

EET&D MAGAZINE

Quarterly Issue 3, 2023 – Volume 26



MISSION ACCOMPLISHED:
DOMINION ENERGY SOUTH CAROLINA ENLISTS TOWER RAISING
COMPANY TO UPGRADE REMOTELY LOCATED TRANSMISSION TOWER



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ACCESS AND COLLABORATION PLAY KEY ROLES IN GRID MODERNIZATION | Elisabeth Monaghan, Editor in Chief

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THE GRID TRANSFORMATION FORUM

MISSION ACCOMPLISHED: DOMINION ENERGY SOUTH CAROLINA ENLISTS TOWER RAISING COMPANY TO UPGRADE REMOTELY LOCATED TRANSMISSION TOWER | Kelvin Rogers, Dominion Energy South Carolina and Mike Haight, Ampjack America

For this quarter's Grid Transformation Forum column, we spoke with Kelvin Rogers, general manager of Transmission Operations and Construction for Dominion Energy South Carolina, and Mike Haight, business development director with specialized tower raising company, Ampjack, about the 15/46kV Stevens Creek-McCormick transmission line upgrade project, and how they tackled the challenges it posed.

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GREEN OVATIONS

THE IMPORTANCE OF A CONVERGED FAN FOR GRID TRANSFORMATION | Dominique Verhulst, Nokia

The Inflation Reduction Act provides \$369 billion over the next decade to fund programs and incentives intended to accelerate the transition to a clean energy economy. It will drive significant deployment of clean energy resources, including the rapid development of transmission lines and the transformation of the distribution grid.

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INTELLIGENT LINE SENSOR PROJECTS: HOW TO GET YOUR GRID MODERNIZATION EFFORTS OFF THE GROUND

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Advanced line sensing solutions are industry-accepted as one of the most effective ways to gain the real-time distribution system performance and reliability data necessary to meet today's power delivery demands.

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EV ADOPTION: DRIVING CUSTOMER ENGAGEMENT IS CRITICAL TO GRID STABILITY | Paul McDonald, Opower (part of Oracle Energy)

As more EVs pop up in driveways across the country, there is a prime opportunity to reframe how utilities think about the interaction between customers and the grid that powers their lives.

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BECOMING OUTAGE RESILIENT WITH REMOTE ACCESS TO CRITICAL | Ismet Pekin, Opgear

Perhaps the most talked about issue currently plaguing companies in the energy sector is the surge in weather-related power outages. While escalating weather-induced power outages necessitate a response, such outages do not represent the only type of outage afflicting those in the industry.

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ENGAGING CONNECTIVITY: BEST PRACTICES FOR BUILDING INFRASTRUCTURE IN REMOTE LOCATIONS

Stefan Glander, Access Limited Construction

Like all construction projects, working in remote environments is not without risk or for the unprepared. But the unique challenges these locations bring often call for an even more expansive — and often customizable — checklist to ensure success.

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ARE MICROGRIDS THE RESILIENT SOLUTION TO OUR POWER GRID WOES? | Ellie Gabel, Revolutionized

Microgrids could solve these woes by providing solutions in an accessible format. Since microgrids are on a smaller scale, it's easier to determine energy needs and how well-connected technologies perform. But are these microgrids the answer, or will nations still need to undergo total grid modernization for a sustainable planet?

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SMART METERING SOLUTIONS AND INFORMATION COMMUNICATIONS TECHNOLOGY CAN WORK TOGETHER TO ENHANCE UTILITY METERING SYSTEMS' OPERATIONS | Elisiario Cunha Neto, Ericsson

Around the world, utility providers are responding to a need for smarter ways to control energy flow. To thrive, utility companies are adapting and harnessing the power of connectivity to build more reliable, secure and flexible digital infrastructures – including smart metering.

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GUEST EDITORIAL

PAVING THE WAY FOR GRID MODERNIZATION WITH PRIVATE BROADBAND | Bobbi Harris, Utility Broadband Alliance (UBBA)

The old saying “out with the old, in with the new” has never been more appropriate for utilities in the age of grid modernization – particularly when it comes to communication. No longer can utilities rely on the siloed, narrowband wireless networks of yesterday to meet the demands of an evolving, distributed digital grid.

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GUEST EDITORIAL

AT THE CORE OF CONTROL SYSTEM DESIGN ARE STANDARDS, STANDARDS AND STANDARDS | Robert M. Ard, Valmet

A Distributed Control System (DCS) serves as the hub of a processor's operations and controls and monitors key variables such as flow, applied temperatures, pressure, level and material conveying/handling. The DCS' HMI collects all the data from the production equipment and presents it in a highly “human-factored” manner for an operator.

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POWERFUL FORCES

FELICIA KOHLENBERGER, S&C | Elisabeth Monaghan, Editor in Chief

Felicia Kohlenberger talks about her role at S&C and how the role of human resources professionals is changing.



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CONVERGENT

RELIABILITY AND SUSTAINABILITY OF ONTARIO'S ELECTRIC GRID SET TO IMPROVE THROUGH JOINT VENTURE BY CONVERGENT ENERGY AND POWER AND ALECTRA ENERGY SOLUTIONS

The 80 MW energy storage systems will reduce dependency on fossil fuels while preventing capacity shortfalls

August, 2023

Convergent Energy and Power (Convergent), a leading provider of energy storage solutions in North America, and Alectra Energy Solutions, a trusted provider of innovative, turnkey energy solutions, are pleased to confirm that their joint venture was recently selected by Ontario's Independent Electricity System Operator (IESO) to build and operate three battery energy storage systems.

The Convergent/Alectra joint venture will install a total of 80 MW of storage enough to power more than 83,000 homes across three sites, a 20MW facility in Guelph and two facilities in Vaughan, a 20MW and 40MW facility respectively. The systems will also increase the reliability and resiliency of Ontario's electric grid while reducing reliance on fossil fuel generation.

Convergent and Alectra Energy Solutions responded to the IESO's expedited long-term request for proposals, which aimed to add capacity services from new and expanded electricity resources starting in 2025. Construction of the systems is expected to begin in 2024.

Ontario is entering a period of emerging electricity system needs, driven by increased demand and the retirement and refurbishment of existing power plants. To address these needs, the IESO's recent request for proposals included energy storage, which can store energy when there is a surplus and provide energy supply in times when it is needed most.

The Convergent/Alectra joint venture's battery storage systems will not only support the reliability of Ontario's electricity grid but will also bolster Ontario's minimal usage of fossil fuels. Because Ontario's grid is effectively -92% decarbonized, the power supply that the batteries will store and discharge will be almost entirely clean.

"Ontario is a leader when it comes to carbon-free electricity generation, and we are pleased to be a reliable partner to the province's residents and utilities," said Tremor Temchin, Head of Canadian Operations, Convergent Energy and Power. "Alectra Energy Solutions shares our desire to address the challenge of increasing energy demand by investing in the clean energy transition. We look forward to working with the IESO to ensure the province has the resources it needs to continue being a leader in renewable energy generation."

"We're committed to bringing proven solutions through innovative partnerships and advanced technologies," said Ammar Nawaz, VP, Distributed Energy Solutions at Alectra Energy Solutions. "As energy demands increase, battery storage systems will serve as an efficient means of supporting an effective as well as clean energy transition in the communities we serve. Sustainable solutions like these are central to Alectra's commitment to assist in addressing Ontario's long-term energy goals."



HYDRO ONE INVESTING \$35 MILLION TO ENSURE THE DELIVERY OF CLEAN AND RELIABLE POWER TO KENORA AND THE SURROUNDING AREA

August, 2023

On August 21, Hydro One announced it is investing \$35 million to enhance local transmission infrastructure in Kenora and the surrounding area to improve power resiliency and reliability for years to come. This investment at the company's Rabbit Lake Switching Station, a key station serving the region, includes upgrading aging critical equipment such as breakers, switches and insulators along with installing new equipment that will provide additional flexibility to how power is managed through the station. In order to complete this critical investment, a power outage is required so crews can safely complete the work. The outage will take place on Sunday, October 1 from 6 a.m. to 2 p.m. CDT and affect all SYNERGY NORTH customers in Kenora. Hydro One is working with SYNERGY NORTH to coordinate the power outage and schedule it during a time when customers are using the least amount of power.

"Hydro One is committed to energizing life in Kenora and the surrounding area by ensuring clean, safe and reliable power is available for customers now and into the future. With most of the electricity system built in the 1950s and 1960s, it's time to invest in renewing or replacing critical infrastructure," said Andrew Spencer, Executive Vice President, Capital Portfolio Delivery, Hydro One. "We understand how difficult it is to be without power and thank SYNERGY NORTH customers for their patience as we complete this critical work."

"We are excited to support Hydro One in undertaking this critical project. By implementing these strategic upgrades, the customers of Kenora will reap the benefits of a more resilient power supply," said Tim Wilson, President and CEO of SYNERGY NORTH.



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GMP'S REQUEST TO EXPAND CUSTOMER ACCESS TO COST-EFFECTIVE HOME ENERGY STORAGE THROUGH POPULAR POWERWALL AND BYOD BATTERY PROGRAMS IS APPROVED

August, 2023

Highlights

1. Vermont Public Utility Commission lifts cap on customer enrollments
2. Customers in GMP's home battery programs stay powered up during severe weather
3. Expanded enrollment is an urgent need as Vermont experiences increasing extreme storms due to climate change
4. Neighbors helping neighbors: Programs' unique energy sharing cuts costs for all GMP customers
5. Decision addresses growing waitlist to enroll that currently extends to 2026

Green Mountain Power (GMP) customers will have greater access to seamless, cost-effective home battery backup power following an order by the Vermont Public Utility Commission late Thursday. In April, after the third devastating storm in less than twelve months, GMP filed a request to lift the enrollment caps on its popular Powerwall and Bring Your Own Device (BYOD) home battery programs. Removing the cap allows more customers access to the program as Vermont sees increasingly severe weather due to climate change. The Commission agreed, citing growing customer demand for home batteries, the likelihood of more extreme weather in the future, and that the home battery programs benefit all GMP customers.

“Accelerating storm resiliency is our path forward, especially after what Vermonters have gone through this year. We’re pleased we can expand access allowing more customers to enroll in these programs which have a proven track record of keeping customers powered up through extremely tough conditions,” said Mari McClure, GMP president and CEO. “This is just one aspect of the multi-layered resiliency work we have been doing across our system since launching our Climate Plan three years ago building out initiatives to help Vermont communities stay connected.”

Since 2020, both the Powerwall and BYOD programs had been capped at 500 customers, or 5MW of energy storage, per program, per year. The waitlist for the Powerwall program is now 1,200 customers long, and the program is full into 2026. About 300 customers joined the waitlist this summer, following historic flooding in the state.

Candace Nattie, a GMP customer from Norwich, cheered the regulators' decision. She joined the waitlist for the Powerwall program after heavy, wet snow tore down trees and poles across Vermont in December 2022. She had a few days without power while her neighbors, already in the Powerwall program, stayed powered up.

ABOUT 2,900 GMP CUSTOMERS
HAVE MORE THAN
4,800 BATTERIES
IN THEIR HOMES

“This is a relief, to have the ability to have power and stay at home safely in severe weather, and the severe storms keep happening here and around the world. It is a real sense of security and comfort to have power, water, and heat,” Nattie said.

In the Powerwall program, customers lease two Tesla Powerwall batteries from GMP for \$55 per month. Customers choose the certified installer they prefer. The lease is a significant savings over purchasing the batteries on your own because customers in the program also agree to share stored energy with GMP during peak energy use times, like heatwaves. During times of peak demand, energy can be expensive and carbon intensive. By sharing energy during these peak times and putting it back on the grid, it reduces costs and carbon emissions for all GMP customers.

In the BYOD program, customers buy a battery of their choosing from a local installer, and they can receive an incentive up to \$10,500 from GMP depending on how much stored energy they agree to share during peaks.

To date, about 2,900 GMP customers have more than 4,800 batteries in their homes. During energy peaks, GMP networks that stored energy together, along with utility scale batteries and devices like car chargers, into a virtual power plant of about 50MW of stored energy. Combined, this growing stored energy network has saved GMP customers up to \$3 million a year for the last few years.

With the cap lifted, customers can now continue to sign up for GMP's home energy storage programs online, and the timing for installations will depend on scheduling with the installer a customer selects.

Expanding access to home batteries is just one part of the resiliency work GMP has been doing, and continues to accelerate, across Vermont. The company is undergrounding lines and using storm-hardening line construction techniques to keep communities powered up by preventing outages before they happen. GMP is also using CDC vulnerability and other data to partner with communities on Resiliency Zones to keep them connected with distribution circuit microgrids and renewable power generation.

GMP first offered home batteries for backup power through pilot programs in 2015, becoming the first utility in the U.S. to partner with Tesla. GMP was the first utility in the country to earn regulatory approval to offer fully tariffed home energy programs in 2020, after regulators decided the Powerwall and BYOD pilot programs provided reliable, seamless backup power for participating customers while also reducing costs for all GMP customers through energy sharing.

Customers who are interested in signing up for the program can visit the GMP website.

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INCENTIVE
UP TO
\$10,500



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EEI BOARD NAMES DAN BROUILLETTE PRESIDENT AND CHIEF EXECUTIVE OFFICER ELECT

August, 2023

The Edison Electric Institute (EEI) today (Aug 16) announced that Dan Brouillette has been selected as EEI's President and Chief Executive Officer Elect, effective October 1, 2023, following a comprehensive search process. Brouillette will become EEI President and CEO on January 1, 2024, and will succeed Tom Kuhn, who previously announced his plans to step down on December 31, 2023.

"I am pleased to welcome Dan to the EEI team," said EEI Chair Pedro J. Pizarro, President and CEO of Edison International. "With his deep experience in both the public and private sectors, as well as his extensive energy industry expertise, Dan is the clear choice for EEI's next leader."

"Dan's strong policy background and proven track record of collaboration across political lines will be key to EEI's success and that of our member companies as we continue our work to get the energy we provide as clean as we can as fast as we can, without compromising customer affordability and reliability," Pizarro added. "Most important, Dan's appreciation for the culture and values that make EEI such an effective organization and a wonderful place to work were evident throughout our discussions with him during the search process. It is clear to EEI's Board that Dan shares our strong commitment to safety, integrity, bipartisanship, and excellence. We are confident he will embody these long-standing values as he leads the EEI team in supporting our members' clean energy transition, maintaining strong relationships with our partners in organized labor and other stakeholders,

and advancing our workforce development and DEI efforts."

"I am honored to be joining the world-class team at EEI at a pivotal point for the industry," said Brouillette. "EEI is a preeminent voice helping to guide the nation's energy policy, and I believe the leadership role it performs has never been more important than it is today. I have long admired the determination of EEI and its member companies to deliver clean, reliable, and resilient energy in the most affordable and inclusive manner possible. In my former role as U.S. Secretary of Energy, I witnessed firsthand EEI's relentless dedication to these goals, and I am excited to now work with the EEI team in support of their member companies, their customers, and our country."

"On behalf of the EEI Board, I would like to thank Tom Kuhn for his visionary leadership and the incredible legacy he has established over the last three decades," Pizarro continued. "His passion and commitment to advancing EEI's mission and his clear love for the industry have been instrumental to the countless public policy and operational milestones we have achieved during his tenure. We trust that our industry, our members, the customers and communities they serve, and the country as a whole will reap the benefits of these initiatives for years to come. We look forward to benefiting from Tom's wisdom and support until the end of the year and wish him all the best in his next chapter."

DAN SHARES OUR STRONG COMMITMENT TO SAFETY, INTEGRITY, BIPARTISANSHIP, AND EXCELLENCE

"It has been an incredible honor to have led EEI for more than three decades, and I am incredibly proud of the significant results that EEI and our member companies have achieved in so many critical areas for the benefit of electricity customers across the country," Kuhn said. "When Dan was leading the Department of Energy, I got to know him well through our work on energy issues and the Electricity Subsector Coordinating Council, addressing storms and other extreme weather events and cyber issues. I have full confidence in his ability to guide EEI as the organization continues its important work in support of our members' clean energy, reliability, and energy security goals. I look forward to working alongside Dan and the rest of our talented EEI team in the coming months to ensure a seamless transition for our employees, member companies, and all of our stakeholders."

Brouillette currently serves as president of Sempra Infrastructure, a leading global energy transition company. Prior to joining Sempra, Brouillette served as the 15th United States Secretary of Energy. He served as the President's primary advisor on energy and nuclear weapons matters, and was a member of the President's National Security Council as well as the Vice President's National Space Council. Brouillette also served as U.S. Deputy Secretary of Energy, the chief operating officer of the department. Brouillette is the only person ever to be confirmed by the U.S. Senate to serve in both roles.

