

# FutureReady

WHERE THE SMART GRID IS HEADING



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Empowering Consumers with  
New Demand Response Technologies

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# Engaging Consumers is Key

A Message from  
Prasanna Venkatesan

Of the many future challenges utilities face, the solutions to these challenges are increasingly dependent upon consumer engagement. Utility executives continue to rank reliability, aging assets, looming retirements and generation resources as top concerns. Many of these concerns are tied directly to areas — such as peak load management and distributed energy resource integration — where consumers play a direct role.

Landis+Gyr is aware that the next-day benefits of smart grid automation must involve tools for raising engagement and awareness on the part of the consumer, as well as finding ways to further automate processes and decision-making to improve service.

In this issue of *FutureReady*, we take a closer look at how utilities are utilizing new strategies for demand response programs, and how tools like mobile applications might aid in program effectiveness and recruitment efforts.

At the same time, utilities are utilizing new technology to limit the need for direct consumer involvement. The case of Nashville Electric's voltage management program shows the potential for utility-directed load management on the grid, while helping to improve power quality.

Finally, we take a look at how consumer awareness of the smart grid and its benefits has remained relatively unchanged over the last five years. While perhaps not surprising, this news does indicate an opportunity for more education and interaction.

The challenges of the future in the utility industry are mostly extensions of the challenges we face right now. As we continue to evolve as an industry, the technological groundwork already being implemented will make the problems of tomorrow much easier to manage. And all of us, as energy consumers, will be the beneficiaries.

**Prasanna Venkatesan**

*Landis+Gyr, Executive Vice President, Americas*



# SmartGrid 2.0:

Empowering Consumers  
with New Demand  
Response Technologies

With the two-way communications to the home made possible by deployment of smart meters, utilities are gaining new intelligence about consumer energy usage. More importantly, they're empowering their customers with greater control of their energy usage with next-generation demand response programs.

Legacy one-way direct load control (DLC) programs enabled the utility to remotely control customer appliances during peak demand in return for a credit on the customer's utility bill. But, the results of load shedding events were often not known for weeks or months. Not only were results from these programs difficult to measure, they were also virtually impossible to verify.

Today's DLC programs have come a long way. "DLC has grown over the years from unintelligent systems that you deployed and crossed your fingers," says Clark Pierce, Vice President and General Manager of [Load Management Solutions](#) for [Landis+Gyr](#). "Now, with smart grid, the industry can deploy load management systems where desired, monitor available load and verify reductions in real time."

Utilities are leveraging DLC to help them meet the growing energy demands of their residential customers — to test and deploy new pricing schemes, contend with seasonal peak loads, adapt to disruption of the grid caused by the introduction of renewables and electric vehicles and, in many regions, to meet the requirements of new energy mandates.

## CPS Energy

New smart grid-enabled DLC programs are cropping up across the country, driven by factors that range from protecting system assets to eliminating the need to build new power plants or to buy power from other sources.

[CPS Energy](#), the nation's largest municipally owned natural gas and electric company, is located in San Antonio, TX. In 2012, the utility

launched [Energy Savers](#), a DLC program with which the utility hopes to conserve 771 megawatts of energy by the year 2020. In exchange for free installation of a [Home Manager](#) energy management system, customers who enroll in the program agree to participate in "conservation events," during peak demand periods or when disruptions occur on the grid.

"CPS Energy has deployed [Landis+Gyr's Virtual Peak Plant](#) system, which provides real-time information about the load available to shed from controlled air conditioners, pool pumps and water heaters, and confirms that the reduction has occurred," says Pierce. "This year, they'll have about 60 megawatts under control. Because the system is real time, it allows them to feed into the [ERCOT](#) (Electric Reliability Council of Texas) market as an ancillary service."

The program was launched via multiple channels, including email, direct mail, billboards, newspapers and television. Today, about 7,000 customers, representing approximately one percent of the CPS Energy customer base, have Home Manager systems installed in their homes. According to the utility, customers can lower their heating and cooling costs by as much as 10 percent.

