

THE GLOBAL SMART ENERGY ELITES 2017/2018

PROJECTS AND PEOPLE

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**METERING &
SMART ENERGY**
INTERNATIONAL

South African Wine, Springbok Rugby & Allbro Enclosures



Allbro is a South African manufacturer with more than 800 employees and has 20,000 sqm of production facility. Since 1978, the company has supplied key components that are now used in almost every locally made transformer. With the acquisition of ABB's local enclosure factory in 2011, Allbro also became a leading supplier of non-metallic enclosures to the industrial, commercial and residential contracting trades. Local manufacture to international standards means that products are suited to the rigors of an extremely tough local environment.



ALL-BROX*

- IP Level: 66
- Wall Mount
- Pole Mount (with Kit)



ALL-ROBUST*

- IP Level: 66
- Up to 4 pole din breakers or isolators



ALL-TILT*

- IP Level: 45
- Light Weight
- Wall and Pole Mount
- Pad lockable



ALL-VAULT*

- IP Level: 66
- Vandal proof
- Light impact strength
- Wall and Pole Mount
- Various locking system options

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Allbro is committed to prioritizing clients needs. Our continuous product development, quality control measures, stock holding, and speed of delivery, place Allbro in a leading market position in most of the product lines we sell.



ALLBRO

FOREWARD

It's hard to believe that a year has passed since the last *Global Smart Energy Elites* publication was released. Each year we have the privilege of showcasing some of the most innovative projects from around the world, demonstrating the use of cutting-edge technology and critical thinking propelling utility systems into the 21st century.

While some projects are led by large, multinational utility companies, there are also smaller utilities that are leveraging advanced grid technologies and integrating intelligence into critical operations, toward significantly improving service delivery and adding value for their customers and the communities in which they operate.

I personally have thoroughly enjoyed learning about EDP Distribuição's journey toward becoming a fully digital distribution system operator (DSO); Commonwealth Edison's five-step outreach and education strategy, which is building trust through meaningful customer engagement; Pacific Gas & Electric's distributed energy resource demonstration in California; and Jamaica Public Service's Kingston 2.0 Smart City project.

Behind these projects are the teams that are responsible for driving them forward. Many of the interviews with the project teams featured have reinforced the importance of a shared vision, as well as the positive impact and success brought about by the sharing of ideas between more experienced team members and the more digital-savvy.

Each year we ask our project teams what they foresee to be the major sector developments and/or trends for the next 12–14 months. Not

surprisingly, data analytics/data science has been cited as a key market for growth, as well as an increase in the uptake of software-as-a-service solutions by utilities. It is also predicted that customer choices for engaging with energy market participants will grow, with new offerings from retailers and distributors enabling customers to make informed trade-offs between different service offerings.

We really hope that you, our readers, will find the project features in this guide enlightening and that the insights from the teams responsible for their success will serve as references when considering your own projects.

Lastly, we'd like to extend a special note of thanks to our sponsors: Itron, Allbro, Prime Alliance, Meters and More, Landis+Gyr, Netinium and Watt-IS.

P.S. We hope that you like the new design and layout as much as we do

Happy reading!

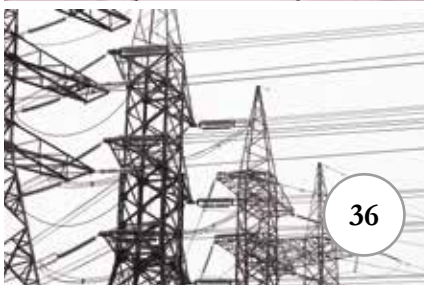
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Amy Ryan

Editor: Global Smart Energy Elites

Deputy Editor: Metering & Smart Energy International



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What if you could solve problems in your distribution system before they become problems? OpenWay Riva uses distributed intelligence to analyze the grid instantly. Visibility is increased, response time is minimized and action is taken when and where it is needed. This is Active Grid in action.



CONNECTED



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RESOLUTION DATA



INNOVATIVE NEW
APPLICATIONS



COMMUNICATIONS
FLEXIBILITY



DISTRIBUTED
INTELLIGENCE

DIRECTORY

ELITE PROJECTS AND TEAMS

- 6 PECO boosts customer experience through advanced outage system
- 9 The world's first smart island
- 14 ComEd builds trust through meaningful customer engagement
- 18 Data and analytics help PECO get the most out of its assets
- 22 CEVE and WATT-IS increase customer savings potential with data analytics
- 26 Distributed energy resource demonstration helps PG&E unlock benefits of the grid
- 30 Smart city sensors and services
- 31 Shared energy economy
- 32 EDP Distribuição: A journey towards a fully digital DSO
- 36 ComEd innovates through advanced meter infrastructure
- 42 SoCalGas AMI creates value beyond gas measurement and operational efficiencies
- 46 Alliander and Stedin collaborate to ensure 'fairness' in Dutch smart meter rollout
- 50 CitiPower and Powercor ready to use smart meter capability for selective load management

HONOURABLE MENTIONS

- 59 Smart meter rollout in Jamaica
- 60 MTI implements AMI project for MEPCO and PESCO
- 61 ENCS member project: Closing the OT security monitoring gap
- 62 Pixolus mobile image recognition solution for meter reading
- 63 Metercloud SaaS for enterprise integration
- 64 Anacle Systems innovates with Tesseract
- 65 Hope Water & Light's smart city project
- 66 City of Toronto's personalised customer approach to water conservation
- 67 Gulf Power's Energy Smart programme

SPONSOR EDITORIAL

- 10 Enclosures made to last
- 12 Interview with Giacomo Gargano, general manager, Meters and More
- 40 Open standards pave the way for innovation
- 54 Creating smart communities with an active network

ELITE PROJECTS AND TEAMS



PECO



KEY FACTS

OPERATIONAL EFFICIENCIES ACHIEVED

PECO's AMOS helped offset more than 10,000 unnecessary truck rolls in 2016

SAVINGS ACHIEVED

AMOS saved PECO approx. \$15 million in Hurricane Sandy restoration efforts

TIME SAVED

AMOS shaves significant time off PECO customers' average outage duration

PECO BOOSTS CUSTOMER EXPERIENCE THROUGH ADVANCED OUTAGE SYSTEM

PECO is Pennsylvania's largest electric and natural gas utility. Headquartered in Philadelphia, it delivers energy to more than 1.6 million electric customers and more than 516,000 natural gas customers in southeastern Pennsylvania. In 2017, PECO was named amongst North America's Best Mid-size Employers by Forbes Magazine. The company is a subsidiary of Exelon Corporation, the nation's only Fortune 100 utility.

PECO also has an estimated annual economic impact of \$4.3 billion in Pennsylvania, supporting more than 8,700 local jobs and producing \$732 million in labour income.

Part of its efforts to provide, smart, reliable, affordable energy services to its customers is PECO's ongoing initiative to utilise smart infrastructure to enhance the customer experience.

PECO'S ADVANCED METERING OUTAGE SYSTEM (AMOS)

To accomplish this goal, PECO has custom-built an application called 'AMOS' – the utility's advanced metering outage system. When a power outage occurs, PECO customers' smart meters immediately send out power fail alarms. AMOS sends these power fail alarms to the utility's outage management system (OMS).

All power fail alarms are received within a few minutes of an outage occurring, which allows an outage ticket to be created quickly and accurately in the OMS. This enables PECO's dispatchers to send crews to the right place, often before any customers call in to report an outage.

As a result of the timely delivery of the power fail alarms from its customers' meters, PECO has developed a process to notify customers that an outage has occurred via text message or email.

For its customers, this means that PECO's crews get to the outage location faster and the outage itself is restored sooner. Customers are kept informed through timeous updates from when an outage occurs to when service is restored.

AUTOMATED 'PINGING'

Another feature of AMOS is its automated pinging process, which helps PECO verify outage locations before a crew is dispatched. The automated pinging process runs periodically throughout the day, to 'ping' the meters of customers who have reported an outage. Based on the data received in response to the ping, the automated pinging process will then update the status of the outage, to ensure the right type of crew is sent to the right place.

This capability helps PECO to optimise its outage restoration efforts and shorten the length of power outages. In 2016, this process helped PECO avoid more than 10,000 truck rolls. AMOS has proved especially helpful during periods of extreme weather. When Hurricane Sandy hit PECO in November of 2012, AMOS expedited the overall restoration process by three days, which saved approximately \$15 million.

AMOS also allows PECO employees to complete various types of outage analysis. Utilising AMI data, customer data, outage data, geographic data and system connectivity data, AMOS has the ability to perform phase analysis, nested outage identification, restoration analysis and geographic outage visualisation. These analyses help PECO get to the root of a power outage and allow it to identify issues it may have missed in the past.

LEVERAGING AMOS FOR DATA COMPARISON

PECO uses AMOS even after an outage has occurred to compare data from smart meters to outage information contained in the OMS. This helps the utility to ensure that every customer outage was captured correctly. Consequently, when PECO plans to implement projects that are aimed at improving grid reliability, it knows that its decisions are based on the most accurate data available to ensure its customers are receiving the greatest benefit. PECO's AMOS Outage Timeline Tool allows it to view customer information, smart meter information, outage management system information and connectivity information in timeline presentation.

"This tool is an efficient and easy way for us to spot discrepancies between AMI outage data and OMS outage data and allows us to make corrections as needed," says Anna Tewfik, manager, Smart Grid Services, PECO.

Behind every project such as the development of PECO's advanced metering outage system is an invested team dedicated to its success, from inception to deployment. Alexandra Ryder of PECO's smart grid service, Jack Mills of distribution operations and Peter Longo of support services have championed the integration of advanced metering technology at PECO. The utility's advanced metering outage system is an example of the team's innovative problem-solving: coming up with new ways PECO can use advanced meter infrastructure data to optimise its daily operations and improve the customer experience. PECO has plans to continue to develop its advanced metering outage system so that it be sure of meeting the evolving needs of its customers in the future. ►

"When Hurricane Sandy hit PECO in November of 2012, AMOS expedited the overall restoration process by three days which saved approximately \$15 million"

PECO TEAM



THE TEAM

From left: Glenn Pritchard, manager, Advanced Grid Operations/Technology, PECO; Alexandra Ryder, general engineer, PECO; John Edward Mills, senior business analyst, PECO; Peter Longo Jr., manager, Support Services, PECO; Anna Tewfik, manager, Smart Grid Services BICM, PECO.

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

The benefits facilitated by the AMOS project have boosted PECO employee's confidence in advanced technology solutions. AMOS is now a key component of the regular outage management process and is continuously relied upon to provide the best possible response to our customer needs.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

PECO's AMI meters allow us to increase our visibility of every power outage our grid encounters. We wanted to take this heightened visibility and utilise the information to better our customers' experience. AMOS empowers us to respond to outages quickly and efficiently. Having the ability to become aware of an outage, its location, and its size almost immediately enables our organisation to dispatch our crews in a more effective manner, which decreases the duration of our customers' outages. In addition, we've

made use of AMI alarm data to send our customers outage notifications. This practice increases customer satisfaction and helps our customers trust that we're taking their power outage seriously and are working to resolve it as soon as possible.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

PECO implemented AMOS using an agile project management strategy. This allowed us to react promptly to the various needs and innovative ideas brought forth by different groups within PECO. A strong collaboration across the organisation permitted us to deliver the most effective solution in a highly efficient manner.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

One unexpected benefit the project team identified while working on AMOS was Nested Outage Identification. We completed our geographic outage visualization map which allows users to see a geographic view of the outage and each individual customer impacted by the outage. This real-time view of the outage includes colour coded customers: green if their power has been restored and red if their power has not been restored. This view lets users easily recognise nested outages by spotting a group of red customers among a group of green customers. Identifying nested outages in this quick and straightforward manner enables us to keep the field crew on site to resolve the

nested outage immediately. For our customers this translates into shorter outage durations.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

PECO is continuously looking for new opportunities to expand the use of AMOS and the data it generates to provide the best service to our customers.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

With a large portion of utility employees nearing retirement age, we may soon see a knowledge transfer crisis that could potentially disturb our business practices. To combat this issue we need to encourage formal mentoring relationships to ensure that critical knowledge from our seasoned workers is successfully transferred to our younger generation of employees.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

In the short-term, more utilities will begin to offer prepaid service to their customers. Within the next few years we predict that utilities will start to take advantage of advanced data analytics processes like machine learning and artificial intelligence. Finally, we see utilities offering a more modern customer service experience on par with companies like Amazon, Caviar, and Comcast. ●

“AMOS empowers us to respond to outages quickly and efficiently”

TONGA POWER



KEY FACTS

PROJECT LOCATION

Tonga is located in the South Pacific just over 3,000 miles (4,828 km) east of Australia

NUMBER OF METERS

15,000 electricity meters

SECTORS IMPACTED

Application across both water and electricity, although water is in the pilot phase

THE WORLD'S FIRST SMART ISLAND

Last year, Itron told of its work with Tonga Power Limited (TPL) and its mission to become the world's first smart island by installing a smart network. Because of its success with electricity, Tonga is now expanding its use of OpenWay Riva technology to improve water efficiency.

Tonga Power Limited (TPL) became one of the first utilities in the world to deploy Itron's OpenWay Riva technology, and is completing an installation of nearly 15,000 OpenWay Riva-equipped electricity meters on Tongatapu. TPL is utilising the system initially to reduce non-technical losses, provide remote disconnection and reconnection of service, monitor voltage on the distribution system, and support a customer prepayment programme. Now, the Kingdom of Tonga is turning its attention to managing its precious water resources more efficiently; and stands to make significant gains in water efficiency if it can reduce both technical and non-technical water losses according to its goals. By utilising the same unified network infrastructure to address both energy and water challenges on the island and partnering with Itron to operate the system through a managed services contract, Tonga will strengthen the business case and accelerate its time to value. ►

ALLBRO



“The practical reality of connecting 70% of the South African population to the grid had numerous challenges”

ENCLOSURES MADE TO LAST

At the tip of Africa is a country that has innovation and manufacturing capabilities that are surprisingly advanced. Automakers are aware of this and brands like Mercedes, BMW, Toyota and Volkswagen have flourished in South Africa to the extent that products made in these plants are exported to sophisticated first world markets.

When the country’s political landscape changed in 1994, in what is regarded as one of the greatest human stories of our time, there was much work to do in the electricity network of our country.

Under the leadership of Nelson Mandela, the new South African constitution made it a basic right to receive electricity in every home. The practical reality of connecting 70% of the population to the grid had numerous challenges.

Vast areas, a harsh climate, and the nature of rural reticulation meant that products from abroad could not simply be adopted. Although the electrical standards of the country are aligned with the IEC, the physical reality required a unique approach, which our company was instrumental in pioneering and has over the years consistently improved.

Although South Africa is not seen to be a low cost manufacturing country in comparison to China and India, there are clear and sustainable advantages in raw material, energy and labour cost when it is compared to first world countries.

Allbro has successfully created solutions that are class leaders in price, function, and durability.

Employing nearly 800 people with a factory space close to 20,000 m², Allbro has developed capabilities that are quite special:

- Raw material compounding – 3,900 tons of raw material produced annually
- Design and development – products are designed by our own team of mechanical engineers using the latest design tools
- Tool making – moulds are made on site (some as large as eight tons)
- Manufacturing to global quality standards ISO 9001
- Testing – laboratory on site to verify ongoing compliance

With more than 100 million enclosures in service for as long as 38 years, the company has learned much from the real world environment in which these products are expected to perform. Allbro's latest innovations have been created to solve specific market demands.

ALL-TILT®

The requirement was to be able to easily adapt the same box for pole or wall mounting without adding special brackets. An upward hinging retained lid for technical personnel to access. Easy cable insertion without compromising IP level. Ability to seal the box without the use of a gasket which is costly and is also often the initial point of failure. Secured with a lead seal and/or padlock and/or screw. Another important requirement for the utility companies was that we reach a TARGET PRICE < \$9 for a four-way enclosure.

ALL-ROBUST®

In numerous applications, there is a need for an isolator or solar switch in an area that is completely exposed to physical impact, direct sun exposure and all forms of weather. Solar combiners and isolators are at voltages that are dangerous for people so insulation is an important prerequisite. The nature of direct current (DC) is such that loose connections quickly lead to arcs and fires when housed in flammable plastic boxes. Access to the operating part of the isolator needs to be easy, but the main circuit needs to be safely separated for access by technical personnel.

ALL-BROX®

Until now, mild steel boxes were much cheaper than sheet moulding compound (SMC). In most markets there is a significant price premium to pay for the benefits of SMC when compared to powder coated mild steel. By being able to offer a premium quality SMC product at a lower than mild steel cost, many OEMs and utility companies have seized the opportunity of upgrading their design to include the superior material.

ALL-VAULT®

As the value of distributed electronic equipment increases, so a need is arising for a vandal "proof" box. A unique design concept allows the box to really take a beating without compromising its integrity. Additional features include GPS or Sigfox connectivity to monitor access and conditions in the field.

Allbro is interested in partnering with and developing markets outside South Africa. The product range that already exists would bring tremendous value to markets that are only now starting to face similar challenges. The company's design capability also means that it is able to adapt or create unique solutions for individual market requirements.

Please connect with our export team on Export@allbro.com ►

“Although South Africa is not seen to be a low cost manufacturing country in comparison to China and India, there are clear and sustainable advantages in raw material, energy and labour cost when it is compared to first world countries”

METERS AND MORE



“There are currently more than 40 million smart meters employing the Meters and More protocol in several pilots around the world”

INTERVIEW WITH GIACOMO GARGARNO, GENERAL MANAGER, METERS AND MORE

Gargarno provides insight into the association’s current projects, expansion plans and the release of its new smart energy gateway, assisting TCS new smart energy members to create value-added services ‘beyond the meter.’