In the private sector, Brouillette has held leadership positions at USAA, where he served as a senior vice president and corporate officer, and at Ford Motor Company, where he was a vice president and served on its North American Operating Committee.

Brouillette is a veteran and former tank commander with the U.S. Army's highly decorated 11th Armored Cavalry Regiment. He has been awarded Distinguished Public Service awards by both the U.S. Secretary of Defense and the U.S. Secretary of State, the highest award an individual can receive by either department. Brouillette holds a master's degree in intelligence and national security from The Citadel and a bachelor's degree in economics from the University of Maryland.



DEWA'S DIGITAL TRANSFORMATION ACCELERATES DUBAI'S SMART CITY VISION

August, 2023

DEWA continues to work to achieve Mohammed bin Rashid's digital vision and contribute to achieving the Dubai Economic Agenda D33's goal of turning the city into one of the top 10 digital economies globally

DEWA has set an outstanding standard in service quality, achieving an impressive 96.22% customer satisfaction level in 2022

With a smart adoption rate of 99%, DEWA's services are seeing increasing demand

DEWA's proactive adoption of innovation and cutting-edge technologies aligns perfectly with the UAE Digital Government Strategy 2025, Dubai Digital Strategy and Dubai Government's Services 360' policy

DEWA's digital transformation has enabled it to encourage sustainable practices in the community

DEWA is the first utility in the world and the first government organisation in the UAE to use ChatGPT to enrich its services

With its steadfast commitment to innovation, Dubai is on the fast track to becoming the world's smartest city. The driving force behind this remarkable journey is the visionary leadership of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. His Highness has set in motion a unique digital transformation journey that aims to make Dubai a global leader among smart cities.

At the centre of this vision is a commitment to elevate the quality of life of Dubai's people and turn it into the world's best city to live, work and visit. By embracing advanced new technologies and fostering a culture of constant improvement, Dubai strives to create standards of wellbeing that rival that of the world's leading cities.

One of the key government organisations leading the emirate's charge to actualise this vision is the Dubai Electricity and Water Authority (DEWA). Right from the launch of Dubai's digital transformation strategy, the utility provider has been at the forefront of delivering world-class smart services that cater to the growing needs of Dubai's population. DEWA was one of the first government organisations to receive the 100% Paperless stamp from the Digital Dubai Authority in 2021, after it completed the digital integration of more than 70 projects with over 30 government and private organisations.

Shaping the future of utility customer services

Harnessing the power of the latest disruptive technologies, DEWA has elevated its digital services and crafted a new exceptional customer experience. The Authority provides all its services through diverse digital channels, including its website and smart app, which are available on Apple, Android and Huawei platforms. DEWA also provides several services through Rammas, its virtual employee available through the DEWA's website, Facebook page, Google Home, robots, WhatsApp Business and Amazon's Alexa.

Earlier this year, DEWA became the first utility in the world and the first government organisation in the UAE to use ChatGPT to enrich its services. Last year, the Authority also became the first local government organisation to provide its services on a Metaverse platform.

Emphasising the organisation's dedication to consolidating Dubai's position as a global digital leader, His Excellency Saeed Mohammed Al Tayer, MD & CEO of DEWA, said: "DEWA continues to work to achieve the digital vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister

of the UAE and Ruler of Dubai. We also seek to be a major contributor to achieving the Dubai Economic Agenda D33's goal of turning the city into one of the top 10 digital economies in the world.

“We are on a relentless quest to provide high-quality digital services, driving continuous improvement and reshaping traditional business frameworks through innovative models to create a smoother and richer customer experience. By engaging stakeholders and fostering local and international partnerships with technology leaders, our ultimate goal is to be one of the world's most future-ready utilities. Moreover, as a pioneering sustainable institution, we are committed to achieving carbon neutrality by 2050. Our journey towards sustainable development is geared towards preserving the environment, safeguarding natural resources, and securing a better future for the coming generations, echoing the spirit of the UAE's Year of Sustainability.”

Digital DEWA: advancing innovation, efficiency and sustainability

The Dubai Electricity and Water Authority's digital arm Digital DEWA is at the centre of its ambitious digital strategy. Launched in January 2020, Digital DEWA has four pillars: Solar Energy; Energy Storage; Artificial Intelligence (AI); and Digital Services. The subsidiary is mandated with leveraging advanced technologies to create a sustainable and smart utility, and optimise energy and water resources while enhancing customer experiences and services.

The backbone of Digital DEWA's operations is its subsidiary the Moro Hub, a state-of-the-art data centre and innovation hub that provides data hosting and managed services not only for the Authority but also public and private sector entities in the UAE and the region. It also offers advanced digital infrastructure and solutions, including cloud computing, big data, Internet of Things and AI technologies to support various digital initiatives and nurture service excellence.

Digital DEWA has orchestrated a remarkable transformation of the Authority's Customer Service Centre into an interactive digital hub. Operated by Moro Hub, the centre helps customers complete their transactions smoothly on multiple channels, apart from providing a wide range of services and solutions through its 24x7 AI-powered Interactive Voice Response (IVR) system. Customers can apply for electricity, water and green charger services through the IVR system.

Further, DEWA's constantly updated digital database ensures personalised attention, particularly for customers with specific needs such as people of determination and senior citizens. The platform also serves as an information hub for all services offered by the Authority. The centre also provides the Ash'ir service round the clock for speech and hearing-impaired customers, and the Hayak service, an online text and video-chat service on DEWA's smart app and website for customers to communicate directly with its call centre staff.

DEWA Customer Care Centre was ranked as one of Dubai Government's top three call centres in an assessment conducted by the Dubai Model Centre in partnership with Digital Dubai Authority as part of a wider evaluation by the Hamdan bin Mohammed Programme for Government Services. →

Pioneering digital initiatives for sustainable living

DEWA's digital transformation has enabled it to encourage sustainable practices in the community. Committed to achieving carbon neutrality by 2050, the Authority actively promotes awareness of environmental preservation and the need to reduce the carbon footprint in line with the goals of the UAE's Year of Sustainability.

DEWA's Smart Living' initiative enables customers to monitor and manage their energy consumption through digital dashboards. Its features, such as My Sustainable Living' programme and high-water usage alert service provide personalised reports and prompt detection of potential leaks to reduce waste.

Further, the organisation's interactive voice response (IVR) tool offers customers a comprehensive survey on electricity and water consumption. DEWA's commitment to sustainable practices extends to campaigns like Make Smart Summer Choices Your Habit' aimed at empowering customers to make intelligent decisions to manage electricity and water consumption. The campaign encourages customers to benefit from smart apps, understand consumption patterns, and access customised tips to reduce waste and adopt sustainable practices.

Customer happiness centres: Digitally empowering the community

While DEWA has transformed the digital experience for its stakeholders, it has also redefined the experience at its physical Customer Happiness Centres by converting them into self-service centres. These centres leverage AI and robotic devices to enable customers to complete transactions independently while also providing video call assistance from Customer Happiness Officers.

DEWA has five Customer Happiness Centres, including: Head Office Customer Happiness Centre, Al Quoz Sustainable Building Customer Happiness Centre, Future Customer Happiness Centre - Burj Nahar, Future Customer Happiness Centre - Ibn Battuta Mall, and Future Customer Happiness Centre at Dubai Municipality - Al Twar Centre.

In a significant recognition of its commitment to providing top-notch digital customer experiences, DEWA scored 100% in the prestigious International Digital Customer Experience Standard (IDCXS: 2022) certification. The Authority is the first organisation worldwide to adopt and implement the standards and requirements of this new certification.

Overall, DEWA's customer care set an outstanding service quality level of 96.22% in 2022. Responding swiftly to customer needs, DEWA maintains an average speed of answering calls in just 15 seconds. DEWA also achieved 98% in the Dubai Government's Instant Happiness Index 2022, which is managed by the Dubai Digital Authority.

One of DEWA's remarkable strengths lies in its diverse team of qualified and trained staff, proficient in various languages, including Arabic, English, Hindi, French and Urdu, among others. This multilingual capability ensures that customers from different backgrounds receive personalised and attentive service.

Artificial Intelligence technologies

DEWA started using AI in 2017 by developing a roadmap to enrich the experiences of its customers, employees and other stakeholders. It is now working to enhance its services with Generative AI. DEWA was also the first utility globally and the first UAE government entity to use ChatGPT technology to improve its services.

DEWA started the pilot use of ChatGPT since April 2023 on its website through Rammas, DEWA's virtual employee, to enhance customer experience. ChatGPT contributes to enhancing DEWA's capabilities due to its superior ability to interact with users and better understand their needs. It also enables DEWA to improve the ability of Rammas to learn, understand and analyse customer enquiries based on available data and information to respond promptly and accurately.

Rammas services are available round the clock in Arabic and English through DEWA's website (<http://www.dewa.gov.ae>), its smart app, its Facebook account, Amazon's Alexa, Google Assistant, robots, WhatsApp Business at (046019999), and DEWA's Instagram channel through the Message' feature.

OVERALL,
DEWA'S
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ACCESS AND COLLABORATION PLAY KEY ROLES IN GRID MODERNIZATION



ELISABETH MONAGHAN
Editor in Chief

As the world's population grows, so does the amount of energy people consume, and utilities have always been tasked with figuring out how to meet those increased energy demands. Meanwhile, utilities also must be ever watchful of the latest trends and advancements in technology that will allow them to compete and grow at the same pace as the rest of the power sector. Simultaneously, utilities must continue maintaining existing infrastructure, while dedicating the resources necessary to modernize the power grid.

Because of so much happening with technology, training, processes and policies, it is likely that most industry partners in the electric power sector are involved with some aspect of the modernization of the power grid. In this issue, we feature some of the efforts underway to meet grid modernization goals.

Grid modernization and broadband access

In her article, Bobbie Harris, who is the executive director of the United Broadband Alliance (UBBA), talks about paving the way for grid modernization. Harris reminds us that the COVID-19 pandemic accelerated the need for easy access to high-speed internet. Without such access, it made it difficult for people to work remotely, attend school online or stay connected virtually to friends and family. According to research cited by Harris, 42 million Americans lacked access to the internet, leaving them lost in the crevice of the digital divide.

Crediting utilities across the U.S. for responding quickly with support for their customers and staff, Harris writes, "While their services were essential, utilities typically allowed most of their employees to work remotely. The strength of the digital grid, where operators of the grid can monitor, manage, and repair the grid safely and reliably, was thus demonstrated by the utilities that have some level of smart grid solutions in place."

Additionally, Harris points out the role utilities can play in bridging the digital divide. "Utilities are increasingly seeking to be an essential part of the solution," Harris writes. "The momentum towards rural broadband access provides an opportunity to upgrade critical infrastructure while driving needed utility investments in advanced metering infrastructure, grid modernization, clean energy applications, smart city investments and other initiatives that depend upon that infrastructure."

Harris also explains that utilities have invested in both wired and wireless telecommunications, but many of those investments have been implemented on an ad hoc basis, but planning and coordination can help utilities turn these investments into a framework for better deployment.

To ensure that utilities have the guidance they need to improve their own broadband access while also helping to meet the needs of customers in unserved and underserved areas, Harris provides a roadmap with steps for implementation. →



Building infrastructure in remote locations

As utilities make progress toward bridging the digital divide, they will continue to be tasked with creating, improving and maintaining infrastructure for those customers who live in remote locations.

In his article “Best Practices for Building Infrastructure in Remote Locations,” Stefan Glander, with Access Limited Construction, writes about the challenges utilities face to meet the increased demand for electricity, whether the consumers are in areas with existing infrastructure in place, or in locations, where infrastructure is either non-existent or old and outdated.

Citing a report by the U.S. Office of Electricity, Glander notes that more than 70% of the nation’s grid transmission lines and transformers are at least 25 years old. The challenge to meet the goal to achieve 100% clean energy by 2035 and a zero-emission economy by 2050, as outlined in the Bipartisan Infrastructure Bill, only intensifies the urgent need for access to infrastructure and renewable energy sources.

Pointing out how transmission lines are often in locations that are difficult to access, Glander emphasizes how important it is to have infrastructure in place in those locations to ensure connectivity for urban and rural communities, alike. Recognizing the complexities of building and maintaining infrastructure, Glander presents a checklist people can follow and expand upon to ensure such a construction project is successful.

Remotely located power lines: A real-life scenario

For our readers who appreciate examples of how utilities go about tackling the challenges of accessing T&D infrastructure in remote areas, our Grid Transformation Forum column presents a real-life scenario, where a utility sought the expertise to repair a remotely located transmission tower on an island, that is only accessible by boat or helicopter.

As the representatives from Dominion Energy South Carolina and Ampjack America explain in this article, it was during regular review and maintenance, that Dominion Energy discovered overhead power lines across the Savannah River required updates. Because the transmission tower was located on a remote island not easily accessed, Dominion sought the assistance of Ampjack America.

After assessing the situation, Ampjack came up with an approach to raise the existing tower, saving Dominion Energy time, money, and no doubt, a bit of sanity. Ampjack was able to resolve the issue promptly, which allowed Dominion to remain focused on providing their customers with safe and reliable energy.

The three articles I’ve listed show us how interconnected the power sector is, and how, by sharing best practices and through collaboration, every industry partner continues to play an important role in making grid modernization a reality.

As always, if you would like to contribute an article on an interesting project — whether it involves AI, or not, please email me:

Elisabeth@ElectricEnergyOnline.com

Elisabeth



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MISSION ACCOMPLISHED:

DOMINION ENERGY SOUTH CAROLINA ENLISTS TOWER RAISING COMPANY TO UPGRADE REMOTELY LOCATED TRANSMISSION TOWER



Earlier this year, Ampjack America completed a tower raise project for Dominion Energy South Carolina. The 115/46kV Stevens Creek-McCormick transmission line upgrade project was located in the middle of an island that was inaccessible by road or boats large enough to shuttle heavy equipment. For this quarter's Grid Transformation Forum column, we spoke with Kelvin Rogers, general manager of Transmission Operations and Construction for Dominion Energy South Carolina, and Mike Haight, business development director for Ampjack about the challenges the project posed, and how both companies teamed up to tackle those challenges.

EET&D: Describe the situation that prompted Dominion Energy to seek assistance from the specialized tower raising company?

Dominion: While conducting a routine inspection, Dominion Energy identified some necessary maintenance and enhancements to our overhead lines across the Savannah River.

The project included replacing existing wires with larger lines to accommodate increased demand for energy across the growing region. These larger lines would also need to be raised an additional 15 feet to ensure safe clearance across the river.

EET&D: Mike, would you talk about the challenges your team faced?

MH: As Kelvin explained, there was an existing tower on an island in the middle of the Savannah River. Raising a tower on this remote island became a critical inflection point for the project team. Because it was a difficult location to get to, we were initially concerned that the project would not be feasible due to the cost or timelines to access the island. Also, working on an island in the middle of a major river was problematic, as the water levels fluctuated day-to-day, as expected. To complicate matters, there is no established access to the island, and it would have been extremely difficult and costly to build a bridge to access the tower for traditional construction equipment to change out the tower. →



Image credit: Ampjack America

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EET&D: How did you address those challenges?

MH: We were able to overcome each challenge with a series of solutions that would allow us to raise the tower and keep the project on track for Dominion. First, we used our “crane-in-a-box” lift system that allowed us to raise the structure 15 feet to the required final height. This system is small and packaged in a manner that allows us to Heli lift the equipment into the project site, without the need for roads or other conventional access methods. We are used to working in very remote locations, but they are normally in dry and mountainous regions, so the next challenge was to create a dry and level work platform to combat the fluctuation of water levels. We were able to use scaffolding at the base of the tower to create a dry and safe work platform for the crew, and a place to land the equipment being flown to the project site. We were then able to utilize a small boat to shuttle the line personnel to the site to complete the work each day. Once the equipment and personnel were onsite, it was a normal tower raise for our team, and they executed it perfectly.

EET&D: What were the final results of your effort?

MH: As the project was delivered as an Engineer-Procure-Construct model, we completed detailed engineering and operational planning prior to moving into procurement and construction. The engineering phase included pre-construction tower and foundation audits which identified minor maintenance requirements, which were completed during the construction phase. By the end of the project, there was a 15-foot mid-body extension to the existing tower that would allow for the new transmission line to be brought through and maintain adequate ground and waterway clearance. There was no need to develop or spend capital on temporary access to the tower site.

Mike Haight, director of Business Development for Ampjack America has spent the past 15 years in various different sales and business development roles in the power utility industry. He has spent much of his time in working with utilities to educate and help their engineering teams to integrate new and innovative technologies. Additionally, Haight has worked with many tool and equipment manufactures to train electric line workers on safety and work methods with their hot line tools.

