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FutureReady

WHERE THE SMART GRID IS HEADING

AMI+DA: Building a Smarter Grid

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Some Pros and Cons

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Recent forecasts put global investments in smart grid implementations at more than $45 billion by 2015. As senior leaders at utilities begin to make critical decisions about their own investments in technologies that can save energy, reduce costs, and improve reliability and customer satisfaction, they face daunting challenges and questions.

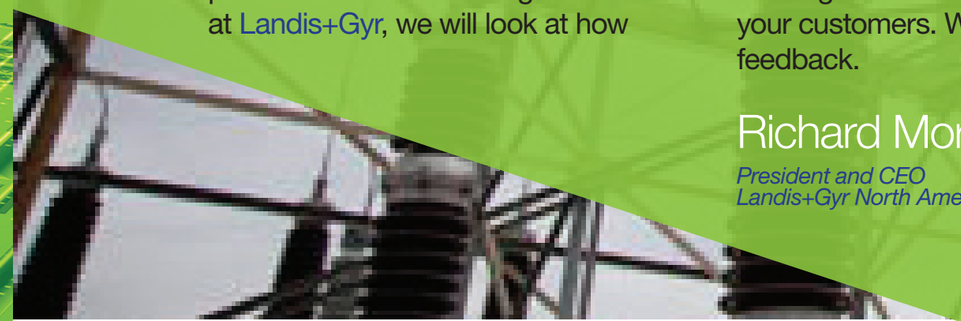
What's the right mix of technologies for realizing the promise of smart grid? How can smart grid systems be protected from intrusion, cyber attacks, theft and other disruptive events? What are best practices for ensuring that smart grid vendors deliver the right functionality? These are just a few of the issues that lie ahead as our industry works to reap the expected benefits of smart grid.

In *FutureReady,* a new quarterly publication from the thought leaders at Landis+Gyr, we will look at how today's smart grid experts are answering questions like these. As a global player in the industry, Landis+Gyr feels a responsibility to share information and best practices in this dynamic field. Our hope is that we will be able to provide guidance for making critical decisions about smart grid technology and services. We also seek to shed some much-needed light on the issues that will continue to matter as we move into a cleaner and smarter energy future.

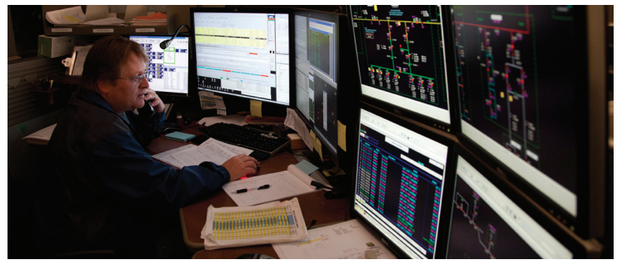
In our first issue, we are just beginning to scratch the surface as we cover some of today's hottest smart grid topics — the convergence of AMI and DA, smart grid security, selecting an MDM vendor, and more.

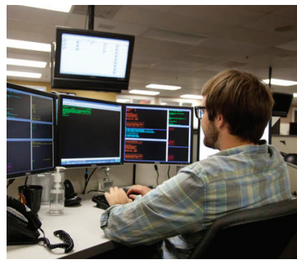
We hope that you'll find *FutureReady* to be a valuable tool as you take the next steps in your journey toward building a smarter grid to serve your customers. We welcome your feedback.

Richard Mora
President and CEO
Landis+Gyr North America



Security Check: end-to-end view of smart grid security





When deploying smart grid technologies, today's electric utilities are increasing their security challenges. To protect critical systems and assets, it will take an end-to-end, systemwide security architecture that encompasses cybersecurity, physical security, and security monitoring and management.

Smart grid technologies are a double-edged sword — a boon for utilities seeking new levels of reliability, efficiency, and power quality and a potential target for cyber attacks. "Opening more of the power grid to monitoring and control by information technologies presents enormous potential for delivering energy more efficiently and profitably," says Heath Thompson, Chief Technology Officer at Landis+Gyr, "but it also brings inherent risks in terms of security vulnerabilities."

The vulnerability of smart grid networks is real. Last September, the National Institute of Standards and Technology (NIST) published an internal report (NISTIR 7628) that acknowledged all smart grid systems will be targets of an attack at some point.

As a result, there is new urgency among utilities to deploy end-to-end integrated security infrastructures capable of protecting personal data and the integrity of distribution and transmission systems.

