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Quarterly Issue 2, 2024 – Volume 28





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INTERPRETING GRID MODERNIZATION | Elisabeth Monaghan, Editor in Chief

I'm sure it comes as no surprise to anyone reading this, but none of those I asked at Distributech about their interpretation of grid modernization or energy transformation gave me the same answer. It all depended on what their organizations do, the role they or their companies play in the energy sector and how much progress their organizations have made in building towards a modernized grid.

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MOVING TOWARDS GRID MODERNIZATION

Matthew Carrara, Doble Engineering

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Many resources and technologies intersect to deliver the current smart city experience — all tied together by one feature: data. Whether it be traffic pattern data informing street light timing and public transportation schedules or solar arrays powering local schools, etc., optimizing the quality of life for smart city residents requires secure, accessible data collection.

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As the UK aims to reduce its fossil fuel reliance in line with the British Energy Security Strategy, tidal power could meet as much as 11% of the nation's annual electricity demand. Yet, in 2022, tidal power made up just 1.8% of the UK's energy mix. So, what is holding back the UK's tidal power potential, and how can technology play its part in increasing energy generation?

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GUEST EDITORIAL

SUSTAINABILITY REPORTING IS EMINENT: HERE'S HOW THE REAL ESTATE INDUSTRY CAN PREPARE | Andy Anderson, Tango

Local jurisdictions across the U.S. have committed to implementing Building Performance Standards (BPS). States such as California, Washington and New York have already adopted BPS. Unlike benchmarking ordinances or building codes, BPS are more tangible and far-reaching, placing a greater emphasis on achieving specific performance targets that will drive energy savings and emission reductions.

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GUEST EDITORIAL

BRIDGING THE SKILLS GAP: HOW SKILL HOW SKILLS MANAGEMENT SUPPORTS INNOVATION | Kelly Hunter, Kahuna Workforce Solutions

The energy sector's widening skills gap is impacting organizational capability and performance on a monumental scale – a problem that is only going to get worse as the industry evolves and new technologies are introduced. Skills development, therefore, plays an integral role in gaining critical insights into an organization's skills taxonomy, helping to identify existing skills and those needed for operational excellence.

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GUEST EDITORIAL

OUR OVERLOADED GRID: RELIEVING CONGESTION

Eran Inbar, Prisma Photonics

You can't open a newspaper or magazine, or listen to a podcast these days without hearing about the dire circumstances our electric power grid – grids, actually – are in. Even in regions with sufficient generation, limits on the capacity of the transmission system may make it impossible to get electricity from where it's generated to where it's needed.

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POWHERFUL FORCES

ESEN KACAR, BENTLEY SYSTEMS | Elisabeth Monaghan, Editor in Chief

In her role with Bentley Systems, Esen Kacar is a solution architect and builds tailor-made solutions for specific user needs, but regardless of her title, Kacar spends her time working closely with her customers to assess the challenges they are facing, and then, she tailors a solution for them to overcome these challenges.

PUBLISHER

Steven Desrochers
steven@electricenergyonline.com

EDITOR IN CHIEF

Elisabeth Monaghan
elisabeth@electricenergyonline.com

ART DESIGNER

Z communications
r.poitras@zcommunications.ca

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electricenergyonline.com

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NEW DATA SHOWS INVESTMENTS TO BUILD CALIFORNIA'S CLEAN ENERGY GRID OF THE FUTURE ARE PAYING OFF

May, 2024

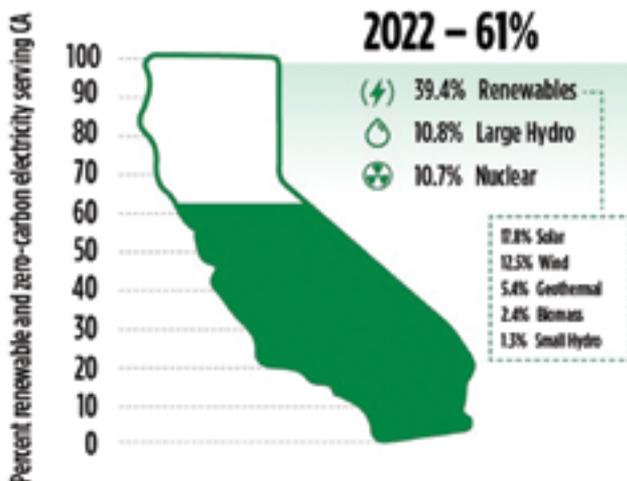
Non-fossil-fuel sources now make up 61 percent of retail electricity sales in California thanks to historic investment that has led to an extraordinary pace of development in new clean energy generation, according to the latest data compiled by the California Energy Commission (CEC). Sources eligible under the Renewables Portfolio Standard such as solar and wind make up 39 percent of the state power mix, an increase of 2 percent compared to the previous year, while large hydro and nuclear made up a combined 22 percent.

"Nearly every week, new clean energy projects are being added to the grid, moving us closer and closer to our goal of a clean, affordable and reliable energy system in California," said CEC Chair David Hochschild.

Ahead of National Infrastructure Week, the CEC and California Public Utilities Commission (CPUC) are highlighting the state's progress to build the clean energy grid of the future.

- Since 2020, new energy projects statewide have brought more than 16,000 MW of new energy resources online, mostly solar and battery storage.
- Last month, Governor Gavin Newsom celebrated the state's build-out of storage resources, which now exceeds 10,000 MW.
- To maintain progress, the CPUC has ordered 18,800 MW of new clean resources to come online by 2028.

California Progress Toward 100% Clean Electricity by 2045



"I want to congratulate the many agencies, groups and organizations whose work has led to the success of California's clean energy efforts," said CEC Vice Chair Siva Gunda. "Your tireless work is helping us march forward toward a more sustainable future."

WHY IT MATTERS: California is in the middle of the biggest transformation of its power grid in a century. The continued rise in renewables and decline in fossil fuel use comes as the state experiences an unprecedented barrage of climate impacts, from heat waves to drought and wildfires.

WHERE DOLLARS ARE GOING: One way the CEC has invested infrastructure dollars recently is to develop advancements in storage of clean energy. →

Ramping up energy storage is a key part of Governor Gavin Newsom's energy roadmap, because it helps maintain a clean and reliable power grid - storing energy from renewable sources like solar during the day to use when solar drops off in the evening hours.

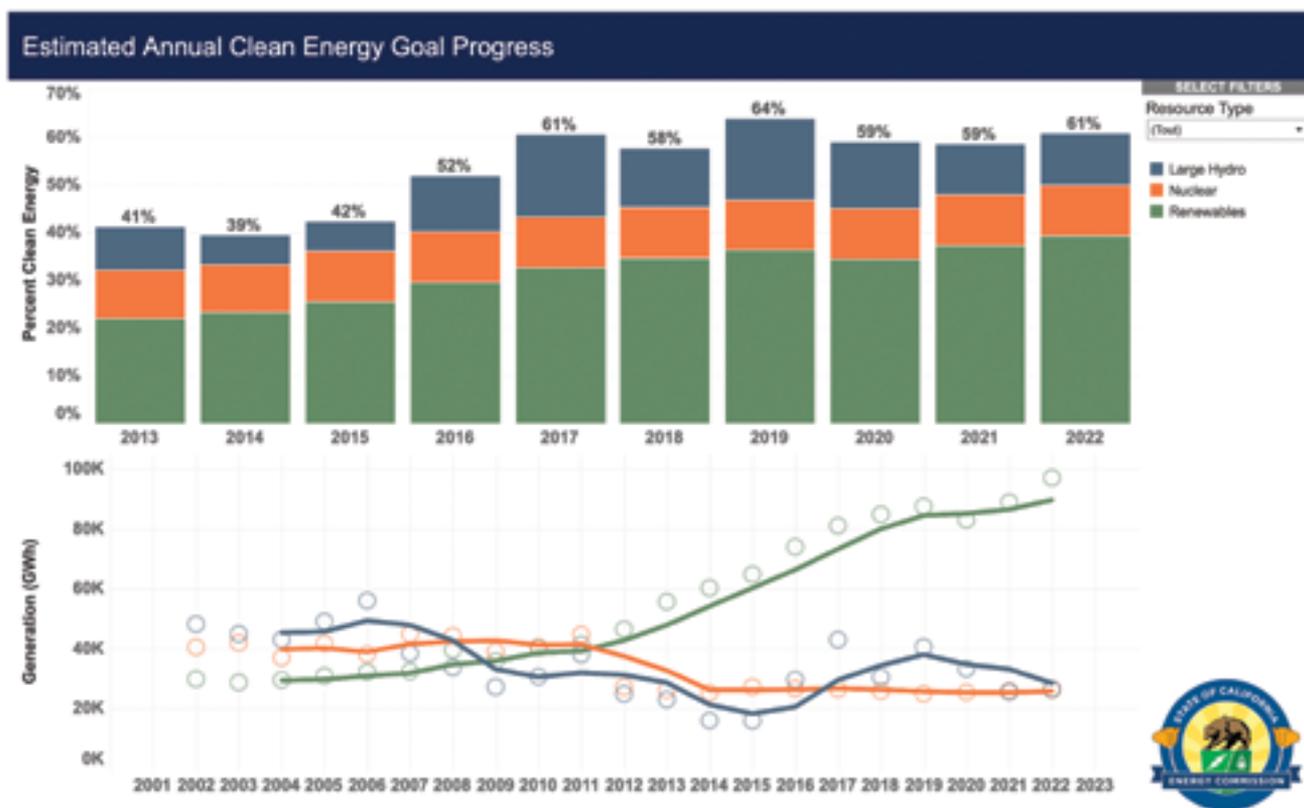
Most of the battery energy storage systems online today can discharge to the grid for four hours, however the CEC is looking to the future by investing in battery projects that discharge for longer periods. The following grants have been issued for long-duration battery storage projects around the state:

- \$30 million for a company to build a demonstration project for a 100-hour iron air battery storage system at a PG&E substation in Mendocino County.
- Tens of millions of dollars for long-duration storage projects for tribes, including the Paskenta Tribe of Nomlaki Indians in Tehema County
- and the Viejas Tribe of Kumeyaay Indians.

Thanks to state budget investments and funding from the Biden-Harris administration, California has \$41 billion at work to help build a 100 percent clean electric grid, strengthen the state's water resiliency and boost water supply, and modernize our transportation system. Visit Building California's Future to explore the many projects happening throughout the state.

RELATED RESOURCES: To help visualize the state's progress toward 100 percent clean electricity, the CEC maintains a suite of interactive tools with downloadable data on the following topics:

- Estimated Annual Clean Energy
- Estimated Annual Renewable Portfolio Standard-Certified Renewable Energy
- 2020 Renewable Portfolio Standard-Certified Renewables





MIDCONTINENT INDEPENDENT SYSTEM OPERATOR, INC

TWO MAJOR GRID OPERATORS EMBARK ON JOINT PLANNING ENDEAVOR TO ENHANCE RELIABILITY

Two Major Grid Operators Embark on Joint Planning Endeavor To Enhance Reliability

May, 2024

PJM Interconnection and the Midcontinent Independent System Operator (MISO) announced today (May 9) that the organizations will collaborate on an informational interregional transfer capability study, set to be performed during the second half of 2024.

Increasing transfer capability between regions may help to support greater grid resilience, particularly following extreme weather events and the influx of renewable generation resources with intermittent output. →

Driven by input received by each organization from the Organization of PJM States (OPSI), the Organization of MISO States (OMS) and the Midwestern Governors Association (MGA), the study will identify potential opportunities for near-term transmission enhancements along the seam shared by PJM and MISO.

“PJM looks forward to embarking on this study process with MISO as a path to increased coordination,” said Paul McGlynn, PJM Vice President - Planning. “Ensuring a reliable energy transition requires greater interdependence among regions and careful planning. Advancing this enhanced effort will benefit electricity consumers in each region.”