EET&D: As the utility that sought the tower raising company's expertise, how did you feel about the way the situation was addressed?

Dominion: Because of the tower's remote location on an island in the Savannah River, replacing the pole presented several challenges. This included getting a new pole and other construction equipment out to the island.

The tower raising company offered a unique solution by raising the existing tower rather than replacing it. To do this, they added new structural steel sections and designed them to accommodate the new, larger wires. They also provided the necessary engineering, material, transportation and construction.

EET&D: How would you suggest other utilities address a similar challenge?

MH: Rather than always defaulting to changing-out structures, utilities now can look at alternative methods, like raising towers using innovative construction methods such as a hydraulically driven tower lift system. The ability to access places with compact equipment and perform tower raises can open opportunities and make what seems like an impossible challenge a much easier project scope. Technology exists in the market and the “we've always done it that way” approach is not necessarily bringing the best value to the utility and stakeholders.

Dominion: [The tower raising company] was able to engineer a safe, innovative solution for this project without replacing the tower. Their work helps us continue to deliver safe, reliable and resilient energy to our customers.

Kelvin Rogers is the general manager for Electric Transmission Operations and Construction for Dominion Energy South Carolina. He oversees the engineering, construction, operation and maintenance of DESC's transmission, substation and protective relay systems, which serve more than 800,000 customers in South Carolina. Rogers has worked for Dominion Energy since 1988. He earned his bachelor's degree in electrical engineering from Clemson University.



Image credit: Ampjack America



Image credit: Ampjack America



Image credit: Ampjack America

THE IMPORTANCE OF A CONVERGED FAN FOR GRID TRANSFORMATION

*FIELD
AREA
NETWORKS*



DOMINIQUE VERHULST

Governments around the world are working to meet international climate change treaty obligations under the Paris Accords. These legally binding obligations are now driving energy policy around the world.

One of the notable examples occurred in 2022 when U.S. President Biden signed the Inflation Reduction Act (IRA), which intends to enable the U.S. to meet its Paris Accords obligations and ensure its future energy security.

The IRA provides \$369 billion over the next decade to fund programs and incentives intended to accelerate the transition to a clean energy economy. It will drive significant deployment of clean energy resources, including the rapid development of transmission lines and the transformation of the distribution grid. Many other countries around the world are making similar investments in an electrified future.

Although much of the press attention has focused on renewable energy resources like wind and solar and the adoption of technologies such as EVs, induction stoves and heat pumps, the foundation for the wide-scale electrification of our energy infrastructure will be a smart electrical grid.

Distribution system operators (DSOs) will need to rely heavily on digital technologies to monitor, protect and control the grid. Especially with the introduction of distributed energy resources (DERs), grid control will require automation in thousands of distribution substations and feeder circuits, as well as the ability to monitor hundreds of thousands of intelligent electrical devices (IEDs) with local intelligence and decision capabilities to control the grid in real-time.

This will only be possible using a state-of-the-art communications network. →

Converged FAN communications

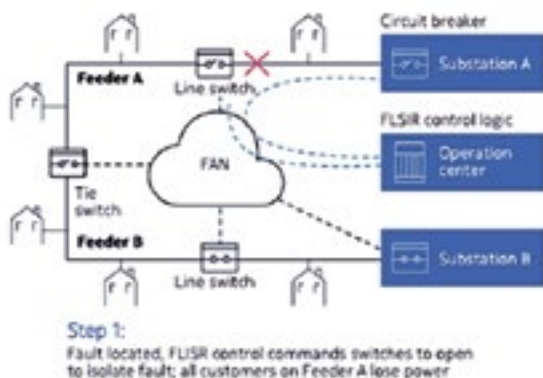
Field area networks or FANs are the networks that connect feeder circuit domains and often low voltage distribution substations. They have been lagging behind the advances in wide area network (WAN) communications generally on the digitalization journey.

Now DSOs will need to adopt the most recent networking technologies to meet the ambitious climate goals reflected in government policies like the IRA. Essential for the digital transformation of the smart grid, FANs will need to scale and expand their footprint with new wireless access and optical networking technologies to connect distribution substations and field IEDs for distribution automation.

Transmission substations are for the most part already connected by fiber optics and currently use IP multi-protocol label switching (IP/MPLS) networks to communicate, yet there are tens of thousands of distribution substations that remain unconnected.

Where fiber plant exists, it can be used for FANs. Otherwise, to economically reach these substations, as well as tens of thousands of IEDs along feeder circuits, robust wireless access will be required. Among the wide range of wireless access technologies, the prevalent choice today is LTE.

Traditionally, the performance and security requirements for monitoring, controlling and protecting the distribution network could not have been met by either packet or wireless networks. Latency, synchronization, service segregation, availability and resilience all demanded the kinds of critical communications services that best-effort wireless networks could not meet.



“ According to a U.S. Department of Energy study, FLISR can reduce the number of customers interrupted (CI) by 55% and customer minutes of interruption (CMI) by 53%. ”

This changed with the introduction of IP/MPLS, which enabled packet networks to meet these critical performance metrics. As a result, it has been widely adopted over the last decade by utilities worldwide, carrying over a mix of optical systems, microwave links and even T1 leased lines.

By extending IP/MPLS over LTE, utilities can now build a converged FAN with the same mission-critical networking capabilities in WAN to support a wide suite of distribution automation applications.

Improving grid reliability with FLISR

There is a long list of use cases for the distribution automation capabilities that a converged FAN can make possible. Fault location, isolation and service restoration (FLISR) is one of the critical use cases and illustrates clearly how a converged FAN can be employed.

As electrical systems become our primary source of energy in industrial, transportation, public works and domestic applications, the impact of service interruptions is becoming more critical. According to a U.S. Department of Energy study, FLISR can reduce the number of customers interrupted (CI) by 55% and customer minutes of interruption (CMI) by 53%.

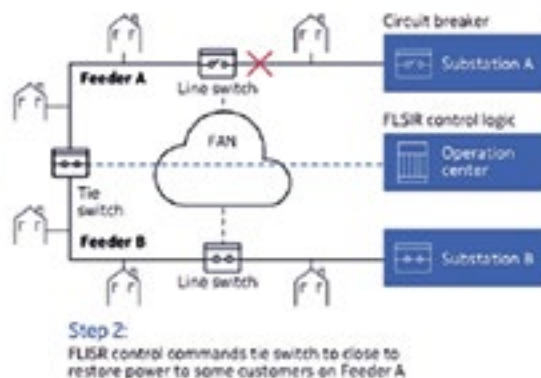


Figure 1: FLISR subsystems communicating over the FAN to restore power

How FLISR systems usually work is that a line sensor, such as a SCADA RTU or an AMI sends a message to the FLISR controller to indicate service interruption. The controller is usually integrated with the distribution and outage management systems (DMS and OMS).

Together, they automatically locate the fault and open the line switches or circuit breakers to isolate the section. Where the distribution topology allows, they can then route power to downstream users and connect them to a different substation.

In Figure 1, the topology has a connecting circuit between Feeders A and B, controlled by a Tie Switch, which allows the utility to bypass the fault so that only the subscribers on the affected circuit lose power.

It is important to note that if the communication paths to the line switches are broken, FLISR fails to restore power to the downstream customers on Feeder A. It is also important to note that as the load level on Feeder B increases with the addition of the downstream customers on Feeder A, voltage levels will naturally drop, sometimes below 5% of the nominal voltage. This can result in brownouts and failure of some electro-mechanical equipment.

This can be remedied by the advanced distribution management system (ADMS) using volt-VAR optimization (VVO), which automatically adjusts the voltage regulator position and load tap changer position. Again, however, any break in communication and VVO will fail to maintain the required voltage level.

Thus, for FLISR subsystems to function properly, communications have to be maintained between distribution automation applications such as VVO, AMI, SCADA and line sensors. This can be achieved using a FAN with a fully redundant end-to-end communication path using either the utility's own private wireless link and/or separate links over a public carrier's wireless network. A dual-homing wireless field router equipped with two SIMs ensures that if the primary wireless circuit fails, the secondary circuit can ensure the service is maintained.

The FAN requires a backhaul network to connect with the wireless core software hosted in the data center. Therefore, multi-fault network resiliency in the FAN backhaul network is also important.

FAN backhaul is very often a use case for a utility's mission-critical WAN. The WAN should already be capable of intelligently re-routing any communications paths that might be affected by the same event or, even, coincidental events associated with the original service outage, such as a storm.

The wireless core system itself also needs to be architected for hot redundant duplex operations, so that in case of core equipment failure, switchover to a standby core does not create issues with latency or synchronization in the distribution automation systems being used by FLISR.

It is also important that the utility operations center, which is the nexus for all grid operations including the sub-systems for FLISR, be geo-redundant. Each center should have redundant headend routers connecting the center to the FAN. This results in a FAN architecture that could look like Figure 2. →

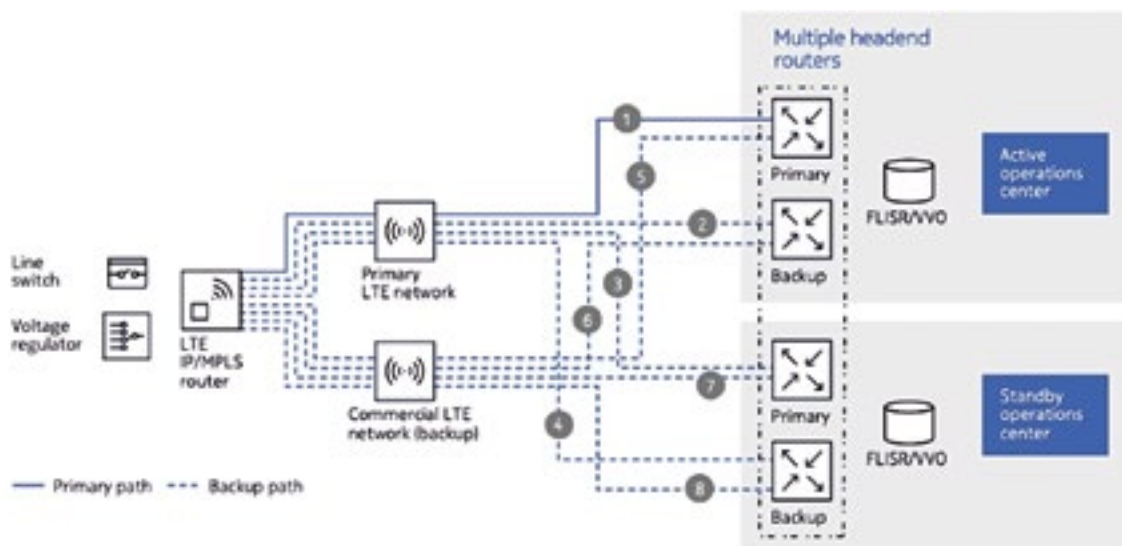


Figure 2: Geo-redundant protection with multiple headend routers



Fire mitigation strategies

As climate change worsens another important use case in some regions is fire mitigation. Increased temperatures, longer droughts and higher winds are affecting the condition of many forests and grasslands, making devastating fire events more likely.

While it is estimated that only 3% of wildfires are started by electric distribution lines, the fines and associated liabilities levied against the responsible utilities can be significant.

The most common causes of electrical wildfires are downed conductors. Often fallen trees are the cause, although other failures can occur. Vegetation can also contact lines causing arcing, especially if a tree branch crosses two conductors. Although rare, conductors can also come in contact and aging equipment can fail, generating arcs and sparks. Thus, the primary means of mitigating fire risk is to perform preventive maintenance to the equipment along utility lines as well as vegetation management.

There are also several technologies that can be employed to enhance system protection and minimize or even eliminate the threat of fire events. The key issue is to quickly detect fallen conductors and trip the power or, in the most at-risk areas, sense breaks and trip the power before the conductor hits the ground.

Detection is, unfortunately, not always straightforward. Many downed lines fall on poorly conducting surfaces, creating high-impedance faults (HIFs) that generate very little fault current. Reports from the U.S. cite a range of 30-50% of HIFs that go undetected.

Most power distribution systems rely on over-current protection such as relays, reclosers and fuses, which will not be tripped in the case of an HIF. Utilities operating in areas where there is a high risk of wildfire, rather than risk an undetected HIF, will close down high-risk power lines and re-route around the area. This is sometimes a good operational practice, but not always possible or practical, often taking days to restore power to the line.

Systems are emerging to improve detection capabilities. These include monitoring interharmonic energy on a feeder to detect arcing or monitoring the ratio of negative-to positive-sequence transfer.

One of the most promising technologies being used by a California utility is to monitor synchrophasor measurements for voltage, current and phase angle of all conductors on the power line. Phasor measurement units (PMUs) provide data to a phasor data concentrator (PDC) that analyzes the data to look for HIF signatures. Upon detection, an IEC 61850 GOOSE message is sent by the PDC to trip the power on the suspected line, in some cases, even before it can hit the ground.

This application requires high-bandwidth communications to move the phasor data from all parts of the grid to the PDC and, in response, send the IEC 61850 GOOSE messages to the circuit breakers/reclosers.

Communications must have very low latencies and low jitter. Using IP/MPLS over optical fiber easily meets these communication tolerances, but the cost is significant if the optical infrastructure isn't already in place.

LTE/5G is a more low-cost solution that can meet the same tolerances and is less subject to some of the same hazards that can cause HIFs in the first place. Where optical infrastructure is in place for a subset of distribution lines, a hybrid IP/MPLS fiber and LTE/5G converged FAN will be the optimal solution.

Converged multiservice FAN

Traditionally IEDs such as line switches, voltage regulators and SCADA RTUs were often connected using application-specific field area networks. Each FAN would have to duplicate resources such as cabling, power and FAN management. In today's evolving smart grid, this approach does not scale as the number of distribution automation (DA) systems multiplies.

The power of a converged FAN based on IP/MPLS and LTE is its ability to scale to support multiple services simultaneously. It is not only a good foundation for emerging and future native-IP applications, such as using Layer 3 VPNs for applications such as synchrophasor and R-GOOSE, but it is also capable of carrying non-native IP applications, using Layer 2 Ethernet to carry IEC 61850 GOOSE traffic, which is necessary for many existing DA applications.

As LTE evolves to LTE Advanced (LTE-A) to 5G and eventually to 6G, it can continue to support emerging and future grid applications for the finest grid control capabilities.

As governments around the world focus on the electrification of their residential, industrial and transportation infrastructure, all the while expanding their use of renewable energy, the once humble utility grid will be in the spotlight. The smart grid applications of yesterday will be complemented by an ever-growing array of intelligent and automated systems to ensure that the grid will continue to run smoothly and safely.

In the evolution of the smart grid, one of the key pillars will be the converged FAN, providing the high-speed nervous system of our coming energy systems.

ABOUT THE AUTHOR:

Dominique Verhulst currently heads the Utilities vertical at Nokia and drives the business and solutions development for Utilities globally. He is the author of the "Teleprotection over Packet Networks" and the co-author of several publications from the University of Strathclyde. He has over 30 years of experience in the telecommunications networking industry, holding senior sales and marketing positions at Nokia, Alcatel-Lucent, Newbridge Networks, Ungermann-Bass and Motorola.

INTELLIGENT LINE SENSOR PROJECTS:

HOW TO GET YOUR GRID MODERNIZATION EFFORTS OFF THE GROUND

RANDY COUGH

The health and modernization of our aging electric grid is a focus for utilities across the U.S. One of the country's oldest infrastructures, the grid is beginning to show signs of its age across physical components — less able to withstand increasingly frequent and more powerful natural disasters such as wildfires and hurricanes. And with newer power system challenges like those related to the growing adoption of electric vehicles (EVs) and rooftop solar adding further strain, utilities are clear that they need improved visibility of what is happening on their distribution lines.

Advanced line sensing solutions are industry-accepted as one of the most effective ways to gain the real-time distribution system performance and reliability data necessary to meet today's power delivery demands. These technologies provide fault detection and remote monitoring to multiple locations along overhead and underground lines to reduce outage durations, quickly pinpoint areas for maintenance across thousands of line miles and enable data-driven decisionmaking for reducing operations costs.

While utility leaders may be clear on the benefits of intelligent line sensing, some may not be as clear on the best way to deploy a line sensing initiative. For those who don't have direct experience rolling out line-sensing projects at their utility, I've compiled several recommended steps to help.

What follows are best practices I've gathered through many years of experience working with utilities and technology providers on grid modernization pilots and implementation projects.

Step 1: Establish achievable goals

Getting buy-in for a pilot project requires the promise of measurement. Discuss with your stakeholders the types of reliability goals you hope to support with this pilot and be sure that the goals are agreed upon and achievable. To do so, identify your utility's most pressing grid needs and explain how money and time investments in the pilot project will result in a return on investment. Build this case by referring to the metrics you'll use to measure the reliability gains (reduced SAIDI, CAIDI, SAIFI) and O&M cost savings.