Because effective security solutions must protect many levels of infrastructure and encompass a complex set of concerns, it is important to take a system-wide view and to plan for protection one step at a time.

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Step 1 | Implement Virtual Security Measures.

Security for a smart grid network demands a delicate balance of three factors — confidentiality, integrity and availability. "Maintaining that 'CIA' forms the foundation of the network," says Thompson.

After developing a risk assessment and inventory of assets, the utility should assess and prioritize its risks.

Confidentiality protects data from access by unauthorized sources and requires the ability to activate encryption from meter to utility center. The integrity issue is addressed by ensuring that the source of data is always authenticated and that data is not modified without authorization. And, because network availability is often considered the highest priority, protections against attacks on the physical network must be put in place.

After identifying the highest-priority risks, the utility can then apply the guidelines provided in NISTIR 7628 to develop cyber-security strategies to address those risks and to integrate the security solution effectively with system architecture, protocols and communication medium.

Step 2 | Address Physical Security.

Another key concern in developing a smart grid security strategy is the protection of physical assets — equipment, components and facilities — from physical or environmental damage. In addition to the need to contain the costs of equipment replacement, utilities must protect themselves against the very real possibility that attackers can gain physical access to network infrastructure and load viruses that can attack the system.

"Tampering is a big concern with the smart grid because you have network nodes that are effectively out in the open, often on the side of someone's house," Thompson says.

Utilities must seek a security solution that protects against attacks that can affect operations and compromise data. In addition to a validated and tamper-resistant hardware solution that supports overall smart grid security, an effective smart grid security solution will need to include monitoring and intrusion detection devices to alert utilities to threats or failures.

A New Look at Security Strategies

When developing their smart grid security strategies, utilities should take a short- and long-term view. "Once utilities solve the problem — with protection against both intentional and unintentional attacks — they need to ask how they'll make the solution cost-effective," says Thompson. "Security is not free. It actually comes at a high cost in high-risk scenarios. The right vendors can help control that cost."

At Landis+Gyr, security has been a priority for more than a decade. This includes practical experience in field applications, as well as developing and maintaining a strong risk-based methodology for ongoing product development. One way that Landis+Gyr addresses dynamic risk is through ongoing penetration testing of the Gridstream™ smart grid solution for advanced metering, distribution automation and personal energy management. ■

Step 3 | Optimize Security Management & Monitoring.

Deploying a secure smart grid solution is just the beginning. Continuous monitoring for cyberattacks or other abnormalities will be critical — as well as the ability to quickly restore the network in the event of an attack.

In fact, it's required. The Critical Infrastructure Protection (CIP) program of the North American Electric Reliability Corporation (NERC) requires the implementation of automated tools and processes for monitoring security events. "Today's utility must be able to monitor security events in real time or forensically," Thompson says. ■

Related Content

Smart Grid Security: Preparing for the Standards-Based Future
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Landis+Gyr Enhances End-to-End Security for Gridstream RF Smart Grid Network
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Distributed Generation:

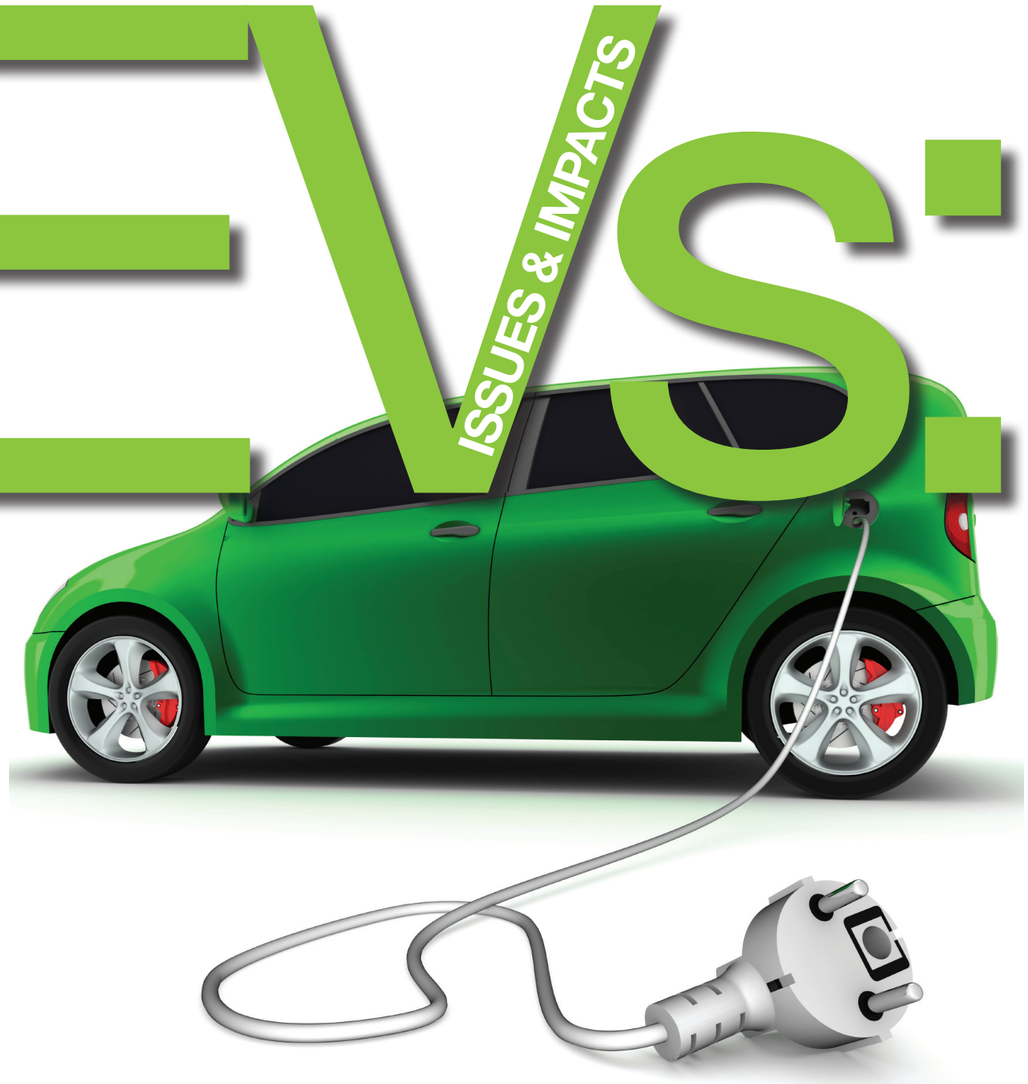
most commonly defined as the generation of electric power at or near the point of use — is one way to meet the growing demand for electricity.

New opportunities for commercial and residential customers to use distributed generation resources for all or part of their own energy needs could have positive and negative effects on the business of utilities.

With growing energy demands and the development of new, environmentally friendly technologies, distributed generation is fast becoming an attractive option for large users seeking solutions to their energy supply needs. And as the concept gains momentum, it will become increasingly difficult for utilities to ignore. Organizations with foresight will begin identifying smart grid partners that not only understand the complexities of distributed generation, but also offer flexible technologies that can evolve and accommodate these new energy sources. ■

PRO	CON
ECONOMICS	
The ability for users to self-generate may help utilities balance system loading, meet regulatory requirements for alternative energy and reduce peak power costs.	Deployments currently lack incentives for utility to support distributed generation as an alternative to peaking plants.
INFRASTRUCTURE	
Generators located close to end users could postpone the need to build costly, large-scale power infrastructure.	The small size and number of distributed generation installations may complicate interactions with the grid.
POWER QUALITY AND RELIABILITY	
Self-generation may reduce or eliminate losses to commercial customers due to power interruptions.	As small generation systems feed back into the grid, power and service quality may be compromised.
PEAK DEMAND REDUCTION	
Utilities may be able to call on owners of emergency distributed generation units to make them available during peak demand periods.	For distributed generation systems to provide additional generation capacity, they may need to be operated as an integral part of the electricity system.

EVs: ISSUES & IMPACTS



U.S. manufacturers are in the fast lane to meet or exceed President Obama's stated goal to have one million electric vehicles (EVs) on the road by 2015. As adoption of EVs increases, electric utilities will feel the effects. Here are just a few of the complex infrastructure issues that utilities will soon need to sort out.