“MISO and PJM have a long history of working together to address operational and planning challenges in our regions,” said Aubrey Johnson, Vice President System Planning and Competitive Transmission at MISO. “As we continue to focus on our Reliability Imperative efforts, we understand the need to explore interregional planning, and with encouragement from OPSI, OMS and MGA, we will conduct a study that will address both near-term needs and create a model for future studies.”

Specifically, PJM and MISO will work together to explore opportunities to:

- Engage in joint transmission analysis and coordinated modeling
- Leverage planning processes to promote reliability and resiliency through holistic, efficient and cost-effective transmission planning for ratepayers

After the study's conclusion in early 2025, both grid operators will share their findings with the Interregional Planning Stakeholder Advisory Committee, an organization established by PJM and MISO to review coordinated system planning activities with all stakeholder groups.

HOW ARTIFICIAL INTELLIGENCE CAN TRANSFORM U.S. ENERGY INFRASTRUCTURE

May, 2024

In the face of accelerating climate change, the U.S. aims to reduce the net carbon emissions of its economy to zero by 2050. Achieving this goal will require an unprecedented deployment of clean energy technologies, and a significant transformation of the nation's energy infrastructure.

It is an exceptionally complex and daunting challenge. But it is not impossible if we harness the transformative capabilities of artificial intelligence, or AI, to help.

This is according to a groundbreaking new report issued by leading energy researchers and scientists from across America's national laboratories. The report is titled "AI for Energy." It provides a bold framework for how the U.S. Department of Energy can use AI to accelerate the nation's clean energy transformation.

"AI, with its unparalleled ability to analyze vast datasets and uncover complex patterns, coupled with the immense computational power of exascale systems such as the Frontier exascale supercomputer, is revolutionizing how we approach the nation's energy challenges,"** said Gina Tourassi, associate laboratory director for computing and computational sciences at Oak Ridge National Laboratory. **"From optimizing energy production and distribution to enhancing renewable energy sources and mitigating environmental impact, this synergy is propelling our nation forward on its mission towards a sustainable and resilient energy landscape."

The report identifies grand challenges across five areas of the U.S. energy infrastructure. These include nuclear power, the power grid, carbon management, energy storage and energy materials. Three common needs emerged across these challenges. The first is the need for quick and highly reliable computer-aided design and testing of materials and systems. The second is the need to improve scientists' ability to pinpoint uncertainties in their predictions and how systems will perform. The third is the need for AI to integrate data from multiple sources and formats.

If the U.S. can overcome these challenges, the benefits could be significant.

Approximately 100 experts from the fields of AI, machine learning and energy met at Argonne National Laboratory outside Chicago for two days in December 2023. Their goal was to map out how best to use AI to solve U.S. energy challenges. Attendees then worked together for three months to create the report.

The report was produced by Argonne and DOE's Idaho National Laboratory, National Renewable Energy Laboratory and National Energy Technology Laboratory. Additional key contributors included DOE's Brookhaven

National Laboratory, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, and Sandia National Laboratory.

"To accelerate the development and adoption of clean energy technologies, it is essential to develop AI solutions that are safe, secure, trustworthy and energy-efficient," said ORNL's Director of AI Programs Prasanna Balaprakash. "We must prioritize the creation of robust and reliable AI systems that incorporate comprehensive security measures and algorithms that are both interpretable and accountable. This timely DOE report outlines the need for developing advanced AI technologies for clean energy to ensure responsible advancement and support a sustainable energy infrastructure, facilitating equitable and accessible deployment."

UT-Battelle manages ORNL for DOE's Office of Science, the single largest supporter of basic research in the physical sciences in the United States. DOE's Office of Science is working to address some of the most pressing challenges of our time. For more information, visit energy.gov/science.



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INTERPRETING GRID MODERNIZATION



ELISABETH MONAGHAN
Editor in Chief

In February, EET&D Publisher Steven Desrochers and I attended Distributech 2024, where more than 17,000 individuals gathered at the largest transmission and distribution event in the U.S. The theme this year was “Transforming Electricity.”

Digital transformation, modernizing the grid and transforming electricity are all such broad terms for an initiative that all of our partners across the electric energy sector should have embraced, created a strategy for their approach and begun working on bringing that strategy to fruition.

When I met with exhibitors at Distributech, I asked several of them, “When you use terms like grid modernization or grid transformation, what do you mean?”

I’m sure it comes as no surprise to anyone reading this, but none of those I asked gave me the same answer. It all depended on what their organizations do, the role they or their companies play in the energy sector and how much progress their organizations have made in building towards a modernized grid.

As we began planning for our Q2 issue, we spoke with Matthew Carrara, president of Doble Engineering and ESCO Utility Solutions Group, about featuring him in our *Grid Transformation Forum* section. Given how many different responses I’d received from exhibitors at Distributech on the concept of a modernized grid, we knew Carrara was the ideal person to weigh in with his thoughts.

As you will read, Carrara defines grid modernization as “the process of updating and strengthening the existing power grid infrastructure to meet the demands of today’s digital age... For example, instead of just delivering electricity from point A to point B, a modernized grid can enable communication with various devices to optimize energy usage, detect faults before damage is done to components and integrate alternative energy sources more effectively.”

According to Carrara, Doble has been working on their grid modernization plan for more than 20 years. Since then, they have continued to build on their strategy, which Carrara explains is “dynamic and driven by a commitment to innovation.” Doble also keeps an eye on the latest technology trends and industry standards to ensure their strategy is on track.

One element that Carrara says must be incorporated into an effective modern grid strategy is collaboration. That means companies must promote a culture of collaboration and clear communication within their organization — but it’s equally important that companies collaborate with partners and stakeholders across the electric energy sector.



Acknowledging the important role collaboration plays in modernizing the grid is nothing new. Almost any time you research the term “grid modernization” on the internet, the results include words like collaboration and integration. When the Department of Energy first introduced the Grid Modernization Initiative (GMI) in 2014, they also launched the Grid Modernization Lab Consortium (GMLC). The DOE described the GMLC as a “strategic partnership between DOE and national laboratories to bring together leading experts, technologies, and resources to *collaborate* on the goal of modernizing the nation's grid.”

While many organizations are moving forward with deploying their grid modernization processes, others are behind in their efforts. With this in mind, we asked Carrara to talk about the impact delays will have on those in the energy sector who are lagging.

Carrara does not gloss over the negative consequences that these delays could have and points out some of the specific ramifications the laggards could experience. He also shares insight that is a bit more encouraging. As Carrara explains, the work done by early adopters of grid modernization may give those who are behind in their work an opportunity to learn from the innovators or early adopters and leapfrog past some of the challenges they ran into while benefiting from the lessons they learned along the way.

It has been about 10 years since the DOE launched the Grid Modernization Initiative. The different interpretations of what GMI means may continue to change, and the rate at which the industry moves to plan and deploy its grid modernization strategies may fluctuate, but for the initiative to succeed, the only way it can move is forward – with all parties understanding that to truly modernize the electric grid, they must remain current in industry trends and standards, and they also must be willing to collaborate.

How is your organization doing with its grid modernization deployment? If you have a story to share, it may benefit others in our industry, and it definitely will be interesting to learn about all the unique perspectives.

As always, if you would like to contribute an article on an interesting project, please email me:

Elisabeth@ElectricEnergyOnline.com

Elisabeth

MOVING TOWARDS GRID MODERNIZATION



For this issue's Grid Transformation Forum, we had a chance to speak with Matthew Carrara, president of Doble Engineering, about grid modernization, what it is, and what the industry is and is not doing to meet the needs for a modernized grid.

EET&D: In simple terms, can you explain the concept of grid modernization and digitalization?

Carrara: Grid modernization is the process of updating and strengthening the existing power grid infrastructure to meet the demands of today's digital age. This means integrating technologies and digital solutions that make the grid more efficient, reliable and sustainable.

For example, instead of just delivering electricity from point A to point B, a modernized grid can enable communication with various devices to optimize energy usage, detect faults before damage is done to components and integrate alternative energy sources more effectively. It's like upgrading from an old flip phone to a smartphone. It's not just about making calls anymore – it's about accessing a whole world of possibilities at your fingertips. This allows for better management of energy resources and improved reliability through real-time monitoring and control systems.

EET&D: How long has Doble had its strategy for grid modernization in place?

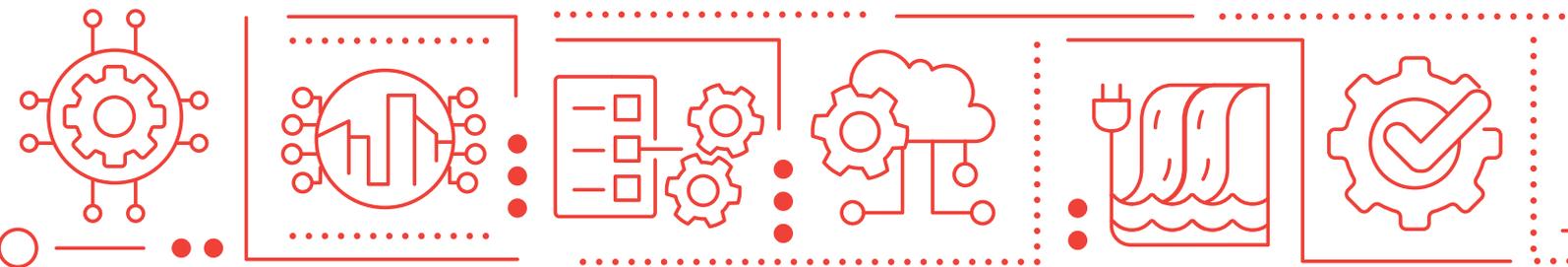
Carrara: Doble has been working on grid modernization for over twenty years. Our strategy focuses on advancing automated monitoring, diagnostic and test systems to help utilities operate smarter and more efficiently. In the late 1990s, Doble began creating products to connect utility equipment digitally and monitor it remotely. This laid the foundation for enhanced supervision of critical assets and over the years, Doble expanded its online monitoring solutions like the Insulation Defect Analyzer (IDB) which was released in 1998 and allowed utilities to monitor bushings more effectively.

We've continued to build on that foundation over the years, offering more insights into the condition of utility assets in real-time. By providing systems that assess oil conditions through DGA monitors, for example, we're able to give utilities a means of knowing their next move in maintaining the performance of transformers. Our focus is also on the digital transformation of protection and control where IEC 61850 is playing a role. Doble's grid modernization strategy is dynamic and driven by a commitment to innovation and empowering utility professionals with accurate information and the right tools for the job. →



UPDATING...





EET&D: Describe how Doble has prepared for and executed its grid modernization efforts.

Carrara: One core piece of our modernization strategy is active participation in IEEE, IEC and other industry organizations. This way, we're not only keeping a pulse on technology standards but also gaining insights regarding trends that influence the direction our products and services take to address industry needs.

We also collaborate with partners and engage the entities we serve – power and utility companies, commercial and industrial operations, colleges and universities – on many fronts. Clear communication is key here as grid modernization efforts require meticulous planning, interdepartmental coordination and input from key decision-makers to deploy new technologies, upgrade infrastructure and develop the workforce effectively.

EET&D: With more industry partners getting on board with grid modernization, what do you think is the most critical point they should consider before taking the next step?

Carrara: When strategizing for grid modernization, industry partners, or in this case utilities, must establish alignment across key areas to facilitate a smooth transition. Implementing a top-down mandate that includes specific standards is usually the first step. This ensures that the plans to modernize are led by one vision and that the utility's data strategy is supported by a framework that adheres to best practices and regulatory requirements.