Step 2: Identify feeders for the pilot

Decide which feeders make the most sense to include in an evaluation pilot. Look at multiple perspectives to help make this decision: age of the line, presence of vegetation, recent outage frequencies, number of customers, patrol challenges for the circuits, reclosers and sectionalizers on the circuit, etc.

Start with at least three to five circuits. This ensures that the pilot can supply meaningful data and serve as a reasonable sample set that is large enough to show potential business impact and whether it makes sense to expand further. →





Step 3: Conduct site surveys of potential locations

Once a set of feeders has been identified for piloting, site surveys need to be performed. Check these important elements during the surveys:

- Cellular Signals — With cellular communications, it is important to check signal strength in the field and confirm, via coverage maps, that adequate cellular signal is expected at chosen sites.
- Overhead Sensor Location — Overhead sensors are designed to be installed with a hot stick from a bucket truck. Make sure there are no overgrown trees above the sensors which could prevent receiving GPS and cellular signals and that the sensor LED is visible. Also, ensure conductors are free of debris which could degrade power harvesting.
- Underground Sensor Location — For many utilities, most of their pad-mounted switchgear was deployed decades ago. Cabinet space may be constrained, especially in the case of live-front switchgear. It is important to check the make and model of the cabinet and available space for installing sensors.
- Continuous Loading — Assess average loading expected at the sites and ensure the necessary loading exists for line powering of the sensor.

Step 4: Plan the software installation

Intelligent line sensing solutions include both sensor hardware and software. As the sensor locations are surveyed and studied, start a plan for the software installation.

Weigh the pros and cons of on-premises or cloud-hosted software deployments. Choosing a hosted implementation for the pilot leads to shorter deployment time and fewer IT resources. Also, decide how data will flow and integrate with OT systems. Sensors with dual DNP master capability simplify data integration as they send sensor data to both Ample and a second OT system such as an Advanced Distribution Management System (ADMS).

Step 5: Train staff on sensors and software

Be sure you have a clear point of contact with the solution provider for any technical questions that arise before or during the pilot deployment. While it's always preferable to have your vendor on-site for training on sensor installation, remote video training is a good alternative and is also effective for software training.

Evaluate and use all training resources made available to you. In addition to training videos, ask for reference resources such as an installation guide with a very detailed walkthrough of installation steps and necessary tools, and condensed one-page quick start cards.

Step 6: Deploy pilot units

For the first pilot configuration, deploy two or three line-sensing solutions at three to five feeders.

Confirm with your vendor how to pre-configure the line sensors as much as possible before installation to make for quicker, easier deployment. Also, confirm how long installations should take, how many utility crew (if any) will be needed and how quickly you'll begin receiving reports of data from the field.



The recommended duration of a line-sensing pilot is generally from 30 to 60 days. In addition to an analysis of real events on the chosen circuits, plan to simulate faults to create additional tests for the line sensing system during the pilot.

Actionable data for grid management

Monitoring with intelligent line sensors is one of the most effective ways to gain situational awareness of the control center, and the visibility and actionable data needed to assist planning and reliability groups for better overhead and underground grid management (especially for utilities striving to meet a complex set of power delivery and reliability challenges). Getting started with line sensing is not difficult. By using the steps in this article as a guide you should be able to quickly start a pilot and achieve the benefits of increased system visibility and data firsthand.

In our next article, I'll go into detail about how to come back and prove ROI from the pilot. I'll provide a step-by-step guide to show the return on investment from your pilot, with recommendations on how to reprioritize investment areas to achieve more value.



ABOUT THE AUTHOR:

Randy Cough has more than 30 years of electric distribution, operations planning and program management experience related to grid modernization programs for electric utility customers. His primary expertise is in utility control center operations, distribution automation and control center applications such as advanced distribution management systems (ADMS) Outage Management Systems (OMS).

Prior to joining Sentient Energy, Cough worked at GE Energy for 20 years. His experience also includes more than 15 years at Niagara Mohawk Power (now National Grid) as a system electric operations director.

EV ADOPTION:

DRIVING CUSTOMER ENGAGEMENT IS CRITICAL TO GRID STABILITY

PAUL MCDONALD

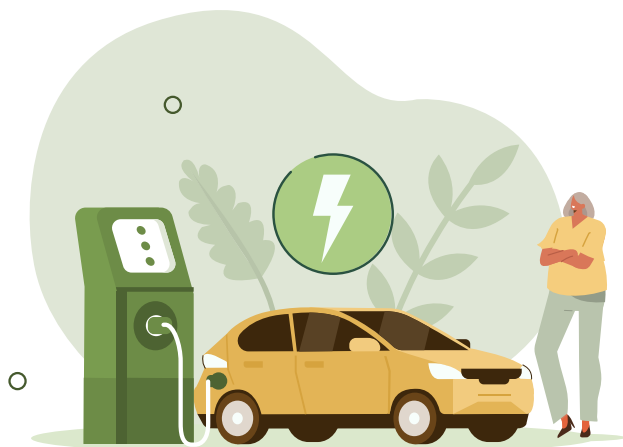
According to research firm Counterpoint, first-quarter 2023 Electric Vehicle (EV) sales in the U.S. showed a 79% year-over-year increase -moving the U.S. into the number two market position worldwide. As more EVs pop up in driveways across the country, there is a prime opportunity to reframe how utilities think about the interaction between customers and the grid that powers their lives.

When someone buys an EV, they most likely don't engage their utility in that decision-making process. However, as more customers start driving electric every day, it becomes even more critical for utilities across the country to have better insight into the EVs in their territory. With the impact they can have on the health of a utility's network, their place in the grid must move from the grid edge to the center of the utility's operations. In this new operating model, the relationship between utility and

customer, between customer engagement and demand management, can no longer be approached separately. Optimization of the customer journey and the grid must be synchronized.

Additional benefits come through capturing the decarbonization benefits EV-focused programs can have to net-zero emission goals. A report by The Brattle Group found that by 2040, actions by customers can reduce nearly two times more greenhouse gas (GHG) emissions than would result from current policies to promote investments in clean energy supply alone. For EVs, the increased contribution to carbon reduction will come in large part due to the industry expecting a fourfold increase in the total number of EVs on the road from 2030 to 2040, as well as anticipated declines in grid emissions. →



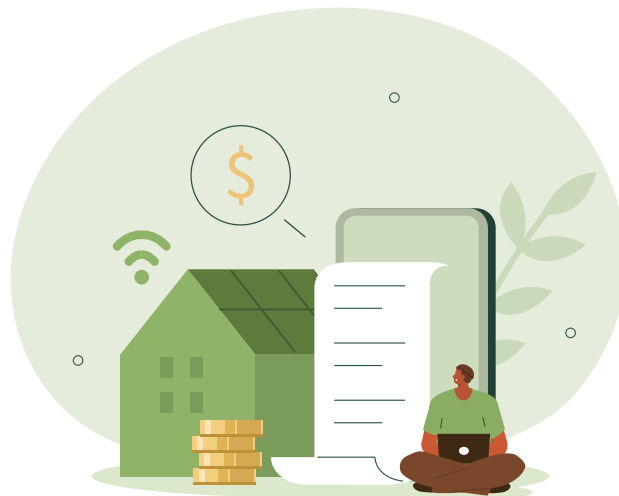


Keys to moving forward

For utilities to succeed in EV management, a comprehensive strategy is essential. The payoffs for this strategy can come in longer-term goals that focus on opportunities to upsell EV customers with targeted rates and offers and leverage those loads as part of Distributed Energy Resource (DER) profiling. However, before utilities set their sights on too many exits down the road, the critical first part of the journey is ensuring EV programs are thorough and accurate for the best chance of success. Three key elements that can help a utility navigate the adoption cycle include:

Adoption: Utilities should also consider playing a more active role in educating customers on the benefits of EV ownership from both an environmental and cost perspective. As utilities look for new revenue opportunities, EV education and associated services are a great place to focus. Proactive outreach is paramount. Utilities should start to offer or expand the use of EV cost calculators, car comparisons and other incentives to drive adoption.

Identification: Tapping deep machine learning, utilities can identify the presence of an EV, show the time and frequency of charging and disaggregate the energy being consumed from the vehicle with advanced metering infrastructure (AMI) data. With highly trained algorithms, this machine-learning insight can pinpoint things that remain indistinguishable to the human eye. For instance, a newly installed pool pump may make a whole-home load curve look astonishingly similar to that of an EV owner, but data science can't be so easily fooled. Machine learning algorithms can identify the signatures that make the EV load unique and help isolate only that load.



Proactive engagement: Utilities can make engagement intuitive and empower customers for essential digital self-service (DSS) transactions, such as bill payments, autopay, payment arrangements, paperless billing, utility program enrollment, usage inquiries and communications. DSS helps utility customers prioritize what they care about most and encourage them to take the right action at the right moment. Highly effective proactive communications include high-bill alerts that provide personalized energy insights, energy efficiency tips and program promotions to help them save and weekly energy reports that provide day-by-day energy benchmarking and help customers answer billing questions without contacting the call center.

Rhode Island Energy: Changing how we think about behavioral programs

Electric utilities such as Rhode Island Energy already are factoring in these developments. The company has long worked together with customers to lower their energy use and bills while also reducing demand on the grid. A deeper look at their EV initiatives shows the many benefits they have achieved for customers.

Successfully transitioning to net-zero emissions requires, in part, increased adoption of EVs and better managing the entire EV process to also avoid negative grid impacts. Rhode Island Energy actively works to provide customers with the information and tools necessary to flex their energy use, such as EV charging, to off-peak hours. Recognizing the role of electrification, they also are making it easier for customers to electrify things like transportation and heating using high-efficiency heat pumps.

Rhode Island Energy already offered a rebate to encourage EV load shifting to off-peak hours. While successful, the enormity of this challenge requires the testing of many different approaches.

“We’ve focused for a long time on running behavioral energy efficiency programs that get the attention of busy customers and influence them to act,” said Ryan Cote, EV Program Manager for Rhode Island Energy. “Based on our success using behavioral science and personalized outreach, we wanted to see if the same principles could be applied to changing electric vehicle charging behavior.”

This is absolutely the right line of thinking. Behavioral programs are about so much more than neighbor comparisons and home energy reports. They are about clarifying and influencing increasingly complex customer actions. We know that electrification is critical to decarbonization, and electrification largely depends on customers taking action, so it’s not something utilities can accomplish without the customer. Behavioral strategies are the perfect approach.

Using behavioral science techniques to shift EV charging load

Rhode Island Energy conducted a digital engagement campaign that educated customers on the impact of charging their vehicles at different times of the day, and it was successful in customers changing their behavior in the ways needed to better manage the grid. Email was chosen as the communications vehicle of choice using effective behavioral science tools. Key examples included:

Personalization and gamification – Rhode Island Energy made it fun for customers to compete with themselves. In the case of this campaign, customers were shown how their charging habits changed month-over-month with rich data visualizations right in their email inboxes.

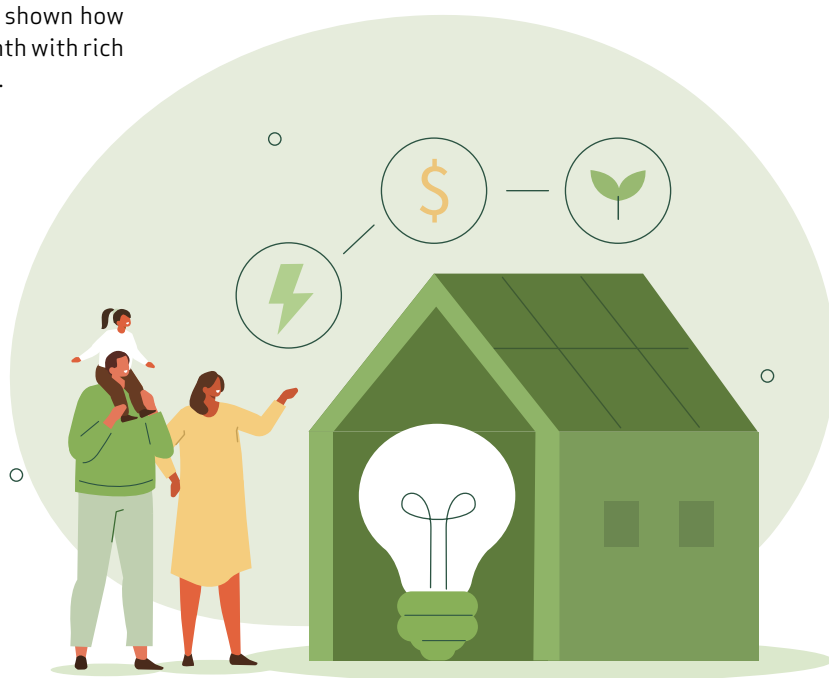
Unity and agency – Customers were reminded that they have the power to have an impact, and when they do it as part of a big group, it feels good and makes a big difference.

Benefits framing – A totally different type of motivator that showed customers what’s in it for them if they take an action. In this case, it was the rebate they received by charging at off-peak times.

Salience – Rhode Island Energy made it easy for a customer to act by showing them the one action that’s most relevant to them. Throughout the campaign, the next best actions relevant to EV drivers were included. Examples included learning where public chargers are available around town, the tangible benefit of upgrading to a level 2 charger and setting an automated off-peak charging schedule, with advice specific to their EV model.

Ease – The decision to act was made to feel effortless. For example, an option was included for a one-tap download of the PlugShare app, which helps customers locate the public charging sites mentioned above.

Achievement – Rhode Island Energy associated a feeling of pride with actions taken and created a sense of anticipation of taking similar actions in the future. By showing customers how much they could save from changing their charging habits, the utility positively reinforced that behavior and increased the likelihood that they will maintain those actions going forward. →





Eye-opening program results

The accomplishments of the program were incredibly promising. It takes a wide variety of behavioral science techniques to measurably change energy consumer behavior. While this may seem like a lot of work and thinking for an email campaign, the initial results show the effort was worthwhile.

Following a 17-month campaign, analysis showed the emails had a whopping 77% open rate in some months, which is 3.7X the average for the utility industry, and an 18% click-through rate, which is 7X the industry average. And, the customers receiving the emails acted on the insights. Rhode Island Energy saw a nearly 10% reduction in on-peak EV charging among study participants. These findings were validated by trusted third-party evaluator DNV, who in their own study found that treatment customers have shifted the start of more of their charging sessions to off-peak periods.

These results speak to the power of behavioral science techniques in influencing the increasingly complex customer actions that are critical to decarbonization. In fact, there's reason to believe this behavioral strategy could be even more effective at shifting load in other circumstances, as Rhode Island Energy had already worked hard to reduce the on-peak charging from this group of EV owners with previous efforts.

It's time to charge ahead

These EV adoption efforts from Rhode Island Energy show what's possible when utilities prioritize synchronizing relationships with their customers. As more EVs hit the roads — and electric grids — in increasingly higher numbers over the next decade, it's up to the rest of the ecosystem to charge ahead. By doing so, we can collectively help drive results in the right direction in invaluable ways, including grid reliability, energy savings and sustainability and personalized customer engagement. The stakes have never been higher, and the keys are in all our hands.



ABOUT THE AUTHOR:

Paul McDonald is a senior director of product strategy for Opower (part of Oracle Energy and Water). He joined Oracle along with Opower, where he previously served in leadership roles in client success, operations, product and solution architecture. Before joining Opower, McDonald consulted cabinet-level federal agencies on their international financial systems and operations. He is a graduate of the University of Notre Dame, where he received a B.S. in computer engineering.

BECOMING OUTAGE RESILIENT

WITH REMOTE ACCESS TO CRITICAL CONNECTED DEVICES

ISMET PEKIN

Perhaps the most talked about issue currently plaguing companies in the energy sector is the surge in weather-related power outages. While escalating weather-induced power outages necessitate a response from these organizations (which, thankfully, many have via investment in alternative energy sources and smart grid technologies), such outages do not represent the only type of outage afflicting those in the industry. In fact, network outages, also known as unplanned downtime or the failure of internet services, continue to rise alarmingly and precipitously. If energy companies do not proactively mitigate these worsening network outages, the consequences could be severe — particularly for global organizations with limited engineers covering vast business regions.