HOW ARE ONGOING INDUSTRY DEVELOPMENTS INFLUENCING THE ASSOCIATION’S CURRENT PROJECTS AND EXPANSION PLANS?

There are presently more than 40 million smart meters employing the Meters and More protocol in pilots and large-scale rollouts around the world. A large percentage of our growth globally is concentrated in Latin America. Looking ahead, we will continue to develop and invest in the expansion of our technology to offer complementary, value-added services based

on the Meters and More principles of openness, interoperability, efficiency, robustness and security of communications. In a world scenario where connectivity, digitization and intelligent systems are rapidly growing, open technologies are indispensable.

WHAT DO SOME OF THE ON-SITE ACTIVITIES FOR THE ASSOCIATION'S TECHNICAL COMMITTEES ENTAIL? WHAT ARE THE INTENDED OUTCOMES?

Meters and More is about more than just metering. The association's purpose is not only to provide an interoperable end-to-end solution for smart metering, but also to develop product extensions for value-added services. There are two technical committees in charge of the technical aspects of Meters and More technology. Part of the technical committees' responsibility is the definition, maintenance and evolution of the Meters and More protocol. Interoperability among devices is a primary concern for any open technology such as the one offered by Meters and More. Interoperability of our devices is guaranteed through an extensive certification process. This process is developed and monitored by the association's technical committee for certification. The Meters and More technical committees are committed to finding new ways to add value 'beyond the meter.' To this end, the association recently released the first prototype of its Smart Energy Gateway, for communication between the smart meter and in-home devices. This interface enables the interchange of energy consumption information in near real-time and the creation of new services based on the Meters and More protocol.

CAN YOU EXPAND ON THE DEVELOPMENT OF THE SMART ENERGY GATEWAY – A PROJECT LAUNCHED UNDER THE METERS AND MORE 'BEYOND THE METER' INITIATIVE?

The Smart Energy Gateway is the key element of the Meters and More 'Beyond the Meter' programme, which is aimed at accelerating the delivery of smart energy benefits for customers. The gateway can connect with other smart devices in the home, using other standard communication technologies such as Wi-Fi, Zigbee, Bluetooth, etc.

METERS AND MORE CONTINUES TO GROW ITS MEMBERS GLOBALLY. FROM A REGIONAL PERSPECTIVE, WHERE IS METERS AND MORE EXPERIENCING THE LARGEST GROWTH?

Currently, Meters and More has 45 members around the world. In 2017, five new members joined the association; namely, Nansen, WEG, PrimeStone, Elster and Shenzhen Constant. Nansen, PrimeStone and Elster are located in Latin America (Brazil and Colombia), while Shenzhen Constant is based in China. Our new members are primarily engaged in the manufacture of energy meters, smart meters and energy management solutions. Latin America and Asia are two regions demonstrating great potential for Meters and More, largely based on the experience and success of existing clients in these markets.

CAN YOU EXPAND ON THE METERS & MORE PILOT PROJECTS AROUND THE WORLD?

Meters and More pilot projects are focused in Latin America: more specifically in Brazil, Chile, Colombia, Peru and Argentina. There are ongoing pilot projects in Chile, Colombia and Peru involving 100,000 customers, where the Meters and More protocol is being tested under real working conditions. Chile is leading the pilot projects in Latin America, with 50,000 meters having already been deployed at the end of 2016.

THROUGH WHICH CHANNELS IS THE METERS AND MORE PROTOCOL BEING PROMOTED?

The Meters and More association has a dedicated committee for communication activities; and this has prepared a communication plan for 2017 consisting of many new initiatives aimed at promoting the association's work, greater integration amongst its members and the recruitment of new members. In the first half of the year, Meters and More celebrated the launch of its new website. The association's committee for communication activities also confirmed and organised its participation at two of the industry's key networking events in the smart utility sector; namely, Latin America Utility Week and European Utility Week. Meters and More also aims to promote its activities through active engagement on social media and other media platforms. ►

“The Smart Energy Gateway is the key element of the Meters and More ‘Beyond the Meter’ programme aimed at accelerating the delivery of smart energy benefits for consumers”

COMED



KEY FACTS

MULTIFACETED APPROACH

ComEd's outreach and education strategy consists of five communication stages

METER STATISTICS

Out of the four million ComEd customers, only 0.1% have refused the installation of a smart meter

CUSTOMER SATISFACTION

92% of ComEd's customers are satisfied with the entire smart meter installation process

COMED BUILDS TRUST THROUGH MEANINGFUL CUSTOMER ENGAGEMENT

The 2011 Illinois Energy Infrastructure and Modernization Act authorised a \$2.6 billion investment by the Commonwealth Edison Company (ComEd) to upgrade and modernise the electricity grid, including the installation of more than four million smart meters across northern Illinois. To help educate both customers and stakeholders about these improvements, as well as the smart meter-enabled tools and programmes customers can use to save energy and money, ComEd developed a staged-messaging approach that helps keep smart meter refusal rates low, while enabling the utility to maintain high customer-satisfaction levels.

ComEd's outreach and education strategy consists of five communication stages to build awareness, strengthen understanding, promote engagement through participation, and encourage customers and stakeholders to advocate tools and programmes enabled and available through smart meter technology.

BUILD AWARENESS

The purpose of this stage is to ensure customers and stakeholders are aware of smart meters and their related benefits. To do this, ComEd provides a bill insert and brochure to customers who are scheduled for smart meter installation. These materials help customers become familiar with smart meter features and the fact that smart meters provide access to energy-management tools and programmes. To help answer preliminary questions from customers, ComEd attends community events so that customers can talk directly to ComEd representatives. A branded outreach and education truck travels throughout the ComEd territory distributing smart meter information and answering customer questions. In communities where no events are scheduled, ComEd deploys street teams in high-traffic areas, such as downtown and public transit stops, to provide customers with direct access to ComEd representatives. Simultaneously, ComEd's leadership, from manager to the VP level, conducts smart meter presentations at municipal meetings and community events to build awareness through public forums. ComEd also reaches out to local media to assist in the development of articles that will help make customers aware of smart meters and smart meter-related benefits.

INFORM

Prior to deployment, customers receive two communications to prepare them for smart meter installation: a forty-five day pre-installation letter and an automated phone call the week of their installation. During each of these communications, customers are informed about their scheduled installation date, as well as what the customer needs to do, if anything, to help ensure a successful installation. During this stage, ComEd continues to deploy street teams in high-traffic public areas to answer any remaining questions and to reinforce the benefits of the smart meter. ComEd also begins to introduce digital advertising and social media posts to help ensure successful installation. If customers would like to set up an installation appointment, they are invited to do so at this time through one of ComEd's dedicated smart meter customer care centre representatives.

EDUCATE

In this stage, ComEd makes a concentrated effort to ensure customers are aware they have a smart meter. Without this education, customers may not be aware of the smart meter-enabled tools and programmes they can use to manage their energy use. On the day of installation, ComEd smart meter technicians knock on doors prior to installation and engage with every customer.

For these exchanges, AMI technicians are trained to address common smart meter questions and are equipped with quick reference cards detailing the features, capabilities and benefits of smart meters, along with a deployment schedule. These reference cards, or Smart Link cards, stored on a carabiner (a metal loop with a spring-loaded gate), are durable and modular allowing ComEd to adapt the content to the needs of technicians in the field. Daily huddles provide an opportunity for technicians and supervisors to share customer anecdotes and strategies for effectively using Smart Link cards and communicating with customers.

Before leaving, the technician provides the customer with an informational door card about the installation of a smart meter at the customer's home, and provides the first details of programmes in which customers can enroll to save energy and money. ComEd also begins ramping up advertising efforts, covering print, digital, billboard, transit signs and social media, to ensure customers are aware that they now have access to energy-management programmes.

ENGAGE

Thirty days after installation, ComEd begins to engage smart meter customers with details on the various tools and programmes that they can use to better manage their energy use. Targeted mailings provide detailed information about high-usage alerts and weekly usage reports, as well as ComEd's peak time savings and hourly pricing programmes. Customers also receive instruction to help them easily participate in these programmes. ComEd holds workshops with senior and social groups to provide hands-on assistance with participation in the programmes. ComEd also continues with its advertising campaign in an effort to encourage customers to enroll in energy management programmes and begin saving money on energy bills.

“ComEd’s leadership, from manager to VP level, conducts smart meter presentations at municipal meetings and community events to build awareness through public forums”

ADVOCATE

The outreach process culminates in an effort to turn customers, municipal officials and key stakeholders into smart meter advocates who can provide continued communication and support. ComEd maintains a presence at community festivals, sponsors local events, hosts workshops at senior centres and provides local students with training on smart meter benefits to help them gain valuable presentation and leadership skills. ComEd continues to reach out to local officials to help maintain the message of energy savings available through smart meter technology.

ADDRESSING CUSTOMER CONCERNS

At all stages of this strategy, ComEd addresses any and all customer questions with a variety of approaches and customised techniques, depending on the needs of the customer. If a customer would like to discuss, in depth, any topic relevant to the smart meter, including data privacy, health or safety, they are invited to bring their concerns to a specialised team of experts available through a customer experience hotline. If a site visit is requested, members of ComEd's management team will meet with customers at their home or business to address their concerns. These site visits include, but are not limited to, offering radio frequency (RF) analysis using cutting edge technology by a member of ComEd's RF engineering team. These studies include taking RF measurements inside and outside customer homes of RF emissions from smart meters as well as common household items such as Wi-Fi devices and microwaves.

If the customer ultimately decides to delay the installation of a smart meter, which approximately only 0.1% of ComEd customers do, the ComEd team ensures the customer is aware of the Illinois Commerce Commission (ICC) tariff which authorises an additional monthly charge of \$21.53 to the customer's bill to partially cover costs of manually reading the meter. The ComEd management team informs customers refusing smart meters that all customers will eventually have smart meters installed at their locations in compliance with ICC requirements.

GOING ABOVE AND BEYOND

In addition to the enhanced outreach strategy and implementation of the smart meter customer experience department, ComEd's smart meter programme continues to seek opportunities to go above and beyond customer expectations. For example, in consideration of concerns over the condition of the existing meter fitting, ComEd improved its installation process to include an in-depth inspection of each fitting, as well as maintaining licensed union electricians on standby. If installers identify the need for repairs to the meter fitting, they coordinate with electricians to resolve the issue prior to installing the smart meter. ComEd has performed more than 49,000 electrician repairs project-to-date.

Because these meter fittings are customer-owned equipment, customers are normally required to hire and pay for their own electrician for these repairs. However, ComEd took this as an opportunity to improve the smart meter customer experience. These repairs are now included as part of the ICC-approved deployment plan, and as a result, repairs are made at no cost to the customer.

To further alleviate customer concerns about meter equipment safety and reliability, ComEd became the first utility in the nation to have its smart meters certified by Underwriters Laboratories, a safety organisation approved by the US Occupational Safety and Health Administration. Because Underwriters Laboratories provides testing for many other consumer products, this certification has resonated with customers and provided an improved level of comfort with the smart meter.

Establishing outreach and education strategies for a large-scale implementation programme affecting more than four million customers is an intricate process. Through keeping its focus on building a premier customer experience, ComEd's smart meter programme has employed unique practices that have yielded a high customer satisfaction rate. According to the Blackstone Group's most recent smart meter installation survey, 92% of ComEd's customers are satisfied with the entire installation process, including all activities leading up to and following the smart meter installation. Since the beginning of smart meter deployment, multiple JD Power surveys have noted that customers with a smart meter consistently report higher satisfaction than those without. ►

“ComEd's smart meter programme has employed unique practices that have yielded a high customer satisfaction rate”

COMED TEAM



THE TEAM

From left to right: Tom Dominguez, senior marketing specialist; Mike McMahan, vice president, AMI Implementation; Paulette Harry, manager of AMI Customer Care; Dave Doherty, director of AMI Customer Strategy; Carla Frieh, manager of AMI Operations; Steve Lesniak, director of Marketing. Not pictured: Laura Basili, manager of Marketing and Customer Education

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

Our customer outreach and education strategy provided us with the opportunity to be more than an electricity supplier for our customers; it enabled us to help them save on their energy bills by offering energy management tools and programmes. This has contributed to a positive customer experience.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

ComEd's smart meter outreach and education strategy offers a unique opportunity for face-to-face contact with each of our customers. Through these interactions, we are able to engage in conversations that reveal customers' expectations. These conversations often provide opportunities for us to respond directly and immediately to customer concerns.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

Many things contributed to the success of our outreach and education project. These included establishing a specialised call centre with resources to respond to customer questions and concerns about smart meters, a multi-tiered 'boots on the ground' approach to customer education with a knock on every

customer door by a smart meter installer, town hall presentations across the service territory, appearances at community events, customer education mailings and phone calls. Perhaps most critical was the clear directive the project team had from our leadership that this was, first and foremost, a customer experience project, not a meter installation project. This set the tone for placing the customer first in every decision by the project team.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

Throughout the course of ComEd's outreach and education strategy, JD Power surveys reveal that customers who had a smart meter installed expressed higher customer satisfaction ratings than those without a smart meter. In addition to the customer education and outreach strategy, we've sought innovative ways to bring value to our customers: such as a new meter ping technology that originates from customer outage reporting channels and notifies customers of potential customer-side issues or access to services such as a personalised home radio frequency assessment by our trained RF professionals.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

Externally, we have had the opportunity to act in an advisory role for other utilities,

offering our experience and strategy as a model for their own smart meter deployment programmes. Internally, ComEd has applied this marketing approach to other customer programmes, using phased communications to provide customers with the information they need as they need it. This enables customers to better understand the advantages of ComEd energy programmes and the benefits they provide, increasing the likelihood they will take action.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

Utilities will be challenged to keep up with customer expectations for technology enhancements and customisable services that they are experiencing in the retail sector. ComEd will balance how we, as a utility, can be agile enough to adapt to changing customer needs while maintaining our core business of reliable energy delivery.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

Utilities will explore ways to utilise the AMI network, capitalising on this new technology and influx of data in three buckets – energy use, smart city applications, and the grid – in respect of disaggregation, smart streetlights and water meters, voltage optimisation and predictive analytics on system equipment. ●

PECO



KEY FACTS

METER DATA ANALYTICS

PECO has been able to achieve a 99.81% success rate for meter reads

SOFTWARE EMPLOYED

Oracle's DataRaker

PECO WORK MANAGEMENT TOOL

Autonomously configures corrective actions – e.g. changing meter orders for broken meters

DATA AND ANALYTICS HELP PECO GET THE MOST OUT OF ITS ASSETS

North American energy company PECO, an Exelon company that serves more than two million electricity and gas customers in southeastern Pennsylvania, is leveraging newly available meter data to improve operational efficiency and provide new tools and resources for customers, following its deployment of advanced meter infrastructure (AMI).

The utility is using data analytic tools and automated work management processes, and has developed advanced monitoring capabilities to identify and resolve meter or system level anomalies impacting customers. As a result of these efforts, PECO has been able to achieve a 99.81% success rate for meter reads during its billing window over the network.

The energy provider first began exploring ways to use the daily meter readings beyond customer billing to derive additional benefit from its one-way automatic meter reading

(AMR) platform. While promising, these initial efforts were limited because of the granularity and resolution of the data. Hourly interval data was needed.

PECO is using data analytics technology to identify meters exhibiting anomalous behaviour, on an ongoing basis. PECO employs a suite of ‘tests’ held within a third party tool, DataRaker, to characterize the type of anomaly based on a number of factors, including but not limited to: meter status, meter reading information, weather attributes, outage information, and geographic/demographic information.

Anomalies identified commonly arise as a result of: meter maintenance (meter malfunction with zero registration), service issues, theft of service and so forth. Recently PECO implemented a proactive data analytics approach which identified meters at risk of failing to provide a read during the billing period, 10 to 15 days in advance of these customers being billed. These tests are integrated into a PECO built work management tool that autonomously configures corrective actions; for example, changing meter orders for broken meters. The combination of advanced exception detection capabilities with autonomous work management capabilities allows PECO to manage a monthly average of 4,500 gas and electric meter anomalies with a team of only five analysts.

Utilizing data to implement real-time monitoring has further enhanced PECO’s operational efficiency. Following an event that impacted PECO’s customers – from a daily IT business process not operating as originally designed – PECO implemented several corrective actions to monitor and send automatic notifications/alerts when data streams are disrupted or not in line with historical norms. This process monitors file sizes and delivery times automatically and sends notifications when file sizes are smaller than average or are delivered late. The implementation of this system has allowed PECO to react in a timely manner to events, minimising customer impact.

LEVERAGING ANALYTICS FOR ASSET MANAGEMENT

PECO also worked with Oracle’s DataRaker team to develop a framework and apply it to the utility’s entire population of distribution transformers. The first application was for a suspected at-risk population of transformers. The result showed the risk was minimal and could be eliminated through local reconfiguration of loads. This type of analysis is used regularly as part of PECO’s summer and winter readiness activities.

The next logical step was to develop overall normal operating parameters for each device. These parameters are being used to define normal operating envelopes. If the device load suddenly exceeds the envelope, exceptions are generated and subsequently reported for further investigation. The advantage of using this type of analysis at the transformer level is not only in recognising that changes can occur quickly without other notification, but also in ensuring that the electrical distribution system is optimally sized and operating at peak efficiency.

PECO expanded this analysis methodology to create a post-failure analysis tool. When PECO’s outage management system identifies a transformer failure, the dispatcher can run an analysis to see if the failure coincided with a peak load. The tool graphically shows the transformer load up to the point of failure, which helps the dispatcher to recommend the proper course of action to restore load and prevent future failure.

This tool helps PECO to visualise a relatively sudden increase in load of a transformer that otherwise had been performing constantly over a long period. The change in load could have been attributed to an apartment building that switched to electric heat without notifying PECO, for example.