## Colorado Springs Utilities

While the goal of the CPS Energy program is to reduce power costs and promote energy efficiency, the DLC program managed by [Colorado Springs Utilities](#) is largely driven by the desire to protect distribution equipment from peak overload and delay capital investments.

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Colorado Springs Utilities is a community-owned utility that provides electric, natural gas, water and wastewater services to customers in the Pikes Peak region of Colorado. Each year, the utility conducts an analysis of its distribution system to identify substations or circuits that are close to exceeding the design guide capacity of the utility's distribution system, or 8.3 megawatts. Earlier this year, four circuits were identified.

"We're targeting these areas to help with some of the load reduction on peak days," says Melodee Gordon, Conservation Specialist, Colorado Springs Utilities. The utility has used a wide range of customer communication channels — including social media, direct mail, billboards and even targeted messaging to homeowners' associations — to get the message out about the launch of the new program.

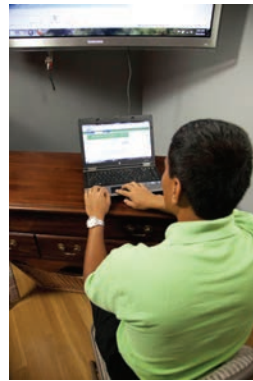


Deployments of smart thermostats at residences in these areas began in early May 2014. "We plan on swapping out 500 thermostats

at the homes of existing customers who participated in ECO [an earlier version of the program]," says Gordon. "We'll give them new thermostats and encourage them to participate in the new **ECO Saver program**. We need about 300 new customers on those four circuits to alleviate the load to bring it down under the design guide."

Although the utility targeted specific neighborhoods where peak demand threatens to overload the system, the ECO Saver program is open to all Colorado Springs Utilities customers.

Following installation of the new smart thermostats, customers who agree to participate in the ECO Saver program will receive a \$25 credit on their utility bill. "They'll have the ability to adjust their thermostats using a mobile app provided by Landis+Gyr. They'll also be allowed to opt out of conservation events," says Gordon. "It's not a mandatory program."



## Smart Grid and DLC Programs

The reliable two-way communications capabilities made possible by smart grid technologies are enabling utilities to transmit load control signals to

customer devices. As a result, customers are empowered to manage energy in a way that best fits their lifestyle and comfort needs.

On the utility side, granular visibility into each load control event provides more flexibility and confidence. The utility can gather data about customer participation that aids the development of customer incentives, as well.

## Conclusion

Going forward, the success of demand response will be directed by consumer interest and participation. That participation level will become easier to achieve through increased automation and easier remote access to information and appliance control. New tools available to utilities can help them build on existing consumer relationships to advance their demand response goals. "Customers trust their utilities," says Pierce. "They want to know what they can do to lower their energy bills, and they turn to their utilities for solutions." ■



# Customer Engagement Best Practices

Advanced load management technology is making the process of operating a demand response program easier and more effective. But, challenges still remain in recruiting consumers to participate. As utilities continue experimenting with program design, some best practices are emerging for achieving optimum levels of customer participation.

**1 Do your research.** Most successful demand response program managers agree it is important to gauge customer interests and priorities before determining the structure of the program and how you'll recruit customers.

**2 Make your offering easy to understand.** Conduct a few focus groups to make sure you get the language right for your launch materials. Don't assume there's a one-size-fits-all solution. You may want to consider tiered participation levels that offer benefits and credits that increase as participation increases.

**3 Use every communication channel to get the message out.** This includes traditional direct mail as well as email blasts, social media, local newspapers, even TV and radio. It's best to communicate your message in phases, measuring results as you go along.

**4 Use customer segmentation techniques.** The more you can personalize your message to customer segments using demographics and psychographics, the better your results will be. [The Smart Grid Consumer Collaborative](#) recently identified five consumer segments defined by motivation. (See "[Smart Grid Benefits](#)" article in this issue of the eZine) As you measure results from the various communication channels, you'll learn which media are most effective for which groups.