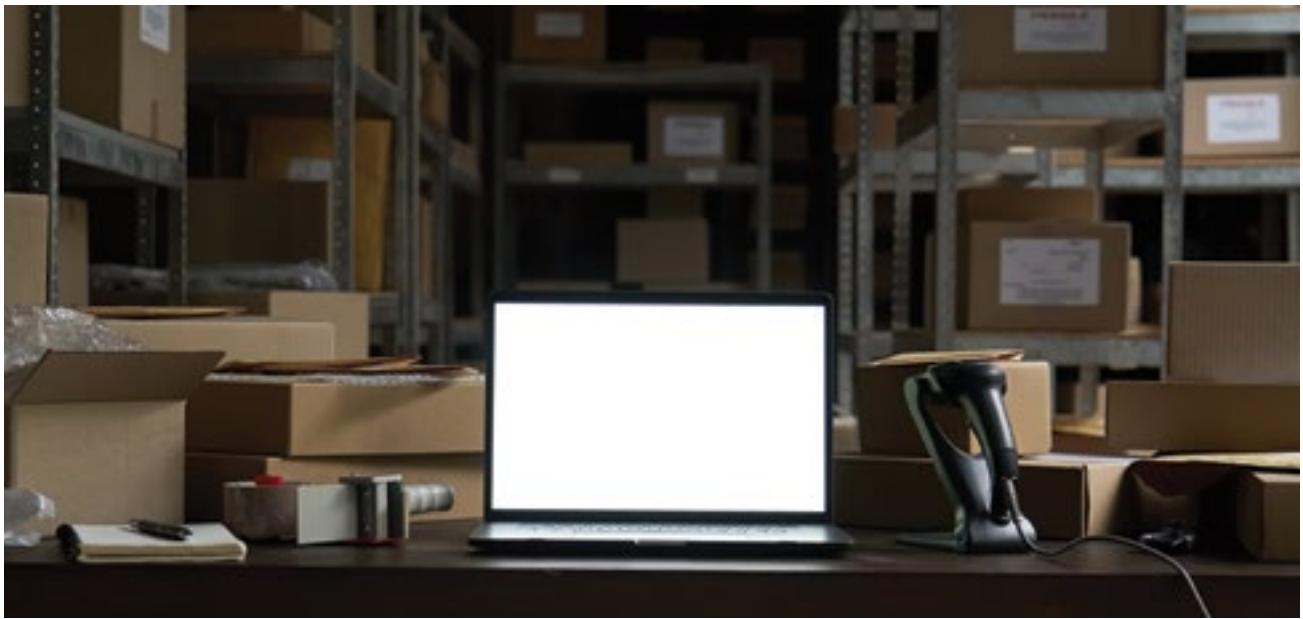
Measuring the costs of mounting network downtime

Network outages are not a novel phenomenon — however, their increasing frequency does represent a more recent

development. An independent study conducted in 2022 discovered that over half of the 500 network engineers surveyed reported a notable rise in outages since 2020. Likewise, the time it takes network engineers to find and resolve an outage (the MTTR or Mean Time to Repair) continues to lengthen. By comparing the findings of a similar study in 2020 to the one from 2022, one will see that the MTTR grew by almost two hours, with the average today being 11.2 hours.

The growth in MTTR is especially concerning for energy companies, and the culprit is the increasing complexity of modern networks. Trends like digital transformation, virtualization from cloud migration and the rise in remote and hybrid work continue to complicate a network engineer's job, making them more challenging to manage and remediate. Simultaneously, the network is becoming more inseparable from everyday business operations. As a result, the consequences of unplanned downtime have also gotten costlier. →





The total cost of downtime is difficult to calculate, involving many factors like lost revenue and productivity and recovery fees. Nevertheless, **a report from the Ponemon Institute** estimated that the cost is around \$9,000 per minute. Another survey conducted by Enterprise Management Associates and facilitated by BigPanda, found a correlation between the increase in cost per minute and the size of the business. For example, an organization with 1,000 to 2,500 employees would lose \$1,850 per minute, whereas a company with over 20,000 employees would lose \$25,402 or \$1.52 million per hour. While these metrics help one conceptualize the monetary consequences, there are also intangible costs, like brand reputation and employee well-being, which can be just as, if not more, damaging.

In light of these findings, those in the energy sector must build more resilient networks through out-of-band management solutions and remote management software to minimize and recover quickly from downtime, thereby ensuring business continuity.

Case in point: Remote network access

The network is vital to modern businesses, especially for a global industrial automation and energy management leader, touting 128,000 employees worldwide and \$32 billion in annual revenue. This company provides products, including connected room solutions, switchgear and smart panels, automation software and digital services to help data centers, businesses and homes become more energy-efficient and sustainable. Over the years, it developed a thriving open ecosystem network of various parties, from customers and suppliers to universities and technology companies, driven by the need for interoperability, strong IT network and technology partnerships.

The energy management company's network is pivotal to powering its smart factories and distribution centers. And its IT Network Service Delivery team was responsible for ensuring the timely and secure delivery of data and communications. However, the company's global footprint required that its IT teams get distributed among its four regional hubs: North America, Europe, China and India. While this distribution allowed them to respond to local circumstances and challenges, like recruiting, its IT Network Service Delivery team was relatively small. Ten engineers were assigned to a region, supporting hundreds of sites across different countries — in the US alone, engineers had to manage 350 sites.

Moreover, like the rest of the world, this leader in energy management experienced considerable challenges and supply chain disruptions from pandemic-related lockdowns and travel restrictions. Nevertheless, despite these limitations, users and devices must still access the network; other essential tasks like provisioning, configuration and troubleshooting (in the event of an outage) could not get put on hold either.

Needing a secure and intelligent means to access, monitor and control critical devices, including their remote management interface in their data centers, the IT Network Service Delivery team looked to their out-of-band provider, a partner of over a decade with whom they already had many solutions across the enterprise. By implementing the provider's out-of-band management solution, the energy management company's IT team could streamline tedious administrative processes, conduct proactive maintenance and facilitate remote recovery.

The company also used its out-of-band provider to console into routers, switches, firewalls and over 112 access points, helping it spin up new offices and stage new sites or upgrade equipment in others. Lastly, the leader in energy management leveraged its provider's remote management software, a unified and easy-to-access dashboard, to access and orchestrate its routers, switches and firewalls from anywhere.

The out-of-band management solution brought peace of mind to the IT Network Delivery team, helping them reliably and remotely access, manage and remediate critical devices even during a disruption, promoting high network service quality. Access and provision to remote sites to perform essential tasks was invaluable — especially during the pandemic, where physical travel was impossible due to the lockdowns.

On average, it can take a network engineer 3.6 days, including travel time, to go to a remote site and remediate an outage. These trips are also expensive due to travel and hotel bills, and expenses typically compound with global organizations. Additionally, they're using valuable employee time that could have been spent on high-priority or business-enabling projects. However, with its out-of-band management solution the IT Network Delivery team reduced travel costs from \$80-100k to \$8k for 90% savings. Likewise, remote capabilities allowed the team's limited staff to cover the company's massive area of business while decreasing the duration of network downtime significantly. As an additional bonus, regularly accessing connected devices from leading vendors helped the IT Network Delivery team members upskill and earn certifications, boosting their career journeys.

Important considerations

When comparing vendors and assessing the effectiveness of different solutions, companies in the energy sector need to ensure that they ultimately create a resilient network. Regrettably, many businesses will settle with a redundant network. However, as demonstrated by the global leader in industrial automation and energy management, a truly resilient network will save much more money in the long run. This network could provide and maintain an acceptable level of service amid challenges to normal operations while allowing engineers to access critical connected devices remotely.

Additionally, those in the energy industry need to find a network resiliency solution provider that can prepare and support them for the first day, worst day and every day in between during the network lifecycle. Ideally, this provider should offer remote management software and an out-of-band management solution with the presence and proximity at every location to support emerging network requirements. Such solutions will permit IT teams to establish a strong network every day and seamlessly access devices in remote data centers to save money and stay prepared.



ABOUT THE AUTHOR:

Ismet Pekin is a product marketing manager at Opendgear. With more than 15 years of experience in the industry, Pekin was a product marketing manager at 7Park Data and also spent time at Verizon and Cisco Systems prior to Opendgear. Pekin received her Bachelor of Science in economics at Middle East Technical University in Turkey and her Master of Business Administration in marketing at San Francisco State University.

ENGAGING CONNECTIVITY:

BEST PRACTICES FOR BUILDING INFRASTRUCTURE IN REMOTE LOCATIONS

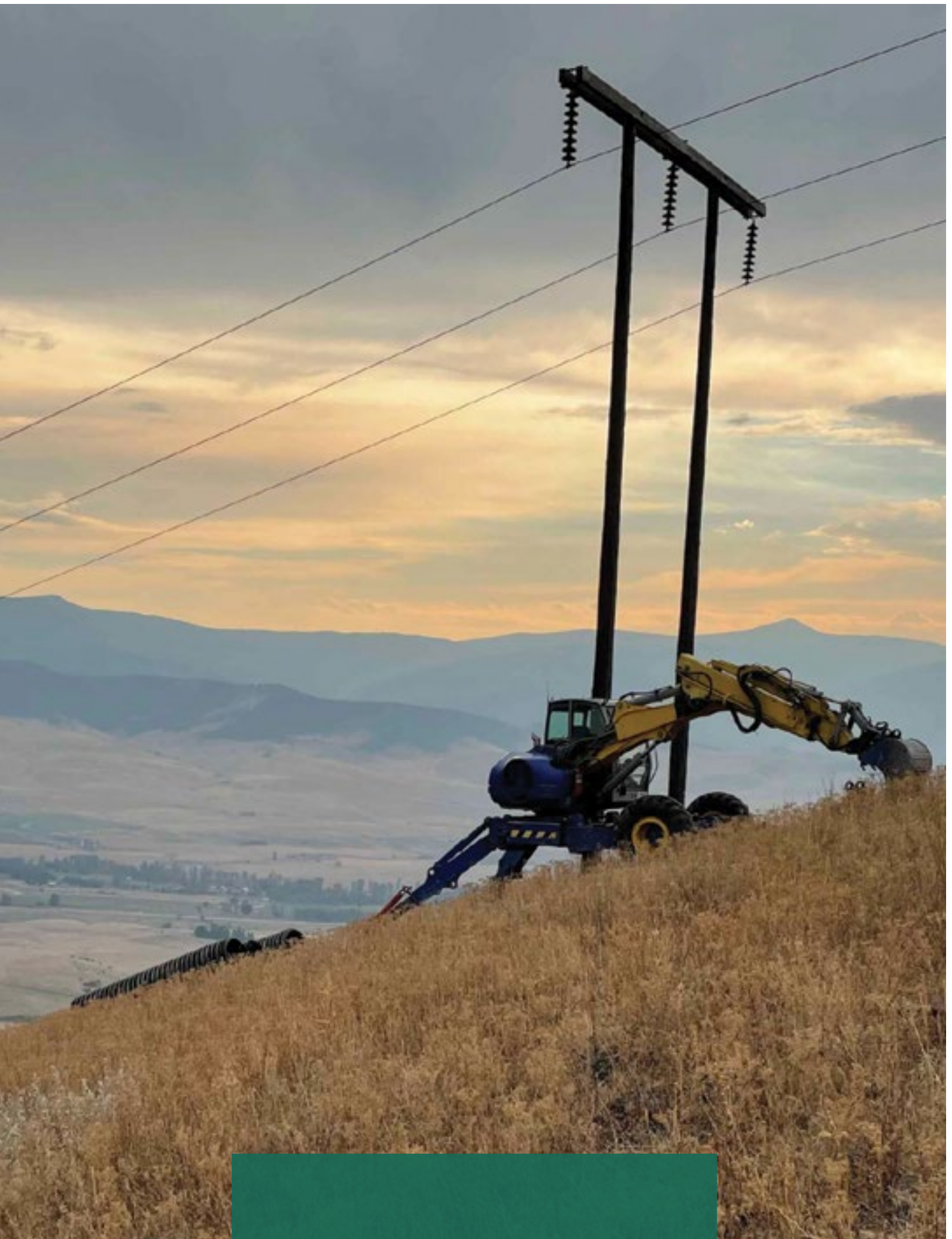
STEFAN GLANDER

Electricity is critical in today's societies — at home and globally. Not only does it keep the lights on, but it is also central to enhancing productivity, health and security, travel and economic growth. And with the total U.S. electricity consumption in 2022 at its highest-ever recorded usage at 4.05 trillion kWh, there's no sign of demand slowing down. As highlighted in the 2022 Global Energy Perspective study by McKinsey, power consumption is projected to triple by the year 2050 as electrification and living standards continue to grow and evolve.

With our increasing reliance on the energy source, a secure electricity supply and resilient power infrastructure are more important than ever. That means updating the current aging infrastructure, as well as expanding transmission systems to include clean energy projects. According to the U.S. Office of Electricity, more than 70% of the nation's grid transmission lines and power

transformers are more than 25 years old, increasing vulnerability and potential failure — especially during extreme weather events. Additionally, to meet the goal of 100% clean electricity by 2035 and a zero-emission economy by 2050, as outlined in the Bipartisan Infrastructure Bill, more renewable energy sources and infrastructure will need to be built.

To ensure connectivity across rural and urban communities, transmission lines are often located in hard-to-access remote environments. And when it comes to renewable energy sources, infrastructure needs to be built far from urban centers to efficiently generate electricity. Like all construction projects, working in remote environments is not without risk or for the unprepared. But the unique challenges these locations bring often call for an even more expansive — and often customizable — checklist to ensure success. →





Get familiar with the location

Before starting any construction project, it's crucial to complete a thorough site investigation to understand the intricacies of the location. In remote sites and environmentally sensitive areas, drones are an invaluable tool for getting a safe, detailed and non-disruptive look at the site and its surroundings. With drone technology and geospatial data, engineers can remotely pinpoint the exact locations where work will occur and develop a design to fit within the environment before crews ever step foot on site.

In addition to a site review, it is also important to fully understand the environment being worked in and around. In historical or archaeological sites, on tribal lands, or in forest service-protected areas such as wetlands, additional environmental restrictions will often be in place, and additional measures must be followed. Depending on the location, permits from local governments and other relevant agencies may also be required. For example, environmental permits are often necessary when work has the potential to disrupt the environment. Permits outline conditions an organization must follow to work in a specified environment. All necessary permits need to be acquired prior to work beginning. To help aid in overall success, establish a collaborative partnership with all relevant parties at project onset. This could include federal agencies, state and local governments, tribal nations, environmental organizations, as well as your industry partners, key stakeholders and local communities. Then, set a plan to ensure regular engagement and communication with partners throughout the project.

Knowing the various terrain crews will be working in and traveling across is another crucial component for strategic design and project planning. Depending on site terrain, specialized equipment, additional crew training and increased safety measures may be necessary. Placing energy infrastructure on steep slopes, for example, will likely call for equipment such as walking excavators, that can effectively and safely traverse and operate along the site. Other considerations may include restricted work hours, ground disturbance restrictions or any additional risks to mitigate, such as fire danger.

Being fully equipped with the information and partnering with industry and area experts will help reduce unexpected work delays while implementing proper solutions. It will also support crew confidence, limit environmental impact and preserve the longevity of the area's ecosystem.

Eliminate unnecessary disruptions

When working in remote areas, access roads are often built to easily haul equipment, materials and people to and from the site. With that, however, comes increased project duration, land disruption and annual maintenance needs of the access road. While that once was the most effective way of accessing remote construction sites, with innovative new solutions and technologies, that's no longer the case.

Today, all-terrain or utility vehicles can provide crew transport and material hauling across rugged terrain and into narrow, hard-to-access locations; helicopters are becoming more common for bringing large-scale equipment or materials, such as power poles into remote areas, and walking excavators can access and operate in difficult locations and on various terrain — including on slopes up to 50 degrees, on rocks and in mud, snow and water up to five feet deep. These innovative excavators have become an ideal solution for increasing safety and efficiency in power pole excavation and installation, right-of-way clearing, steep slope excavation and rockfall protection, especially in environmentally sensitive areas and where limited disruption is imperative. For example, the use of a walking excavator helped one utility company meet environmental compliance, while also saving 13 months on their projected scope of work.

In addition to limiting ground disturbance, consider refueling containment and incorporating sustainable construction methods. Meticulous refueling practices over catch-pans can prevent spills or leaks while using biodegradable materials will help further minimize the overall environmental impact. And whether building new power infrastructure or providing powerline reconstruction, consider using materials — such as metal — that enhance infrastructure resiliency and durability, mitigate the risk of damage and improve the overall safety and reliability of the electrical distribution system.

Using sustainable construction methods and materials, eliminating unnecessary disruptions and prioritizing land requirements — such as compliance with tribal monitors and preservation of historical sites — are critical in providing a secure energy supply while also safeguarding the well-being of the surrounding communities and ecosystem.