Utilities must also truly understand their specific business needs and challenges in order to make the best decisions. Working closely with experts and vendors who possess a deep understanding of industry standards, challenges and equipment can be a critical step to getting utilities on track to modernization. However, it's important to remember that what works for one utility may not necessarily be suitable for another.

For example, a substation situated in the cold climate of Canada will present different requirements and challenges compared to one in the desert region of Utah.

Their digital strategies will be different, and the most advanced or digitalized solution may not always make the most business sense. Industry partners should engage in discussions with experts to identify the best solutions for the circumstances of each utility, ensuring that the money invested in digital solutions is allocated to areas where they will yield the greatest benefits. My advice is this: review the standards, align your strategy, engage with experts and have a business justification for every decision you make.

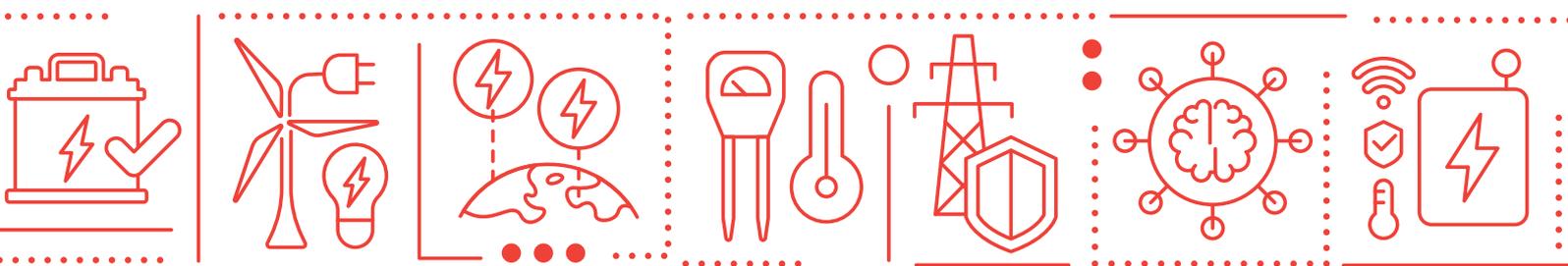
EET&D: What happens to those industry partners who are behind in their efforts to modernize their processes?

Carrara: A measured approach is a good way toward modernization. It can offer an opportunity to learn from early adopters and leapfrog past some of the struggles with ineffective technologies or strategies by benefiting from lessons learned.

However, the longer the delay in modernizing, the greater their potential negative consequences become. For instance, failing to improve efficiency offered by modern software tools could risk falling behind on NERC compliance standards, for example, that risk financial penalties organizations simply can't afford with so many challenges already straining their resources. Additionally, delayed modernization can exacerbate workforce and skillset issues down the road, further constrain budgets and complicate adapting to industry demands.

EET&D: What are the proper steps industry leaders like Doble have taken to make progress in their efforts toward digitalization and grid modernization?

Carrara: At Doble, we know the importance of collaboration and the insights we gather from analyzing market trends. We have the benefit of high exposure and reach into the industry which offers insight into what utilities and other key players are doing. Traditionally, utilities have operated in isolation, each managing their challenges independently. However, we've observed a shift towards greater openness to collaboration. As a result, we're actively engaging with utilities on a personalized level, cultivating partnerships and gaining insights into their unique needs and preferences.



We've developed systems that improve asset management, protection and control testing and online condition monitoring which allow utilities to make data-driven and informed decisions that enhance the performance of their assets while creating new analytics we can learn from. The more we continue to crowdsource, like we do with our expansive database of transformer test and diagnostic data, the smarter we can make our systems and solutions.

Another priority for us is taking steps to ensure that our products are flexible. The industry is evolving constantly, and we want our products— even our software— to interconnect with other systems as part of a larger platform and evolve along with our customers, instead of acting as piecemeal offerings that operate in data siloes.

EET&D: What are the most critical gaps in the utility space that need to be addressed?

Carrara: One of the main challenges in the utility space is the shortage of skilled workers. This gap in the workforce is causing utilities to stay even more entrenched in traditional approaches and limiting their ability to grow and adapt.

The shortage of skilled cybersecurity experts, in particular, poses an obstacle for utilities. A lack of cybersecurity expertise can not only leave systems vulnerable to cyberattacks but also creates much longer vetting and validating processes during cybersecurity review as workers are often learning on the job. Addressing these gaps requires investment in workforce development and training, but also more awareness about the need for cybersecurity experts in the utility space especially as critical infrastructure becomes a key target for cyber threats. Focusing on training and development along with attracting and retaining the next generation of workers will be vital to ensuring the industry has the right resources and tools to handle modern grid infrastructure effectively.

EET&D: What encourages you about how the industry is shifting towards a modernized grid?

Carrara: The industry's move toward a modernized grid is promising. Some key developments are trending towards more flexible systems and improved interfacing, like with APIs. Many providers are becoming more aware of utilities' needs, offering customized solutions that match industry requirements. This teamwork between vendors is making it easier for systems to work together.

The rise of online condition monitoring platforms also marks a big step forward in grid modernization. While these platforms have been around for a while, recent improvements have made them essential for utilities. Moving from offline to real-time monitoring helps utilities save money and work more efficiently. Plus, the fact that these platforms are now widely used shows they're reliable and offer real business value.

The increased focus on power programs within schools and universities and collaboration with the industry utilities is also encouraging. This teamwork is progressing computer science and power engineering skills that the industry needs, but also encourages innovation and improvements in power systems that the industry needs to keep moving forward.

As utilities in the industry continue to adapt to and team up over modernization efforts, we'll keep seeing progress toward a more resilient, efficient and sustainable energy infrastructure.

EET&D: What concerns you about the pace at which the industry is/is not embracing grid modernization?

Carrara: Progress in grid modernization is clear, but there are still concerns about how fast the industry is adopting these new technologies. Even though they bring tangible benefits, challenges like not having enough skilled workers paired with cybersecurity issues could hold initiatives back.

One concern is not having enough skilled people who know how to work with modern grid technologies. There's a high demand for these experts, but not enough of them to go around. This makes it hard for utilities to hire and keep the people they need to push their modernization plans forward. This scarcity creates barriers for the industry to come up with new ideas and keep up with changes.

Cybersecurity is another big worry for utilities as they move to more digital systems. More and more cyber threats are targeting critical infrastructure like the power grid. To keep their systems and data safe, utilities need to focus on strong cybersecurity measures that don't disrupt workers. Getting the job done while keeping cyber systems secure is crucial.

EET&D: What other comments would you like to add?

Carrara: I recently had the opportunity to open our annual Client Conference and tried to put in perspective what's really going on in its simplest terms. At the highest level, the industry is evolving as the demand for electricity is expected to grow nearly 5% nationwide over the next five years, nearly twice as much as previously estimated. So, think about this, funding is approved based on anticipated growth, utility budgets are built based on that same number and then the realization sets in that 2x more is what is really needed.

Here are the facts:

- Data center growth is being supercharged by the rise of artificial intelligence: 2.5% of current load – expected to be 3X in five years.
- Growth in Industrialization/manufacturing: 15% growth over the next five years.
- Electrification of transportation and buildings is building momentum: 10% growth over the next five years.
- Increases in the frequency and severity of extreme weather events.

Add all of that on an outdated power grid, couple that with lengthy permit processes, processing time it takes for IRA funding to trickle into the market, component shortages and labor shortages and you can now see why it's a daily struggle to adapt the grid to today's requirements.

ABOUT MATTHEW CARRARA:

Matthew Carrara is president of Doble Engineering and ESCO Utility Solutions Group (USG) and leads Doble's vision and growth strategy. He has more than 30 years of experience across the process control, measurement and materials properties analysis industries and most recently served as vice president of Process Analyzers and Instrumentation at Schneider Electric. Carrara is passionate about mentorship and driving transformational change for the future of power and utilities.

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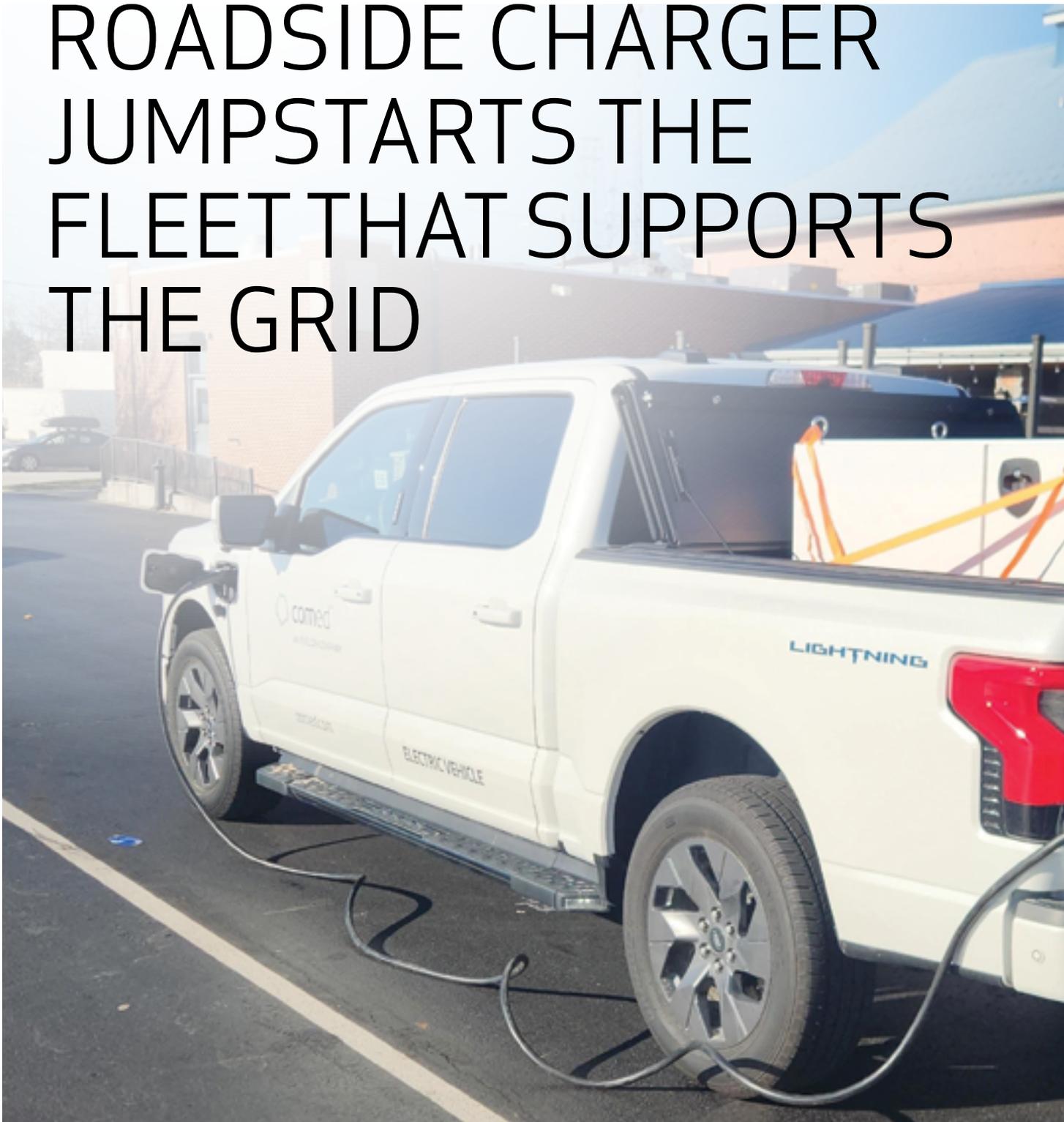
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COMED'S EMERGENCY ROADSIDE CHARGER JUMPSTARTS THE FLEET THAT SUPPORTS THE GRID



ComEd's Emergency Roadside Charger charging a ComEd fully-electric fleet vehicle.