**5 Educate customers and colleagues.** Don't assume anything. Provide easily accessible information on your website and other customer-facing media. Just as important, make sure that all of your internal teams are armed with the knowledge they need about the program in order to field customer questions.

A woman with short dark hair, wearing a green ribbed sweater over a white top, is seated at a wooden table. She is looking at a laptop screen while holding a document. Another document is on the table in front of her. A remote control is also visible on the table. The background is a blurred indoor setting.

# Payment Options a Plus

for Union  
City Electric's  
Advanced  
Metering  
Program



## Improving customer service is often part of the business case for deploying smart grid technology.

For Union City Electric System, it was the primary reason for installing an advanced metering network. As its experience with the technology grows, the utility is finding unexpected benefits for consumers and daily operations.

**Union City Electric** is the municipal electric utility serving Union City, TN, a town of 10,000 people in the northwest corner of the state. Despite a growing population and commercial base, the utility has been challenged with a rising rate of bad debt. To address payment issues, the utility considered raising the residential deposit rate. But, the utility's power board was reluctant to do so without another option for new customers.

"Our deposit for new residential service had been the same for many years. If the rate was going to increase, our board wanted to make sure we could offer new customers an alternative, and prepay seemed like the logical choice," says Jerry Bailey, General Manager at Union City Electric.

The utility began looking for an AMI network and prepay system with proven integration success and the ability to implement time-of-use-rates. In 2011, Union City Electric chose Landis+Gyr's **Gridstream® RF network**, paired with a prepayment solution from **Exceleron**. It began deploying the network in early 2012.

"Even though our top priority was adding billing options for customers, we began to see a variety of other benefits from the technology early on," Bailey says. "For instance, the ability to show customers their daily usage matched with temperature data has been a great help in overcoming high bill complaints, as well as helping customers reduce overall energy consumption."

In addition to offering an alternative to high deposits, Bailey says the prepayment system is leading to faster service connections for customers. It is also reducing confrontations with utility employees, either onsite during a disconnect or at the office, since no penalties or reconnect fees are involved.

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So far, the utility is realizing savings from reduced truck rolls for both disconnects and in other areas of the business, such as maintenance and outage response.

## Lessons Learned

As Union City Electric began deploying the AMI and prepay components, it considered lessons learned by other utilities when installing smart grid technology.

For instance, customer concerns about the new meters causing safety, privacy or billing issues were addressed early in the process. The utility also needed to ensure systems were in place to support the AMI rollout. This included ensuring backhaul communications from AMI data collectors could utilize the utility's existing fiber loop, as well as installing the necessary network infrastructure. The utility's compact service territory, in a flat geographical location, kept infrastructure requirements to a minimum. Even so, it installed an additional data collector to provide redundancy.

The utility leveraged employee expertise for meter installations to confirm that the meter sockets were in working order. Meters also underwent extensive testing before field placement.

“We heard about issues that other utilities experienced where consumers would question meter accuracy. So, we tested meters extensively — one in every eight residential meters installed — without finding one out of tolerance with our strict standards,” Bailey said. “In fact, we found the solid state meters to be much more accurate than electromechanical meters.”

The utility experienced the typical bumps along the road. One of the bigger hurdles involved data connectivity between the utility and the hosted data servers. This was traced back to an issue with the local Internet service provider. Once the utility changed providers, the issue was resolved.

Since the utility moved on from the deployment phase to integrating the technology into day-to-day activities, it continues to find more applications that go beyond billing. These include improved outage response and using voltage data for preventative maintenance to transformers and other power quality improvements.

“There is a lot to learn and we are still discovering new uses for the technology. However, the improvements we've already made to customer service are very real, including many that might not be obvious to the customer,” Bailey said. “And the savings in time and money for the utility also flow back to the customer.”