Having a system with the ability to recognise this type of issue is paramount if the goal is to avoid failures proactively at critical times.

Once transformer load profiles were created, PECO moved to better understand how to use hourly consumption data and mechanical thresholds to improve predictive failure analytics. As it turned out, the winter of 2014, which was one of the coldest in recent history, provided PECO with excellent data from which to build predictive analytics.

“PECO is using data analytics technology to identify meters exhibiting anomalous behaviour, on an ongoing basis”

“Utilizing data to implement real-time monitoring has further enhanced PECO’s operational efficiency”

QUANTIFYING THE BENEFIT

As is true with any investment, it is essential to be able to quantify return or benefit. As previously discussed, one of PECO’s first uses of transformer analytics was to analyze the data from a certain class of transformers in which the utility was seeing unexpected failures. Using DataRaker, PECO was able to determine what the actual loads on one transformer were and then applied the analysis to the other transformers in the same class to identify at-risk transformers and prevent future failures.

The results achieved by this analytics-fuelled approach to proactive asset management encouraged PECO to look at other aspects of transformer asset management, including summer and winter readiness: identifying what transformers are at risk, understanding the prediction of being at risk, and using the results of load and transformer analysis to justify additional work, whether it is load relief or other reliability-based projects. This work also produced clear benefits and operational savings.

PECO is also considering expanding this sort of analysis beyond its distribution transformer population to underground cables and services. These processes are also being evaluated to perform a top-down or bottom-up analysis of every circuit, comparing the energy leaving the substation to the energy consumed, in order to understand and document how the distribution grid is working, and identify actual line losses and even energy theft. ►



PECO TEAM



THE TEAM

From left: Brian Enz, business analyst, PECO; Patrice Cahill, senior business analyst, PECO; Gabriella Cristelli, business analyst, PECO; Frank Tedesco, senior business analyst, PECO; Carol Boyle, manager, Operations Planning and Analysis, PECO; Kim Lusky, senior business analyst, PECO; Rasheeda Clark, senior business analyst, PECO; Jessica Lyman Browne, managing consultant, Black and Veatch; Sabrina Leonard, senior business analyst, PECO; Lauren Davidson, project manager, Anexinet/ QlikView

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

The project had a positive impact on customer experience by decreasing estimated bills and enabling the ability to handle a large volume of inflow with minimum staffing. The automation aspect of the process improvements also improved our accuracy and reduced the number of false positives that had previously resulted in unnecessary follow through or field visits.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

By focusing on the reduction of customer estimated bills and rendering accurate bills on time, we learned about the number of estimated bills that would prompt a customer inquiry. In a regulated environment, it's easy to drive toward meeting regulatory requirements. However, we are looking to meet our customers' needs even if that

"In our business, good vendor relationships are critical to support the work that we do"

means continuously exceeding the regulatory requirements in place.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

In our business, good vendor relationships are critical to support the work that we do. This, along with the establishment of and commitment to common goals with the vendors and across departments within PECO worked really well for the project.

"We plan to continue sharing lessons learned and additional opportunities with utilities within Exelon's family of companies and across the industry. We continue to improve our processes through enhanced data analytics, improved data algorithms and skills"

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

In addition to improved meter reading rates, we also improved our revenue recovery efforts through the effective use of data collected to identify potential theft.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

We plan to continue sharing lessons learned and additional opportunities with utilities within Exelon's family of companies and across the industry. We continue to improve our processes through enhanced data analytics, improved data algorithms and skills.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

The utility sector will need to find ways to continue offering services to customers around flexible rates and managing energy conservation.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS

- Business intelligence and data analytics will be implemented across the industry;
- Pay-as-you-go services will become more prevalent; and
- Utilities will focus on managing big data and how it can inform utility practices ●

CEVE/WATT-IS



KEY FACTS

ENERGY AUDIT SERVICE

Smart meter and household data is combined with advanced data analytics to generate customised energy insights

CUSTOMER SAVINGS POTENTIAL

An average of €330/year per household

CUSTOMER ENERGY SAVINGS POTENTIAL

23% on average

CEVE AND WATT-IS INCREASE CUSTOMER SAVINGS POTENTIAL WITH DATA ANALYTICS

The Portuguese energy cooperative, Cooperativa Eléctrica do Vale D'Este (CEVE), distributes power on the LV network and acts as an electricity retailer for around 9,000 customers in the North of Portugal.

Despite being a smaller utility, CEVE is driven to innovate to meet its corporate sustainability and social responsibility goals. To this end, one of CEVE's main initiatives has been the deployment of smart meters within its concession area since 2016; and it is expecting to reach 13% penetration by the end of 2017. This allows CEVE to streamline its internal operations as a LV DSO, taking advantage of the full functionalities of smart meters, which in Portugal includes the automatic change of contracted power and remote

connection and disconnection of the meter; and affords access to data at 15 minute intervals.

Leveraging existing smart meter infrastructure, CEVE partnered with Watt-IS, an intelligent data analytics solutions provider, to develop a simplified energy audit service that is being provided to CEVE's clients, helping them to become more energy efficient, and increasing the penetration of decentralised renewable energy sources and diversifying revenue streams along the way.

The simplified energy audit service is based on the analysis of smart meter data to perform load disaggregation of a customer's household energy use and identify the most adequate and meaningful energy efficiency measures to be adopted for each specific case. This data is complemented by an on-site visit to identify the household's primary characteristics and specify information regarding existing appliances. This information is uploaded onto a dedicated web-based platform that has been developed by Watt-IS and, after these two data streams are duly collected (smart metering data and household information), an automated energy audit report is generated that provides the household owner with:

- A detailed analysis of the homeowner's consumption profile allowing him/her to understand which times of the day or week he/she is using the most energy
- A breakdown of energy consumption down to appliance level – identifying the most significant loads in a household such as freezers and refrigerators, stand-by power, washing and dish-washing machines, HVAC and hot water equipment, water pumps and cooking appliances
- Tailor-made energy efficiency measures that include: a) suggestions for appliance substitution malfunctioning equipment, b) proposals for the most suitable energy tariffs and contracted power levels, and c) recommendations for efficient use of appliances or set-points;
- Recommendations for the most optimal solar PV solutions, which are accurately dimensioned with the analysis of the solar potential and each specific load consumption curve
- A quarterly forecasted energy consumption breakdown, taking into consideration seasonal weather changes and the corresponding energy use of electrical equipment (such as HVAC or electrical heaters)

This service, which was commercially deployed in April this year, has been generating an average of 23% in “energy savings or economic improvements”, which translates into average savings of €330/year per household. CEVE and Watt-IS are also exploring new ways to better engage with consumers in order to provide this service in a fully automated way, seeking to avoid the on-site visit and reduce the overall cost to provide the service.

CEVE states that this project with Watt-IS is just the first step toward providing value-added services for CEVE's clients, helping it to set itself apart from other energy providers and streamline its operations. One of the goals for the near future is to leverage the analysis of smart meter data, with which home-owners can generate their own energy audit, thus strengthening CEVE's commitment to providing its customers with high-quality service, contributing toward customer satisfaction and churn rate reduction.

The utility notes that the technological innovation is taking place at a rate that is sometimes difficult for smaller companies to keep up with. CEVE adds that there are many dynamics and considerations to take into account, as well as a certain level of uncertainty when deciding to deploy a new technology on a large-scale.

“This uncertainty is, in fact, one of the reasons that we partnered with Watt-IS, when we were considering the deployment of targeted data analytics services for our customers. Our partnership with Watt-IS has allowed us to deliver an innovative solution, with tangible benefits for our customers, that would otherwise be outside the scope of our internal development pipeline,” says CEVE.

Understanding that different customers exist with differing energy needs, has helped CEVE come to the conclusion that different service levels need to be made available to address specific customer demands.

CEVE is also working jointly with Watt-IS to implement a coherent energy efficiency services approach that allows the utility to:

“The simplified energy audit service is based on the analysis of smart meter data to perform load disaggregation of a customer's household energy use”

- Leverage data analytics and smart metering data, increasing the amount of information provided to customers with smart meter technology; for example, incorporating load disaggregation information and optimal energy tariff type and contracted power levels into their existing client web-portal
- Provide enhanced energy efficiency services such as the energy audit service (that is already in place) or advanced real-time energy monitoring and advice for customers with more complex needs, contributing towards the diversification of revenue streams
- Extract more meaningful information from smart metering data, allowing CEVE to optimise the use of daily and intra-daily energy markets, paving the way to deploy smart grid pilots with demand response that will be supported by advanced adaptive algorithms

For Watt-IS, as a start-up company, being able to partner with CEVE – with its sustainability and social responsibility commitments, innovation-driven mind-set and highly dynamic and competent technical team – provides the ideal platform on which to apply its data analytics capabilities. In fact, this partnership allows both companies to jointly develop, fine-tune and field-test solutions that are fully scalable in other markets/countries as they address existing needs of other larger utilities.

The interaction with CEVE also allows Watt-IS to recognise the existing needs and challenges of a DSO and energy retailer, presenting additional market opportunities for the application of data analytics to improve daily operations and/or further diversify revenue streams.

This partnership demonstrates that advanced energy data analytics can provide real value for the end customer and for a utility/DSO, opening the door for a joint development of targeted services that could potentially help optimise the management of the supply/demand system. ►



YOUR PARTNER IN ENERGY DATA ANALYTICS

With WATT-IS, you increase user satisfaction and reduce churn rates with an innovative approach that delivers tailor made energy efficiency advice to consumers, based on the analysis of smart metering data, helping them to use resources more efficiently.

Use case: Partnership with CEVE (Energy utility)

Using advanced data analytics capabilities on top of smart metering data, Watt-IS supports CEVE on delivering an innovative remote energy audit platform that provides load disaggregation information, optimal energy tariff & contracted power and solar PV dimensioning, helping consumers to identify the most adequate energy efficiency measures to adopt. CEVE is now able to offer an innovative service, aiming to reduce churn rates and aggregate new clients, while contributing towards revenue diversification.

For more information about Watt-IS energy data analytics capabilities, please contact us at info@watt-is.com and visit watt-is.com

CEVE/WATT-IS TEAM



THE TEAM

From left: Joel Queirós, IT manager, CEVE; Alexandre Rodrigues, deputy technical director, CEVE; Carlos Costa, CEO, CEVE; Luís Macedo, president, Board of Directors, CEVE; Miguel Carvalho, chief executive officer, Watt-IS; Henrique Pombeiro, chief operating officer, Watt-IS

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

The impact of a project like this has to be seen in three dimensions, namely: i) operations, ii) commercial opportunity, and iii) social impact. With regard to the operational dimension, this project has created new challenges, leading us to allocate technical resources to support the on-site visits needed to identify the main household characteristics and existing appliances with the consumer. The project also pushed us to fine-tune the smart metering data delivery process, ensuring that it is available to be used with advanced data analytics modules including: i) load disaggregation, ii) selection of best tariff type and contracted power, and iii) dimensioning of optimal solar PV solutions. However, with new challenges, there are also new opportunities that arise. On a commercial level, having added knowledge about each customer's specific energy needs has helped the team identify potential for new revenue streams. On a social level, this project aligns closely with CEVE's social responsibility goals as it pursues environmental concerns and also the promotion of the local economy.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

With the data analytics capabilities implemented in this project, we are now able to better understand the specific energy consumption patterns and existing appliances of each customer and identify the areas with the greatest potential for energy efficiency improvement. This allows us to provide tailor-made recommendations on specific products or services.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

The joint collaboration between CEVE and the Watt-IS engineering teams has created a young and dynamic workgroup, with the aim of creating an innovative service which, making use of advanced data analytics on top of smart metering data, can provide the adequate energy efficiency measures to be adopted for each individual customer.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

We started this project with the primary objective of providing a highly automated, simplified energy audit service to our customers in order to improve consumer satisfaction and reduce churn rates. However, after evaluating the detail of information that could be extracted, we realised additional revenue streams such as automated solar PV dimensioning could be developed.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

Through the mobile application and data analytics modules developed, CEVE now has the ability to perform, in an easy and intuitive way, a simplified energy audit for its customers.

Leveraging on the developments made, the future landscape in which we are already operating is one in which the consumers will have access to a diversified range of services that help them become more energy efficient, in the easiest possible way.

“With the data analytics capabilities implemented in this project, we are now able to better understand the specific energy consumption patterns”

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

The biggest challenge may be navigating its business in a way that is able to take advantage of the opportunities that technology evolution has to offer, and has a direct impact on energy distribution. Grid operators need to continually invest in technology, incorporating intelligence into the energy grid to be able to keep up with the changing needs of customers as well as their participation in the energy system.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

Acknowledging the fact that there are many customer segments, each one different in terms of its participation and involvement in the energy market (passive or active consumers, prosumers and producers), will highlight the need for grid operators and retailers to develop targeted value propositions for each segment. ●

PG&E



KEY FACTS

PG&E DER INTEGRATION

PG&E has more than 300,000 private solar customers connected to the energy grid

PROJECT FUNDING

PG&E's DERMS demonstration is funded through California's Electric Program Investment Charge (EPIC)

ENABLER FOR RESOURCE PLANNING

PG&E views its DERMS project as an enabler to California's future distribution resource plan (DRP)

DISTRIBUTED ENERGY RESOURCE DEMONSTRATION HELPS PG&E UNLOCK BENEFITS OF THE GRID

The rapid growth of distributed energy resources (DERs) has ushered in a new era of electric distribution, and the smart grid is emerging as a reliability, storage and interconnection system that complements the new energy technologies that utility customers are using in their homes.

The nature of this change is profound, because it is moving a system that was designed more than a century ago to accommodate one-way energy flow from a central power plant, to a two-way energy system providing customers with their own energy and transferring the excess back into the grid.

As this dynamic, two-way operating environment develops, Pacific Gas and Electric Company (PG&E) continues to embrace and test innovative technologies that improve electric reliability and equip its customers with valuable services and products that support their choices to adopt clean energy.

DISTRIBUTED ENERGY RESOURCES

PG&E expects a dramatic increase of DERs connecting to its grid between now and 2025, making it essential to thoughtfully plan and enhance its grid to effectively address that growth.

As it works to build a smarter energy infrastructure and position itself as a next generation energy company, PG&E has launched a demonstration project to evaluate how energy storage and/or smart inverters used with customer-sited solar can be controlled and coordinated through grid management technology.

PG&E has more private solar than any other energy utility in the US, with more than 300,000 private solar customers connected to the energy grid. The utility connects approximately 6,000 new solar customers to the grid monthly, or approximately one every seven minutes. This is more than any other utility in the world, and PG&E is leading the way with short interconnection times for customers.

Funded through California's Electric Program Investment Charge (EPIC), the main objectives of the demonstration project – which is currently taking place on two feeders in San Jose, California – are to test smart inverter functionalities to support the grid at the secondary transformer level and below; and to test aggregated dispatch of behind the meter storage to shave the evening peak while providing benefits to customers.

The EPIC programme enables California investor-owned utilities to develop smart grid technology demonstration and deployment projects, and to evaluate how they support safety, reliability and affordability objectives for the benefit of customers.

SAN JOSE DEMONSTRATION

As part of the distributed energy resource management system (DERMS) demonstration, the DERMS solution will communicate with DER aggregators. DER dispatch schedules determined by DERMS and vetted by PG&E engineers will then be communicated to and executed by DER aggregators.

PG&E's DERMS project has enrolled 40 customers in San Jose, California. The technical demonstration has deployed 175 kW of residential solar with smart inverter control, 440 kW of behind-the-meter battery storage (360 kW Commercial & Industrial and 80 kW residential), and a 4 MW utility-owned battery.

The residential battery storage systems will interface with the DERMS to evaluate whether and how customer-sited energy storage can be used to operationally support the grid during periods of high electric demand.

One major goal of the demonstration is to evaluate to what extent the DERMS technology enhances the stability and power quality of the grid as well as optimising solar generation and power-flow management as more customers adopt solar and energy storage.

PG&E is seeking to obtain data on how DERMS (developed by GE's Grid Solutions business) and the DERs (provided by Green Charge and Tesla) can work together to provide solutions for high DER penetration use cases.

Visualising actual and forecasted DER-related grid conditions in real time; controlling DERs to dynamically mitigate overload issues through operational control; leveraging DER flexibility to resolve an existing voltage issue by altering real power output; leveraging smart inverter settings and functionality to generate reactive power to support voltage stability; dispatching distributed generation/energy storage based on economic factors such as cost or external pricing signals; and demonstrating that DERMS can be used to develop forecasts and optimisations during abnormal switching configurations.

“The rapid growth of distributed energy resources (DERs) has ushered in a new era of electric distribution”

“PG&E believes DERMS is needed to enable the safe and reliable operation of the high-DER penetration grid of the near future”

PG&E's DERMS project involves close collaboration with other leading organisations in the US including Tesla, Green Charge and GE Grid Solutions. It has received great support from the highest levels of the company and is recognised as a leading example of embracing collaboration to drive a clean energy future.

COORDINATING THIRD-PARTY-OWNED ENERGY STORAGE

The demonstration project will also coordinate third-party-owned energy storage with PG&E-owned storage, the 4-MW Yerba Buena battery energy storage system. Located next to a research facility in the San Jose foothills, the utility-owned battery can send reserve power to the grid when demand increases.

PG&E will be evaluating how to make the day-to-day trade-off in maximising the value of utility-owned storage, either by bidding into California's International Organization for Standardization markets or dispatching to meet distribution-level needs.

PG&E sees DERMS as an enabler to the future state that the California Public Utilities Commission's Distribution Resources Plan (DRP) and the Integration of Distributed Energy Resources (IDER) proceedings are seeking to create. The utility believes that DERMS is needed to enable the safe and reliable operation of the high-DER penetration grid of the near future.