Put safety front and center

Understanding the variables of a job site and the surrounding environment allows for a thorough plan that outlines the scope of the work and the best way to undertake the job. It also allows for effective safety planning to ensure any risks to the health and safety of the team and others are minimized. →



Work in repairing and expanding power infrastructure will always come with risk, and in every environment, crews should be industry certified and extensively trained, including on any site-specific protocols. In environmentally sensitive locations, personnel may need additional training, such as on invasive species, ecosystem preservation, tribal or archaeological sites, or spill containment. Depending on the training required, it may be done by the utility company, a third party or local environmental organizations.

In remote and inaccessible locations, additional safety measures should also be implemented. If phone service is limited, radios and satellite phones can ensure communication is always available for crews. Having designated medical professionals, such as EMTs, onsite can provide immediate care in emergencies. Notifying local emergency personnel of crew locations and providing routes to access the region will also expedient response time. Depending on the season and area risks, additional measures and mitigation precautions should also be implemented. For example, fire suppression equipment should be carried on all machines in areas with high-risk of fires, and reduced working hours may be necessary. And during the hot summer months, extra water should be on hand and increased crew breaks should be incorporated throughout the day.

Equipment that promotes safety and increases efficiency should also be incorporated. Fall arrest systems and harnesses should always be worn by crews when around active excavation sites. Additionally, equipment such as walking excavators will further enhance project and crew safety by eliminating the need for manual digging and decreasing overall time spent within the environment. In fact, these excavators can be up to 10 times more efficient than other solutions, such as hand digging.

Manual digging, for instance, typically requires a crew of four to six groundsmen to hike to the job site and dig the holes by hand — often placing crew members into situations of being several feet underground in unstable soil conditions. Once dug, crewmembers then manually set the poles with the assistance of a helicopter. In environments with steep slopes, these jobs would also require a compressor to be brought in and moved by helicopter multiple times throughout the project, allowing the crews to utilize a jackhammer in rocky conditions. These difficult job site environments dramatically increase the risk of crew accidents and recordable safety incidents. Walking excavators help reduce this risk by requiring a fraction of the number of people onsite to complete the job. Additionally, attachments can help with digging in rocky terrain, and setting poles safely without the assistance of crewmembers or helicopters, increasing job site safety and project productivity.

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In fact, these excavators can be up to 10 times more efficient than other solutions, such as hand digging.

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While effective equipment can make or break job site success and safety, it's important to remember that not all equipment is created equal. Ensure industry partners and contractor agencies leverage equipment that meets the job at hand, performs as advertised and is industry-tested, proven and up-to-date. Each piece of equipment should meet current industry standards and specific manufacturer guidelines. Additionally, all hired contractors should have a proven history of safety protocols, including thoroughly training crew members on safe equipment use and operation. Anything less can gravely sacrifice safety.

Every morning on the job site, safety checks on all equipment should be conducted, an overview of potential hazards should be completed, and everyone should know where their teammates will be located throughout the day. Incorporating these comprehensive safety measures will create a safe and secure working environment, mitigate potential hazards and ensure prompt emergency care and response.

Engage connectivity

To continue to meet the ever-growing demand for electricity consumption, it is necessary to ensure reliable access to energy. The current infrastructure will need to be updated, new transmission systems will need to be built and an increase in work within remote and environmentally sensitive locations will need to be performed. Organizations that establish industry partnerships and collaboration at the onset of each project, equip themselves with area knowledge and guidelines and utilize innovative equipment that enhances safety and efficiency while limiting environmental impact will see the most success in reducing risk to crews, communities and area ecosystems. And in ensuring connectivity now and into the future.



ABOUT THE AUTHOR:

Stefan Glander is a Director of Steep Slope Operations at Access Limited Construction. In 2015, he became an owner of Dyer All Terrain Excavation, which now falls under Access Limited Construction since its acquisition by GeoStabilization International. With 14 years of heavy civil and steep slope experience, he has acquired extensive knowledge of limited access regions across the United States managing operations for over 750 projects.

ARE MICROGRIDS THE RESILIENT SOLUTION TO OUR POWER GRID WOES?





ELLIE GABEL

The world avidly discusses grid modernization as electric vehicles (EVs) and the renewable energy boon wash over the planet. Those technologies are advancing faster than the grid, but humans need the grid to power them. All nations will have the same issue — coming up with the time, finances and resources to update their current grid or install a new, expensive high-tech utility grid that can power these equally costly technologies.

Microgrids could solve these woes by providing solutions in an accessible format. Since microgrids are on a smaller scale, it's easier to determine energy needs and how well-connected technologies perform. But are these microgrids the answer, or will nations still need to undergo total grid modernization for a sustainable planet?

How do microgrids empower communities: The pros

Microgrids are one of the most recent solutions to help the world avoid a complete grid overhaul. They serve a community or building ecosystems, like a hospital or college campus, providing clean energy on or off the more comprehensive national or macrogrid, with a wide scale of wattages.

Many organizations believe microgrids are an ideal solution. They're easier to implement than larger grids and could save connected buildings **20%-30% in electricity costs**, as proven by microgrid tests in Australia. The possibilities are vast. →

AI integration

Microgrids become increasingly relevant when scaling alongside other budding technologies, like AI and machine learning. Compatibility with these forces increases the long-term value of microgrids, especially for researchers attempting to streamline and optimize manufacturing, implementation and engineering processes.

Studies explain the most **useful ways to incorporate AI** into a microgrid, especially during times of struggle:

- Optimization
- Load forecasting
- Stability assessment
- Defect detection
- Alerts for security challenges

Machine learning (ML) can learn enough about the usage habits of a community to execute predictive analytics, project future financial burdens, operational excellence during a disaster and energy expenditure based on supply and demand.



Installing a few microgrids at a time puts less stress on the planet as researchers discover less damaging ways to execute eco-friendly objectives.



Scalability

Raw materials are in short supply worldwide in every sector. Citizens are often blissfully unaware of how much energy they use during natural disasters, sapping resources from the grid for comfortability. Installing microgrids a little at a time will quell the daunting feeling of doing the whole grid simultaneously. Only 0.2% of the U.S. is currently on a microgrid, extending over seven states — but microgrid usage could exceed current trajectories if regulatory bodies become aware of their benefits.

Instead, smaller projects can compound over time — mainly when renewable technologies rely on environmentally intensive metals like nickel **which account for 90% of EV batteries**. Installing a few microgrids at a time puts less stress on the planet as researchers discover less damaging ways to execute eco-friendly objectives.

The most enticing scalability boon arrives when looking at price. Microgrids are inevitably cheaper than national digital transformation. Incorporating thousands of microgrids will add up, but they can hit neighborhoods little by little with smart financial planning.

Grid relief

Implementing high-octane technologies like EV chargers and massive renewable infrastructure is weighing down the antiquated grid. Taking some of these electronics off its back will allow it to perform efficiently to everything it's connected to. **Grid congestion is a growing concern** among governments and utility providers, and they struggle to find consistent, reliable solutions for curbing it. It means fewer outages caused by stress or entities abusing it by pulling unfair amounts of power.

Microgrids also provide relief in another way — emergency care access. If the macrogrid suffers from outside influences, causing outages on a large scale, emergency services could struggle to repair and restore it. While microgrids may need extra care, a different category of responders can assist with isolated microgrids. They'll find solutions faster, freeing resources for those helping the old grid and increasing the speed people can obtain access again.

Promotes regulatory change

If governments are not taking the initiative to instigate legislation concerning microgrids, the people must make them aware it's a critical concern. Many places are still unsure of what a microgrid constitutes, needing governmental bodies to define what microgrids can and can't do. Providers and users of microgrids need **formalization of responsibilities and clarity** with contracts with standardized language. Nothing is better for motivating federal action than adoption, particularly when microcommunities vocalize how microgrids improve their livelihoods.

Communities worldwide are looking to adopt a microgrid in their community, and the more that appear, the greater incentive federal governments must regulate it and find a way to optimize it for economic betterment.

Microgrids will inevitably collect data, especially with other technological compatibility. Not only will governments have to define and invest in microgrids, but they will also have to create legislation surrounding its related subject matters, like data privacy and collection. Lawmakers resist legislation around these issues because they're novel, and humanity doesn't have all the answers for what's best, ethical or within a government's control. It has to happen soon, and microgrids stoke that fire.

Environmental wellness

Another apparent benefit of microgrids is that they help parts of the world become more eco-conscious and reliant upon clean energy instead of fossil fuels. It can make a community zero-emissions and energy independent. Regarding environmentalism, it's best to implement some



changes immediately instead of waiting for a complete overhaul potentially decades later. So, why not start now?

It also promotes environmental well-being by capturing residual energy from existing power plants, whether fossil fuel-based or not and can reallocate that energy into a microgrid. Transmission lines are notorious for the amount of power they waste. For example, captured hydrogen from a natural gas plant could funnel into microgrids like energy from solar storage or reclaimed nuclear waste.

Why the drawbacks of microgrids turn heads: The cons

While microgrids have clear advantages, it's far from a perfect system. Numerous drawbacks prevent it from obtaining widespread adoption that experts attempt to respond to with research and development — but it's all still underway.

Cyberattack vulnerability

Critical infrastructure is one of the most vulnerable targets for hackers. Since IoT-connected devices and data-driven companies collect as much as possible, everything from utilities to government offices has precious and priceless data hackers want to exploit. Damaging or disrupting critical infrastructure is one of the best ways to cause a wide-scale distraction to compromise their desires.

It's crucial to note **microgrids are safer** but still accessible to hackers compared to a comprehensive grid. Segmenting and fragmenting the system will put fewer people in harm's way, but it doesn't mean they still aren't at risk. Every electronic device is susceptible to cyber-criminal whims, and utility providers and microgrids are no exception, regardless of their defensive efforts.

Lack of control

Cyberattacks could shut off critical infrastructure, but so can a bad storm. The age of the current utility grid is showing as outages and disruptions are more frequent every week. Though microgrids have increased resilience against these influences because they're smaller and sometimes independent of the national grid, they're still at risk of cyberattacks or natural disasters.

These factors that would impact microgrids the most, causing distress in related communities, are primarily outside human control. Defending against cyberattacks is one thing, but defending against erratic weather patterns is different.

Investor tensions

Numerous stakeholders give countless dollars to utility companies, making microgrids a direct challenge to their financial wealth. With most old-time investors nestled into fossil fuels, the major players that have made the utility industry successful are unlikely to transition to microgrid investments. If they did, mixed ownership could bring unnecessary politics into the sector as public-private partnerships skew priorities, especially if businesses attempt to sync everything back to the macrogrid.

The stubbornness could harm progress, especially when renewable energy needs private and federal support to keep momentum to achieve global goals. Investors are already upset about **how little say** they maintain in how entities deploy microgrids, arrays or battery storage and how that impacts their funds. These frustrations can build until they affect attempts at passing federal regulations. →



Specialized equipment

Microgrids are streamlined once implemented. However, operating them requires special software and operators. The setup is more complex than connecting a neighborhood to some solar panels. A microgrid can consist of the following:

- Other controllable energy generation, like hydrogen fuel cells
- Backup generators
- Energy storage
- Non-controllable generation, such as other weather-reliant renewables like wind power
- Coupling points to connect distribution
- Grid management hub
- Uninterruptible power supplies (UPSs)

These backend necessities are more labor-intensive than a homeowner putting some fuel in a classic generator. Ultimately, performing a boot-up of a microgrid during a disaster will require configuration to battery stores and data. **The need for green skills is rising**, meaning people will be qualified to operate and maintain these technologies in the coming years. Even if the controllers are reliable, many question if it's genuinely more straightforward than having an old-fashioned generator.

Will the pros or cons win?

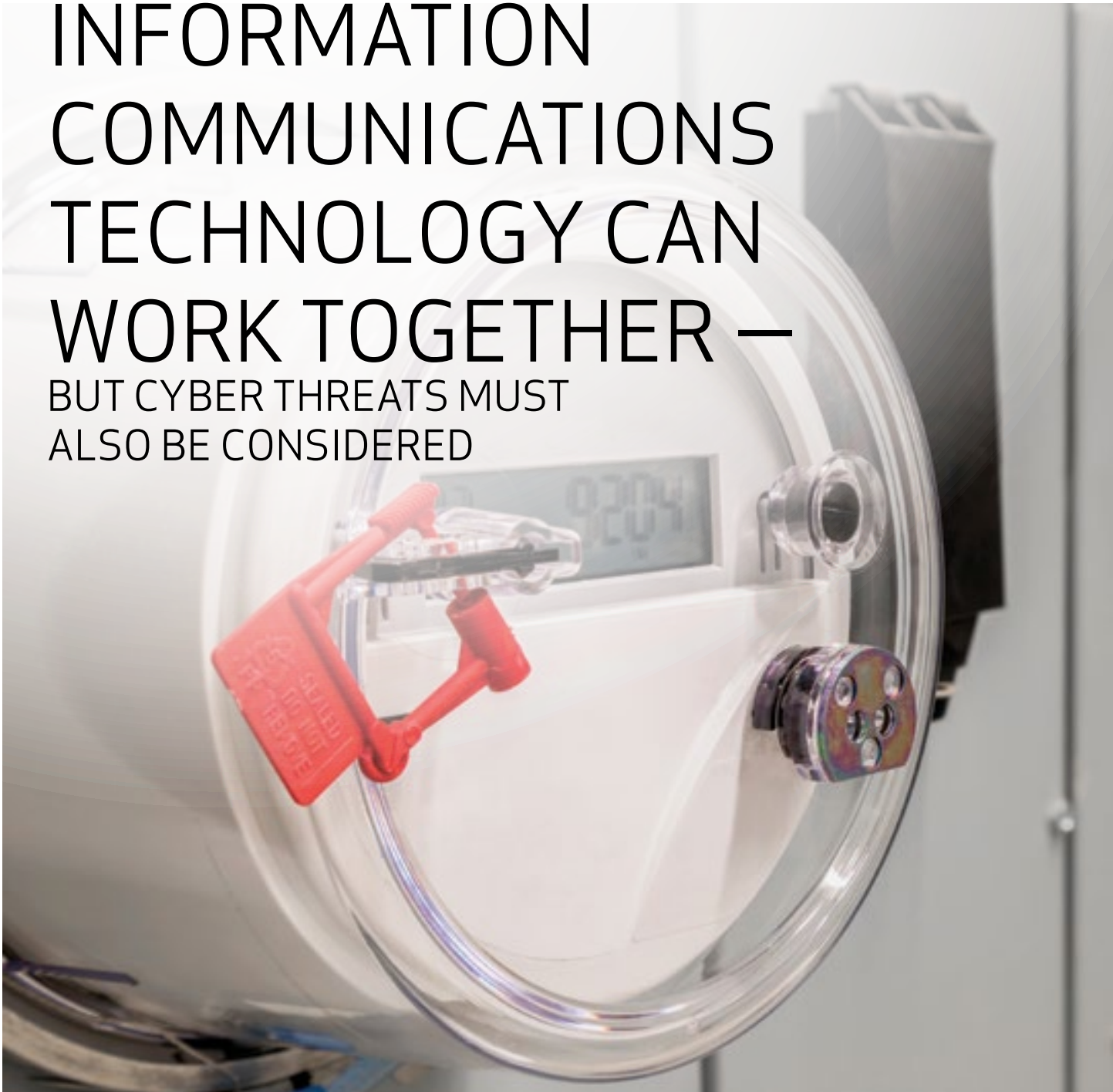
There is uncertainty about how likely people will adopt microgrids. They could solve numerous environmental issues while providing consistent, clean energy access. Communities want the energy independence and autonomy associated with microgrids, but in the back of everyone's minds lies practical sustainability concerns and the potential for cyberattacks.

When regulatory bodies and advocates combine their knowledge and motivations, they can align their goals to fit the needs of the many to incorporate more microgrids when it's helpful and other eco-conscious initiatives where it may not be the best option.

ABOUT THE AUTHOR:

Ellie Gabel is a writer based in Raleigh, NC. She primarily writes about environmental issues and innovative technology, and she works as an associate editor for Revolutionized.

SMART METERING SOLUTIONS AND INFORMATION COMMUNICATIONS TECHNOLOGY CAN WORK TOGETHER — BUT CYBER THREATS MUST ALSO BE CONSIDERED





ELISIARIO CUNHA NETO

From generative AI advancements to virtual reality headsets, technology is transforming every aspect of our lives. Utilities are no different, as digitalization enabled by cellular connectivity brings efficiency and new capabilities to the sector.

Around the world, utility providers are responding to a need for smarter ways to control energy flow. To thrive, utility companies are adapting and harnessing the power of connectivity to build more reliable, secure and flexible digital infrastructures — including smart metering.

Smart meters measure and monitor energy consumption in residential and commercial settings and use cellular networks to transmit data securely and efficiently. Unlike traditional analog meters, they provide real-time information on energy usage, so consumers and utility providers can make informed energy management decisions.