Issue — What's likely to happen:	Impact — Utilities will need to:
EV energy consumption may double peak residential electricity demand.	Evaluate substation, circuit and transformer loading and upgrade as needed to handle excess pressure on the grid.
Many EV owners will want separate meters at home to take advantage of special prices for EVs.	Determine whether they want to own, maintain and service these additional meters.
A significant percentage of home charging will be done in peak hours.	Offer incentives to customers to charge EVs in off-peak hours.
In the early stages of EV adoption, EV usage will emerge in neighborhood "clusters."	Track charging locations in order to pinpoint areas with the highest electricity loads.
Smart grid technologies will provide new opportunities to sell appliances to the EV market.	Decide whether opportunities to offer new services and products are worth the risk.
Many charging stations will be owned by third parties.	Develop new business models for tracking power used by these stations.
EV owners will need to plug into charging stations away from home.	Develop transfer pricing agreements to accommodate "roaming" or pay stations like parking meters.

Electric vehicle and battery storage technology are going to work hand-in-hand in the future, according to Steven Schamber, Vice President and General Manager at Landis+Gyr North America. "People are going to start driving electric vehicles, which are going to be a big demand on the grid, and we see battery storage as a way to provide that capacity when energy is in short supply." Advanced battery storage will enable energy to be stored locally, and then dispensed for electric vehicles as need be. Schamber also sees applications of energy being put back on the grid during peak times. "What Landis+Gyr is working on today is how do you measure energy in both directions? How do you provide billing reconciliation as you provide energy that is delivered to the customer and received from the customer? We're very much a leader in that space, but it's also going to take a lot of work by the utilities to decide what direction they're going to go and what type of back office systems they are going to put in place to make it happen," he added. ■

AMI + DA: Building a Smarter Grid

Advanced Metering Infrastructure (AMI) was the first smart grid application and many utilities, if they haven't already, plan to deploy AMI systems to enable automated two-way communications with smart meters. Yet, for smart grids to realize their full potential, utilities need the ability to integrate communications and intelligence in order to realize new synergies and efficiencies. Enter Distribution Automation (DA). Here's how the convergence of these two formerly disparate solutions can make a smart grid smarter.

With new technologies and solutions, utilities are finding the need to optimize distribution grids in order to deliver "smarter" capabilities — including on-demand information for every point in the system, monitoring and control of distribution assets, energy efficiency and reliability, and management of new sources of generation.

Most utilities begin smart grid deployment with investments in AMI for the transfer of energy consumption and power quality data through the network. Yet, to realize a greater return on its investment, the utility can make its distribution grid "smarter" by networking multiple applications via a single communication technology.

DA: A Key Piece of the Puzzle

For smart grids to be ready to support new capabilities such as distributed generation and microgrids, electric vehicles (EVs), and energy storage, utility decision makers will need to take proactive steps to ensure greater levels of network intelligence. This is driving demand for DA solutions, which enable real-time monitoring and remote control of substations, capacitor banks, feeder switches, and other physical distribution assets — as well as fault detection, fault location analysis, volt/VAR control, and power quality measurements.

DA is widely considered to be the real "intelligence" of smart grid. "More and more utilities are interested in the DA applications of communication networks," says Lizardo Hernandez, product marketing manager at Landis+Gyr. "Most benefits are in new efficiencies for the utility."

DA delivers many critical operational capabilities that utilities need to gain greater visibility of the distribution area network. "DA is a key component in delivering smart grid," says Kent Hedrick, senior product manager at Landis+Gyr. "A utility must have this to realize the full benefits of smart grid."

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AMI-DA Convergence

With the convergence of DA and AMI on a single network, electric utilities and their customers will realize a wide range of new benefits. Working together as an integrated system, these two formerly disparate smart grid ecosystems can provide greatly improved visibility between substations and customers, resulting in new capabilities like outage and loss detection and power quality monitoring.

It's the best of both worlds. Utilities gain access to data about operating characteristics of major segments of the distribution system and additional insight from the substation to the customer endpoint for operational and engineering applications. They're also able to develop information and programs that promote energy efficiency and help consumers lower their electricity bills.

In AMI-DA systems, advanced meters work with intelligent distribution controls throughout the network to provide and verify consumption and demand data, as well as time-of-use, voltage, and outage information. This data can be used not only for traditional billing and customer service, it can also be used to improve distribution efficiencies and system designs as well as for preventive maintenance.

> One of the specialized benefits of this whole system approach — one that is being considered by an increasing number of utilities — is voltage conservation.

This is increasingly being looked at as a demand side management tool capable of reducing energy use by as much as 5% — a significant savings in generation costs — and of greatly reducing greenhouse gas emissions. Customers benefit because their electricity bills are reduced without any need for change in behavior.