NORMAN CURTIS

Covering 11,000 square miles in northern Illinois stretching from Lake Michigan to Iowa and from Dixon to Wisconsin, ComEd utility crews have a lot of ground to cover to ensure the grid is well maintained and operational for its 4 million customers – roughly 70% of Illinois' population.

The team charged with taking care of the most reliable grid in the country has always found innovative solutions to the challenges the utility industry faces, whether that be through proactive grid hardening, enhanced storm recovery tactics or advanced smart grid technology. As the world moves toward a more sustainable future, ComEd is leading the charge by electrifying its fleet and embracing innovative solutions to support a growing number of electric vehicles (EVs).

As the latest example of the company's commitment to reduce its environmental footprint and enhance the efficiency of its operations, ComEd's Fleet Services team has introduced an Emergency Roadside Charger (ERC) within the company. The ERC is a first-of-its-kind mobile charging system, built by Vanair, to provide emergency roadside charging for ComEd's electric fleet vehicles.

ComEd has a substantial electric fleet, with a mix of over 550 fully electric, plug-in hybrid and idle-mitigation vehicles included. As the number of ComEd electric vehicles continues to grow, the Fleet Services team saw the need to introduce an emergency roadside assistance solution for its EVs. →

Meet ComEd's emergency roadside charger

If a gas-powered vehicle in a fleet were to run out of fuel or discover it had a drained engine battery, it could be quickly revived by a colleague giving them a jump start or bringing a small tank of gas to their location. Unfortunately, neither of those solutions is the right fit for an EV, which prompted ComEd to explore innovative solutions to meet this need.

ComEd's ERC features a 10-kWh lithium-ion battery pack with a built-in EV charging station. This mobile charger can provide a ComEd fleet vehicle with approximately 30 miles of range following a one-hour charge in the field.

This roadside charging solution was designed with flexibility in mind. The ERC can be placed in the back of nearly any ComEd pickup or mechanic truck and driven out into the field to support a vehicle whose battery has been depleted.



ComEd's Emergency Roadside Charger charging an electric fleet vehicle.

When ComEd first began looking into mobile charging stations, the solutions they found were intended to be permanently mounted to a single fleet vehicle. Once ComEd took ownership of its first Emergency Roadside Charger in January 2024, the team installed forklift pockets on the bottom and lifting rings on the top so that the 270-pound ERC could be placed into a ComEd pickup or mechanic truck via forklift or crane.

The best emergency backup plans are the ones that can be executed quickly, and designing the ERC to not be anchored to a specific vehicle makes the charging technology more nimble.

ComEd is currently housing the ERC at one of its fleet garages, where it will remain fully charged until needed. Within 30 minutes or less of receiving a support call from the field, the charger can be safely loaded into any available vehicle and deployed. If ComEd had permanently mounted the ERC to a single vehicle, more coordination and time would likely have been required to have the ERC vehicle deployed to support the drained fleet vehicle.

Following the ERC pilot program, ComEd hopes to expand its ERC network to have mobile chargers placed at reporting centers throughout its service territory to support its growing EV fleet.

A (charging) port in a storm

During storm recovery efforts, keeping utility crews mobile is crucial for quick recovery and maintaining customer satisfaction. ComEd is part of three mutual assistance networks that support 30 states, often sending vehicles and crews to support restoration efforts across the country. With the number of EV fleet vehicles rising each year, being able to bring a backup charging solution to support ComEd and local EV fleet needs is an added bonus to having ERCs in a utility's solutions portfolio.



ComEd's emergency roadside charger



Having a mobile charger to support the fleet allows the ERC to be both a reactive and proactive tool to ensure the fleet remains operational.



Beyond having EV charging capabilities, the ERC has a built-in inverter designed to support other 110w crew power needs when out in the field. From charging battery-powered hand tools and electronics to powering scene lighting to help ensure work is completed safely, the ERC has a variety of use cases, and both the inverter and EV charger can be utilized at the same time.

Keeping ComEd's fleet and crews operational

Electrifying a fleet has more steps than simply purchasing an EV. ComEd has made facility upgrades across its territory and added more than 500 charging stations to support its growing EV fleet. With many of the ComEd EV fleet vehicles having ranges of at least 300 miles from a full charge in standard operating condition, a full battery should be more than enough to complete the expected workload of a given day. However, unforeseen circumstances like severe weather or time-intensive repairs can lead to battery depletion – requiring a backup plan. Having a mobile charger to support the fleet allows the ERC to be both a reactive and proactive tool to ensure the fleet remains operational.

While ComEd has never had a fully electric vehicle experience battery depletion in the field, the team feels preparing for the worst is the key to success. The ERC hasn't been needed in an emergency yet, but through the ongoing pilot, the Fleet Services team is building a better understanding of charging needs for its fleet vehicles and identifying locations throughout its service territory where ERCs can be most impactful.

ComEd expects to continue building necessary support programs to complement its increasing green fleet as the utility continues to ensure the highest levels of service for customers amid the clean energy transition.

Leading by example

ComEd recognizes that the grid will need to work in new ways to enable millions of electric vehicles that are hitting the roads and plugging in. Electric service must remain reliable and resilient for customers, and one way ComEd is achieving this is through the implementation of innovative programs like the ERC pilot program.

In 2023, ComEd announced its 2030 plan, which sets out a vision of how the company's investments in its infrastructure and customer programs can advance critical policy goals, including the goals of the landmark Climate and Equitable Jobs Act (CEJA) which aims to decarbonize Illinois' power sector by 2025.

The ComEd 2030 plan is supported by five pillars to guide ongoing work to serve customers and communities. Two of the pillars focus on economywide decarbonization powered by a carbon-free grid and enabling our customers to simply make cleaner energy choices.

ComEd expects its grid will be capable of delivering 100%, 24/7 carbon-free power in northern Illinois that will enable increasingly electrified transportation, building and industrial sectors. In support, ComEd has set a 2030 target of being able to support up to 1.8 million electric vehicles on the road in northern Illinois. ComEd hopes that its customers will continue to adopt carbon-free solutions in their daily lives, and as a company, feels it's important to walk the walk when it comes to transportation electrification.

The ComEd 2030 plan is coordinated with parent company Exelon's "Path to Clean," which in addition to setting goals to reduce operations-driven emissions across the company's businesses by 50% by 2030 and achieve net-zero operations by 2050, commits to electrifying 50% of its utility fleet vehicles through a combination of fully electric vehicles, plug-in hybrids and vehicles with build in idle-mitigation capability by 2030. Beyond reducing company emissions, Path to Clean is focused on supporting customers and communities in reaching their clean energy and emissions goals.

ABOUT THE AUTHOR:

Norman Curtis has been with ComEd for 12 years and led various teams throughout his utility career. In his current role Curtis is responsible for the day-to-day operation of ComEd Fleet Services; acting as a service provider and strategic advisor and providing oversight to all ComEd business units

Curtis most recently served as senior manager of Electric Operations, Training and Methods. In this role, he led the personnel and activities of these departments. He also ensured the development and effective implementation of training strategies that sponsor employee engagement. Before joining ComEd, Curtis worked in third-party logistics as an inventory control manager for National Freight Industries and served for eight years in the U.S. Marine Corps earning the rank of Sergeant.

FOUNDATIONAL TECHNOLOGY

FOR OUTAGE PREVENTION AND MANAGEMENT

MIRRASOUL MOUSAVI, PH.D.

Load growth, climate change and aging infrastructure are taking a toll on power grid reliability. Any one of these factors could be a challenge. Combined, these circumstances make grid visibility crucial to preventing and managing outages effectively. Utilities can get the insight they need with a solution that combines advanced analytics, intelligent line sensors, elastic computing and machine learning capabilities.

Forces to be reckoned with

Several circumstances make outages more common today than they were two decades ago. One is load growth, which can strain an aging grid.

A power sector consultancy based in Washington D.C. lays it out in a December 2023 report titled *The Era of Flat Demand is Over*.¹ During the past decade, grid planners have forecast an annual growth rate of 0.5%. However, peak demand rose to at least 0.9% in 2023, and the report notes, “This is likely to be an underestimate.” Five-year forecasts jumped from 2.6% growth in 2022 to 4.7% growth in 2023.

This is happening when aging infrastructure also demands utility attention and investment, in part because aging infrastructure contributes to outage frequency and duration. The American Society of Civil Engineers publishes an infrastructure report card every four years. In the 2021 edition², ASCE noted that some 70% of T&D lines in the U.S. “are well into the second half of their lifespans.”

“

Compared to the 2000 to 2010 timeframe, the annual average number of weather-related outages increased by 78% between 2011 and 2021.

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Aging infrastructure is an issue for Canada, too, according to research conducted by the Canadian government.³ Even though 80% of that nation’s generation capacity is non-emitting, reaching the nation’s goal of achieving net zero emissions by 2035 will require \$400 billion to replace energy infrastructure and expand generation capacity.

Meanwhile, climate change has contributed to increasingly frequent outages. Researchers at Climate Central, an independent group of scientists and communicators, collected power outage data from 2000 to 2021 that was reported to the U.S. Department of Energy by power providers.⁴ When looking specifically at major outages — events affecting at least 50,000 utility customers — 83% of those outages were attributed to weather conditions. Compared to the 2000 to 2010 timeframe, the annual average number of weather-related outages increased by 78% between 2011 and 2021.

A different study conducted by the Wall Street Journal noted that there were fewer than two dozen major outages in 2000 and more than 180 in 2020. →

¹ <https://gridstrategiesllc.com/wp-content/uploads/2023/12/National-Load-Growth-Report-2023.pdf>

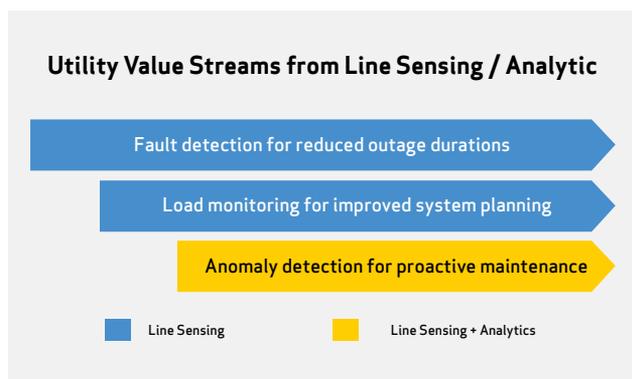
² <https://infrastructurereportcard.org/cat-item/energy-infrastructure>

³ <https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/electricity-infrastructure/powering-canada-forward-building-clean-affordable-and-reliable-electricity-system-for/25259>

⁴ <https://www.climatecentral.org/climate-matters/surging-weather-related-power-outages>



The good news is that there is a cost-effective way to predict, prevent and manage outages that will also help utilities prioritize investments and get maximum value out of existing assets through predictive maintenance. That solution, as noted before, is the combination of advanced analytics, elastic computing and intelligent line sensors. Intelligent line sensors capture system data for remote visibility from more grid locations. This data allows utilities to address reliability in three key ways. The first is detecting outages and pinpointing fault locations. The second is monitoring load for much more precise system planning. When you add in predictive analytics, utilities can perform a third key activity: detecting system anomalies for proactive maintenance that can help reduce fault occurrences.