While the project originally set out to examine how DERs can provide distribution services, the project has expanded in scope to explore opportunities to also enable participation in wholesale markets, thus demonstrating the concept of value stacking where DERs could provide services across the energy system.

Part of PG&E's vision to build a smarter grid and support 21st century infrastructure is leveraging DERs to provide benefits to different power system components including:

- Wholesale energy and generation level: Compete in the market with traditional generation sources
- Transmission system: Defer the need for investment in transmission infrastructure
- Distribution system: Provide services that are similar, or complementary, to traditional grid equipment
- At the edge: Enable customer choice and participation in a low carbon energy future

The demonstration commenced in September 2016 and is expected to end in December 2017. “PG&E supports the increasingly complex and dynamic energy needs and desires of our customers, including private solar, energy storage, electrification of transportation, and the achievement of California's environmental and energy policy goals,” says the utility.

“We are living in one of the most exciting times in the energy industry, and these demonstrations are the latest examples of PG&E's many technology investments to improve our operations supporting clean energy options and lay the foundation for the future.” – Geisha Williams, president and CEO, PG&E Corporation. ►



Green Charge installs battery storage units at a Safeway grocery store in San Jose, California, as a part of PG&E's DER/DERMS technology demonstration

PG&E TEAM



THE TEAM

In no particular order: Alex Portilla, principal product manager, DERMS (green long-sleeve shirt with glasses, right of front row); Morgan Metcalf, expert product manager (black polka-dot shirt, right of front row); Sabrin Mohamed, senior mechanical engineer (black and white shirt, middle front); Rustom Dessai, expert technology lead (grey shirt and glasses, second row, second from left); Franz Stadtmueller, electrical engineer (red shirt, middle, second row); Bennett Chabot, senior project manager (white shirt and glasses, back middle); Matt Baker, day ahead analyst, expert (blue shirt, back middle); Junaid Fatehi, electrical engineer (back row, third from left); Manel Abad Tallon, IT project manager, expert (purple shirt, middle, third row)

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

PG&E's Distributed Energy Resource (DER) Demonstration Projects in San Jose represent a microcosm of what the smart grid will look like, and how it will operate in the future when energy storage, smart inverters, solar, electric vehicles and other distributed energy resources become increasingly prevalent and seemingly ubiquitous. To that end this project helps PG&E learn about the people, processes and technologies required to safely and reliably operate the grid of the future.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

The energy industry is truly in a transformative period, with California and PG&E serving as models for reducing carbon emissions, while improving the quality of life and expanding the economy. California is on the cutting edge of decarbonisation, renewable energy integration, distributed generation, and electric vehicles. This has given rise to many partnerships, industry collaboration, and putting policy goals and objectives in place so that we can better enable our customers to meet their energy needs in the ways that they want.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

This project set out to explore how PG&E can accommodate a higher penetration of DERs on the grid and also explore how these resources can provide additional value to the grid and our customers. The project represents a unique, open ecosystem where battery storage systems and smart inverters can be used to provide participating residents and businesses with services such as backup power and bill reduction in addition to grid services. In that sense DERMS helps both customers and utilities: customers capture more value from their existing investment and utilities can offset infrastructure costs by leveraging customer-funded investments.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

This technology demonstration will help inform how PG&E will approach integrating 3rd party assets into distribution grid operations and identify investments that will be required to modernise the grid to enable a more distributed and interactive grid.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

The pace and variety of change creates a challenging balance within the utility sector. At PG&E, we are very supportive of ambitious efforts to address climate change with new clean energy innovations – solar, battery storage, electric vehicles, etc. While supporting these changes, we also have an obligation to continue delivering safe, reliable and affordable power to all customers. These goals are by no means mutually exclusive, but they do require a significant increase in innovation, vision, and agility in order to deliver on all of these critical areas and to ensure that all of our customers benefit from the transformation of the energy system.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

- Sustained growth of DER adoption
- Customers will have more choice with regard to the source of energy they consume and the ways that they interact with the energy system
- The energy system will continue to become less carbon intensive ●

URBANOVA



KEY FACTS

PROJECT ENCOMPASSES

Smart, networked streetlights along with motion, noise, pole orientation and air quality monitoring capabilities

PROJECT LOCATION

Spokane, Washington

PROJECT CONSORTIUM

Urbanova's six founding members are Avista, the City of Spokane, Itron, McKinstry, the University District Development Association and Washington State University (WSU)

SMART CITY SENSORS AND SERVICES

To build a smart city or community, a collaborative effort is needed by public-private partnerships, as well as an engaged community. Urbanova, a smart city living laboratory in Spokane, Washington, acts as a model demonstrating how utilities can partner with cities and other stakeholders to leverage IoT technology to build a more liveable, sustainable and economically vibrant urban community.

One of Urbanova's initial projects is the Smart and Connected Streetlights Project. In early 2017, in collaboration with Urbanova partners Avista, Itron and WSU, Urbanova began installing smart, networked streetlights in the University District adjacent to downtown Spokane.

The streetlights are the first step in Urbanova's efforts to develop and test a range of smart city sensors and services in the University District. Specific application areas Urbanova is targeting include energy efficiency, environmental quality public safety, smart infrastructure and health monitoring. ►

AVISTA



KEY FACTS

NUMBER OF CUSTOMERS SERVED

750,000 gas and/or electric customers in the Pacific Northwest

PROJECT ENCOMPASSES

Distributed Energy Resource optimization, microgrid, smart buildings and transactive energy

ALSO INVOLVED IN THE INITIATIVE

UniEnergy Technologies, McKinstry, Schweitzer Engineering Laboratory, Pacific Northwest National Laboratories, the US Department of Energy, Washington State University and Itron

SHARED ENERGY ECONOMY

While often viewed as a threat to the regulated utility business model and customer franchise, rapid proliferation of distributed energy resources (DER) – solar, wind, CHP, EVs, energy storage – are viewed by Avista as an opportunity. The opportunities for significant efficiency gains, new “economies of scope,” and optimisation of assets throughout the energy value chain hold the promise of delivering significant new value for both utilities and consumers if they can be managed intelligently through the application of real-time communication, device-based data processing and control.

As the energy provider to 378,000 electric and 342,000 natural gas customers in the Pacific Northwest, Avista has embarked on an ambitious project in 2017 in University District Spokane, Washington called the ‘Shared Energy Economy.’

The microgrid will integrate and optimize energy storage, rooftop solar and building energy management systems. Avista will demonstrate how DERs can benefit consumers/prosumers, as well as utility systems, by orchestrating the operation of groups of assets based on system conditions and economic signals, and providing a resiliency product during grid outages. ►

EDP DISTRIBUIÇÃO



KEY FACTS

INDUSTRY LEADER

EDP Distribuição's InovGrid initiative was selected by the EU Commission and Eurelectric as a leading smart grid reference project

INVESTING IN PEOPLE

EDP Distribuição receives IACCE Award for Corporate Leadership

LEADING CHANGE

EDP Distribuição CEO, João Torres, serves as vice-chairman of EDSO for Smart Grids

EDP DISTRIBUIÇÃO: A JOURNEY TOWARDS A FULLY DIGITAL DSO

Given what has been discussed recently under the scope of the European Commission's Clean Energy Package, together with the implementation of the EU Digital Single Market and the EU data protection initiatives, it is clear that the transition toward a fully digital and smarter distribution system operator (DSO) is being driven, primarily, by the need for DSOs to lead the way forward toward a more sustainable future, putting consumers at the very centre of this process.

In this new paradigm, the traditional role of the DSO has evolved, requiring them to act as market officers, data handlers and neutral market facilitators, to manage distribution constraints and local energy balancing, network efficiency and optimisation as well as system security and smart meter operations. DSOs are also beginning to play a key role in managing relationships between customers, regulators and authorities.

These new roles are needed to create value for various stakeholders, offering reliable, intelligent and cost-effective solutions that will foster the uptake of new market-based, customer-centric services, without jeopardising quality of service and security of supply.

EDP DISTRIBUIÇÃO: FULLY ENGAGED IN THE DIGITAL TRANSFORMATION PROCESS

Under these guidelines, the InovGrid programme, EDP Distribuição's umbrella project for smart grids, counts on the strong commitment of its board of directors and the direct involvement of all EDP Distribuição staff to facilitate the transition to a fully digital and increasingly intelligent DSO.

Efforts under EDP Distribuição's InovGrid initiative include retrofitting the grid with intelligent devices and ICT solutions to put into place a digitally advanced and reliable framework for network automation, improving quality of service, fostering energy efficiency measures and promoting environmental sustainability. These actions are geared toward empowering prosumers, supporting the integration of distributed energy resources (DERs) and electric vehicles and encouraging demand-side participation, while maintaining the highest cybersecurity and data privacy standards.

EDP Distribuição is committed to technological innovation, demonstrated through several R&D projects and ventures in different fields of technology, from IoT to big data, ICT and the future of distributed ledger technologies, such as blockchain.

SMART METER DEPLOYMENT

The continued deployment of smart meters is increasing visibility and control of the distribution grid, paving the way for more active control of local networks, with more than 1 million smart meter devices that have been deployed. Currently, more than 70% of electricity distributed is remotely metered, with up to 1.3 million smart meters to be installed by the end of 2017. The rollout of residential smart meters will increase EDP Distribuição's installed base of smart meters to more than 60% of its 6 million consumers by 2020. Tools and applications such as GAME and SIGO, which were built to support the rollout of smart meters, allow for the digital tracking of the smart meter lifecycle and monitoring the status of smart grid devices and communications.

The automation and remote control of MV networks quadrupled between 2006 and 2016, with more than 6,500 automated reclosers spread throughout the country. Apart from smart meter devices, the number of sensors in the network is expected to reach 100,000 by 2020.

BIG DATA AND ANALYTICS

The migration to a future-proof infrastructure based on a uniform data model has provided EDP Distribuição with an adequate framework in which to handle big data and implement an ICT roadmap. In support of market facilitation activities, EDP Distribuição, in its daily operations, generated more than 24 billion records of metering data in 2016. The use of analytical tools for identifying and combatting electricity fraud is proving to be a key contributor to revenue assurance. The use of these tools has improved fraud detection by 50% and has resulted in the recovery of more than €15 million annually.

ACTIVE NETWORK MANAGEMENT

With regard to EDP Distribuição's load and generation forecasting activities, hybrid predictive models and algorithms are being used to forecast electrical load 72 hours in advance while accounting for disaggregated renewable energy sources (i.e. wind, solar) with updates every 15 minutes. Another important upgrade relates to the continuous improvement of the digital platforms that give support to active system management activities. These are gradually moving towards the lower levels of the network, where challenges are becoming more prominent and operational management becomes a more complex task. New developments are contributing to more dynamic monitoring and control of LV networks and the management of power disturbances and outage situations. An example of this is the SINAPSE project which relies on the interconnection of the smart grid with telcos' assets to generate valuable information that will be used to deal with and solve occurrences in the networks of both parties.

“Efforts under EDP Distribuição's InovGrid initiative include retrofitting the grid with intelligent devices and ICT solutions to put into place a digitally advanced and reliable framework for network automation”

“EDP Distribuição launched the Move2Future initiative in 2015 in order to adequately prepare for digital transformation, which would impact every aspect of its business”

INVESTING IN SMART ENERGY

EDP Distribuição is engaged in an energy storage demonstration at a project site near the city of Évora, where it is assessing the potential of grid-connected storage, distributed energy storage applications and energy management tools, complemented by its direct involvement in the H2020 SENSIBLE project, also under implementation at the same location.

The company is also testing the application of augmented reality technology for the execution of complex maintenance operations. Blockchain is offering promising prospects to the future of energy transactions and is a technology that EDP Distribuição is considering integrating with its smart grid.

A VISION FOR CHANGE

EDP Distribuição launched the Move2Future initiative in 2015 in order to adequately prepare for digital transformation, which would impact every aspect of its business. The Move2Future initiative set out to define future business needs, identify potential changes in processes and systems and select suitable technologies to suit future business needs and aid value creation. More than 45 use cases have been evaluated and are in the process of implementation. The ownership of the process belongs to the entire organisation and not to a single team.

INTERACTING WITH CONSUMERS, PARTNERS AND SOCIETY AT LARGE

EDP Distribuição makes a considerable effort to engage not only with its customers and partners, but also the larger communities in which it operates. Under the company's digital programme a new version of its app was launched in 2016 which customers can use to interact with the utility and notify EDPD about any problem in the network. A new app is being finalised to provide detailed information at municipalities' fingertips, including detailed network data.

Several other projects have been developed to foster consumer engagement. A platform called 'Voice of Customer' is helping EDPD to improve customer satisfaction and experience.

More 'open data' has been added to EDP Distribuição's website. Anonymised or aggregated, this data is being made publicly available to help public administrators and market participants to offer smart energy solutions.

INTERNATIONAL COLLABORATION

Contributing to the EU policy is also part of the digital transformation process. A strong commitment is necessary to foster collaboration with peers and TSOs, as well as other stakeholders at European level. EDP Distribuição is an active member of many energy industry associations and groups in Europe. The company's CEO, João Torres, also served two consecutive terms (2013–2017) as chairman (now vice-chairman) of the EDSO for Smart Grids Association, the entity representing DSOs across Europe.

HUMAN RESOURCES AND TALENT MANAGEMENT

EDP Distribuição strongly believes that its skilled, motivated employees are key contributors to the success of its business. Upskilling and talent management are core focus areas of the company. In order for newcomers (EDP Distribuição has welcomed 456 new-starters over the last five years) to be ready to face the new sector challenges, several initiatives have been developed. Students are also given the option to choose Vocational Educational Training (VET) which is available in public schools. These initiatives are the result of an extensive partnership between EDP Distribuição and the responsible educational institutions. Together with other sector representatives, the company has managed to create the 'Association for Technical Qualification in the Energy Sector' (AQTSE). Supported by several training centres across the country, this association assures certification of all employees that work for EDP Distribuição, allowing them to become more familiar with the digital needs of the future. All these initiatives won EDP Distribuição the Award for Corporate Leadership, from the International Association for Continuing Engineering Education (IACEE) – in recognition of exceptional leadership in the continuous training of its employees. ►

EDP DISTRIBUIÇÃO TEAM



THE TEAM

In no particular order: João Torres, CEO, EDP Distribuição; Ângelo Sarmento, board member; Carlos Alves Pereira, board member; Luís Vale Cunha, project leader, Digital and Smarter DSO Transformation; António Aires Messias, head, European Projects (not pictured); António Amorim, head, Energy Management; Aurélio Blanquet, head, Digital Network Platform; Francisco Campilho, head, Commercial Operations; Isabel Ferreira Marques, head, Human Resources (not pictured); João Martins de Carvalho, head, Planning, Control and Business Development; Joaquim Mendes Teixeira, head, Organisation and Development; Manuel São Miguel Oliveira, head, InovGrid Operations; Paulo Libano Monteiro, head, Technology and Innovation (Please refer to digital magazine for full list of EDP Distribuição team names)

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

Digitalisation in the energy and utilities sector is driving forward utility transformation. The initiatives undertaken by EDP Distribuição are largely disruptive, but also complementary to each other and are geared toward fostering active engagement. Everything within the organisation is becoming increasingly interconnected. More than ever, a genuine culture of innovation is emerging even in areas of the business that were considered less likely to adopt new processes and technologies. Furthermore, EDP Distribuição's transition to a fully digital, more intelligent DSO is a clear indication of the sweeping change taking place in the sector.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

The deployment of smart, digital solutions is helping customers become more receptive to and engaged in the energy transition. Active engagement and greater transparency is reinforced by the availability of digital tools and access to information, bringing about more opportunities for utilities to learn more about their customers and innovate together with them.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

The commitment of the entire organisation to the change management process. This commitment helped strengthen ties and communication between departments as well as external partners. The strong commitment to change management also brought about a greater sense of cohesion between the younger and the more experienced employees, allowing everyone to understand the value of each individual's contribution in the digital transformation.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

There has been a great interest and participation in the transformation process toward a fully digital and smart DSO, with many of the successes realised as the result of a fertile environment in which innovation is encouraged and where young and old, past, present and future, inform the development of win-win solutions. This is further strengthened by the fact that the company has been honoured by an award and acknowledged for its efforts in several areas, from business continuity to environmental practices.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

We are speeding up the implementation of smart technologies for local networks and households in the country. New opportunities are being exploited in anticipation of future needs, not only from the organisation's perspective, but also from an existing and emerging stakeholder perspective.