In a survey conducted by **Smart Energy GB** with almost 10,000 participants in Great Britain, 73% claimed they had done at least one energy-saving activity since getting a smart meter.

Between more accurate billing, remote meter readings, the ability to quickly identify outages and more, smart meters offer a variety of benefits and play a pivotal role in modernizing the grid — saving energy and increasing grid resiliency. But like any technology that depends on connectivity, there are also increased threat surfaces for cyberattacks, and vigilance on that front should be part of any utility considerations as they incorporate smart metering. →



Smart utilities grid harness IoT devices and smart meters to measure and monitor energy consumption, driving forward sustainability goals.

Saying goodbye to legacy technology

In the past few years, utility companies in the United States have been working to see how they can modernize their networks and bring cellular networks to smart grids, which comes with a slate of benefits for both utility operations and end customers who receive better, more reliable service.

In the process, providers realize that legacy technology doesn't provide the infrastructure to keep up with the pace of evolving their networks and connecting more devices. Today, connectivity is everything, and upgrading network infrastructure at utilities is essential to keep up with growing demands more efficiently.

Making the switch to smart meters

Smart meters can track and control energy consumption using remote contact with a metered contact point, which makes it easier to save energy and money. Smart meters and Information Communications Technology (ICT) are like a marriage. When they both work together, they bring new, advanced features and the overall system improves.

Seven key benefits of smart meters:

1. Data collection/communication: In the past, crews needed to measure counters at each home and workplace manually. But when a smart meter is connected to a network, it collects data on how much electricity, gas and water is used. Every 15 minutes of every day, the

meter collects information and transmits it more accurately and quickly than ever before. This helps eliminate human errors and other challenges, like crews not having access to meters. Ultimately, constant data collection and seamless communication reduce the cost of measuring utility usage and help the system operate more efficiently overall.

2. Remote monitoring and control: Smart meters and ICT allow utility companies to provide controlled monitoring on the smart grid. That means that through various sensors, they can collect real-time data and respond to issues quickly and efficiently, leading to lower costs, improved customer satisfaction and more precision when it comes to detecting things like peaks in consumption and failures. With remote monitoring, companies can fix problems before they cause damage or outages, allowing utility companies to operate more efficiently and proactively to provide the best service possible.

3. Demand response: Another way to make the system more efficient is by sharing information between utility providers and users — and smart meters are key to facilitating that connection. For example, suppose a consumer has a battery at home and is notified that consumption is peaking and the rate is increasing. In that case, they can opt to use power from batteries instead of from the grid, which saves them money and helps eliminate the load on the system.

4. Enhanced data analytics: Smart meters and ICT networks don't just allow for data collection; they also enable data analytics that benefit consumers and providers alike. For instance, subscribers can take data that identifies how rates fluctuate throughout the day and change their behavior to save money and energy. If you wanted to charge an electric car, you could figure out when rates are the lowest and charge it then. Likewise, utility companies connected to various nodes can determine where demand is increasing or decreasing and use that data to help them plan for future investments based on that location.

5. Grid resilience: Smart meters play a crucial role in optimizing grid efficiency by providing real-time visibility. By strategically placing bellwether meters throughout the distribution circuits, including at the endpoints, smart meters enable accurate monitoring and management of voltage levels, ensuring the grid operates at its most efficient capacity.

6. Consumer budgeting - With near real-time usage data provided by smart meters, consumers gain valuable insights into their energy consumption patterns. Armed with this information, they can proactively adjust their usage behavior to align with their budgetary constraints, avoiding any surprises when they receive their bill. As utilities are beginning to recognize the importance of empowering consumers, there is a growing movement to introduce pre-pay capability, akin to pre-pay wireless phones, allowing individuals to monitor and control their energy expenditure and ensuring they do not exceed their affordability limits.

7. Remote connect/disconnect - Smart meters revolutionize the way utilities handle move-in and move-out events. By incorporating remote connect/disconnect capabilities, smart meters eliminate the need for utility technicians to visit residences. This not only minimizes delays for customers wanting to make changes but also reduces the utility's operational costs associated with dispatching technicians, which would have otherwise resulted in expensive truck rolls. Smart meters enable seamless and efficient connectivity, improving customer experience and optimizing utility resources.

How smart meters and information communications technology work together

ICT companies design, build and deploy mission-critical networks for utility providers. ICT providers work with utility companies to ensure new smart meters, devices and sensors are connected and operating efficiently, which requires extensive testing and thoughtful design.

The goal is first to determine the best location to build a site and then to define how many devices and crews will need to be connected. It's not just about the number of devices and users — it's also about the use cases of that particular site. For example, video surveillance requires more capacity, so choosing the best spectrum to meet that need is essential. Every element of the ecosystem needs to work together, and it's vital to test the interoperability of each component before deploying.

Testing is also crucial. Various utilities need to be tested for compatibility, security and reliability on cellular networks to ensure that the networks can support an ecosystem of industry-specific use cases and devices. This testing allows key industry players to pioneer new use cases with confidence.

For a modernized grid to work, there needs to be standardized technology. Standardized technology allows an ecosystem to be implemented and evolve as technologies change over time. With more players in the ecosystem, the ecosystem evolves faster and more seamlessly, and ultimately, customers benefit.

Understanding smart grid cybersecurity risks

As important as it is to ensure the system is optimized and devices are working together, it's just as important to keep the network safe from vulnerabilities. With any new technology comes new cybersecurity threats, and smart grids are no different. And to mitigate security risks, it's essential first to understand what they are — so let's break down a few of the most pressing threats.

1. Unauthorized access: Bad actors may attempt to connect false base stations to the grid to gain unauthorized access to control systems and disrupt operations.

2. Denial-of-Service (DoS) attacks: In these attacks, hackers can overwhelm systems with excessive traffic or requests, leading to service disruptions that affect the availability and reliability of the grid.

3. Malware and ransomware: Malicious software can be deployed to infect and compromise devices within the smart grid network. Ransomware attacks can encrypt data or systems, rendering them inaccessible until a ransom is paid.

4. Communication interception: Attackers may attempt to intercept or manipulate communication within the network by installing false base stations, allowing them to gather sensitive information or send malicious commands. →



Mission-critical network solutions from ICT providers help drive efficient operations across electrical power substations.

Mitigating risks and securing the grid

Security is key for mission-critical networks, and three key pillars can help prevent attacks and protect smart power grids.

1. Authentication: LTE networks can verify a SIM's identity by challenging it for the right keys and results. That way, devices can be blocked from the network to prevent rogue SIMs from accessing the network. Application-level authentication mechanisms can also be used to ensure authentication from device to application.

2. Integrity: Checksums are used to ensure that the received message is the same as that transmitted. This mitigates man-in-the-middle attacks. Denial-of-Service attacks are addressed with algorithms that use EPC keys to track sequential LTE message counts and avoid rogue

network nodes from intercepting signaling in the network. Encrypting data with a key known only to the LTE receiver guards can protect against hackers listening to the data.

3. Advanced security management systems: This system is designed to detect and identify abnormal events and behaviors, such as false base stations and anomalous devices, thereby mitigating potential risks. By leveraging sophisticated algorithms and real-time monitoring, the security management system scrutinizes network traffic, communication patterns and device activities to promptly identify and respond to potential threats. Through its proactive approach, the system enhances the overall security posture of ICT infrastructure, safeguarding against unauthorized access, data breaches and other cybersecurity vulnerabilities.



Paving the way for a more sustainable ecosystem

The pressure to seek sustainable solutions and reduce the carbon footprints of our homes, businesses, government institutions, schools and more is only growing. At the same time, the electricity demand is expanding. Over the next two decades, **electricity demand is expected to grow at a 2% compounded annual growth rate (CAGR)**, according to IEA. So, how can utility companies work toward a sustainable future while keeping up with demands?

Switching up the energy mix and growing renewable resources is essential, but it's also important to consider how changes like smart meters can impact carbon footprints. Benefits like real-time monitoring allow businesses and individuals alike to effectively monitor their energy usage and make informed decisions about reducing energy waste and adopting more sustainable habits. And as renewable energy sources are incorporated into the grid, real-time data on energy supply and demand can be used to distribute renewable energy where it's needed.

Utility providers are faced with a delicate challenge to keep up with demand while implementing changes to reduce emissions. But there is no magic solution — instead, each element of the ecosystem adds up to work together toward a smarter, more sustainable grid.

Building a thriving ecosystem for the future

The modern world's infrastructure depends on reliable electrical power sources to power our homes, businesses, schools, hospitals and more every day. Structural changes like making the move to smart meters aren't just nice-to-haves — they're essential to ensure a more flexible, secure and reliable power grid as we head into the future.



Over the next two decades, electricity demand is expected to grow at a 2% compounded annual growth rate (CAGR)



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PAVING THE WAY FOR GRID MODERNIZATION WITH PRIVATE BROADBAND





BOBBI HARRIS

The old saying “out with the old, in with the new” has never been more appropriate for utilities in the age of grid modernization — particularly when it comes to communication. No longer can utilities rely on the siloed, narrowband wireless networks of yesterday to meet the demands of an evolving, distributed digital grid. Transitioning to private broadband can help provide the scale and efficiency utilities require to deliver new, connected services to customers and tackle aggressive goals like sustainability.

Utilities that are looking to adopt broadband communications infrastructure as part of broader grid innovation efforts may be venturing into activities and services that fall outside their core competency. As examined in the Utility Broadband Alliance (UBBA) **Utility Rural Broadband Playbook**, collaboration in sharing models and best practices for deploying modern communications infrastructure can help utilities expand broadband access and optimize its use for the benefit of all. →

Defining the digital divide

The gap between haves and have-nots when it comes to reliable, affordable home broadband access — also referred to as the “digital divide” — became apparent during the COVID-19 pandemic. While high-speed internet became essential in facilitating remote work and learning amid social distancing and stay-at-home protocols, it was estimated that **42 million Americans lacked access**.

For their part, utilities across the U.S. responded quickly to support customers and staff during the pandemic. While their services were essential, utilities typically allowed most of their employees to work remotely. The strength of the digital grid, where operators of the grid can monitor, manage and repair the grid safely and reliably, was thus demonstrated by the utilities that have some level of smart grid solutions in place.

Thanks to increased awareness of the digital divide and its impacts from the pandemic, policymakers are realizing the need to speed broadband deployment to every citizen. Utilities are increasingly seeking to be an essential part of the solution. The momentum toward rural broadband access provides an opportunity to upgrade critical infrastructure while driving needed utility investments in advanced metering infrastructure (AMI), grid modernization, clean energy applications, smart city investments and other initiatives that depend upon that infrastructure.

Investments drive accessibility

To facilitate grid advancement, utilities have made investments in both wired and wireless telecommunications networks that have overlapping as well as disparate components. These investments have often been implemented on an ad hoc basis, with a single network serving just a single application, resulting in multiple wireless networks that may be a mix of narrowband for voice, some SCADA applications and public cellular to enterprise use. Additionally, AMI networks that have been deployed in the past decade may have primarily used a mesh network with unlicensed spectrum that depends upon a separate fiber network or public cellular to connect substations.

Wired fiber networks have often been deployed where high capacity is required — such as for connecting data centers. Wireless technology is frequently the most efficient where endpoints are highly distributed — such as for AMI, distribution automation (DA) and connections to remote areas of a utility’s territory. Wireless networks typically operate on a variety of spectrum bands as well, depending on utility security needs and available spectrum options within a service territory.





While the multitude of siloed networks that utilities sometimes manage can seem bewildering, the right planning and coordination can help turn these investments into a framework for better broadband deployment. By taking a holistic view that considers utility needs for private broadband connectivity as well as the enablement of broadband deployment initiatives, utilities can create a unified network of both wired and wireless technologies with fiber and other broadband infrastructure.

A roadmap for implementation

To increase their own broadband access while also helping meet the needs of customers in unserved and underserved areas, utilities have four basic models to consider:

- **Colocation:** Colocation involves the siting of third-party telecommunications equipment on utility infrastructure. This typically involves placement of fiber or wireless equipment on utility poles or transmission structures, or in substations, but colocation can also refer to laying fiber into utility ducts, underground conduit, or rights-of-way (ROW). Since most electric utilities own poles, ducts, conduit and easements in the ROW, enabling colocation is not only a familiar exercise, but a required one.
- **Lessor of infrastructure elements:** With many utilities investing in their own networks, there are opportunities to lease elements of those networks, including dark fiber, microwave links and electric power connections. Dark fiber or microwave links

can provide an internet service provider (ISP) with the middle-mile connectivity needed for backhaul to enable retail broadband internet service. Revenue from infrastructure leases can return some or all of the investment to the utility and its customers, creating more return for the utility.

- **Wholesale providers:** Utilities can also provide wholesale broadband service over any unused fiber. Wholesale broadband service is a high bandwidth connection that ISPs use to connect their retail networks. In the analogy to the electric grid, this would be the electrical transmission service. Some electrical cooperatives provide wholesale service in addition to retail service. There are many wholesale providers in the telecommunications market, so utilities that enter this space can face stiff competition, making it a riskier investment.
- **Retail provider:** To date, most investor-owned utilities (IOUs) have indicated that they do not want to serve as an ISP but prefer to stay oriented on their core mission of providing safe, reliable utility services. Their broadband focus is rather on laying the groundwork for ISPs, making it more cost-effective for them to provide broadband to rural communities. IOUs — and their commissions — are therefore more likely to embrace models with less risk and less potential return allowing them to focus on provision of electric service. →



Each of these models carries varying degrees of risk and return for a utility and is not mutually exclusive. An IOU could, for example, focus on collocation and infrastructure leasing. An IOU can also leverage its expertise and industry knowledge to partner with ISPs, and to support electric cooperatives and municipalities that are deploying broadband, in addition to leveraging their assets. These creative partnerships can be a powerful force for broadband expansion.

How it works with ISPs

There are generally two architectures that ISPs use to connect to consumers' homes to provide broadband internet service: wired and wireless. Wired connections typically depend upon fiber optic cable to each home for the last mile as well as fiber connections to the internet. Wireless architectures (exclusive of satellite) depend upon radio wave communications to connect the home with equipment mounted on a radio tower; from there the connection to the internet is typically fiber, perhaps with a high-capacity microwave link on the way.

While the terminology for communication networks differs from that of the electric grid, there are rough parallels to the basic elements of a fiber network and the grid: the middle mile is similar to transmission infrastructure and the last mile is similar to the distribution system. Both middle-mile and last-mile infrastructure deployed by a utility can support an ISP providing home broadband connections to customers.

Wireless networks use fiber or wireless microwave connections for backhaul (the middle mile) and wireless technology for distribution into the service area (the last mile). Traffic from the radio access network (RAN) is aggregated and backhauled to the wireless network core and the head end using a fiber network or combined fiber-microwave network. Utilities with deployed AMI and DA equipment usually rely on wireless networks for the last mile to communicate with devices in the field. This architecture can also be used for private Long-Term Evolution (LTE) and 5G to serve homes and businesses.

A win-win strategy

Since utilities are making substantial investments in communication networks to support grid modernization efforts, allowing this investment to also facilitate broadband deployment helps optimize the use of that infrastructure. The results generate benefits that extend to the utility, customer and community:

- **Maximizes value of customer investment.** Allowing existing assets to be monetized to support broadband deployment brings revenue back to the company, reducing overall ratepayer costs. When future investments are designed with a secondary use for broadband in mind, incremental investments in larger fiber cables, enhanced tower capacity and minor design modifications such as strategic splice points for last-mile fiber can further increase the value of the assets as a platform for broadband deployment. Greater amounts of dark fiber and other communications infrastructure mean more opportunities for leasing and lease revenues.

- **Reduces deployment costs for ISPs.** Making network infrastructure available to ISPs reduces the ISPs' cost of deployment, saving the ISP the need to build its own infrastructure and duplicating that of the utility. The cost reduction improves the business case for broadband deployment and increases the potential for deployment to unserved areas. This dual use of the utility infrastructure increases the public benefit: customers will have the improved resiliency, reliability and other benefits of grid modernization even as they realize substantial economic, educational and social benefits of expanded broadband service into unserved areas.
- **Stretches public dollars available for broadband.** Federal, state and local governments are pouring billions of dollars into improving broadband access. Utility actions that reduce deployment costs allow public funds otherwise earmarked to defray these costs to be put toward other aspects of broadband projects, thus extending service to more consumers without increasing the investment.
- **Enhances opportunities for smart city and connected community applications.** Smart city and connected community initiatives bring together telecommunications, energy and transportation technologies. Examples include lighting controls, parking and traffic management, smart meter infrastructure, energy controls and other solutions that rely on broadband connections. Utility infrastructure used to enhance broadband supports and enables these initiatives. Healthy, safe and resilient communities provide economic and societal benefits which in turn benefit the utilities that serve them.
- **Increases availability of utility programs and services for all customers.** There is increasing interest and demand for energy equity: equal access to utility programs and services for all utility customers and fair and even distribution of the costs and benefits of those programs and services. The major concern is that though low-income consumers pay for such programs and services through charges on their electric bill, they have less opportunity to access them because of cost or rural location. Supporting broadband deployment throughout a utility's territory helps provide every customer with access to any initiative that requires connectivity, such as dynamic charging for electric vehicles, power walls and time-of-use rates.