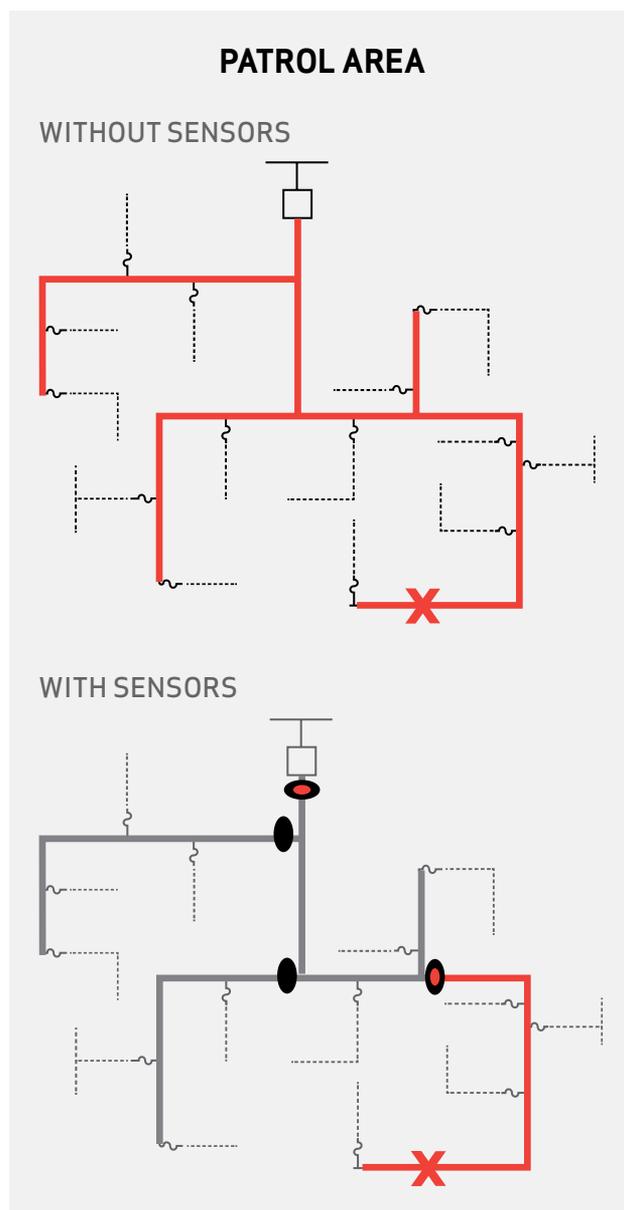


Fault detection and location

Intelligent line sensors can be installed on overhead lines, underground cables, vaults or pad-mounted switches and in underground residential transformer cabinets. A best practice is to install sensors every 3-5 circuit miles. This enables enhanced system visibility along the feeder. A similar approach also works for lateral lines.

Data supplied by the sensors enables utilities to better triangulate the section of the distribution system in which the fault occurred. Grid operators can compare line sensor data to data from other systems, including SCADA, DMS and OMS. Alternatively, system operators can directly integrate the sensor data with these same systems using software APIs. Either way, the utility achieves a more precise diagnosis of the fault attributes (e.g. magnitude and phase) and location.

That narrows down the area that line crews will need to go out and inspect. Workers have fewer line segments to visit and less windshield time to put in before locating the fault and restoring power.



Line sensors have been proven to improve outage durations, which reduces SAIDI. The improvement is largely due to reduced patrol time, with some utilities reporting upwards of 65% patrol time savings. Reducing patrol time also saves O&M costs. In one case, a large utility in the southeast achieved an 11% reduction in O&M costs by using line sensing.

Another benefit of line sensors is a reduction in customer minutes interrupted (CMI). Some utilities have seen CMI drop by as much as 20% when sensor data is integrated with advanced distribution management system (ADMS) applications like fault location, isolation and service restoration (FLISR) or distance-to-fault calculations. In the FLISR scenario, grid operators link sensors with non-communicating reclosers or feeder relays, which allows these devices to participate in the FLISR schemes.

Load monitoring for improved system planning

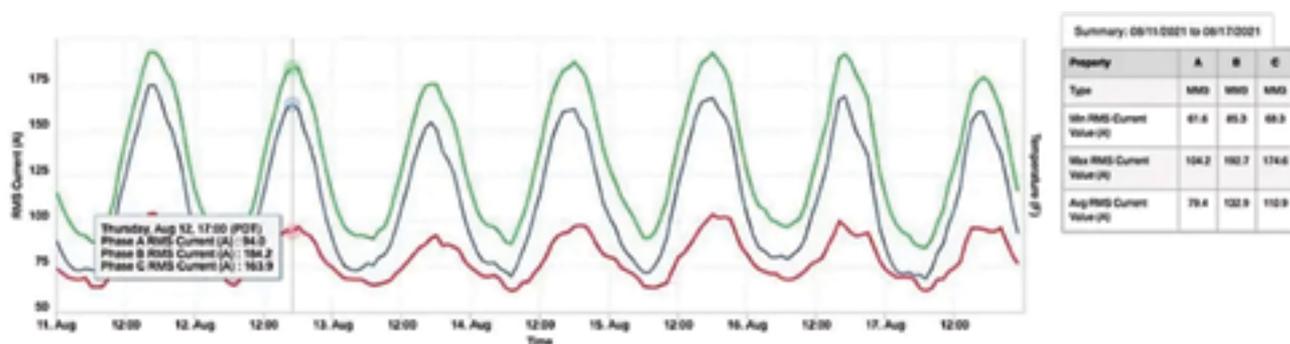
Now, integrated system planning is more important than ever before. With the increasing adoption of intermittent renewable generation, utilities need to plan for the integration of variable supply as well as system management that may need to include wind or solar firming.

EVs will impact future load curves, too. Worse, EV adoption tends to occur in neighborhood clusters. One 2023 study analyzed new EV retail registrations spanning five years in 11 markets and found substantial evidence that peer influence impacts EV purchases.⁵ This means a local transformer could see overloading if households served by it add EV charging to their power consumption around the same time. According to an article in the Financial Post, Saskatchewan's power utility SaskPower found that "a cluster of 22 homes could only handle 11 electric cars before outages would occur."⁶

Today, load data from the substation and circuit extremities are no longer sufficient. Utilities must know what's happening along feeder segments and laterals for operational decision-making and longer-term capacity planning. They need to know what's happening at transformers to support EV adoption. In the shorter term, they also need load data for switching decisions to ensure that circuits taking on new loads during an outage don't overload.

Utilities also need visibility down the line for system optimization and reconfiguration. While the three phases of a feeder may look balanced at the substation, they can become significantly unbalanced at locations down the feeder. Phase unbalance can lead to uneven loading on transformers, conductors and other distribution equipment. The phase with higher load experiences greater stress, potentially leading to equipment overheating and early asset failure, which means another potential outage source.

The graph below shows how system planners can identify a location with excessive load unbalance and initiate action to rebalance the load to gain efficiency and reliability.

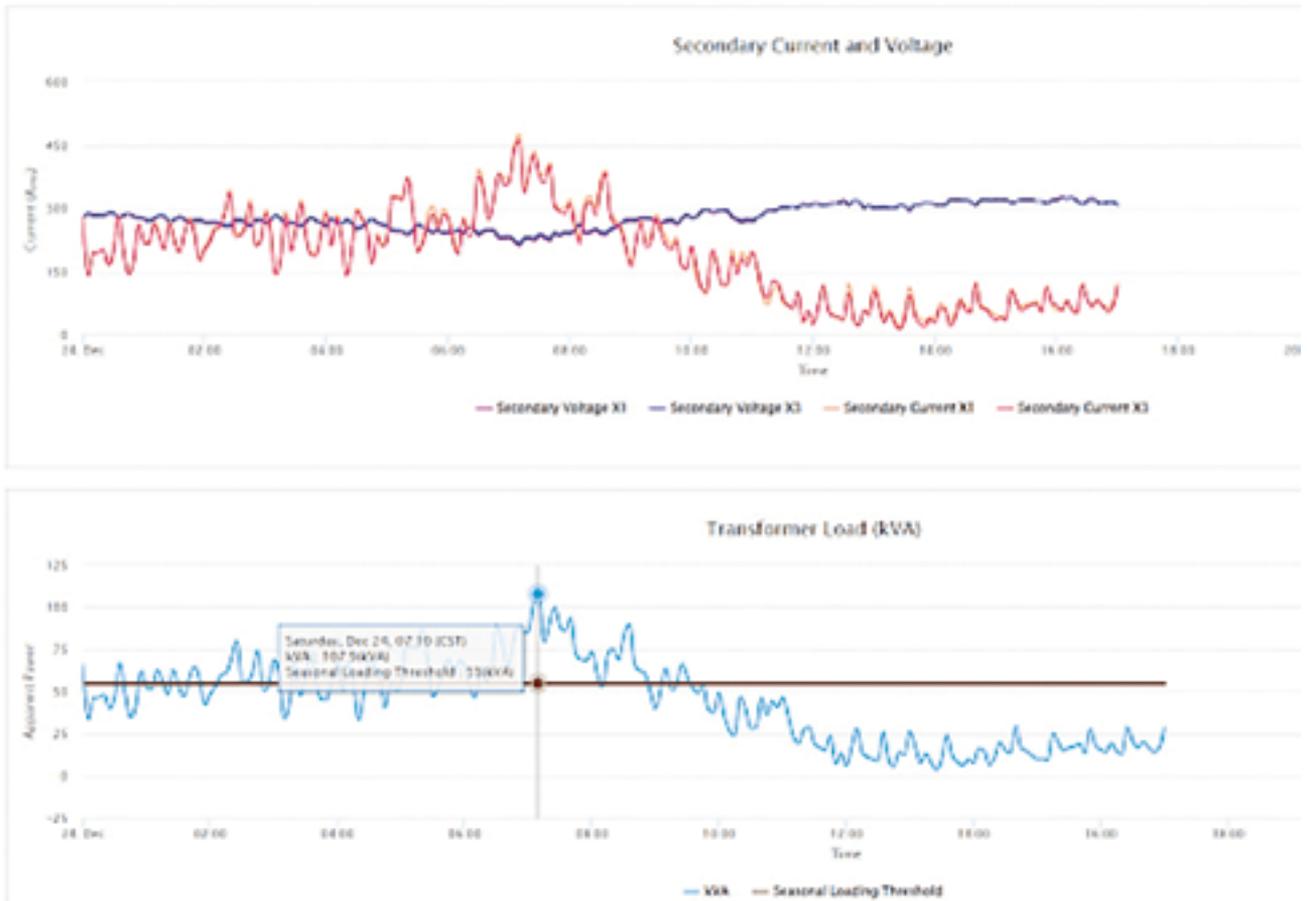


Insight into transformer loading is another benefit of intelligent line sensors. Years ago, it was a commonly accepted practice to run assets to failure. Today's supply chain constraints, reliability and resiliency expectations and lengthy wait times for critical equipment make this a risky approach.

When added to underground residential distribution transformers, line sensors detect faults on the primary side and continuously monitor transformer loading. This loading information helps utility engineers improve asset management and replace overloaded assets before they fail. →

⁵ <https://generation180.org/wp-content/uploads/YourInfluenceMatters-PeerInfluenceandEVAAdoptionOctober-2023.pdf>

⁶ <https://financialpost.com/opinion/shocking-gap-ottawa-ev-plan-lack-due-diligence#:~:text=On%20many%20Canadian%20streets%20the,cars%20before%20outages%20would%20occur.>



The graph shown is from a leading Southwestern utility and shows line sensor data indicating an overloaded transformer. This transformer was overloaded 150 times in eight months, with an average loading of 126% of its nameplate rating and a peak loading of 212% during this period. When a transformer is overloaded this severely, there's a risk of an outage or transformer fire.

Operational data from intelligent line sensors enable grid operators to quickly identify overloaded transformers and replace them proactively. That delivers potential reductions in CMI and O&M cost savings as well as diminished legal risk related to fires.

Anomaly detection for proactive maintenance

You can't predict all outages. Who would have guessed a raccoon would take out power for 40,000 people in Midtown Toronto, or a bird would drop a fish on a transformer, leaving residents in Sayreville, N.J. in the dark? Those were two of the more unusual outage sources in 2023.