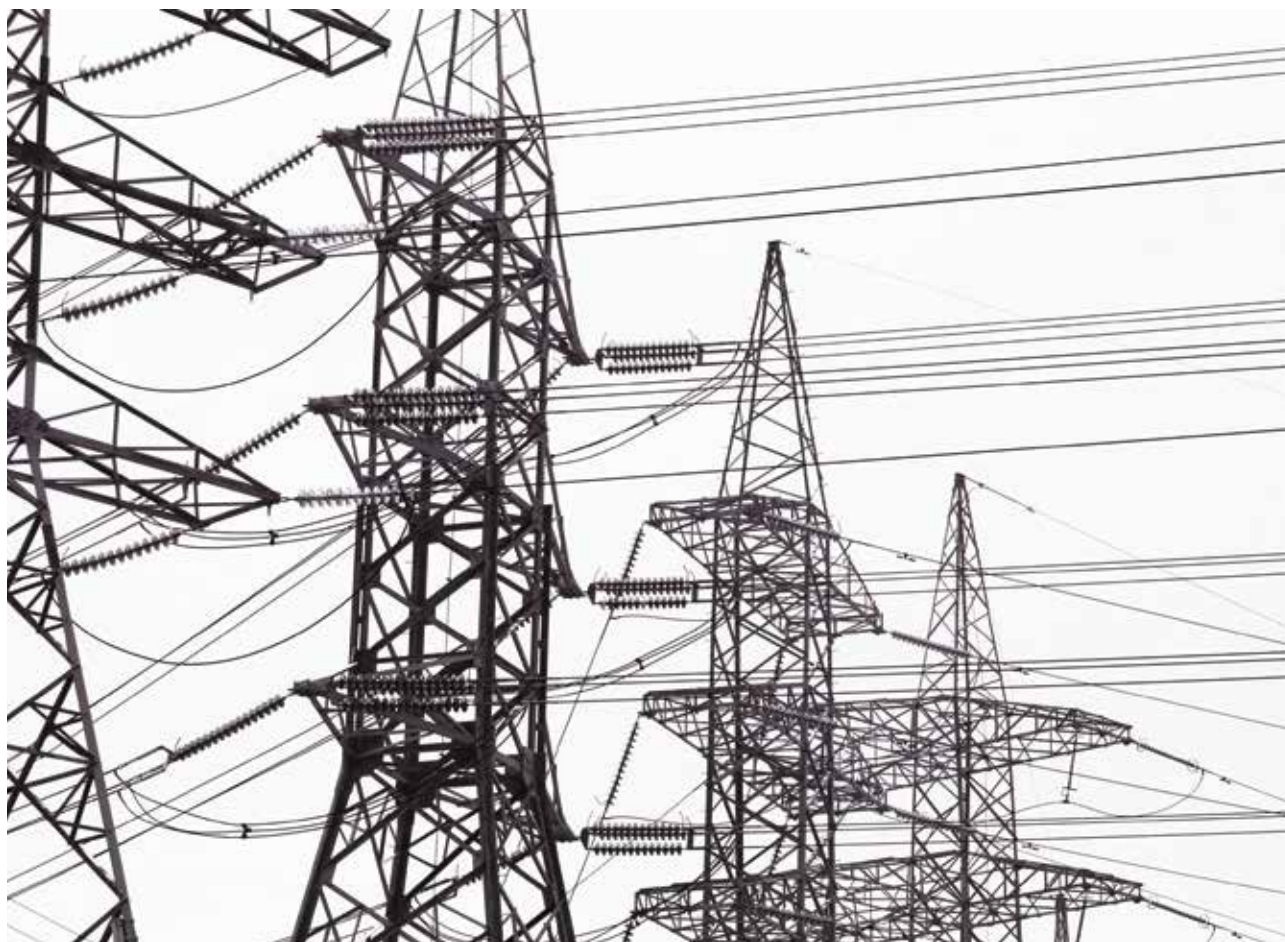
WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

To get all responsible parties, specifically those with decision-making power, aligned in understanding and supporting the sustainable and cost-effective development of the sector, in which DSOs play a central role.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

- i) The increasing importance of DSOs in fostering customer engagement and the uptake of new services
- ii) An increase in the availability of digital solutions with analytical capabilities
- iii) A greater focus on human capital ●

COMED



KEY FACTS

SMART METERS DEPLOYED

2.4 million since September 2013

AMI OUTAGE REPORTING

ComEd has integrated a meter ping across all of its customer-facing outage reporting channels

LEVERAGING AMI FOR SMART WATER MANAGEMENT

ComEd is working to integrate two segregated utilities, water and electricity, by utilizing its AMI assets for smart metering purposes

COMED INNOVATES THROUGH ADVANCED METER INFRASTRUCTURE

While many utilities have been slow to change, Commonwealth Edison (ComEd), a 110 year old utility serving Chicago and much of northern Illinois, is among those adopting new technologies and is pioneering new ways of doing business. ComEd is roughly halfway through its system-wide smart meter deployment, having installed some 2.4 million meters in its territory since September 2013.

ComEd is leveraging its advanced meter infrastructure (AMI) to identify customer-side problems related to power outages through its AMI Outage Reporting Channel Integration project. In the utility's service territory, 60% of the outages reported on "blue sky days" are a result of a problem on the customer's side of the meter—typically a problem with the customer's breakers. The goal of ComEd's AMI Outage Reporting Channel Integration project is to identify the customer-side problems upon initial customer contact.

To this end, ComEd has integrated a meter ping across all of its customer-facing outage reporting channels including its customer information system (CIS), interactive voice response (IVR), company website (ComEd.com), mobile app, mobile web, text (SMS) and Facebook. With the exception of the CIS, the meter ping occurs automatically without human intervention, while the customer is in the act of reporting an outage. If the meter ping is successful, the customer receives a message that ComEd has successfully verified power to the property's meter and informs the customer to check his or her breakers.

This process has identified customer-side issues more than 26,000 times (60% of outage reports) on blue sky days. As a result of the meter ping integration, the customer's perceived outage has been resolved at the time of the customer's report more than 18,700 times, eliminating the need for ComEd's dispatchers to perform any research. At this rate, ComEd is on track to pro-actively identify customer-side issues over 100,000 times in 2017.

Prior to implementing this change, all customer-reported outages would automatically be recorded in ComEd's outage management system (OMS). ComEd's dispatchers would evaluate the outage, oftentimes pinging the meter, and identify that the problem was on the customer's side of the meter. In these cases, the dispatcher would call the customer to let them know the problem was on the customer's side of the meter and not a problem with ComEd's service. While the customer was waiting for ComEd to research and call back, their experience was similar to a power outage—their lights and appliances would not be functioning. Once the dispatcher had informed the customer that the problem was with the customer's breakers, the customer would reset the breakers, restoring power to the premises.

MULTI-PURPOSE ADVANCED METER INFRASTRUCTURE NETWORK

ComEd's advanced meter infrastructure will not only be used for smartening up its electricity networks, but will also be of use to local municipalities and water system operators. ComEd is working to integrate two segregated utilities, water and electricity, by utilizing its AMI assets for smart metering purposes.

Local municipalities and water system operators have experienced logistical and economic challenges in their effort to pursue an AMI for their water systems. The capital investment to construct network towers, install network devices and train employees to utilize these new systems can be limiting to water system operators. In 2015, ComEd began exploring a potential service, offering to collect and distribute water meter data to water utilities in its service territory.

This technology is aimed at leveraging ComEd's growing AMI, granting smart or "smart-ready" water meters access to ComEd's AMI through radio integrated registers or smart ready device radios, respectively. Data from water meters will be transferred and housed using the software that ComEd currently uses to manage its water systems, where it will then be transferred back to the water utility. By leveraging ComEd's already robust and growing AMI to read water data, water utilities can avoid the capital investments needed to design, construct, and manage AMI assets like network towers, access points, and software systems. This project has become another opportunity to demonstrate how ComEd is building on the strength of its smart grid platform to create new value streams.

Says David Alvarez, project engineer, Smart Grid and Technology, ComEd: "Using an electric smart grid to perform meter reading for other utilities presents a great opportunity to deliver a truly innovative customer solution. This is new territory for us so we cast a wide net to tap the broad range of expertise required.

"We're proud of the strong, cross-functional team that came together to create an end-to-end solution, execute testing, develop a regulatory strategy and business model, as well as partnerships with water utilities.

"Pending a successful proof of concept with three municipality-owned water utilities, ComEd could see a wider scale deployment throughout these municipalities and in other communities in our 11,000 mi² (28,489 km²) service territory."►

"Using an electric smart grid to perform meter reading for other utilities presents a great opportunity to deliver a truly innovative customer solution"

COMED AMI OUTAGE REPORTING TEAM



THE TEAM

Front row, left to right: Jennifer Joseph, principal project manager, IT; Kim Friebe, developmental manager; Andrea Wills, senior eChannel programme manager; Kevin Perry, technical analyst, IT; Wei Chen, technical analyst, IT

Back row, left to right: Syed Ahmed, business analyst; Thomas Deja, manager, Digital Business; Mark Sayers, principal project manager; Patrick Kelly, technical analyst IT; Mark Jordan, consultant; Jennifer Mesenbrink, manager eChannels

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANIZATION?

The AMI eChannel Outage Reporting integration helps ComEd deliver premier customer experience by utilizing AMI outage management capabilities to enable first contact resolution for outage reports. It also creates efficiencies for ComEd operations by helping it to avoid creation of outage trouble reports for customer-side issues. This allows operations to focus on tickets that truly require ComEd assistance.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND THE CUSTOMERS' NEEDS?

Our smart meter technology has given us access to insight that we didn't previously have with analog meters. Being able to remotely check a customer's meter to confirm an outage helps us facilitate first contact resolution in cases where the customer may not realise the issue is a tripped breaker or an issue on their side of the meter. When a meter is pinged in a customer outage reporting channel, the customer gets a message that we are verifying the status of their electric service. When the message comes back confirming their outage, the customer feels

confident that ComEd has confirmed the outage at our end and will begin working to resolve it immediately. If the message comes back explaining that the customer should check their circuit breakers, because the outage is not on the ComEd side, the customer is very likely to check their circuit breakers and not go on to report their outage. Although the message sent to customers to check their circuit breakers is given before they begin reporting their outage, customers have more confidence when the message is specifically related to an investigation on their own meter. About 70-75% of the customers who receive the message to check their circuit breakers after their meter is pinged resolve the outage on the customer side and do not go on to report an outage.

WHAT WORKED WELL FOR THE PROJECT OR THE PROJECT TEAM?

A strong partnership between multiple departments including eChannels, customer care, operations and information technology was vital to delivering this solution. The project team ensured the concept was adequately socialized with all internal stakeholders and that buy-in was received before proceeding with the development of the solution.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALIZED?

When we decided to implement the meter ping, we thought we might see about 30-40% avoidance of trouble reports due to customer-side issues. Once we completed the integration and were able to track the actual metrics over a period of time, we realized we were avoiding roughly 70% of trouble reports for meters. This was a larger percentage of avoided trouble reports than we initially expected.

HOW WILL THE PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

The AMI eChannel Outage reporting integration was one of several advanced capabilities that ComEd sought to deliver for its customers. ComEd has also teamed up with one of its sister utilities, PECO, to integrate an automated AMI evaluation in their customer notifications for outages, restorations and estimated time of restoration. This automated AMI evaluation ensures the customer is sent the most up-to-date information about their outage through their preferred communication channel. ●

COMED WATER AMI TEAM



THE TEAM

From left: Greg Bell, senior engineer, AMI Operations; Bill Westrick, IT utility communications manager; Carla Friehe, AMI operations manager; Kathleen Kremer, principal regulatory specialist; Susan Olavarria, corporate affairs manager; Charles (Chip) Tenorio, regulatory strategies manager; David Alvarez, project engineer, Smart Grid and Technology; Jen Joseph, principal project manager IT

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

Our water advanced metering infrastructure (AMI) project is creating a lot of excitement within ComEd because it presents the opportunity to leverage the strength of the smart grid platform that we've been building since 2013. We serve nearly 4 million customers in northern Illinois, about 70% of the state's population, but we do not presently have any water customers, and that creates a new learning opportunity. The project has brought together subject matter experts to further develop the technology and work to understand the water industry. When the smart water meter technology was introduced to ComEd, it was not completely developed nor was it fully compatible with our new smart grid network, but we've come a long way in a short period of time. It was imperative that we could ensure that the smart water meter would work with ComEd's electric smart meter operations once deployed. It required significant testing, but we achieved our goal – we achieved system compatibility.

HOW HAS THIS PROJECT HELPED COMED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

Generally speaking, the water utility industry has not moved as fast as the electric industry in the move toward developing smart grid

infrastructure. Through our smart grid programme, we have gained the insight needed to design a combined solution with water customers in mind. With more frequent and remote reads, water utilities can now apply analytics to their customers' usage and evaluate this data in a way not possible before. Abnormal usage patterns can help prevent theft or leaks in homes by evaluating interval data, as it is collected and stored every 30 minutes and transmitted every 12 hours. More advanced water meters, like the Master Meter interpreter register, can process this data internally and send alarms through ComEd's network.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

A major hurdle we overcame involved testing the technology in an environment that would not negatively impact ComEd's electric smart grid operations, even early stage testing environments. ComEd was able to leverage its partnership with the Illinois Institute of Technology and begin preliminary development of the solution in a laboratory. Through working with students and industry partners, like Silver Spring Networks, at IIT's Center for Smart-Grid Application, Research, and Technology (CSMART), ComEd tested and worked with Silver Spring Networks to continuously enhance a solution to enable

smart water meters to communicate with ComEd's smart grid connected devices; and to bring the water data to the same software used by electric meters.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

While we haven't begun project deployment, we're confident that customers participating will find value in the data analytics that identify system issues and opportunities to them; and that the utilities will be better stewards of precious water resources.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCH PAD FOR FURTHER DEVELOPMENT?

Pending a successful proof-of-concept with three municipality-owned water utilities, ComEd could see a wider scale deployment throughout these municipalities and in other communities in our 11,000 mi² (28,489 km²) service territory. Learnings from the proof-of-concept would be used to develop a tariff filing for an ongoing service offering. A regulated tariff offering would give a community the added confidence of knowing that its utility partner is making a long-term commitment to this technology and its continued evolution. ●

SHARELYNN MOORE



“Smart cities respond to this demand by taking a strategic approach that relies on integrated technology and business processes to bring together a broad ecosystem of partners”

OPEN STANDARDS PAVE THE WAY FOR INNOVATION

We asked Sharelynn Moore, Itron senior vice president, network solutions some insight into the development of Itron's OpenWay Riva IoT solution and open standards. We share her insights below.

WHY ARE OPEN STANDARD NETWORKS SUCH AN IMPORTANT PART OF ITRON'S FUTURE STRATEGY?

In the past, utilities deployed closed, proprietary networks to address a specific need of the utility, such as smart metering, load control or distribution automation. These networks were essentially built in silos to serve a single purpose. That, however, is changing.

At Itron, we seek long-term benefits for our customers and to protect them from stranded investments, which is why we joined forces with Cisco more than seven years ago to create a fully open and standards-compliant internet protocol network architecture for Itron's OpenWay Riva IoT solution. Utilities want choices and to be able to use technologies

from multiple vendors and have them work together in order to realise the full benefits of a modernised and digitised grid.

OpenWay Riva delivers this vision. The solution is standards-compliant with Wi-SUN, which aims to advance seamless connectivity by promoting IEEE 802.15.4G standard based interoperability for global and regional markets. This gives our customers more choices, freedom and flexibility to add other devices and applications from third parties to our network. We are leaders in key standards bodies, we build ecosystems, we provide development kits and build out our partner networks. These activities, taken as a whole, enable us to deliver true interoperability to our customers.

CAN YOU TALK TO US ABOUT THE INTERPLAY BETWEEN SMART CITIES, OPENWAY RIVA AND OPEN STANDARDS?

By 2050, it is estimated that 70% of the world's population will live in cities. These growing populations will put an increased demand on city resources, including energy, clean water, sanitation, transportation, public safety and other services.

Smart cities respond to this demand by taking a strategic approach that relies on integrated technology and business processes to bring together a broad ecosystem of partners. This ecosystem is only possible if different devices can work together, regardless of what company manufactured them. Itron empowers smart cities to use the best solutions to address urban challenges by allowing various devices to work together using one, open standards network with our OpenWay Riva IoT solution. Smart cities can use our technology to unify streetlights, water and energy management and other smart technologies and applications.

WHERE ARE YOU SEEING THESE DEVELOPMENTS STARTING TO GAIN MOMENTUM AND WHERE DO YOU SEE THEM CONTINUING TO GROW?

It is exciting to watch the goal of creating smart utilities and cities become a reality. Across the globe, we are working with utilities and cities to upgrade their systems using our OpenWay Riva IoT solution. In fact, we are even helping create a smart island in the Kingdom of Tonga. [Ed's note: see page 9] Our smart technology will help reduce water losses associated with leaks, capture lost revenue due to non-payment, and improve customer service. It's all a part of Tonga's plan to become a truly smart island.

As Itron's IoT solution continues to gain momentum, we are providing the foundation for smart cities and smart utilities around the globe.

WHAT OTHER INITIATIVES ARE ON ITRON'S HORIZON THAT WILL IMPACT THE SECTOR?

Historically, utility data has been gathered and analysed on premise. Within three years, 83% of all data center traffic will be based in cloud computing, according to a market analysis report from Cisco. Itron is taking advantage of this shift. Working with utilities and municipalities across the globe, Itron has harnessed the power of cloud services to deliver information safely, reliably and efficiently. Itron is transitioning our software solutions across the globe to Microsoft Azure the largest cloud infrastructure available, to provide higher reliability at lower costs.

WHY IS ITRON UNIQUELY POSITIONED TO ASSIST IN MAKING MANY OF THE OPPORTUNITIES HIGHLIGHTED A REALITY?

Itron was born out of the need for better technology and services in the utility industry. In 1977, Itron embarked on a mission to find more efficient ways to read meters and in the 40 years since then we have deployed more than 160 million connected devices. With nearly 8,000 customers in more than 100 countries, Itron has extensive experience in creating solutions for numerous municipalities and utilities.

With our decades of experience, we are positioned to address the problems facing utilities today and Itron is leading the industry in utilising open standards. The cloud has made it cost effective to provide more services in less time, and with nearly 20 million Itron OpenWay meters in the field, collection of data has never been easier. At Itron, we help our customers make the most of what they have. Our technology and services connect people, devices and insights to better manage energy and water resources, all around the world. ►

“These growing populations will put an increased demand on city resources, including energy, clean water, sanitation, transportation, public safety and other services”

SOCALGAS



KEY FACTS

CUSTOMER SATISFACTION

SoCalGas's 2015 J.D. Power Billing and Payment score increased by 5 points with the provision of weekly bill alerts enabled by AMI

ENERGY SAVINGS

SoCalGas's heating conservation programmes produce natural gas savings which average at 1.5%

SHARED NETWORK

SoCalGas is using its advanced meter network to pilot a shared network platform with water utilities

SOCALGAS AMI CREATES VALUE BEYOND GAS MEASUREMENT AND OPERATIONAL EFFICIENCIES

Southern California Gas Company (SoCalGas) is successfully exploring potential new operational and societal benefits enabled by its advanced metering infrastructure (AMI) system. The company, which has now nearly fully deployed the advanced meter technology throughout its territory, has found the system offers a new application – the to detect abnormal natural gas usage patterns and thus potential leaks – at customer homes or facilities more quickly.