The convergence of DA and AMI also enables automated VAR (volt-amp-reactive) management, which, by more aggressively managing power factor, can benefit the utility by reducing transformer, line side and customer equipment losses. As another way to balance system loading, this capability reduces distribution losses while maintaining power quality throughout the system — and the need for infrastructure upgrades in the process.

Best of Both WORLDS

Not only can AMI-DA systems provide valuable consumer data for the utility, they can optimize business operations that include systems engineering, maintenance and customer service. "With both, the utility can manage the complete distribution and consumption curve — both sides of the equation," says Ruben Salazar, director of technology at Landis+Gyr.

Outage management is a good example. When operated jointly, AMI supports DA with intelligence from each endpoint, indicating momentary or sustained outages. The real-time communications capabilities of some DA and SCADA applications allow the utility to confirm the location and nature of the outage. In some cases, automated sectionalizing applications may be used to promptly restore power to affected areas, while crews have better information to quickly locate the trouble spot and complete repairs. Restoration notifications from the AMI system help confirm that the necessary repairs are complete.

AMI-DA convergence enables new applications that use data from meters and intelligent distribution devices. "By placing AMI and DA on the same network, the utility is well positioned for the advent of many new electric applications and solutions," adds Hedrick.

The convergence of AMI and DA working together as an integrated system is the key to realizing the potential of smart grid. By using DA and AMI in tandem, utilities can gain greater return on investment (ROI) and improve revenue, while lowering generation needs. It will be important for utilities to work with partners that can bring these technologies together and create an infrastructure that will support newer technologies as they emerge. ■

Related Content

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Landis+Gyr Gridstream DA Products & Services
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DA Services Brochure
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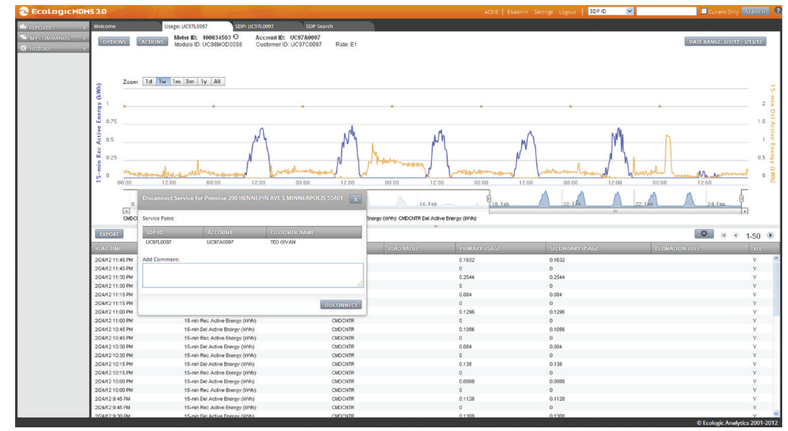
Best Practices for MDM Selection

MDM Solutions: What to investigate before you invest

Today's AMI systems have given rise to vast amounts of data — millions of reads that are almost constantly flowing from endpoints to utilities. Naturally, this creates a new set of concerns: What's the best way to collect and store this information? How can it be validated? And, most importantly, how can utilities make use of it?

"But all MDM systems are not created equal," says Craig Norman, president of Ecologic Analytics. "After 12 years in this industry, we've seen a lot of disparity between what many providers promise and what they're able to deliver."

Meter Data Management (MDM) solutions are the indispensable answer. By transforming AMI data into actionable intelligence, they play a critical role in realizing the promise of the smart grid.



The Next Generation Ecologic MDM, version 3.0 validates hundreds of millions of reads every day, providing current and visualized data for business and operations decisions across the utility enterprise.

To maximize your investment and avoid pitfalls, it's important to consider best practices:

INSIST ON A STANDARDS-BASED SOLUTION

To be useful, AMI data must be integrated with many enterprise applications — often from different vendors. A standards-based platform not only streamlines implementation, but also drives down total cost of ownership by interfacing with existing systems.

SCRUTINIZE YOUR VENDOR'S TRACK RECORD

MDM implementation is extremely complex, and it's success in this area that distinguishes amateurs from experts. So check your prospects' background for costly missteps on other engagements.

UNDERSTAND DATA VALIDATION CAPABILITIES

Effective analysis depends on accurate data. Choosing a vendor with the best Validation, Editing and Estimation (VEE) capabilities helps ensure the highest quality data.