Fortunately, two categories of outage causes are predictable: those caused by vegetation contact and those caused by equipment failure. This is possible because faults caused by vegetation contact and equipment failure are often preceded by subtle anomalies in high-resolution sensor data. If these anomalies are captured and properly classified, faults can be predicted and preempted.

Vegetation management is crucial to effective outage prevention. A study conducted by scholars from the College of Natural Resources at the University of Wisconsin-Stevens Point surveyed vegetation management experts at 71 U.S. and Canadian utilities in 2019 and 2020. The survey found that vegetation issues contributed to 23% of outages and 21% of lost customer minutes. An average of 21% of trees trimmed were in contact with distribution lines when vegetation management crews showed up to do their work.⁷

⁷ file:///C:/Users/betsy/Downloads/UWSP-CNUCVMSurveyReport_.pdf

In some areas, vegetation management is even more important. Eversource Energy, a power provider to more than 3 million New England-based electric customers, shared its data with researchers at the University of Connecticut. That utility reported that as much as 90% of its outages were caused by tree contact in storms with heavy wind or snow in Connecticut, where forest covers more than half the state.⁸

University researchers used Eversource data to evaluate the effectiveness of tree-trimming operations. Among the findings, the researchers correlated a high level of vegetation management led to a 37% reduction in outages during severe storms. In less severe storms, outages could be reduced by 45% to 65%, depending on the level of vegetation management performed.

Often the single largest line item of utility O&M budgets, vegetation management costs can exceed \$100 million annually for larger utilities. Given the potential impact of proactive, informed tree trimming, savings could be substantial.

Precursor anomalies also can be detected before equipment failures of insulators, cutouts, lightning arrestors, transformers, capacitor banks and other devices. If these failures are predicted, utilities can inspect feeder segments proactively for problems and make repairs before these equipment failures lead to unplanned outages.

A diversified approach is most effective for improving reliability

The complexity of today's distribution grid challenges calls for breakthrough reliability solutions that improve power delivery in multiple ways. With three sets of use cases and value streams, intelligent line sensing coupled with advanced analytics and elastic computing offers a multi-pronged and quick time-to-value approach to improving reliability now and into the future. The fault detection and load monitoring value streams provide immediate ROI to operations and system planning teams. Achieving high probability prediction of outages takes time and effort, but the potential payback in reliability improvements and customer satisfaction can be a game changer.



ABOUT THE AUTHOR:

Dr. Mirrasoul "Mir" Mousavi serves as head of advanced analytics and applications at Sentient Energy, where he leads a multi-disciplinary team of data scientists, power system engineers and software developers.

He received his Ph.D. in electrical engineering from Texas A&M University. He holds more than 14 U.S. and international patents and has published several journal articles, conference papers and book chapters. He also is a senior member of IEEE and IEEE Power and Energy Society (PES) and has contributed to a number of PES technical working groups.

⁸ <https://www.mdpi.com/2071-1050/14/2/904#B2-sustainability-14-00904>

SMART COMMUNITIES:

BUILDING EQUITABLE ENERGY RESILIENCE IN OUR CITIES

FRANK MAGNOTTI

How do you define a smart city? If you're an average urban resident, you believe it's the use of electronics, devices and systems that collect and interpret digital data to improve resource efficiency and quality of life. While most utilities and technology providers would agree, the term "smart city" has evolved, and is born out of the technological advancements a given society has available or is developing at the time. Many resources and technologies intersect to deliver the current smart city experience – all tied together by one feature: data. Whether it be traffic pattern data informing street light timing and public transportation schedules or solar arrays powering local schools, hospitals and businesses, optimizing the quality of life for smart city residents requires secure, accessible data collection.

With specific attention to our energy systems, even the smartest cities have much to gain from optimizing grid functions with clean and accessible distributed energy resources (DERs) – namely through regulation and adoption of residential solar + storage. This cannot be achieved, however, without overcoming some inherent challenges: bridging the gap between outdated infrastructure and advanced electrical technologies; implementing smart-city-supporting policy; and creating truly equitable clean energy solutions.

When the relationship between cities, utilities and citizens becomes mutually beneficial, a city – and its communities – can truly become smart.

A brief history of smart cities

As far back as ancient Rome, the throughline of each city across history that made significant contributions to our infrastructure systems can be considered a smart city blueprint. In those cases, each facet of society worked together to improve the overall quality of life. Artisans and aristocrats defied class expectations to contribute to the mutually beneficial collective, developing artworks that are universally recognized as masterpieces to this day. On an infrastructure level, ancient Romans understood that a well-designed road network was critical for the city's success: trade routes, transportation and military movement all relied on efficient, reliable roads.

Enter the first electrical systems. In a short few hundred years, cities that once lit individual street lanterns were revolutionized by the advent of electricity. Thomas Edison's own [Pearl Street Station](#), which is considered the start of the electrical age, ushered in the concept of electricity for practical commercial use in 1882. In less than 150 years, the utility framework we still rely on came into being. The advent of electricity unlocked a vast array of new economic development opportunities that propelled society forward. But today that system is showing its age. →



Back to the future

The electrical grid infrastructure we utilize today was built primarily in the 1960s and 1970s. [According to the DOE](#), 70% of transmission lines are over 25 years old and approaching the end of their typical lifecycle. Additionally, our grid system gathers and monitors data in a centralized “producer-controlled” framework. As a [DOE Office of Electricity study](#) outlines, it was designed to support one-way power flow from a small number of large, centralized generation sources to customers. As originally conceived, the power grid was able to function with minimal end-to-end communications, as usage patterns were once predictable. This is no longer the case.

Increased communications bandwidth, the transition to intelligent software and the continuous addition of electrical devices and DERs result in a more complex grid supply and demand relationship; increasing less predictable demand with less reliable supply. Electricity and data are two sides of the same coin: as electricity flows, digital information can be collected, managed and analyzed. Although data cannot flow through electrical wires, the information is critical for the grid to predict and adapt to daily usage or changes.

Data capture is an essential piece to the smart city puzzle. Indeed, smart cities today use a variety of electronic data collection methods to optimize a city's operations.

The digital divide

There is now a broad understanding of what's known as the “digital divide,” where each player in our energy system does not have equal access to (i) how data is collected and (ii) how data use impacts end users. Arguably, it's one of the major impediments to the electrical side of smart city adoption. The systems set up by the original utilities in the late 19th century had no means of accounting for the technological advancements we use today. Short of crunching numbers in spreadsheets with utility bills, cities that attempt to smarten the process will use technologies such as automatic meter readings and wireless devices to transmit usage data.

Among the data challenges we're currently facing are establishing secure communications pathways to prevent unauthorized access and/or attacks on data/systems. This also lends itself to the issue of data privacy; those whose energy is being monitored do not have full transparency about what the data purveyors are accessing. Data systems today are sophisticated beyond the means of the average individual. A truly smart city supports communities that are well informed as to where and how their data is used — and that starts with the technologies the smart city implements.

Smartening our cities with technology

There's a myriad of electrical resources and technologies available to support smart city development. Here's where clean energy systems enter the conversation: smartening a city requires an exit from harmful fossil fuel reliance and the development of renewable generation and storage that fully support grid capacity and function. Localization of these technologies is an important factor: both for the utility that can predict the grid's weaknesses and potential outages and for DERs to support critical grid functions.

DERs are among the most effective tools for not only improving grid reliance, security and resilience but also supporting reliability for communities most in need of access to resources. Working in tandem with management systems, DERs unlock a more secure, diversified power system for a smart city, enabling the city (or asset owners within the city) to mitigate power outage risk, support electrification efforts and improve the overall efficiency of energy systems. DERs are commonly implemented behind the meter; homeowners installing rooftop solar + battery storage systems or who purchase an electric vehicle reduce their own demand and dependence on the grid.

Smart cities should encourage DER adoption via residential solar + storage; this is critical for achieving city and individual goals. While a city can implement solar arrays for its own buildings and functions, delivering the benefits of clean energy can be a much more individualized effort with support for home solar + storage installations. A home solar array + battery system unlocks many benefits: backup power, energy independence and reduced utility costs — for both single- and multi-family units.

As more homes implement smart technologies, such as electric vehicles, that place excess demand on the grid, the battery system's intelligent software is another key component to managing grid resilience in front of and behind the meter. By acting as the energy management hub of the home, the battery's software makes it possible to track, analyze and manage energy consumption so that the homeowner can optimize usage to their own needs. This also allows, if the system is connected to the grid, the homeowner to discharge excess stored solar to support the utility's requirements when predictable outages or shortfalls occur.

As a behind-the-meter DER, home solar + storage must balance the need for residential energy resilience, overall grid stability and return on investment for the city or asset owner. While each side of the meter has the potential to support the grid's function, current regulations place obstacles in the way of total collaboration.



Image credit: Electriq Power

Regulation

From a regulatory perspective, a lack of overarching legislative initiatives, whether statewide or federal, leaves much to be desired — although within the last several years we’ve seen steps in the right direction. Among the biggest organized pushes has been the [Smart Cities and Communities Act](#) of 2021, a collaborative effort between the U.S. Departments of Commerce, Labor and Energy to establish programs “for the implementation and use of smart technologies and systems in communities of various sizes.” The bill has not yet moved forward in the U.S. House of Representatives but is an encouraging signal for more smart city legislation in the future.

Where is the jumping-off point for cities that want to become smarter, and in turn, create smart communities? One step is to implement policies for installing the most DERs possible. This type of policy would require collaboration both in front of and behind the meter. Individuals with solar + storage capability should be able to discharge and deliver excess stored solar to

their neighbors, facilitated through utility-managed infrastructure. However, a major pain point is third-party ownership. State legislation is required for the adoption of expanded financing options for solar systems, such as power purchase agreements or non-traditional consumer loans.

When an individual installs solar + storage, they should be incentivized to generate as much solar capacity as possible. In conjunction with the utility storing, managing and utilizing the excess solar, they are better able to help neighborhoods when grid outages occur. Currently, some states have programs that financially incentivize discharging excess solar via tax credits, such as [California’s DSGS](#) program. The ability to create networks of DERs not only supports the grid but also boosts smart community building. →



Image credit: Electric Power

Creating community

At the end of the day, each player is dependent on our energy system and resources. As citizens, it's not only our job to help smarten our cities but to foster smart communities. In an ideal world, neighborhoods could be connected via DERs – the power one home generates could power another home in the same vicinity when their lights go out. If we become able to distribute our energy resources in this way, we can also support critical applications when the grid fails, creating a more energy-resilient community. When there is an outage, hospitals, first responder stations and other critical facilities would either be able to utilize the discharged power from individual DERs or the utility can (as they already do) prioritize these applications and communicate to DER owners to use their power reserves.

There is a caveat: a well-functioning grid from which each user can receive energy, regardless of socioeconomic status, is arguably “less smart” when only certain citizens can mitigate the risk of a power outage. DERs are not always financially within reach for people in rural areas or those in multi-family urban units. When power outages occur due to extreme weather conditions, excess demand, or even an unplanned event, rural homeowners are often the last group to have power restored.

We can all come together as a part of a smart city solution when individuals and utilities mutually benefit from DERs. This is how to build truly energy-resilient smart cities.

Equity through energy resilience

Even the most innovative business models that seek to bridge the energy equity gap when developing a smart city are focused in front of the meter — where their options are limited. Taking agency over one's energy consumption behind the meter is possible via solar + storage systems, but the traditionally cost-prohibitive nature of the systems prevents homeowners most in need of affordable, reliable energy from accessing it.