In areas where the advanced meter communications network is fully deployed, the company is successfully integrating data to develop algorithms that provide a more granular awareness of energy use, and identify unusually high gas consumption patterns at customer homes or facilities. This allows the company to find, investigate and respond to potential gas leaks or other abnormal gas usage situations, such

as hot water heater leaks, much more quickly than it could before advanced meter technology was introduced.

The benefits of an expedited response to abnormal gas usage are threefold. These include recognising potentially hazardous leaks and responding to these much faster, reducing methane emissions as well as eliminating any financial burden on customers as a result of unusually high natural gas or water use.

The use of advanced meter data analytics forms part of a comprehensive set of tools and processes aimed at ensuring customer safety. The advanced meter team assesses unusual consumption patterns on both occupied and vacant accounts using a 'per day average' and in some cases, will take into account hourly reads to conduct further research. SoCalGas expects that, as it continues to build out enhanced analytics capabilities, further customer service and safety benefits will accrue. More rapid detection and resolution of potential natural gas leaks provides enhanced safety for customers and their communities, as well as energy and financial savings, reduced greenhouse gas emissions and conservation of scarce water supplies.

FIELD SERVICE AUTOMATION

With advanced meter automation, a field technician visit to collect a customer's starting meter read is no longer necessary for turn-on service orders. As of June 30, 2017, SoCalGas's customer service field organisation has seen a reduction of over 2.7 million field service orders since the implementation of automated meter reads for the initiation of new service. Advanced meter automation has also enabled SoCalGas' field operations to reduce other order types, such as meter read/verification orders and orders related to investigating customer billing inquiries. If in the past customers had to provide SoCalGas personnel with a key to their security gates, leave latches unlocked or confine their dogs to allow for meter reading to take place, in future they'll only need to provide entry for periodic maintenance.

CUSTOMER ENGAGEMENT

New energy and bill analysis tools have been deployed for SoCalGas customer service representatives, field technicians, and other customer contact personnel through SoCalGas's advanced meter project. These tools allow both SoCalGas customer contact personnel and its customers to access daily and hourly natural gas usage information and costs. By empowering its customer service representatives with more detailed information regarding customers' usage patterns, as well as providing customers with proactive weekly bill alerts, the number of customer bill inquiries resulting in a fielded billing investigation has been steadily declining. Reductions in billing-related customer inquiries may also be attributed to the reduction in errors inherent to the manual meter reading process.

SoCalGas also initiated a shared network pilot programme, leveraging the utility's advanced meter communication network infrastructure to enable water utilities to implement their own advanced meter systems. This network sharing capability has the potential to provide significant operational and conservation benefits to water agencies and their customers within SoCalGas's service territory. Year-long pilots have been established by Aclara and SoCalGas with a limited number of water utilities to evaluate the feasibility of the shared network concept. As of December 2016, three municipal water utilities have been participating in the shared network pilot, and approximately 2,000 water meter transmission units (MTUs) have been found to be successfully transmitting data from municipal water utility MTUs over SoCalGas's advanced meter network. SoCalGas also deployed eleven methane sensor devices in areas near a transmission pipeline, under its 'Methane Detection' pilot project. These devices are successfully communicating over the advanced meter network with the ability to provide remote alarm registration and processing when the methane-in-air concentration, as measured by the sensors, exceeds limits established for the utility's testing period.

CUSTOMER ENERGY SAVINGS BENEFITS REALISED

Through the upgrade of its natural gas meters to advanced gas meter technology, SoCalGas is offering its customers new ways to save energy and money and reduce their impact on the environment. Customers are benefiting from conservation efforts

“SoCalGas’s customer service field organisation has seen a reduction of over 2.7 million orders since the implementation of automated meter reads”

through new programmes, tools and capabilities developed and implemented as part of SoCalGas' advanced meter implementation project. These include:

- Energy efficiency programmes that incite behavioural change by leveraging advanced meter-enabled usage data to motivate customers to reduce their energy usage, and presenting this information in monthly energy reports delivered via post and e-mail.
- 'Bill tracker alerts' delivered weekly via e-mail or text throughout the billing period helping customers monitor their consumption. The J.D. Power 2015 Gas Utility Residential Customer Satisfaction Study indicated SoCalGas's Billing and Payment score increased by 5 points as a result of weekly bill alerts.
- New energy presentation and analysis tools made available through the utility's "My Account" customer portal and the SoCalGas Mobile App.

To build acceptance and awareness of advanced meter benefits amongst its customers, SoCalGas's stakeholder education and outreach team performed an array of targeted outreach activities to inform customers about its advanced meter deployment activities. Outreach efforts were assisted by several local organisations – more than 135 CBOs, chambers, business organisations and agencies – who simultaneously performed outreach activities on behalf of SoCalGas via grants. Each organisation provided a specialised focus that allowed SoCalGas to reach a specific audience in a given geographical area. The strength of the outreach programme was demonstrated by the ability to leverage the resources, experience and reach of each organisation to create awareness of the advanced meter project and educate customers and communities about its benefits.

'TEST AND LEARN'

SoCalGas initiated a series of 'Test and Learn' behavioural change conservation campaigns to demonstrate how to best meet the minimum 1% energy savings goal associated with the advanced meter rollout. Overall, residential conservation pilot programmes tested during the 2016-2017 and 2015-2016 heating season campaigns produced natural gas savings of around 1.5%. Also noteworthy is that one pilot programme achieved savings upward of 3% over the winter period.

Once fully installed, the advanced metering system will enable the removal of 1,000 service vehicles off the road each day, eliminating close to 7,000,000 miles (11,265,408 km) driven each year to perform manual meter reading. Through customer conservation efforts along with fewer vehicles on the road, the utility expects to reduce CO₂ emissions by approximately 140,000 tons each year.

CAPGEMINI - A KEY CONTRIBUTOR

Bringing their experience in managing robust AMI programmes, Capgemini has had the opportunity to engage with SoCalGas since early 2011. Capgemini worked jointly with SoCalGas to execute many core project delivery areas, including the project management office (PMO), business process design, release management and test strategy.

In addition, Capgemini helped execute ongoing project functions, such as the master project plan, IT and field readiness checklists and IT delivery approvals. As the project progressed, new focus areas emerged, including the support of large-scale supply chain operations, managed rollout of advanced meter technology to pressure monitors and the implementation of a structured benefits realisation methodology. For each of these new challenges, Capgemini teamed with SoCalGas to deliver the required capabilities. ►



“Through the upgrade of its natural gas meters to advanced gas meter technology, SoCalGas is offering its customers new ways to save energy and money and reduce their impact on the environment”

SO CAL GAS TEAM



THE TEAM

In no particular order: Jeffery L. Walker, director, Advanced Meter Project and Meter Reading; Rene F. Garcia, manager, Advanced Meter PMO; Robert Y. Wu, manager, Advanced Meter IT Programme; Gino Vingino, manager, Mass Installations; Nancy Carrell Lawrence, manager, Customer Experience and Energy Presentment. Not pictured: Tatiana S. Garcia, manager, Financial Planning and Analysis; Ricardo J. Garcia, manager, Meter Reading Operations; David M. Mercer, Network Deployment; David C. Wei, manager, Advanced Meter IT Programme; Raul Gordillo, project manager, Community Education and Outreach; Natasha Dowling, engagement director, Capgemini Client Partner for Sempra Energy

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

Our advanced meter deployment has impacted every aspect of the business and helped SoCalGas realise tremendous benefits related to meter reading, customer services, field operations, and service delivery enhancements as a result of enhanced data analytics and much more.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

Strong executive leadership, vision and support throughout the project. A project management office was established which defined governance approaches leveraging best practices for large scale project implementations. The advanced meter implementation organisational structure incorporated empowered, cross-functional work streams for each of the functional and/or specialty areas associated with the advanced meter rollout; for example, a team dedicated to customer experience, employee awareness and engagement, meter data management systems, network operations, etc. Significant project resources were dedicated to orchestrating the internal employee 'change management' required to ensure a solid 'ownership transition' of new advanced meter business processes and capabilities.

SoCalGas also developed a local stakeholder education and community outreach programme to ensure every city and county it serves is addressed.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

Through the advanced meter-enabled 'Test and Learn' customer pilot programmes, SoCalGas further developed its ability to employ an agile development process to quickly develop, launch and enhance new pilot programmes prior to rolling them out on a larger scale. The process embraced the principle of "failing fast" and quickly eliminated and/or modified conservation approaches that were initially not successful.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

The advanced meter system has provided SoCalGas with a platform on which to offer new services internally and externally. Furthermore, SoCalGas's "Energy Efficiency Business Plan" filed with the California Public Commission on 17 January 2017 outlines programmes and approaches that will leverage advanced meter-enabled usage data in future programme offerings.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

In California, one of the sector's biggest and most exciting challenges will be meeting the state's aggressive greenhouse gas (GHG) reduction goals. The state has set a GHG reduction target of 40% below 1990 levels by 2030. SoCalGas is helping to meet that

challenge with its Renewable Natural Gas (RNG) initiatives. Each year, California's waste and agriculture industries release about 31.68 million metric tons of carbon dioxide equivalent (MMCO₂e) of methane—about 80% of total methane emissions in the state. This waste-generated methane acts as a potent greenhouse gas that contributes to climate change. SoCalGas is working to increase the amount of this energy that is captured and put to beneficial use, providing a carbon-neutral, or even carbon-negative energy resource. In October 2017, the company will complete its first renewable natural gas interconnection project, and it recently announced three new initiatives that will make it easier for renewable natural gas production facilities to connect to the company's natural gas pipeline system.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

First, we predict an increase in renewable natural gas (RNG) produced in California. To meet its aggressive greenhouse gas (GHG) reduction goals, California needs to capture the methane emissions produced by the state's waste and agriculture industries.

Second, we foresee a continued reduction in NO_x pollutants and GHG emissions from the transportation sector as renewable natural gas is increasingly used in transit buses and heavy-duty trucks.

Lastly, there will be a rapid increase in analytics-driven processes. ●

ALLIANDER AND STEDIN



KEY FACTS

FAIR METER INITIATIVE

Alliander and Stedin partner to ensure 'fairness' in smart meter rollout

COMMUNICATIONS TECHNOLOGY

Alliander and Stedin create CDMA 450 mobile network

SMR5

Dutch smart meter specifications

ALLIANDER AND STEDIN COLLABORATE TO ENSURE 'FAIRNESS' IN DUTCH SMART METER ROLLOUT

Following the favourable evaluation of smart meter pilot projects carried out in the Netherlands, the Dutch distribution system operators were mandated to deploy smart meters in order to meet the EU requirement of providing 80% of households with a smart meter by the end of 2021.

While having separate smart meter deployment milestones to reach, Dutch grid operators Alliander and Stedin joined forces to create the Fair Meter Initiative, to ensure that advanced electricity and gas meters to be implemented were not only smart but also fair. A Fair Performance Ladder was developed which included all elements its originators deemed relevant to Fair.

The ladder zooms in on the energy use of the product; the materials in the product and if they are scarce, toxic or a conflict mineral; if they can be recycled or if recycled content is used. The ladder also looks at labour conditions in the entire supply chain. The Fair Performance Ladder continues to play a key role in the procurement process of smart meters in the Netherlands.

The ladder was first used to rank smart meter suppliers on the level of fairness in their production process and secondly on the fairness of their product.

“Two of the four primary goals of the project are to maximise client satisfaction and develop a fair product,” says Johan Koster, smart metering programme manager at Liander; and Ton Brugmans, head of Meter Technology and Smart Data at Stedin.

Both Liander and Stedin are part of the ‘Green Deal’ and the next steps are being taken toward the development of the next generation SMR5 [Dutch smart meter specification] meters to achieve a further reduction in the use of plastics and other non-recyclable components.

The Green Deal approach in the Netherlands is an accessible way for companies, other stakeholder organisations, local and regional government and interest groups to work with Central Government on green growth and social issues.

DUTCH SMART METER TENDER

Global energy management solutions provider Landis+Gyr was amongst those selected to deploy smart meters based on the SMR5 Dutch smart meter specifications in the country. In 2015, Landis+Gyr was awarded a contract by the four Dutch distribution grid operators Liander, Stedin, DELTA Netwerkbedrijf (now known as Enduris) and Westland Infra (now a NV JUVA subsidiary) for the supply of three million smart meters in the Netherlands.

Landis+Gyr is supplying both smart electricity meters and smart gas meters to all four grid operators. The majority of the meters will be rolled out between 2016 and 2020. The project may be prolonged until the end of 2026. With this tender, the four grid operators comply with the legal obligation to offer a smart meter to every household in the Netherlands before 2021.

Commenting on the award of the contract, Coco Geluk, managing director of Landis+Gyr, Netherlands, said: “The winning of this public tender marks a continuation of Landis+Gyr’s long-standing relationship with these four grid operators. We are very happy and proud to be able to make a contribution to the smart meter rollout in the Netherlands, which will bring tangible benefits to Dutch consumers and strengthen the energy supply system.”

According to Koster and Brugmans, “This project was one of the largest tenders and smart meter implementations for the Dutch DSOs – Stedin, Liander, Enduris and NV JUVA. In total, five to eight million smart electricity and gas meters are being deployed between 2016 and 2026.”

P1 PORT

The smart meters being installed will be equipped with a communications port, the ‘P1 port’, that allows the smart meter to communicate into the home. This will enable consumers to visualise their energy consumption on an in-home display, or connect to a home energy management system (HEMS). This functionality will give Dutch consumers the ability to have direct feed-back and control their energy consumption.

Alliander and Stedin’s collaboration also extended to the joint development of a CDMA 450 mobile network to avoid being limited by commercial mobile operators’ technology, but also to have dedicated bandwidth and sufficient coverage in the service areas it is operating in.

“Through our joint efforts [Alliander and Stedin] we have reached several milestones; for example, one common smart meter for the four DSOs, the development of a unique CDMA 450 mobile network, and gas meter technology that can be used by all gas operators. Another collaborative venture is the creation of a planning and forecast model to further optimise the supply chain,” conclude Koster and Brugmans. ►

*“Dutch grid operators
Alliander and Stedin
joined forces to create the
Fair Meter Initiative, to
make electricity and gas
meters not only smart
but also fair”*

ALLIANDER AND STEDIN/ LANDIS+GYR TEAM



THE TEAM

Fair Meter Project team, from left: Dominique Hermans, Alliander; Joe Andrews, Landis+Gyr; Reinout Wissenburg, Stedin; Dirk Bijl de Vroe, Stedin; Marcel de Nes Koedam, Alliander

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

The SMR5 programme is one of the flagship projects for Landis+Gyr in the EMEA region and globally. The impact of such a project is big. Not only are customer requirements and expectations high, but it also offers an opportunity to further develop Landis+Gyr's competencies and portfolio. As the programme will run until end 2020 at least, both the customers and Landis+Gyr are determined as partners to make it successful.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

The SMR5 customer group has applied best value procurement principles and so it was clear from day one what four key objectives it was targeting. We focused on what was important and pushed ourselves to improve in those areas. A good example is the Fair Meter. Landis+Gyr has always been focused on sustainability and related topics, but the customer [Stedin and Alliander] really pushed us to take a next step and make a focus on sustainability the starting point of our product development.

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

The close cooperation between parties, including the other meter supplier, ensured that everybody focused on the same

goals. Apart from this, big steps have been taken in transparency between parties and how we deal with forecasting and supply chain optimization, all resulting in a very high security of supply for the SMR5 customer group.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

"Through our joint efforts [Alliander and Stedin] we have reached several milestones like one common smart meter installation procedure for the four DSOs [Stedin, Liander, Enduris, NV JUVA], the development of a unique CDMA 450 mobile network and gas meter technology that can be used by all gas operators. Another collaborative venture is the creation of a planning and forecast model to support the optimum demand and supply balance of smart meters" – Johan Koster, smart metering programme manager at Liander; and Ton Brugmans, head of Meter Technology and Smart Data at Stedin.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

One of the challenges was the rollout volumes. The product developments initiated for the SMR5 project will be the starting point of new meter platforms which will be used in many other countries around the world in Landis+Gyr rollout projects.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

The world around us is changing rapidly. More applications for smart metering are developed continuously; EV and solar applications are also growing. The biggest challenge will be to find stability and continuity in an ever-changing world, especially for utilities who install assets to operate for the next 20 years.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

Landis+Gyr:

- More advanced logistic models and close cooperation will further strengthen the supply chain reliability
- Sustainability and Fair Meter principles will become increasingly important
- Metering-as-a-service will be applied more by customers in the EMEA region

Alliander and Stedin:

- Increased customer awareness around electricity and gas usage with smart meter installation, but additional incentives will be required for higher reduction
- Data will help to further optimise the grid
- More sustainable and local generation e.g. solar panels, heat pumps etc. highlight the need for a balanced grid ●

A clear energy vision from a proven partner

At Landis+Gyr, we realize our energy vision by creating connectivity, improving grid transparency and facilitating the utility transformation. Our AMI and smart grid solutions grow into intelligent platforms, enabling industrial IoT and providing new tools to command and control the energy assets. We support our customers to extend the value of their grid investments with managed services, grid analytics and leading edge communication technologies under a single solution open for next generation energy management applications.