COMMUNICATE YOUR NEEDS UPFRONT

At the RFP stage, let your prospects know your specific requirements and priorities. This saves time and effort, while helping to ensure that the right players are in your consideration set.

1 "The Emergence of Meter Data Management (MDM): A Smart Grid Information Strategy Report," Aug. 2010, Chet Geschickter, GTM Research

Landis+Gyr Acquires MDM Leader Ecologic Analytics

After a period of minority ownership, Landis+Gyr has acquired the remaining stock of Ecologic Analytics, bringing the Meter Data Management (MDM) provider's industry-leading capabilities completely in house. Ecologic Analytics is the most experienced MDM provider in North America, with more endpoints in service and more meter reads handled annually than anyone else in the industry.

A critical part of the smart grid, MDM software transforms AMI data into accurate, timely and actionable information for utilities. The acquisition of Ecologic Analytics allows Landis+Gyr to further enhance its end-to-end capabilities, while ensuring that its utility customers are able to reap the full benefits of the smart grid. ■

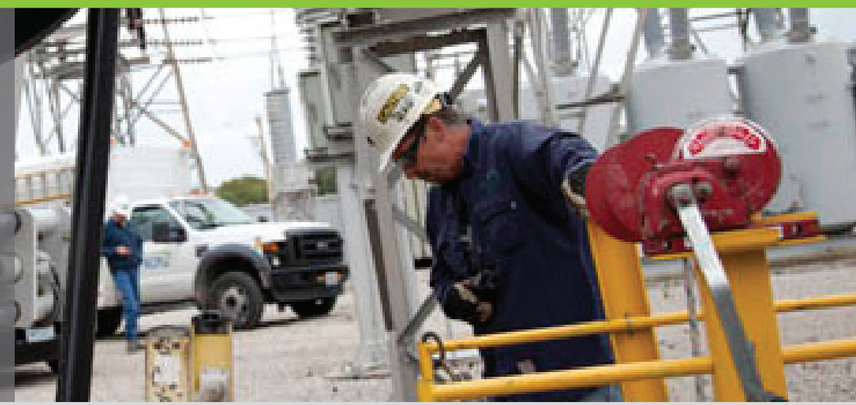
Hawaiian utility selects *Landis+Gyr's* Gridstream technology for smart grid development

Kauai Island Utility Cooperative (KIUC) is working with Landis+Gyr to deploy advanced meters and infrastructure as part of a wide-ranging smart grid project aimed at improving energy efficiency, reducing costs and integrating alternative energy sources. KIUC is one of 23 electric cooperatives participating in the National Rural Electronic Cooperative Association's (NRECA) Smart Grid Demonstration Project, which helps rural utilities implement technologies that make the electricity grid more efficient and reliable.

KIUC will be deploying Landis+Gyr's Gridstream™ RF mesh network technology that provides an intelligent communication path with advanced meters, distribution devices and home area networking equipment.

In addition to automated meter reads, the utility will use the Gridstream platform to improve outage management, manage peak energy use, provide flexible billing options and help integrate emerging uses for electric energy. The utility plans to complete installation of new meters and network equipment in two years, beginning in 2012, and then will spend another three years in data gathering and analysis. ■

Nashville Electric Service selects *Landis+Gyr* for smart grid roll-out



Nashville Electric Service, one of the 12 largest public power utilities in the nation, is partnering with Landis+Gyr to install the smart grid network that will support the utility's immediate advanced metering and demand response needs, while making future smart grid projects easier to implement.

The installation of Landis+Gyr's Gridstream™ network will enable Nashville Electric Service to meet demand response requirements from power supplier Tennessee Valley Authority, as well as provide high-speed advanced metering and distribution automation communications throughout the utility's service territory.

The utility plans to deploy Gridstream network infrastructure across its entire service territory as part of the initial deployment phase. This will include the strategic installation of 30,000 advanced meters and 3,000 to 4,000 load control units within the next couple of years. Once the umbrella communications network is in place, the utility will be able to strategically deploy Gridstream-equipped meters to its remaining consumers as business needs dictate. ■

Events: Landis+Gyr will be participating in these upcoming industry events:

Exchange 2012
Jacksonville, FL
April 23 - 26,
Register here

CS Week
Dallas, TX
May 1- 3,
Booth #109

IEEE PES
Orlando, FL
May 8-10,
Booth #870

System reliability

Distributed generation

Data analytics

Grid automation

Interoperability

Consumer engagement

Peak load management

Where is smart grid heading?

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