One method is implementing Home Power Programs (HPPs), which enable access to solar + storage for underserved communities via power purchase agreements. In this model, a technology provider partners with a city, municipality or community organization to deliver zero-up-front-cost solar + storage systems to the area's low-to-moderate income (LMI) communities. An HPP is an opportunity for a city, municipality or community organization to navigate the intersection of local and state government policy on DER projects. If the city participates in an HPP or similar program, they can start to encourage policies that reward or incentivize the largest potential installations of solar behind the meter, to begin with. Ideally, this will help utilities understand behind-the-meter grid support potential. If solar + storage systems can discharge excess stored solar back to the grid, the effort can be organized and managed when the utility expects an outage or increased demand.

HPPs have to exist within the regulatory framework within which our cities operate. We need to examine both perspectives: how do both utilities and individuals create a long-term value proposition that supports smart cities and communities? Although the primary goal of HPPs is enabling reduced reliance on the grid, by creating networks of DERs you are in essence helping alleviate peak loads with additional capacity. Being behind the meter acts almost as a shield against regulations that negatively impact individuals. Cutting reliance on the grid enables near-complete energy independence.

A key element in the conversation is accessibility — how can a city be fully smart if not all residents have equitable access to the technologies that can improve their everyday lives? The answer is enabling HPPs for LMI communities. By removing the barriers of traditionally cost-prohibitive solar + storage, LMI communities can reap the benefits of clean, affordable and reliable energy that would otherwise be inaccessible due to financial, geographical or socioeconomic restraints.

A smart city is not just defined by its technological advancements — it's the improved quality of life for its communities. Smart cities past and present enhance the quality of life for residents not only because of technological advancement but because those advancements can benefit each member of society. Technologies supporting our current electrical infrastructure, namely residential solar + storage, when distributed widely and equitably, unlock mutual benefits for utilities, households and cities.



ABOUT THE AUTHOR:

Frank Magnotti is the CEO and member of the board of directors at Electriq Power. Magnotti has over three decades of experience leading and scaling energy and cleantech companies, specializing in innovative products, technologies and disruptive business models that make a positive impact on our world.

THE POWER OF TRUSSES:

POST-STORM RESEARCH PROVES TRUSSES ARE A LONG-TERM SOLUTION

NELSON BINGEL AND KRIS NEIGHBOR

On September 28, 2022, Category 4 Hurricane Ian made landfall in southwest Florida. Per the Saffir-Simpson Hurricane Wind Scale, a Category 4 hurricane has sustained wind speeds of 130 – 156 mph and can result in “catastrophic damage.” As one of the strongest and costliest hurricanes to ever hit Florida, an estimated 3.28 million customers lost power within the state. While tragic, the storm provided a unique opportunity to study the performance of utility poles that had been strengthened by a tough truss system developed by an Atlanta-based structural resiliency and utility asset management company. The study revealed several insights:

Trusses are a long-term, life-extension solution

Far from mere “temporary” fixes, trusses are a capital improvement that can extend a pole’s productive life by 30 or more years – near the expected lifespan of a new pole. Certain engineered trusses can restore poles to code strength or can upgrade a pole by 1, 2 or 3 equivalent classes.

Trusses play a powerful role in grid resilience

Trusses enable poles to withstand hurricane conditions without service interruption. Relative to replacement with a new pole, using a truss to upgrade a pole proves to be a faster, less costly and at least as effective a method of ensuring greater asset strength and resilience.

Trusses are an essential grid asset prioritization tool

Too often, utilities grapple with budgetary decisions regarding the allocation of funds between expanding

their grid and maintaining or improving their existing assets. Rather than force a choice between adding structures to the grid or replacing old structures with new ones, trusses provide a strong alternative. Using trusses to return poles to necessary strength frees up money for other priorities.

Measuring the role of trusses in grid resilience

The increasing frequency and severity of extreme weather events has elevated resilience to a major concern for the operators of electrical and telecommunications grids. Resiliency performance is characterized by two primary factors:

1. How well a system performs in a major storm and minimizes service outages
2. How quickly service is restored following any outages

Structural resiliency is one aspect of overall grid resiliency that, when addressed efficiently and effectively, can improve resiliency, reliability and safety – ensuring performance, mitigating downtime and reducing restoration costs. Trussing is a common approach to restoring, upgrading and hardening grid structures. A truss is a steel-constructed, structural addition designed to increase the strength and bending capacity of wood utility poles. Some trusses extend along decayed or damaged sections of the pole and transfer loads to areas of the pole that are structurally sound. Other trussing systems work in conjunction with sound wood poles to create a combined bending capacity greater than the original pole class rating. →



Image credit: Osmose Utility Services

Steel trussing systems have a long history of proven performance beginning in the mid-1960s. In the early years of use, trusses were perceived by utility companies as temporary solutions that may only extend the useful life of a pole for five to ten years. However, poles restored with trusses during this time can still be found in service today. Truss solutions have advanced significantly over the years, providing reliable decades-long life extension, and introducing additional design options that enhance bending capacity.

Measuring the long-term performance and resiliency of infrastructure assets like wood utility poles, and the equipment they support can be especially difficult. Among the factors complicating the performance measurement of grid assets is the unpredictability of climate-related stressors like extreme weather events and other natural crises. Beyond analyzing historical data, demonstrating the effectiveness of trusses in ensuring sufficient pole strength and resilience would require an assessment of pole performance following a major weather event. The Atlanta-based structural resiliency and utility management company had the opportunity to conduct such an assessment on 288 trussed poles in the aftermath of Hurricane Ian.

Storm-proven performance

Background

Extreme weather events along the Gulf and Atlantic coasts can result in forces that exceed the original capacity of installed utility poles. As such, increasing the strength of existing poles or installing new, higher-strength class poles may be necessary for improving resiliency. The truss upgrade systems increase the bending capacity of existing wood poles and provide an upgrade to the pole of one or more classes along the length of the truss.

The truss upgrade system consists of specially formed high-strength steel sections with a tapered “C” profile mated to the wood pole. High-strength steel banding is installed at specific locations of the top truss to keep the pole and truss engaged together. The strength and stiffness of both the wood and steel act together to provide an improved rated bending strength in the trussed portion of the pole.

In the years prior to Hurricane Ian, hundreds of upgrade systems were installed on poles along Florida’s Gulf Coast which would later be within 32 miles of landfall of Ian’s cone of influence for exposure to the highest wind speeds of the storm. Prior to the event, most of the truss upgraded poles visited for this field evaluation had already been in service for at least one typical inspection and treatment cycle of eight years.



Image credit: Osmose Utility Services

To obtain real-world results of 288 truss upgrade reinforced poles following that major hurricane, the Atlanta-based structural resiliency and utility asset management company independently performed a post-storm field evaluation to determine the pole status, the survival rate, and whether the trussing system improved the resiliency of the poles.

Results and conclusions

Of the 288 truss upgrade poles, 283 had sufficient resiliency to survive Hurricane Ian. While there was a lack of conclusive evidence to definitively conclude failure, five of the upgraded poles in this study were replaced at some point following Ian.

The forensic physical evidence revealed poles with a truss upgrade system had less movement through the soil at groundline when compared to similar, unreinforced poles. This reduced movement directly correlates to reduced structure lean. The improved bearing area that the truss below ground provides can reduce structure lean after a wind event and is an additional resiliency benefit that an installed truss upgrade system provides.

Investigation and field observations

Extensive research and analyses were first conducted with available weather data and generated Hurricane Ian wind speed maps (cone of influence); and review of historical pole data. Maps were created of truss upgrade pole locations, site visits were performed post-hurricane, and existing conditions were photographed and documented. The forensic physical evidence was analyzed, and aerial and/or street level imagery for various pole locations was researched and analyzed as well. The National Hurricane Center (NHC) Tropical Cyclone Report of April 3, 2023, for Hurricane Ian was researched and reviewed.

The site visits occurred from March 20 to 24, 2023, in or generally near Port Charlotte, Florida, and included 288 truss upgrade poles. For the purposes of this study, each pole is identified by a unique, audit ID number. It should be noted that the pole owner is proactive at pole change-outs and system hardening regardless of pole serviceability. A replaced pole is not conclusive evidence of a prior pole failure.

A typical pole site visit for this study included but was not limited to, documentation of the following: GPS coordinates at the pole, a minimum of two photographs, documentation of the current pole condition and status, and information on replacement pole material (i.e. if replaced or double wood).

During the evaluation, each of the truss upgrade poles was classified into one of the following groups: resilient poles and event-impacted poles.

Resilient poles (Qty. 283)

Locations where the truss upgrade pole was deemed “resilient” and survived the event if the following conditions were true:

- The pole was still present and standing on the visit date.
- The pole did not have a replacement pole installed as a direct result of Ian-related forces. For instance, if the trussed pole was double wood and the new pole was installed before Ian.

Potential event-impacted poles (Qty. 5)

Locations in which the truss upgrade pole had potentially been replaced because of the event were deemed “suspect” if the following conditions were met or could not be ruled out:

- A replacement pole was installed during the timeframe having the potential to be event-related, such as immediately following Ian.
- Replacement poles with 2022 manufacturing dates received increased analysis to determine the installation date range and whether there was a potential correlation with the event.

An additional trussing benefit

Leaning poles can pose a threat to service continuity as well as to public safety. A leaning or fallen pole might lead to power outages and can present electrocution hazards. In reviewing post-Ian pole data, the study highlighted an additional trussing benefit. Of the proven resilient poles, one particular truss upgrade pole and its adjacent un-trussed poles illustrated how trusses can reduce pole leaning.

This pole was a 40 ft Class 5 pole prior to reinforcement in 2012. The forensic physical evidence revealed this truss upgrade pole survived loading sufficiently to cause a slight structure lean measured by approximately two inches of displacement at groundline. The two adjacent unreinforced, 40 ft Class 5 pre-Ian poles had greater lean, with approximately 3.5 inches and approximately 4.5 inches of displacement at groundline respectively, in comparison to the truss upgraded pole. These observations infer a distinguishable benefit of improved foundation capacity provided by the truss upgrade pole installation. →



Image credit: Osmose Utility Services

Final summary

A key part of resiliency for a grid system is ensuring its supporting structures are up to the task. Just as a chain is limited by its weakest link, so too are improvements from the latest smart grid technologies if numerous circuits are on the ground from pole failures. Such scenarios become obvious following a major event, but unfortunately, the supporting structures that hold up the grid are often overlooked or ignored until that scenario becomes reality.

Fortunately, as demonstrated in the preceding case study, effective solutions exist which can improve the structural resiliency of in-service wood poles. The improved resiliency provided by the Atlanta-based structural resiliency and utility asset management company truss solutions demonstrate improved performance and reduced damage, enabling poles to remain in service or return to service more rapidly than if replacement was required.

Furthermore, given the expediency of a professional tough truss installation, especially compared with pole replacements, a pole owner can more rapidly reduce risk, address safety and improve their structural resiliency.



ABOUT THE AUTHORS:

Nelson Bingel has more than 30 years of industry experience focused on structural aspects of overhead lines. He received a BSME degree from Purdue University and has worked on research and development of improved structure inspection processes and restoration systems along with software for field strength and loading evaluation. Bingel was chairman of the Strength and Loading Subcommittee of the NESC for two code cycles and was chairman of the full NESC Committee from 2016 to 2023, and he will be the past chairman until 2028. Bingel is also vice chairman of the Accredited Standards Committee O5, which develops standards for new wood poles and crossarms. He retired after 30 years from Osmose Utilities Services, Inc.



Kris Neighbor holds a BS in civil engineering from the Georgia Institute of Technology, an AS in physics from Gordon College, is a licensed Professional Engineer (LA), and has an AWS D1.1 Structural Welding Certification. He is a member of ASCE, SEI, AWS, AISC, ICRI, IEEE and AMPP. He also is the inventor of the NeighborPlate utility pole restoration system (Patent Nos. 9,611,666, 10,081,963, and 10,526,809), temporary support structures for towers, (Patent No. 10,385,534) and has patents currently pending for other industry innovations

THE ROLE OF PROGRAM MANAGERS IN UTILITIES

DUNCAN KERR

The role of a program manager in utilities has complexities worth exploring as part of a role clarification or “swim-lane” discussion.