Landis+Gyr has a proven track record in helping utilities to manage energy better. Together, we shape the future of energy.

**Want to know more? Visit us at European Utility Week,
Amsterdam, 3 – 5 October 2017 or under
www.landisgyr.eu**

CITIPOWER AND POWERCOR



KEY FACTS

SELECTIVE LOAD MANAGEMENT (SLM)

Enables meter level demand reduction

SMART METER TECHNOLOGY

Citipower and Powercor's smart meters employ emergency supply capacity control

PRIORITY METER GROUPS

SLM helps to keep critical organisations running, should a network disturbance or outage occur

CITIPOWER AND POWERCOR READY TO USE SMART METER CAPABILITY FOR SELECTIVE LOAD MANAGEMENT

During times of extreme network constraint like the loss of major generation, transmission failure or a catastrophic weather event, a distribution network service provider (DNSP) may be called upon to shed load. This would traditionally be executed by opening circuit breakers that indiscriminately disconnect thousands of customers connected to large feeders including hospitals, emergency services, life support customers, traffic lights, rail crossings and other sensitive loads.

The installation of more than one million smart meters across the CitiPower and Powercor networks, provides the business with improved capabilities to work with customers and other stakeholders, to better manage electricity demand through the deployment of a range of network and customer-side demand management solutions.

One of these capabilities is selective load management (SLM). SLM allows for meter level demand management through the activation of the emergency supply capacity control (ESCC) feature of the AMI smart meters. The SLM Engine builds its meter groups from residential and commercial customers on each feeder, excluding sensitive load customers from the groups.

This means that should CitiPower and Powercor be instructed to shed load in extreme events, the company can maintain supply to sensitive load customers, such as life support customers and key essential services.

LOAD REDUCTION

In a situation requiring SLM, utilising features built into a distribution management system (DMS), controllers select an area of the electricity network at the network, terminal station or zone substation level and enter the required reduction, in megawatts.

The SLM Engine calculates the meter groups (by feeder and customer type), to activate emergency supply capacity control in order to achieve the required reduction. The SLM Engine then passes these requests to the company's AMI Meter Network Management System (Utility IQ) which communicates with the targeted AMI meters to activate ESCC.

ESCC is enabled in customer AMI meters with a trigger threshold demand setting of 500 watts, a calculation period of one minute and a disconnection period of 60 minutes.

Once ESCC is activated on an ESCC-enabled meter, if demand is 500 watts or more over a one minute period, the contactor in the meter will open and remain open for 60 minutes, immediately reducing the demand impact of that meter. The meters themselves remain on-supply and therefore in communication with the electricity network remaining energised.

ROTATING METER GROUPS

The system is designed to automatically rotate through different meter groups. After a pre-defined period, a new set of meter groups will have ESCC activated and the previous set of meter groups will have ESCC deactivated, allowing their contactor to close and remain closed at the end of the disconnection period, until next required.

CitiPower and Powercor will be working with stakeholders and customers to further develop its smart meter functionality, with a view to mature its network and customer-side demand response solutions. ►



“The SLM [selective load management] Engine builds its meter groups from just the residential and commercial customers on each feeder, excluding sensitive load customers from the groups”

CITIPOWER AND POWERCOR TEAM



THE TEAM

Front row, from left: Pricilla Mottal, IT specialist programmer; George Aspros, head of Network Control and Operations; Elizabeth Ryan, business analyst

Middle row, from left: Kevin McKenzie, project manager; Cassandra Allen, solution architect; Luke Skinner, head of Network Technologies; Adam Ng, network technologist; Stuart Bannister, communications networks manager

Back row, from left: Grant Gardiner, real-time systems manager; Peter Galey, network control manager; Bill Tarlinton, IT specialist programmer; Kunal Singh applications architect

WHAT IMPACT HAS THE PROJECT HAD IN THE ORGANISATION?

The Selective Load Management (SLM) solution uniquely positions our business with the capability to provide the communities within our distribution regions with a safer and lower impact experience during times of severe generation shortfall or transmission failure. Knowing that we have this additional layer of 'supply security insurance' is very important to our business.

HOW HAS THIS PROJECT HELPED TO BETTER UNDERSTAND CUSTOMERS' NEEDS?

Throughout this project, we have analysed customer segmentation options to balance the required load reduction against customer safety and the economic value of customer reliability. We have drilled into what characteristics of a customer qualify them to be classified as a "sensitive load customer" and what services are important to keep a community functioning (e.g. traffic lights, rail crossings etc.).

WHAT WORKED WELL FOR THIS PROJECT OR THE PROJECT TEAM?

The technology stack worked as expected, and this was a major contributor to the project's success. The project involves end-to-end integration between smart meters, the smart meter management software and the electricity distribution management software – no mean feat considering how securely isolated these systems and networks are.

WERE THERE ANY UNEXPECTED UTILITY/CUSTOMER BENEFITS REALISED?

The technology simulates an outage using a smart meter feature called emergency supply capacity control (ESCC), a feature that monitors a customer's usage pattern and if it is over a predefined threshold, the meter contactors open and power is dropped to that customer. An unexpected benefit is that if the customer has only the bare minimum of load, like a fridge, they may not experience an outage at all. The unexpected benefit to the utility was that we uncovered use cases that were not part of the original scope of the project, such as utilising SLM to reduce load on the network for asset protection.

HOW WILL THIS PROJECT BE SCALED UP OR SERVE AS A LAUNCHPAD FOR FURTHER DEVELOPMENT?

This solution will be leveraged for an 'opt-in' incentive-based demand management programme that offers customers an attractive payment or tariff to have their supply capped (at a reasonable level) several times per year during peak periods. This is targeted for the 2018/2019 summer period.

WHAT DO YOU SEE AS THE BIGGEST CHALLENGE FOR THE UTILITY SECTOR GOING FORWARD?

Supply reliability and affordability are two of our biggest focus areas going forward. Offering the same reliable service at

record low network costs, while catering to customer choices in centralised and distributed sustainable generation, is challenging with the saturation of smart meters. However, we believe that the data that comes with that, along with the insights that we develop from that data, puts us in a better position to address this challenge.

WHAT ARE YOUR TOP THREE PREDICTIONS FOR THE SECTOR FOR THE NEXT 12 TO 24 MONTHS?

- Renewable technology costs will continue to drop as national and state renewable energy targets become clearer and more aggressive. This will drive the need to shore up the bidirectional resiliency of transmission and distribution networks.
- Energy storage technologies will reduce in cost and the domestic market will improve with the emergence of more service oriented business models like Sonnen. There will be a much larger shift in grid scale storage technologies including significant advancements in hydrogen storage and transport.
- Customer choices for engaging with energy market participants will grow; new offerings from retailers and distributors will enable customers to make informed trade-offs between different service offerings. ●



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inefficiencies



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Demand increase
by 2035



34%
OF WATER
Lost in the
distribution system



8B
PEOPLE
Global population
by 2025

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At Itron, we believe that the way we manage energy and water will define this century. We connect people, devices and information through technology and services—and in the process, we build more insightful utilities, stronger communities and smarter cities.

From integrating renewable energy at Reunion Island off the coast of Africa to protecting scarce water resources in Mali, or partnering with Charlotte, North Carolina on their smart city vision, we are helping **create a more resourceful world.**

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“Based on load calculation and the rated capacity of the transformers, which the smart meters monitor, they quickly determine if any transformers are approaching overload conditions”

CREATING SMART COMMUNITIES WITH AN ACTIVE NETWORK

By Tim Wolf, Itron Director of Marketing, Smart Grid Solutions

It's late afternoon on a hot August day in a suburban neighbourhood. Rooftop solar panels are producing lots of electricity, more power than the homes they serve require. At the same time, two electric vehicles are charging on level-two chargers under a single transformer. People arriving home from work are turning up their air conditioning and cooking dinner. As a result, electricity demand and transformer loading in the neighborhood is headed for the red line from power flowing in both directions.

However, something else is happening. Smart meters in the neighbourhood – each equipped with a computing platform, robust processing power and peer-to-peer communications capability – are analysing 1-second data in real time to sense detailed information about the power grid. Guided by a continuously updated connectivity model and running a transformer load management app downloaded from over

the network, the meters communicate with each other to calculate total load on the nearby transformers.

Based on load calculation and the rated capacity of the transformers, which the smart meters monitor, they quickly determine if any transformers are approaching overload conditions. They also identify whether that overload is coming from the line side or customer side of the meter. If overloading is occurring, the app on the meters runs an analysis to determine the most appropriate course of action: whether to curtail controllable loads behind the transformer or to increase or decrease distributed generation on the customer side.

All this happens locally, continuously and automatically and without human intervention. The summary data is provided to utility grid operators over the network. As a result, safe loads are maintained on each transformer by the smart meters working collaboratively and in real time with other devices and assets – load control switches, smart thermostats, DER, electric vehicle charging stations, energy storage and smart inverters – at the edge of the network.

The story doesn't end there. By running another app in parallel, the smart meters also create and administer a 'local power pool' in the neighborhood so that surplus distributed generation can be used locally instead of being wasted, in an effort to protect utility equipment. Using a customer-facing version of the app running on a customer's smart phone that automates the entire transaction, a customer purchases excess generation from their neighbor at a discounted price to dry their clothes, charge their electric vehicle or cool their home. The utility manages this local power pool and transactions as a service to its customers while creating a new source of revenue in the process.

The scenario described above represents one or two use cases made possible by deploying an active network to create smarter communities. An active network features an Internet of Things (IoT)-enabled platform and network where smart metering is viewed as an initial application rather than the fundamental purpose of the network. The ability of intelligent devices to communicate, collaborate and take coordinated action in real time at the edge of the network to solve problems, create opportunities and manage rapidly changing grid conditions is the essence of any smart community vision. The active network, such as Itron's OpenWay Riva IoT solution, makes the vision a reality.

UTILISING THE ACTIVE NETWORK

The active network leverages significant recent advancements in IoT technology, including distributed intelligence, machine-to-machine communications, multi-application network architecture, cloud computing and data analytics to deliver an entirely new level of awareness and control in the distribution network. With these capabilities, the active network provides services to utility customers that were simply not possible just a few years ago.

For instance, with implementation of just a few distributed intelligence applications, it is estimated that utilities can increase their smart metering business case benefits by up to 50%. By running a more efficient, reliable and safer grid, active network technologies also accommodate more distributed generation into the resource mix with the ability to manage rapidly changing grid conditions on a localised level. Plus, consumers can benefit from a more personalised and higher-value customer experience based on their needs and preferences.

ATTRIBUTES OF AN ACTIVE NETWORK

In order to support the capabilities of the active network, there are four key attributes that solutions like OpenWay Riva must deliver:

- Devices must be active. Every smart meter, grid device and sensor needs the processing power on the device to enable analysis of highly-detailed data in real time at the edge of the network. This also provides an application platform to run apps on meters and devices.
- The technology must be connected. Since the active network incorporates a flexible portfolio of communication technologies, there must be communication options for high-performance and assured connectivity in all service environments.

“The active network leverages significant recent advancements in IoT technology, including distributed intelligence, machine-to-machine communications, multi-application network architecture, cloud computing and data analytics to deliver an entirely new level of awareness and control in the distribution network”

- Open standards are vital to create a truly interoperable active network. Ensuring open standards allows customers to easily add new devices, applications and services to the network from an ecosystem of suppliers.
- Finally, the active network must be unified. There must be seamless support across electricity, gas, water and smart city applications. A unified structure enables applications for safer and more sustainable communities and more energy efficient solutions.

With all four of these components engaged, active network capabilities can equip smart utilities and smart communities with technology that enables future applications well beyond smart metering and other utility applications.

THE IMPACT OF ACTIVE NETWORK APPLICATIONS

Itron's OpenWay Riva solution delivers the active network and redefines what is possible for smart metering, grid operations and customer service. Designed to specifically meet the key challenges that utilities face, the active network unveils countless opportunities. For example, utilities can accelerate outage detection and analysis while eliminating reliance on customer calls to understand outage conditions.

OpenWay Riva also equips customers to increase the accuracy of energy theft detection by 300%, download and run customised apps on each meter and quickly detect and locate grid problems. These solutions directly impact a utility's bottom line, allowing them to create new service and revenue opportunities by partnering with other utilities and municipalities for meter reading and smart city services.

The active network accelerates digital transformation in an increasingly challenging business environment. By leveraging advances in technology, such as distributed intelligence and machine-to-machine learning, it goes far beyond current smart metering offerings to unlock entirely new sources of value. The active network is where smart grid, smart cities and IoT come together. ►

AUTHOR

ABOUT TIM WOLF

Tim Wolf is the director for marketing at Itron, where he is responsible for marketing and communications for Itron's global electricity and smart grid businesses. He is a regular presenter at industry conferences and writer in the industry trade press. He can be contacted at tim.wolf@itron.com.



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SMART METER ROLLOUT IN JAMAICA



In 2016, the Jamaica Public Service (JPS) began its rollout of smart meters across the island. The initial implementation saw the installation of over 20,000 smart meters in eight out of 14 parishes in Jamaica.

The primary objectives of the project were to further develop the company's grid to a smarter, transactive grid which would improve reliability for both the utility and its customers; provide more data points for grid analysis; and prepare the grid for demand response which will significantly increase the efficiency of the entire electrical delivery system. The rollout of these meters seeks to improve customer satisfaction through added value such as loss detection, identification and the intelligence to help with loss prevention through the use of analytics which was also implemented.

JPS collaborated with Silver Spring Networks Inc. (SSNI) in an effort to leverage their highly interoperable and reliable mesh network in the rollout of Aclara residential and commercial meters. To date, the system has been able to maintain a 99.84% access to load profile data for analysis and register readings for automatic billing purposes. On the Silver Spring Mesh Network, the utility has also piloted the use of Smart LED Streetlights.

JPS has recorded an improvement in efficiency with its meter read to bill cycle. The use of smart meters has resulted in a reduction in the need for manual meter reads on more than 70 routes island-wide. Consequently, estimated energy use has been significantly reduced. This has also caused an uptick in bill sales from the time that the smart meters have been installed in comparison to the previous year.

JPS's Kingston 2.0 Smart City Pilot (the first of its kind in the Caribbean) has had a similar impact for the utility's customers. The scope of this project included the deployment of smart

meters for all of the company's commercial customers (within the pilot area). This empowered JPS's commercial customers to view their consumption pattern through the use of the utility's energy management web portal.

In an attempt to curtail its non-technical losses, JPS equipped every transformer circuit in project areas with smart meters, following which the company could measure transformer energy delivery with its smart transformer meters, dubbed internally as 'total' meters. The utility then undertook an elaborate customer to transformer connectivity mapping exercise to solicit the customers associated with a particular transformer.

JPS leverages improved analytics, supported by SSNI, to help drive business decision-making particularly in field operations. Fifteen-minute interval data and events detected by the smart meters are organized into "use cases," which correspond to the different ways that losses present themselves. The premiere use case is the "transformer energy balance," which combines data from transformer and downstream revenue meters to detect loss situations that may escape detection by individual smart revenue meters.

The analysis helps the business in managing critical resources like field teams, which can better coordinate on site visits and benefit from an improved strike rate. The resources and time-to-detect candidates for onsite visits have also been greatly reduced, improving revenue protection. In addition, the data will help to guide decisions about future projects and initiatives.

JPS intends to replace at least 50% of the revenue meters with smart meters by the year 2020. Moreover, the company is still exploring opportunities to expedite full rollout of smart meters and data analytics across the grid. ●

MTI IMPLEMENTS AMI PROJECT FOR MEPCO AND PESCO



Pakistan has been afflicted by an energy crisis for the past few years. The energy sector is beset by a host of issues and shortcomings. These include technical and non-technical losses that are mainly caused by electricity pilferage, an inefficient distribution system and poor energy management. The prevailing power losses adversely affect the utilities' profitability and consequently the quality of services. Moreover, the cumulative revenue depletion from these losses amounts to billions of rupees annually in Pakistan.

To overcome these problems different stakeholders in the power sector have been actively seeking and investing in opportunities to reduce electricity losses, optimize consumption, improve customer support services and modernize the electricity metering & billing operations using the latest technology in energy management and metering.

To deal with such problems, efficient and smart technologies are needed that are designed and customized taking into account local requirements and international standards. A one-size-fits-all solution will not work in this market as its dynamics are unique.

Foreseeing this scenario, Pakistani technology company MicroTech Industries (MTI) has been spending a substantial amount of resources on the research and development of smart technologies. This has eventually led it to develop a comprehensive portfolio of smart metering solutions for both local and global energy markets.

These solutions have allowed the company to successfully implement multiple smart metering projects impacting the lives of hundreds of thousands of people. One such example is the AMI project for Multan Electric Power Company (MEPCO) and Peshawar Electric Supply Company (PESCO) implemented in two of the major utilities of Pakistan.

The USAID-funded AMI project is the largest smart metering project in South Asia. It is being implemented in two of the major utilities of Pakistan to cater to residential, agricultural (tube-wells), small industrial and public sector consumers.

The project aims to reduce distribution losses and modernize the electricity metering and billing operations. In these two separate AMI networks more than 50,000 smart energy meters have been deployed. The major objectives of this project were to introduce the AMI system in order to reduce technical and distribution losses; enhance load control and load management; and provide automated consumption data for monthly billing and monitoring.

In order to improve the DISCOs' performance in terms of reduction in losses, improvement in revenues, customer services and to modernise the billing system, MTI implemented a comprehensive and customised end-to-end solution that was in line with the unique customer requirements.

The solution is equipped with a number of advanced features that are distinctive to the local energy sector. These include demand side load management, customised reporting, automated consumption data, reduced technical and distribution losses, improved revenue collection and so forth. For this project, MTI devised and delivered a complete GSM/GPRS based end-to-end AMI system.