# Deployment Process Decisions

**Union City Electric's planning and preparation before and during the AMI deployment process helped it accelerate its deployment schedule and begin realizing benefits sooner. Some considerations the utility faced included:**

- **Backhaul communications** — Union City already had fiber loop in place around the city for substation communications.
- **Compact service territory required less network infrastructure** — but a second collector was installed to add redundancy.
- **Utility employees used for meter change-outs** — employees were better equipped to diagnose socket issues when replacing meters.
- **Meters were installed in the Fall and Spring** — learning from industry experience, the utility did not want new meters blamed for higher summer or winter energy bills.
- **Hosting meter data in the cloud is an added value** — contracting data management with [Landis+Gyr](#) eliminated the hardware and support expense of bringing the data in-house. ■



***Popularity of mobile applications as a consumer engagement tool for utilities is growing. According to a recent study published by Northeast Group, a smart infrastructure market intelligence firm, 43 of the 50 largest U.S. utilities have a mobile website and 15 have mobile apps.***

Another survey of electric utility residential customers conducted by J.D. Powers found that, in 2014, the number of customers visiting their utility's website on their smartphones or tablets has more than doubled.

It's no wonder, then, that utilities are adopting new mobile applications to reach customers for a wide range of engagement services — bill pay, outage alerts, energy-saving tips and more.

CPS Energy, a municipally owned utility in San Antonio, Texas, is one of many utilities that are extending the application of mobile technology to their demand response programs. The utility recently launched a mobile app for its residential customers enrolled in



# DLC:

*There's an App for That!*

its direct load control (DLC) program. The new Home Manager app makes it possible for customers with Home Energy management systems installed in their homes to remotely control their air conditioners, water heaters and pool pumps, and to monitor their energy usage in real time.

By accessing the [Home Manager app](#) — which features an easy-to-use interface, customizable graph with weekly energy usage summaries, and a 24-hour summary for each device — customers can make adjustments to their thermostats, turn water heaters on and off, and switch between preset programs even when they're away from home.

“Even though the use of smart apps by utilities is in its early stages, it’s growing quickly,” says Clark Pierce, Vice President and General Manager of Load Management Solutions for [Landis+Gyr](#). “As customers demand more control of their energy costs, they look to their utilities for solutions like the Home Manager mobile app.”

Because of the relationship consumers have with their utilities, they're more likely to turn to them for these solutions. “They know that the utility will do the testing to ensure the application is compatible with the necessary systems and technology,” Pierce says. ■

# Smart Grid Benefits Improving Customer

***With unprecedented growth in smart grid ramp-ups and deployments, consumer awareness about smart grid and its benefits should be at an all-time high.***

But according to a report recently published by the [Smart Grid Consumer Collaborative \(SGCC\)](#) — a nonprofit research group whose mission is to accelerate the adoption of a “consumer-friendly, consumer-safe and consumer-approved” grid — that’s not the case.

The SGCC’s “2014 State of the Smart Grid Consumer” report found that, even though smart meters are now installed in nearly 40 percent of U.S. homes, consumer awareness has not changed much since the first SGCC survey conducted in 2011. In fact, just a little more than half (54 percent) of respondents reported that they have never heard the term “smart grid.” SGCC based the findings on discussions with more than 5,000 consumers over the last three years.

While these results indicate that utilities have a great deal of work to do to educate and engage consumers, there is good news. Vocal protests by anti-smart meter activist groups have not had a measurable effect on consumer perceptions. That leaves the door open for utilities to positively impact customer thinking about how smart grid can deliver cost-saving energy benefits.

## **How Utilities Can Make a Difference**

Even with low awareness about why smart grid matters, consumer interest in smart grid-enabled technologies and energy management programs is strong. The report also disclosed that clean energy and grid reliability are important enough to customers that they are willing to pay more for these benefits,

# Benefits: Awareness

depending on their market segment. Essentially, these varying perceptions give utilities the opportunity to use customer segmentation strategies in communicating smart grid benefits.

