform a thorough inspection of the meter.

Theft Scenario #2 | Meter Switching

In this kind of theft, consumers typically steal a meter from another service to activate energy on a disconnected or inactive service. It also applies to consumers who periodically "borrow" meters from other premises, so usage is not recorded on the meter associated with their bill. To identify meter switching, watch for:

- Power interruptions logged at the meter level
- Validation estimation and editing data reads at the MDMS level, indicating significant usage fluctuations (either very high or very low), as well as a high instance of missing/estimated reads
- Isolated outage alerts at either the Command Center or the MDMS level

It's important to note that meter switching can be challenging to prove. If you suspect this type of activity, use your outage management system or NPM to investigate any isolated outages. Try to identify patterns in the power interruptions—do they occur only on certain days or at certain times? By knowing when switches are occurring, you may be able to time a visit to the premises to catch the power thief in the act.

Theft Scenario #3 | Partial Service Diversion

A more sophisticated form of power theft, partial diversion involves allowing some, but not all the electricity flowing to the premises to pass through the metering circuit. The thief's goal is to hide the true magnitude of his energy consumption—without raising the suspicion of the utility. This tactic is popular with marijuana growing operations and methamphetamine labs, both of which require large amounts of electricity. Often, power is partially diverted by tapping directly into a distribution line or connecting to a transformer. Utilities can spot this type of activity by looking for:

- Significant drops in service voltage at the meter level, viewable within Command Center or the MDMS (this can be a consequence of high power consumption)
- A service diagnostic error at the meter level, viewable within Command Center or available to third-party applications via real time application programming interfaces
- An NPM low service voltage flag at the Command Center or MDMS level
- An NPM high temperature flag at the MDMS level
- Non-technical losses in the Virtual Meter & Aggregation Engine (VME) when compared to overall transformer or circuit in the MDMS

A confluence of these errors and alerts could indicate a partial service diversion. The first step should be comparing the meter in question with other service points on the same transformer to look for discrepancies. This will help rule out more commonplace problems, such as a faulty circuit or metering equipment. If you still suspect service diversion, proceed with caution. Consult local law enforcement before dispatching a technician.

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The Power to Protect Revenue

While there is no silver bullet for stopping theft, it is possible to recognize when electricity is being used illegally and take corrective action. The solution lies in both implementing reliable smart grid systems and knowing how to interpret the data they provide. You can further enhance and operationalize your approach to theft protection by documenting the processes used to identify it, then sharing this information internally.

Choosing the right smart grid partner also makes a difference. At Landis+Gyr, we are constantly improving our products to include even more robust notification systems—for meter tampering, excessive leading current and more. It's all part of our commitment to helping our customers protect their assets today and well into the future. ■

Related Content

Landis+Gyr solutions are designed with revenue protection in mind

Landis+Gyr prepayment meters help protect revenue for African utilities

Best Practices ***for Theft Prevention***

PUBLIC NOTIFICATION	*Include a page on your website to remind energy consumers that power theft is a crime and will be prosecuted.*
KNOWLEDGE SHARING	*Stay abreast of the latest revenue protection resources and information through industry groups like the International Utility Revenue Protection Association (IURPA).*
ESTABLISH A PROCESS	*Create and communicate an internal process for suspected theft reporting; you may even want to consider hiring a Revenue Protection Investigator to oversee this effort.*

New IEEE Networking Standard

MOVES INDUSTRY TOWARD INTEROPERABILITY

The recent release of a new global wireless networking standard from IEEE (Institute of Electrical and Electronics Engineers) moves the smart grid industry one step closer to network interoperability. The IEEE 802.15.4g radio standard, published on April 28, 2012, establishes common and consistent communication specifications for utilities deploying smart grid technologies, enabling interoperable communications between smart grid devices, including smart meters and smart home appliances. The specifications will help enable interoperability in mesh, star, point-to-point or any other topology.

Landis+Gyr experts were active in shaping the new standard, as were other major industry players, including Elster, Itron, the National Institute of Information and Communications Technology (NICT) of Japan, and Silver Spring Networks. The focus of all participants was on backward compatibility with existing deployed devices and the ability to support future growth for features, services and increased network speeds.

The standard can already be supported by products deployed from many global vendors and is expected to rapidly gain worldwide adoption. It represents a major milestone on the path to network interoperability—which will eventually allow utilities to use standards-compliant devices from a variety of vendors in their smart grid networks.