The AMI network was integrated with both utilities' billing systems. In order to achieve this integration different utility business processes and commercial procedures were incorporated into the system. This integration has automated and streamlined the utility business processes, minimizing human intervention and reducing errors and operational expenditures.

This project serves as a launchpad for future AMI projects in Pakistan. ●

ENCS MEMBER PROJECT: CLOSING THE OT SECURITY MONITORING GAP



Pictured from left: Bart Luijkx, advisor, asset management, Liander; Maarten Hoeve, technical lead, ENCS; Lhoussain Lhassani, cybersecurity expert, Stedin; Pavel Šilling, head of SCADA and Secondary Technology Management, E.ON Czech; Arnaud Thoen, cybersecurity officer, Joulz/Stedin; Luisella ten Pierik, manager, Information Security, Stedin; Anjos Nijk, managing director, ENCS; Federico Griscioli, PhD student, ENCS/Roma Tre University; Youssef Ait Beh Ouali; project manager, ENCS

It's almost unthinkable today that a company – especially a critical infrastructure company – would not monitor its IT systems from a cybersecurity perspective. Yet that's precisely the situation many utilities find themselves in when it comes to operational technology (OT) systems.

A large part of this is that the cybersecurity sector has barely begun to provide dedicated, built-for-purpose cybersecurity solutions, standards and procurement requirements for OT assets. For most utilities, the desire is there but the pieces aren't yet in place to implement best-practice OT security monitoring – understandable given that OT assets only began to be connected relatively recently.

So there's a gap between OT assets becoming connected to the smart grid and the security solutions being implemented to match. The gap needs to close if we're to keep Europe's energy grids resilient and secure.

To address this issue, the European Network for Cyber Security (ENCS), along with members Alliander, Enexis, Stedin, E.ON, EVN and EDP, are conducting a joint project in OT cybersecurity monitoring.

The project's scope includes the definition of requirements for OT security solutions, the evaluation of available solutions on the market, the definition of organisational guidelines as well as the development of an incident response training programme.

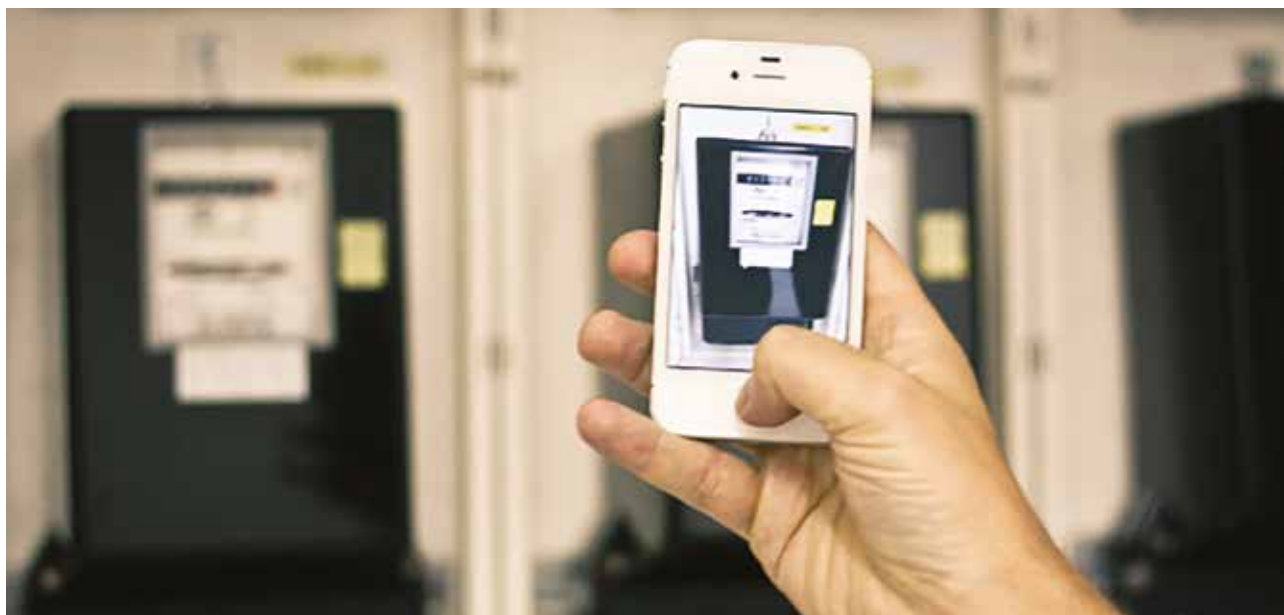
In April 2017, security officers from the project participants met for a workshop at the ENCS headquarters in The Hague to exchange ideas and experiences of monitoring for OT cybersecurity. Next, ENCS will use this insight to create a test environment for members to lab-test potential OT solutions before implementation.

At the same time, ENCS is canvassing input from the vendor community to assess the solutions on the market and any potential gaps. At the moment, OT security generally entails IT security systems modified to fit, but that's beginning to shift as purpose-built solutions enter the market.

Says Maarten Hoeve, technical lead, ENCS: "The topic of security monitoring for operational technology systems is new. One challenge is that a lot of innovative solutions are being launched in this market, and it is difficult for grid operators to judge their value. Another challenge is building an organisation that performs the security monitoring, for which grid operators will need a team of analysts. Analysing and responding to advanced attacks requires specialised knowledge. By setting up a shared incident response team, ENCS hopes to create the necessary capabilities for its members."

At the end of the OT security monitoring project, ENCS members will benefit from a set of standards for system procurement, guidance on the solutions on the market and guidelines on ongoing monitoring and incident response. Ultimately, this will mean better protection for utilities and their customers. ●

PIXOLUS MOBILE IMAGE RECOGNITION SOLUTION FOR METER READING



Pixometer is a mobile image recognition solution tailored for meter reading, developed by German company, pixolus GmbH.

The pixometer solution is aimed at making data entry easy, with the scanning and digitisation of values on digit counts on both mechanical and digital meters (power, gas, water, heat) with a camera in a smartphone or tablet.

According to Gencosman Kaya, Marketing and Sales, pixolus GmbH: “[The pixometer] mobile image recognition technology enables data entry using the camera of smartphones or mobile

computers. This spares tedious and error-prone retyping of data.”

pixometer can be implemented in both B2C and B2B processes: used by meter reading personnel in the field as well as by customers themselves. pixometer is available as a software module for iOS and Android as well as mobile development platforms such as Cordova, Titanium and Xamarin.

Utilities such as First Utility in the UK as well as yello and Vattenfall in Germany, have implemented the pixometer recognition module into their B2C applications ‘kWhapp’ and ‘ENPURE’.

The same-named pixometer app, as seen in the app stores, is also available as a brandable app – especially for utilities that do not have an app for customer self-services yet. The utility’s corporate design can appear in the app, which can be extended with additional content and functionalities.

“More than a test – we decided to test pixometer spontaneously and were pleasantly surprised. This solution has a great future in the energy sector and will optimise meter reading and meter change processes” – Alexander Grafe, OVE Objekt-Versorgung mit rationellem Energieeinsatz.

“The tremendous advantage of pixometer is the automatic capturing and assignment of reference pictures. The manual process of assigning pictures to meter readings is omitted.” – Martin Schleger, KMS Kosten-Management-Schleger. ●

“Utilities such as First Utility in the UK as well as yello and Vattenfall in Germany, have implemented the pixometer recognition module into their B2C applications ‘kWhapp’ and ‘ENPURE’”

METERCLOUD SAAS FOR ENTERPRISE INTEGRATION



With its grid intelligence platform Metercloud, Greenbird Integration Technology – headquartered in Oslo, Norway – provides an innovative and disruptive solution addressing utilities’ core challenge with regard to the transformation toward a digital future: Enterprise integration.

“All utilities face significant challenges with enterprise integration. Most integration projects hit the wall, fail and consume budgets and timelines. Enterprise integration is the number one break for utility innovation,” says Thorsten Heller, chief executive officer, Greenbird Integration Technology.

With Metercloud, Greenbird is solving this problem through the provision of a hybrid cloud platform for big data integration, empowering the smart grid, smart city and the Industrial Internet of Things (IIoT).

Heller adds: “Typically, utilities would hire a system integrator to build a custom solution on any middleware, whereas Metercloud provides enterprise integration in a software-as-a-service (SaaS) delivery model. The traditional system integration approach would take place in a period of anywhere between 12 to 18 months, whereas Metercloud enables customer onboarding within a few days.

“All other product innovations within big data, AI, grid intelligence are highly dependent on the availability of real-time data. Again, these product innovations would require a massive integration project to be able to deliver value to utilities. Greenbird completely disrupts the way system integration is solved and challenges the traditional system integrator model.”

Some of the advantages of the Metercloud software-as-a-service solution include faster customer onboarding; less CAPEX and OPEX; increased flexibility; no vendor lock in; and real-time analytics capabilities to create smart signals as a foundation for smart services.

Metercloud is currently managing ten distribution system operators in Norway in a single cloud environment.

“2017 is the year of cloud integration – the year of a hybrid utility cloud,” concludes Heller. ●

“Typically, utilities would hire a system integrator to build a custom solution on any middleware, whereas Metercloud provides enterprise integration in a software-as-a-service (SaaS) delivery model”

ANACLE SYSTEMS INNOVATES WITH TESSERACT



Singapore-based Anacle Systems Limited (“Anacle”) is reinventing smart metering with the Tesseract, obviating the need for a complex infrastructure setup. The Tesseract is equipped for the future, packing massive computing power and extensive capabilities. Complemented by the company’s Starlight energy management software, the Tesseract goes beyond measuring and analysing utility consumption by offering proactive functions such as demand response control and load management, allowing users to manage their energy consumption efficiently.

Recently launched in July, the Tesseract has been garnering keen interest from various industries – from energy retailers to property developers. Tesseract is designed to be future-proof. Complemented by an app eco-system, the capabilities of the Tesseract can be expanded simply with an app download in situ. Protocol agnostic, it can readily communicate across a wide spectrum of networks including low power wide area network (LPWAN) and wireless wide area network (WWAN).

Alex Lau, chief executive officer of Anacle, says: “We wanted to create a solution that empowers users and can withstand the test of time literally since that is an industry standard: building equipment that has to function for more than 15 years. We future-proof the Tesseract so it can be updated and be as relevant then as it is now. It has the potential to empower users to overcome challenges – be they energy retailers who face revenue monitoring challenges, property owners facing energy theft, or even those homeowners who may wish to be in better control of their utility consumption and expenses.”

Features of the Tesseract:

- Industrial sensor with 64-bit computing power and 10 GB in-device storage encryption capabilities and processing power
- Advanced integrated circuit provides impressive class 0.2s accuracy

through sampling rate and temperature compensated Real Time Clock (RTC)

- EMC-safe capacitive touchscreen for improved user experience and interface flexibility
- Future-proof with its compatibility to an extensive spectrum of communication networks
- Adopts an app eco-system architecture: the capabilities of Tesseract can be expanded with the installation of on-demand management apps
- Multiple input/output ports capture information from other servers and control multiple external equipment

APPLICATIONS

Early fault detection

- An alarm will be triggered when an energy consumption anomaly is detected
- Facility managers can take pre-emptive actions such as scheduling maintenance, allowing for cost savings through early intervention (cost of repairing equipment at the early stage is usually much lower than equipment replacement). Disruption to operations can be minimised if not totally avoided.

Demand response and interruptible load programmes

- The Tesseract can interrupt secondary loads (turn off non-critical equipment) to prevent energy consumption from exceeding maximum demand
- The Tesseract can stagger the switching on non-critical equipment so that energy consumption is below maximum demand.

Disaggregate household electricity consumption

- Identify energy consumption of individual household appliances via electricity fingerprint, allowing homeowners to identify malfunctioning equipment. ●

HOPE WATER & LIGHT'S SMART CITY PROJECT



Hope Water & Light, a municipal utility based in Arkansas, is implementing a citywide Smart P3 City project involving the installation of advanced metering infrastructure (AMI) for electric and water meters as well as connected LED streetlights. The advanced metering infrastructure will be integrated with the utility's new LTE network, offering voice, video and data services to consumers and others including government, police, and hospitals. The LTE network is being implemented through a unique public private partnership (P3).

Hope Water & Light is operated as a municipal entity, connected to the city through a five member water and light commission. Hope services approximately 6,500 electricity customers and 4,500 water customers.

Given the full-scale implementation of AMI and LTE broadband services in a P3 relationship, Hope believes that it is a unique "smart city" role model for other cities interested in providing high quality consumer services to their citizens at the lowest possible cost. The utility plans to implement consumer utility management services, empowering customers to better understand their electricity and water use, enabling them to more effectively manage monthly bills.

The city will explore options to enhance its non-revenue water management capabilities and electrical non-technical losses. These, coupled with a broad range of additional business case benefits, will contribute to enhancing Hope's operational resilience and sustainability – especially with its location in "Tornado Alley".

The project is unique because Hope had an existing hybrid meter reading capability that included drive-by mobile meter reading for electricity meters and traditional manual meter reading for its

water meters. Hope was able to successfully develop a standalone business case that justified the conversion from mobile meter reading to advanced metering infrastructure. Electricity and especially water utilities in the US and the rest of the world already have a large number of existing drive-by systems that have already realised the majority of the labour saving benefits. Hope believes it is contributing to the industry by demonstrating a viable business case for transitioning from mobile to AMI.

The AMI core platform is a two-way 900 MHz 802.15.4 standard compliant mesh radio network. Initial edge devices include enhanced electric meters, water meter communication modules (MIUs) and enhanced multifunction streetlight controllers.

The edge devices being deployed will migrate over time to support a fog computing capability that will enhance grid resilience management.

Hope partnered with a strategic consulting company, MW Consulting, to assist with the planning and implementation of the project.

Like Hope Water & Light, Conway Corporation – a provider of utility and telecommunications services also based in Arkansas – collaborated with MW Consulting to assist in the planning and implementation of a citywide smart IoT city project involving the installation of an advanced metering infrastructure for electric and water meters as well as connected LED streetlights.

The advanced metering infrastructure will be integrated with Conway's existing hybrid-fiber-coax plant offering 1 GBPS services in voice, video and data to consumers and others including government, police and hospitals. ●

CITY OF TORONTO'S PERSONALISED CUSTOMER APPROACH TO WATER CONSERVATION



The city of Toronto has launched a number of new initiatives following successful implementation of smart meters for water. The five-year project involving installation of meters that transmit water consumption data has provided a number of benefits and efficiencies.

From this data, the city of Toronto has developed a unique customer enhancement strategy that involves sending notification warning letters to customers who experience higher-than-normal consumption, but would otherwise not be aware of that higher-than-normal consumption.

In most of these cases, customers have had or have leaks or faulty fixtures resulting in water loss and unintended water consumption. The city of Toronto's new programme identifies 500 customers per week and sends them 'high-consumption warning letters' advising the customer of the high consumption and asking them to check their plumbing and fixtures to rectify leaks. There is no charge to the customer for these letters. The city of Toronto estimates that it saves customers (collectively) \$350,000 per year through this early warning programme. Without this notification, customers would be faced with paying high bills that are the result of leaks or unintended consumption.

The city's online tool, MyWaterToronto, also allows customers to view their water use information, anytime, anywhere, from their computer or mobile device. Customers can log-on to MyWaterToronto portal

and view their total and average water use by day, week, month or year in an easy-to-read graph or chart format. The platform helps customers identify potential leaks and become more aware of their water use habits, thus encouraging water conservation. ●

"The city of Toronto estimates that it saves customers (collectively) \$350,000 per year through this early warning programme. Without this notification, customers would be faced with paying high bills that are the result of leaks or unintended consumption"

GULF POWER'S ENERGY SMART PROGRAMME



Gulf Power, an investor-owned utility in Pensacola, Florida that serves 450,000 customers, has launched a new residential time-of-use (TOU) pilot programme, Gulf Power Energy Smart. Gulf Power partnered with Ecobee to offer its home energy management programme to a limited number of customers. Featuring a free ecobee3 Wi-Fi smart thermostat, approximately 400 customers signed up for Energy Smart. Through its partnership with the Electric Power Research Institute (EPRI), Gulf Power learned that customers are saving money on their monthly bills by shifting their energy use away from on-peak to off-peak periods. For most customers, heating and cooling accounts for the largest portion of monthly energy costs; and smart thermostats, like the ecobee 3, afford Gulf Power customers more control over their energy usage and a greater opportunity to save.

The Gulf Power market analysts and creators of Energy Smart, Ron Robertson and his team, are looking to find out if customers

are shifting usage from on-peak periods when electricity demand is highest to off-peak periods when electricity demand is lowest; and are examining how energy-conscious customers make these decisions. In addition to the TOU component of the rate, the pilot rate also features a critical period which is called when Gulf Power's demand for electricity is at its highest. During critical periods, the smart thermostat receives a signal and makes temperature adjustments. If the customers do not override the thermostat during this period, a bill credit is applied.

The development behind Energy Smart was a strategic process. The team conducted focus groups with current customers and found that customers wanted something simple and easy to understand. The team took all the feedback and designed a rate and programme to meet these needs. Once enrolled, customers were sent a free ecobee3 Wi-Fi smart thermostat with self-guided installation instructions. ●

“In addition to the TOU component of the rate, the pilot rate also features a critical period which is called when Gulf Power's demand for electricity is at its highest. During critical periods, the smart thermostat receives a signal and makes temperature adjustments.”

INDEX

IFC.....	Allbro
OBC, 2-3, 53.....	Itron
49	Landis&Gyr
IBC	Netinium
58	Prime Alliance
24	Watt-IS

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