The SGCC report defines five segments (with five distinct attitudes) that utilities can use in targeting their messaging:

**Easy Street** — “We can afford to pay for electricity.”

**Concerned Greens** — “Smart Grid and smart meters will help protect the environment.”

**Young America** — “We wish someone would tell us how Smart Grid can help us save money and help the environment.”

**DIY & Save** — “Energy efficiency and Smart Grid programs sound appealing, because they would help us save money.”

**Traditionals** — “Frankly, we’re not at all sure Smart Grid is needed.” ■


## best practices

A review of field-tested best practices gathered from successful smart grid programs across the U.S. yielded a core set of recommendations and strategies for engaging customers in smart grid programs, including:

- *Engage customers via segmented programs before launching a smart grid deployment.*
- *Anticipate customer concerns and answer questions before they ask.*
- *Deploy a user-friendly Web portal.*
- *Communicate the benefits and provide instructions to enable customers to shift their usage to off-peak periods.*

Ultimately, SGCC is optimistic about the future of consumer support for smart grid investments. Yet, the organization reiterates the need for utility operators to more fully understand who their customers are and what they value.

To download an executive summary of the 2014 State of the Smart Grid Consumer report and to learn more about becoming a member of SGCC, [visit smartgridcc.org](http://smartgridcc.org).




*A conversation about demand response (DR) initiatives often turns to consumer engagement strategies. That's because typical DR programs commonly rely upon a reduction in energy consumption to achieve peak shaving goals. But smart grid technology is offering alternatives to traditional demand reduction approaches.*

# High Value Low Impact

At Nashville Electric Service, Dynamic Voltage Management Benefits Utilities and Consumers





One of the key features of dynamic voltage management is the ability to lower peak demand without impacting customer power delivery or requiring consumer participation.

“Voltage management is a very high-value, low-impact tool that directly benefits the customer,” says Landon Roeder, AMI Network Lead of [Nashville Electric Service \(NES\)](#), the 12th largest public electric utility in the United States. “It’s one of the most efficient responses to peak demand management.”

NES implemented a smart grid infrastructure project in 2012, partially in response to how its power supplier, [Tennessee Valley Authority \(TVA\)](#), changed the billing structure for distributors. The previous rate structure was based on customer class, but TVA began billing for energy consumption as well as demand imposed on the transmission system. This provided a large incentive for the utility to find cost-effective ways to lower peak demand. As part of a peak load reduction demonstration project supported by TVA, NES began installing advanced meters and other equipment to study the impact of dynamic voltage management, direct load control and critical peak pricing.

“Demand response was the primary driver during our initial smart grid roll out,” says Tony Richman, Meter Services Manager — Smart Grid at NES. “We started out with the goal to test three virtual power plants, and the one that has shown the most potential for us is dynamic voltage management. Moving forward, it will continue to be a key factor as we respond to the needs of our power supplier and rate payers.”

NES contracted with TVA to deliver 52 megawatts of peak load reduction. So far, dynamic voltage management alone has accounted for 41 megawatts toward that goal.

While voltage management isn’t a new concept, smart grid technology has made it more practical for demand response. That’s because advanced meters and intelligent distribution devices provide the information and control to effectively adjust voltage and maintain power quality during a peak demand event.

According to Roeder, voltage management has been part of Nashville Electric’s emergency load curtailment plan for years, but only recently became viable for load management.

“In case of a dire emergency, if a brownout or blackout was imminent, step 30 in our

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emergency plan calls for us to drop voltage by five percent on the entire system,” Roeder says. “However, dynamic voltage management wasn’t readily available as a demand response tool before because we couldn’t tell what was happening at the end of the line. With the technology we have in place today, we can create a closed loop, know what is happening at the endpoint, and make changes at the substation without adversely affecting customers.”

## How It Works

At NES, utility personnel monitor weather, system activity and historical patterns to predict upcoming peaks. Once an anticipated peak begins, system operators can enact one of four groups of transformers to begin lowering voltage. The utility manages voltage levels at the substation bus level. It currently enlists 52 substations in the program.

Some transformers have analog controllers, while newer units are equipped with digital controllers for the load tap changers. When a peak event is called, the utility is able to “trick” the analog controllers into reacting as if there is an overvoltage situation. The electronic controllers, on the other hand, can be remotely adjusted to multiple settings.