Allowing wired and wireless assets to support broadband benefits utilities in many of the same ways it does the customers. Grid modernization initiatives can be costly, and a private utility broadband network is a critical element of almost every grid modernization application — whether the network is wired, wireless, or both. Monetizing wired and wireless assets and creating a revenue stream for the benefit of the utility and its customers helps offset the cost of grid modernization initiatives.

One priority at the forefront for many utilities is that of sustainability. Utilities have started to add renewables to the grid which frequently leverage distributed energy resources (DERs) to provide critical grid stabilization, which in turn requires efficient and effective communication with these devices to realize the full range of capabilities. Thus, by investing revenue they're generating back into their evolving grid strategy, utilities can move forward aggressively in meeting carbon reduction targets.

A clearer path forward

While every utility has its own unique obstacles and objectives, it's clear that the path toward grid modernization will require collaboration. Private broadband will help utilities maximize resources and accelerate their journey on many initiatives, which calls for coordination in information sharing, evaluating business cases and developing standards for critical infrastructure innovation. By establishing a more common framework with communications infrastructure serving as the foundation, utilities will be able to achieve dual benefits in enhancing broadband access and enabling grid modernization.

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Bobbi Harris is a utility telecommunications and smart city industry expert and the executive director of UBBA. She is a leader in market analysis, strategic intelligence and marketing strategy. In her years as a global strategic marketing professional, she has focused on utility issues, business drivers and telecom technologies to address water and energy challenges including smart cities, cleantech and green building initiatives.

AT THE CORE OF CONTROL SYSTEM DESIGN ARE STANDARDS, STANDARDS AND STANDARDS





ROBERT M. ARD

As the famous saying goes, the three most important factors in real estate sales are location, location and location. For Distributed Control Systems (DCS), used to control sophisticated processes in many industries, the equivalent can be just as easily summed up as “standards, standards and standards.”

A DCS system serves as the hub of a processor’s operations and controls and monitors key variables such as flow, applied temperatures, pressure, level and material conveying/handling. The DCS’ HMI collects all the data from the production equipment and presents it in a highly “human-factored” manner for an operator.

Still, there are infinite variables related to the type of equipment, the material being processed, the operator’s actions and the control system. The DCS must therefore be designed to handle common, expected disturbances as well as unexpected anomalies in a predictable way. →

Unfortunately, designing a DCS application from scratch is like staring at a blank sheet of paper; it can be configured in almost any way imaginable. This is a two-edged sword that can lead to a robust system that delivers precise and predictable control if done carefully, or it could lead to lost products, process interruptions and even safety issues when done poorly.

The potential for poor configuration only accentuates the need for established standards and best practices in DCS design. Many professional organizations and associations define the standards and best practices for process control systems. However, most provide only general guidelines that can be applied to any distributed control system.

But there are many other ways to achieve a level of standardization in the programming and design to create a robust DCS.

Standardization begins with a commitment to a shared design philosophy, adoption of best practices and utilization of tools and techniques that reduce programming complexity and time for similar processing equipment.

Start with a well-defined design philosophy

Every application configuration should begin with a well-defined design philosophy. Most DCS applications are created and maintained by teams of engineers, so they should all be rowing in the same direction.

The best results can only be achieved when all contributors to the overall process control application follow the same best practices and techniques.

When this is not the case, the result is unintended process errors and a system that is difficult to maintain.

Every engineer contributing to the application should strive to write their logic in the same way. The standard practices used should be well documented and taught to everyone responsible for the control system.

In fact, it would be an appropriate indication of a well-designed DCS application if control systems engineers cannot identify the specific programmer by looking at the program logic or by observing its execution.

One specific area of DCS design that illustrates the benefit of an established, shared philosophy is alarm management. In process automation, an alarm is defined as an audible and/or visible means of indicating to the operator an equipment malfunction, process deviation, or abnormal condition requiring an operator response.



Poorly designed and maintained alarm management systems can overwhelm operators with chattering and nuisance alarms under normal conditions and debilitating alarm floods when abnormal states emerge. When this occurs, it can be difficult for operators to ascertain and act on the most critical alarms, contributing to abnormal situations, lost production and even serious accidents.

Recently, organizations like ANSI (American National Standards Institute) and ISA (International Society of Automation) have released updated guidelines related to alarm management. The ANSI/ISA 18.2 Standard addresses the entire lifecycle of alarm management from design and configuration through performance monitoring, auditing and enforcement for the life of the control application.

Basically, what the ISA committee determined was that an alarm should only be used if it requires an operator's response, and that is probably the number one thing most processing plants violate. They use alarms for all kinds of notifications, alerts and reminders.

Leading process automation companies have incorporated more of a standards-based approach to application development, focusing on differentiating alarms that require immediate attention from less urgent notifications, alerts and messaging. For example, there are some DCS systems that are designed to meet or exceed the requirements outlined in the ISA-18.2, albeit with slightly different terminology. This includes limiting alarms, supporting alarm prioritization, alarms by classification and allowing dynamic alarm management.

Standardization of the HMI

To facilitate operator monitoring and control, the DCS utilizes Human Machine Interfaces (HMI) for a visual overview of process systems and to monitor critical status and control information.

The DCS interface should display real-time process information in a complete customer-oriented graphical HMI. With standardization at top-of-mind, even seemingly minor details in the design of the presentation of the information have been considered in high-performance HMI layouts. Examples include consistent alarm notification terminology and phrasing, location on the screen and color coding.

A properly designed graphical user interface improves situational awareness, reduces workload and enables the operator to view the entire process at-a-glance so they can focus on mitigating abnormal situations.

Although the best practices for any control system have pursued a standardized approach to configuring the application software, the challenge of designing a system from the ground up is admittedly a daunting task.

In the end, however, it is clear that a properly designed DCS can deliver robust and predictable control with constant monitoring of process conditions, clear and concise communications with operators and smart alarm management, as long as we keep in mind the three most important factors – it is all about standards, standards and standards.

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Robert M. Ard is director of Applications Engineering at Valmet. Ard is writing a comprehensive guide to control system design to assist processors in this endeavor, tentatively titled "How to D3." The book is expected to be published in Q4 of 2023.

FELICIA KOHNLENBERGER



BY ELISABETH MONAGHAN

Introducing (or Getting Reacquainted with) Felicia Kohnlenberger, chief human resources officer at S&C Electric Company. We asked Kohnlenberger to talk about her work at S&C and how the role of HR is changing.

A bit about me

As chief human resources officer, I am responsible for the entire HR function and our Food Services department. This covers all aspects of HR, including Payroll, Benefits, Total Rewards, Human Resources Information Systems (HRIS), our Human Resources Business Partners (HRBPs) who support our team members, our Talent Enablement group — which creates the development programs and classes that we offer — and our talent acquisition teams who are responsible for hiring.

I previously worked at a technology company, but this is my first time working in the energy sector. One of the things I really pride myself on is being able to come into a variety of different industries and apply what I've learned. I've worked in insurance, done consulting and held other roles. The first thing that I do is get up to speed on the business. Then I conduct an organizational assessment.

In my experience, I've found a lot of similarities no matter where I go. For instance, it could be that you need to have more women in leadership positions, or you need to have more people of color in positions, or you need to work on leadership development. One industry may be a little bit more ahead of the game than others, but there are very similar themes that have existed and continue to exist across industries.

Coming to S&C

I joined S&C in September 2021. I was at a time and place in my career where I wanted to work for an organization that was doing something meaningful. I got a call from a headhunter — at the time. I didn't know who S&C was, what they did, or their impact on the electrical grid.

When I came out and met S&C CEO Anders Sjoelin and the management team, I had a chance to get a sense of the company's culture. The strong safety and values-driven culture and the people I met made me feel like this was a place where I could make a difference. The leaders at S&C enjoyed coming to work and were passionate about their jobs. They wanted to take a highly successful company from where it was and propel it to become bigger and better. I felt that I could take a very active role in that.



Challenges early on

I've often found leadership development to be challenging because for a leader to be better and do better, they have to be self-aware and, in some cases, humble, vulnerable and willing to say

The changing role of HR

1. First, the pandemic brought a fundamental shift in how and where we work.

2. Second, the use of technology and the tools available have changed dramatically over the last five years. They are shifting HR from a manual Excel spreadsheet kind of space to automated systems where employees can get basic requests, like benefit changes, met via self-service. This enables HR professionals to refocus on meeting the larger needs of employees.

We need more HR people who understand the role of being an advocate for everyone, especially underrepresented people. In my opinion, HR professionals need to be able to connect with people in a very personal way, know how to leverage the resources available and realize that they don't have to be a psychologist to make a difference. Even if I can't help, I have the emotional wherewithal to listen, to be empathetic, and when appropriate, to do a proper handoff to our Employee Assistance Program (EAP) services or another HR person. I try to do this in a way that has the most positive impact on the employee's experience.

5. The last change I'll mention is around diversity, equity and inclusion (DEI). DEI has been top of mind for many years, and it's evolved. In addition to diversity, equity and inclusion, we are now talking about belonging. If you think about it, this goes hand in hand with emotional well-being. When you bring people into an organization, they want to feel a connection and a sense of psychological safety. I strongly believe that when people feel like they belong at work, they are more productive, motivated, engaged and more likely to contribute to their fullest potential. I'm optimistic that the desire for belonging within organizations will not only increase but will reshape the employee experience.

Diversity is no longer just about gender minorities, ethnic groups, or people with disabilities. It's much, much deeper than that. Companies now are looking at DEI and B (the belonging piece) very differently, and they are connecting this to emotional well-being.

Artificial intelligence and HR

I am still learning about AI and its possibilities. It's been predicted that AI will help improve the quality of hires and revolutionize the way HR functions work today by automating repetitive tasks. I look forward to seeing how different tools will allow HR to assess talent more effectively.

With the trend towards a People Sciences approach, I think we will need more HR people who understand data analytics and use that to tell a story and bring businesses along. That said, while I love having tools to assist, I'm not ready to turn over the keys to artificial intelligence, at least not now. For me, human resources is all about that human-to-human connection. I'm not convinced that people can be defined by percentages of data.

Giving back

I recently became a board member for a wonderful organization called **Holy Family Ministries**. They provide educational opportunities for children, youth and families in Chicago's under-resourced neighborhoods. The intent is to help these students excel academically, expand their life experiences and become exceptional leaders.

Earlier, I mentioned my passion for developing leaders. This organization really does that — they're starting with young people and are really helping these families and children become better citizens and better leaders — the future leaders in the world. What better place for me to become a board member and to really help them with that?

As I looked for where I could give back and continue to make an impact on this world, I was blessed enough to find an organization that fits within my personal values and allows me to help shape the minds of the potential future leaders of this organization.

I just love it. It's working with children, young adults and families together. I'm pretty excited about that.

Forecasting challenges

I think the greatest challenge is attracting the right people and retaining them. Companies are going to have to get creative. I mentioned earlier about working remotely and being flexible. This means that companies need to be open-minded. They need to understand that when seeking dynamic talent for a role, the talent does not have to be physically located in any one place. They need to cast a wide net and reinforce that with strong employer branding.

Once you can attract top talent or those with high potential, then the question is, how do you retain them? It is still an employee market, and I strongly believe that not everything is about money. Companies need to be sensitive to the employee life cycle. It's the attraction, the onboarding, the development of employees' career paths...it's all of that and even includes offboarding when the employees retire or exit an organization to join another company.

This is why you need to have talented HR people to help at each stage. In addition to technical skills, as I mentioned previously, they need to be emotionally equipped to be those advocates and make those genuine, authentic connections.

Finally, I firmly believe that we all need to master emotional intelligence. People aren't choosing to stay with the same company for 20-30 years as they did before. The employee experience, which includes the relationships at work, matters a great deal and can be the one thing to get an employee to want to stay.

Meeting those challenges

I think the industry really has to continue to focus on DEI and belonging and creating emotionally intelligent leaders. Having diverse employees with different experiences "at the table" allows for opportunities for creativity and problem-solving. Also, leaders set the tone of their organization. If they lack emotional intelligence, it could result in low employee engagement and higher turnover. Lastly, we have to rethink how we attract and develop talent. When you put employees in positions where they're on stretch assignments, they must have the support needed to grow, develop and succeed.



Sometimes you need to challenge your recruiting partners to do better if they are not giving you the talent mix you are looking for, or seek out new recruiting partners that can reach a more diverse pool of candidates. You have to look at your pipeline, sources and partnerships and get creative. You have to “court” and build a relationship with candidates. They may not be ready to join your team right away. That doesn't mean that you stop. The whole attraction piece is a dance, and it's a dance you need to do. You have to become very good at it.

The future for women in electric energy

At DISTRIBUTECH, S&C sponsors a diversity panel and are now giving out a diversity award – both have been very well received. At the conference, I've had people come up to me as I'm walking around wanting to talk about DEI – and so there is a need, a desire and a truly an opportunity for companies to do more and make a difference. So, I do believe it's just that people need a playbook, or they need to be able to sit down and have a vulnerable and uncomfortable conversation with someone and say, help me, or I don't understand X.

Why HR matters

HR can be a great resource for business leaders. Business leaders have to bring HR in and be able to take the time to explain the business and the rationale.

I always communicate that I don't want people to view me as just HR – I'm a business partner. I'm an extension of your team and your department. When people can wrap their brains around that, it makes it very easy to sit down and have a conversation with HR, even to say, “Hey, Felicia, I made a mistake. I need your help. Or I'm trying to figure something out. I don't know where to begin.”

We can work together to figure it out. But business leaders need to be willing to do the reach. I think a lot of times, people think HR has the radar on – that we automatically know where to reach, and in reality, we don't. Leaders have to be assertive enough to say, “I need help,” to get that conversation started. →

More than a seat at the table

It's not only important for HR to have a seat at the table, it's important for us to have a voice and to promote what we are passionate about. As an HR leader, there are three people that I encourage employees to seek out. I call them SAMs. First is a sponsor. This is a person in your organization who holds a position of great power and influence. Next is an advisor. This person can facilitate introductions to those that can help move your career forward. Lastly, seek out a mentor. This person can tell you the good, the bad and the ugly about yourself.

During your career, everyone should have a SAM—especially women and underrepresented employees. Having a SAM can help you successfully navigate the corporate landscape. Find them because they will help you. They'll help you navigate things when things get really, really bumpy... and they WILL get bumpy.

With those three roles in place, if you make a mistake, you're covered versus trying to figure it out yourself. I cannot overemphasize how important it is to have this support system in place. They will give you the honest feedback that nobody else will give you, and they will give it to you in a way that will help you grow and develop. They have your back. It's incredibly important.

The thing I'm most proud of in my career is that I've always stood up for what was right and for those who are underrepresented. That is my purpose in life, and I work on it every day. Throughout my life, I learned how to be more empathetic. I realized that a little kindness goes a long way. Sometimes people just need a hug, a little bit of TLC, and to be heard.

I firmly believe that we need to cultivate kindness. When you think about it, that's not easy. Cultivating kindness does not mean weakness. It doesn't mean that you just let everybody walk over you. Kindness is strength. There is something very powerful about that, and I try to emphasize that this is all related to leadership development. If people treat each other respectfully and with dignity and have a little empathy, it goes a long way.

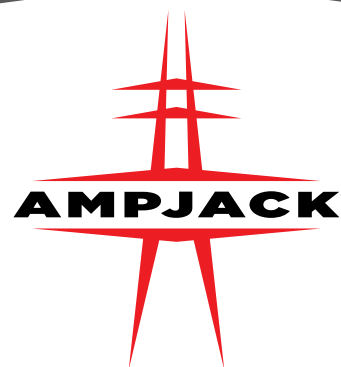
ABOUT FELICIA KOHNLENBERGER:

Felicia Kohlenberger leads S&C Electric Company's Human Resources organization. This includes total rewards, talent acquisition, talent management, diversity, equity and inclusion, employee relations, leadership development and HR operations and technology.

She has been a leader in human resources for nearly three decades, focusing on driving business results through the unique intersection of strategy, talent and culture.



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A man and a woman are seated at a desk in a server room, looking at multiple computer monitors. The man is pointing at one of the screens. The background is filled with rows of server racks. A semi-transparent white box with red text is overlaid on the top left of the image.

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