Landis+Gyr believes interoperability is essential to realizing the potential of smart grid. It continues to support industry-wide collaboration on behalf of utilities for definition, selection, validation and certification of the set of standards that must be established for a fully interoperable communications stack for smart meters. ■

GRIDSTREAM™ SERIES V IS ON ITS WAY

Landis+Gyr Will Deliver Even More Features in its Most *Future Ready* Platform Yet

The next generation of Gridstream™—Landis+Gyr's powerful smart grid technology—is currently in production. Gridstream RF Series V is a fully upgradeable platform capable of adapting to future applications and communication protocols, while still interfacing with currently deployed assets.

Series V provides the same networking capabilities and support for advanced metering, distribution automation and home energy management as Series IV, but includes key enhancements:

- ***Industry-leading network performance with a 300% increase in data rate***
- ***Open computing platform with headroom to support growth in both processing and memory as utility needs change***
- ***Migration paths that reduce risk and provide options that offer backward compatibility with existing Gridstream devices***

It also features ample processing capabilities that are well suited for multiple protocols—including the IPv6 family (IPv6, ICMPv6, UDP, RPL), and emerging IEEE and IETF open communication and networking protocols. At the same time, customers using the previous version of the platform, Gridstream Series IV, can rest assured their investments are protected. Series IV will continue to be fully supported and will integrate with all Series V systems.

With the release of Gridstream Series V, Landis+Gyr continues to deliver on its promise to help utilities perform today, while they prepare for tomorrow. ■

Green Button

EMPOWERS ELECTRICITY CUSTOMERS

With more and more U.S. households taking control of their energy consumption, there's a greater need to make energy data accessible.

Now, responding to a White House call for action, a few forward-thinking utilities and electricity suppliers will provide consumers with the information they need to lower their energy costs.

Dubbed "Green Button," the new industry-led initiative will enable customers to securely download user-friendly energy usage information from the websites of their utility or electricity supplier. Participating utilities have agreed to base their Green Buttons on an open standard, which will enable the development of innovative Web and smartphone applications that consumers can use to choose a rate plan that matches their usage patterns, access customized energy efficiency tips, find tools for sizing and financing rooftop solar panels, and much more.

Landis+Gyr fully supports the Green Button initiative, which mirrors its mission to help utilities and their customers manage energy better, and is already participating in this initiative by providing data for Smart Meter Texas (SMT), a website built by a consortium of Texas utilities to give customers with smart meters greater control over the electricity they use.

Green Button capabilities are also being integrated into SmartData Connect™, a meter data management (MDM) module created by Ecologic Analytics and offered exclusively by Landis+Gyr. This feature will help ensure that all MDM data is validated and "consumer ready."

Landis+Gyr is committed to helping standardize consumer usage data and delivery and to fully engaging consumers in managing their energy consumption. ■

Landis+Gyr A KEY TO TOSHIBA'S SMART COMMUNITY

With its robust smart grid solutions and recognized expertise in energy management, Landis+Gyr has become essential to Toshiba's "smart community" vision.

Toshiba, which acquired Landis+Gyr in 2011, has dedicated significant resources to promoting smart communities—places where major infrastructure systems use linked IT platforms to optimize efficiency, sustainability and quality of life. The global electronics company already has an array of smart infrastructure technology—including solutions for power supply and distribution, information and security, water, transportation, and hospital information. Landis+Gyr's end-to-end smart grid capabilities are the perfect complement to this portfolio.

"The smart meter is a gateway for the smart community business," said Dr. Katsutoshi Toda, Technology Executive with Toshiba's Social Infrastructure Systems Company. "By adding Landis+Gyr to the Toshiba group, we can be the world's first one-stop solution provider in the smart community business."

Toshiba is currently involved in 27 smart community projects worldwide, including an American-Japanese collaborative project in Los Alamos County, NM. This project focuses on large-scale solar integration utilizing a megawatt-scale hybrid battery system, and Toshiba's control software. It also includes construction of a "smart house" for demonstrating demand response functions, real time pricing initiatives, and other new home area network technologies.

Another U.S. project demonstrates demand management control of multiple electric vehicle charging stations with Toshiba's energy storage infrastructure and control software at a commercial location.

By leveraging these experiences and growing the Landis+Gyr business, Toshiba is on track to deliver the first generation of comprehensive smart community solutions. ■

Events:

JOIN LANDIS+GYR AT THESE UPCOMING INDUSTRY EVENTS

Autovation 2012	*Long Beach, CA* *Sept. 30 – Oct. 3*
EEI Transmission, Distribution and Metering Conference	*Indian Wells, CA* *Sept. 30 – Oct. 4*
Utility Analytics Institute Forum	*Arlington, TX* *Sept. 18 – 20*