Once voltage changes are made, the utility monitors the system voltage at reclosers, capacitor banks and other sensing devices along the circuit, and with advanced meters at various service delivery points. What makes dynamic voltage management, “dynamic,” is the ability to confidently monitor and adjust the voltage level to stay within the [ANSI C84.1](#) A range of 114 to 126 volts at the premise.

“We use capacitor banks to make sure we don’t drop too low, correcting power factor and flattening the voltage profile on the circuit,” Roeder says.

## Quality Results

In addition to significant energy savings during peak, the project is also helping NES improve power quality. While many utilities retrieve voltage information from advanced meters, NES leverages that data to spot failing transformers and conduct preventive maintenance before an issue arises.

“To view voltage at the customer premise with this degree of accuracy allows us to not only monitor and mitigate low voltage, but also recognize when voltage may be too high,” Richman says.

For the 365,000 consumers served by NES in Nashville and the surrounding area, the benefits of dynamic voltage management may go largely unnoticed. At the same time, the financial savings, power quality improvements and overall energy efficiency that accrue can be passed on to the customer. ■



**“ We’ve seen a savings of \$3.25 million from peak demand reduction over a period of 16 months,” says Richman. “That’s a very positive financial impact for us, as well as our customers. ”**

## Voltage Management Solution Promotes System-wide Efficiency

While many utilities are using voltage management for peak load reductions, [Central Lincoln People's Utility District](#) intends to manage voltage around the clock to promote overall energy efficiency. The Oregon-based utility is deploying [Landis+Gyr's Dynamic Voltage Management](#) solution to improve energy efficiency across the distribution system.

The system uses Central Lincoln's existing [Gridstream® advanced metering](#) and smart grid network technology to monitor and determine voltage levels throughout the controlled circuit. [EDGE® software from Dominion Voltage, Inc.](#) integrates with both the

Gridstream platform and the utility's SCADA system to make real-time decisions on optimum voltage levels and to remotely control regulators.

"Dynamic voltage management has many benefits," said Bruce Lovelin, Chief Engineer and Manager of Systems Engineering for Central Lincoln. "But, our primary goal for the program is to deliver energy savings to the customer without requiring a change in behavior. All socioeconomic groups benefit as the savings occur without regard to homeowner or renter status. What makes this system unique is the intelligent use of real-time voltage data from

multiple locations along the feeder to make adjustments. It allows us to get added value from our existing advanced metering system."

Landis+Gyr's Dynamic Voltage Management solution uses each advanced meter as a voltage monitor. Historical meter data helps select the best circuits for reduction within the [ANSI-approved voltage range](#), while real-time data integrates with the SCADA system to drive automated adjustments. The software then validates the adjustments and continues monitoring voltage levels to maintain the appropriate range. ■

## Landis+Gyr Adds to Grid Analytics Capabilities

The influx of data from advanced metering, intelligent sensors and other distribution devices can challenge a utility's ability to utilize data for planning and operational performance. To help utilities meet this challenge, Landis+Gyr has expanded its advanced analytic offering by acquiring [GRIDiant Corporation](#).

GRIDiant's proven analytics suite will be integrated into Landis+Gyr's advanced metering infrastructure (AMI), distribution grid management

and cloud-based solutions for utility customers.

Advanced grid analytics enable utilities to extract business value from large data sets, as smart meters and other grid devices provide more timely and in-depth information about their distribution networks. Utilities implementing these tools can use this information to improve reliability, enable renewable energy resource integration, and enhance customer service.

"We are pleased to be broadening the analytics

capabilities of our solutions portfolio and integrating the GRIDiant team into our North American operations," said Prasanna Venkatesan, Executive Vice President for Landis+Gyr Americas region. "The combination of our market-leading smart grid platform and the analytics tools developed by GRIDiant will offer utilities additional quantifiable benefits as they work to address the many challenges faced today — such as aging infrastructure, distributed generation and outage management." ■

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# Landis+Gyr's award-winning solutions for a smarter grid



## Gridstream

The smart grid is about more than advanced metering. It's about integrating new sources, new uses of energy, building strong partnerships and developing solutions that deliver today — and into the future.

Landis  
| Gyr+  
manage energy better