At a very high level, the objective of the program manager is simple. Utilities hire program managers to improve the likelihood that their various programs will be delivered as intended. That has parallels with another business endeavor, which is building construction.

In the construction business, some architects design buildings, construction and project managers who guide the construction process and all the various trades who perform the construction.

The primary role of the architect is to design the building to meet the needs of the client funding the project. Therefore, the architect’s main focus is on the end product. If architects could snap their fingers and make their buildings magically appear, most would be happy to just skip over the messiness of the construction process.

On the other hand, the role of the construction manager is to guide the construction process to achieve the architect’s vision. Unlike the architect, the construction manager can’t avoid the messiness of the construction process.

In utilities, asset management teams are like the architects. Asset Management’s role is to develop and secure funding for programs that support the utilities’ goals. Portfolio management groups and the various program managers are like construction managers in the building industry, their role is to guide the process of delivering the programs and projects to achieve their individual and collective objectives.

This simple analogy is useful because it clarifies some of what the different roles should be expected to do as well as things that are outside their swim lanes. →





For instance, if a construction manager does not like the look of a building, that does not mean they are entitled to change it. The role of the construction manager is to respect the architect's vision and build the building efficiently, even if they think it's hideous.

However, that does not mean that architects hold all the decision-making rights. The construction manager and the building trades have obligations to respect regulations and building codes and may be constrained by budgets and schedules. Therefore, architects don't get to do whatever they want.

The answer is that collaboration between architects and construction managers is essential. However, it is helped by understanding how to work through situations where something has to give.

Shared resources – a critical distinction

When program and project manager's roles are being discussed, a critical difference is that the role changes when the PM has authority over the deployment of resources, or not.

One option for program or project management is to set up the project as a "standalone" undertaking, assign a person to the role of PM and provide them with the

authority over the resources needed to complete the project. Under this model, the PM has the authority to bring on the resources they need to complete the different phases of the project and they can let resources go when they are no longer needed. Under this operating model:

- The PM can be held accountable for delivering the project.
- The PM monitors progress and moves resources around as needed to complete the project.
- The PM is the single point of accountability for decisions on the project.

Standalone projects or programs are not the norm in utilities. In utilities, it is more common to see projects and programs sharing the various resources needed to complete the work such as engineering, design and field execution crews. Under this model, program managers are expected to monitor and guide the program towards the program goals, but the PM does not have the authority to direct resources to work on their projects or programs and not work on other programs. Under this model:

- The PM cannot be held individually accountable for delivering the work because they do not have the authority to deploy resources as they see fit.

- The PM monitors progress and is the primary point of contact for information on the status of the program or project, but they are not the single point of accountability for all decisions affecting the work.
 - A PM should know if they have lost resources on their program to higher priority work, and should be able to report that fact, but may not be able to change it.
- The PM guides the advancement of the program or project work. In some cases, that means they make decisions, but in other cases, they are limited to making recommendations that others are accountable to accept or reject.

Something has to give

A requirement that shapes the role of the program manager, is that they must bridge the gap between strategic goals and the reality on the ground.

A good example is the cheap, fast, quality triangle. The idea is that somebody may want all three (cheap, fast, quality) but they won't get all three. There is an inevitable trade-off when there is pressure on one side of the triangle.

The implication for program (and project) managers is that they should always know where to adjust when situations come up where something has to give.

- Running out of budget - Change scope, quality or speed?
- Under time pressure - Spend more money or compromise quality?

Good, Fast or Cheap: Pick Two



The alternative to dealing with this issue pragmatically is just hoping everything works out. Unfortunately, hope is not a leadership strategy. As the well-known quote says, “No plan survives contact with the enemy.” In business, the “enemy” is the reality on the ground and the curveballs the business environment throws at the operations.

Some companies put project and program plans together, roll them up into an annual business plan and hope it all works out, and if they are lucky, it might work (sometimes).

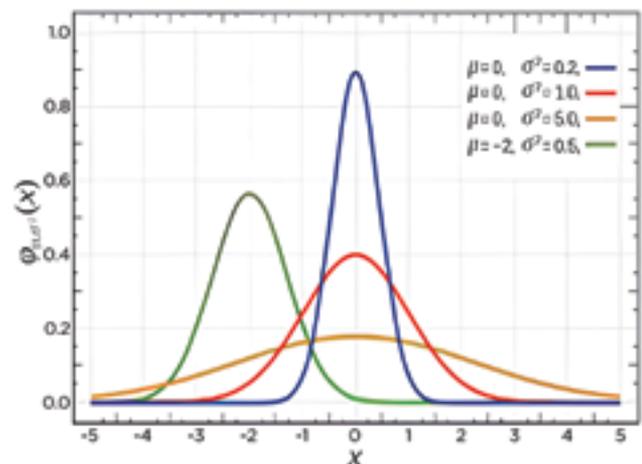
The more realistic and pragmatic approach is to acknowledge that even the best plans won't completely survive contact with the reality on the ground, and when adjustments are required, the role of the program manager is to know what should give and provide the best guidance. A PM should know how to adapt to the circumstances and come as close as possible to delivering the important elements of the program they are responsible for.

All estimates are wrong, it's just a matter of degree

Estimates are approximate calculations or judgments of the value, number, quantity or extent of something.

At the same time, the time to complete tasks that are done multiple times will be plotted on a distribution curve of some shape. Also, different types of tasks or jobs have different distribution curves. Some jobs have very tight distributions around the mean, (blue curve) and a good estimate of the average can be used to plan and schedule work without much difficulty.

On the other hand, work that has a wide distribution (beige curve) means that an estimate of the average could be significantly different from reality on any given day. That does not mean the average is wrong, or the estimate is poor. →





The critical thing for anyone involved in planning and scheduling processes is to understand what estimates and averages represent, when to use them, and when to not use them.

- A provincial average estimated time to complete a job may be very close to the actual over several repetitions, so it may be ideal to use for annual investment planning.
 - However, that does not mean that an individual occurrence of the job will be close to the average.
- If the time it takes to complete one job is bang on the average, it's a fluke and nothing more.
 - Throw enough darts at a target blindfolded and one is sure to hit the bullseye.
- An estimate (or previous average) is not a target. Estimates are a valuable point of comparison, but to maintain an average, 50% of all repetitions of a job must come in below average to make up for the ones on the "harder" side of the curve. Therefore, the average should not be the target.
- Good tactical planners and schedulers make adjustments to the estimated "average" situation to optimize plans and schedules. They don't blindly schedule using the average.
 - Some jobs will be quicker than average (e.g., work is bundled with other work, and the device being worked on is already open and prepared).
 - Some jobs will be longer than average (e.g., travel time is demonstrably longer than the average allowance, access is a nightmare, etc.).

Unconstrained vs. constrained perspective

In capital-intensive industries, one of Asset Management's responsibilities is advising the leadership of the company on maintenance strategies designed to optimize the life cycle costs and reduce the operating risk profile of the company's assets.

That means that asset management teams should have a perspective on the best maintenance strategies for different assets given the way the company uses and maintains its assets (the duty cycle) and the current age and condition of the assets.

Going into a strategic planning cycle, it is Asset Management's responsibility to evaluate what the "right" level of maintenance is to achieve the company's business goals.

This should lead the asset management team to develop an unconstrained perspective of the best maintenance activities to do so that they can advocate for the ideal level of funding to optimize values for the company and stakeholders.

However, what Asset Management wants to do and what they can do are not always the same thing. Asset management teams routinely discover that mundane considerations such as budget and resource constraints get in the way of doing all the asset maintenance work they would like to do.

This gives rise to the idea that when the plan that's ultimately implemented is constrained, Asset Management's role is to make risk-based decisions on how to scale back plans to do the best they can under the constraints they have been given.

The complication for program managers is that asking, "What are we going to do in the next few years," (while a legitimate question) does not have a simple answer.

- Asset Management can provide an unconstrained view of what they believe the company *should* do.
- Asset Management could provide a perspective of what they think the constraints will be and what the company will do (but they don't make that decision).

The complication is that no view of future years is "right" or "wrong," or empirically provable.

Both the unconstrained and constrained views of future program work are opinions. They are not facts. It is the planning equivalent of driving into the fog.

The implication for program managers and asset management teams is that they need to embrace this reality and design planning processes that allow them to move forward making the best plans possible while understanding that the view is imperfect, and things can change.

Dealing with uncertainty and inevitable variability

The conclusion is that planning processes need to be designed to deal with all the unknowns that could affect plans and the inevitable variability in how things unfold in the real world.

Planning is also made more complicated in situations where the programs and projects are sharing resources. Planning and project management are always easier when the PM can bring on resources when needed and release them when they are not. However, utilities tend to have workforces that come to work every day whether a project needs them or not, and the company wants to fully utilize its resources to minimize operating and maintenance costs. That leads to the desire for workforce flexibility, for crews to move from job to job without being tied down to one project or program.

While perfectly logical and very achievable, sharing resources adds another dimension of variability for PMs to deal with. It means that the plans for one program or project are not only subject to the variability within that project but they are also impacted by the variability in all the other work going on around them.

Thriving in this kind of environment requires flexibility which comes with implications.

Even good plans that are fundamentally sound should not be considered 100% locked in. Locking in a plan is like building a dock and hoping the water level won't change. It may appear to work for a while, but it won't in the long run.

Just like building a dock, good program managers should know how where the flexibility is in their program. They should know (in advance) how they should flex to deal with the inevitable inaccuracies in estimates and inevitable variables in work execution.

Strategically it should be straightforward to identify and manage the flexibility in any work program. Intuitively people understand that some pieces of work are just so important, that they should still get done even if the cost is higher than estimated. Other work may be required "sometime" in the next few years, but if budgets are constrained there is not much harm in deferring it until next year. The implication is that dealing with variability by being flexible boils down to pragmatic adjustments that align with what's important.

The program manager's role is to provide insight

The reason program managers exist in utilities is simple, it is to improve the likelihood that the objectives of the various programs in the company will be realized.

However, program managers operate in a kind of "middle office" between asset management teams, who are like the architects who strategize program objectives and funding, and the work execution teams.

Interestingly, most utilities design their organizational charts so that groups like Asset Management, Portfolio Management and work execution groups are peers. The implication of that is that they are expected to collaborate to achieve the company's goals, but the company has not given any group authority over the others.



This all means that an individual program manager is in a role where the objective is to guide a program to meet its goals while not having decision-making authority over the design of the program or the ability to direct resources to work on the program. The PM does that while being surrounded with estimates that will never be perfect, variability in field execution, unforeseeable curveballs from the weather and plans that are built from flawed databases.

The implication for the program manager is to realize that their fundamental role is to provide insights that influence the organization around them. Good PMs position themselves so that they can:

- Provide insights about what is happening in the field to Asset Management so AM can improve their work program strategies.
- Provide insight into the strategic objectives of the program to tactical planners, schedulers and execution teams.
- Provide insight into trends impacting the program to leadership in various LoBs.

PMs who fail to understand that their role is to influence the organization through the power of their insight may fall into the trap of thinking their role is to control the other parts of the organization involved in the end-to-end process, or they see fault and blame in the inevitable variability around them. Struggling PMs may become more rigid when the right answer is to become more flexible.

Accountability for unit costs of work is a good example to use to understand the difference between insights and control. On one hand, a program manager cannot be accountable for unit costs. After all, Asset Management decides what needs to be done and the field execution groups are accountable for their productivity in completing the work.

On the other hand, the program manager can and should be accountable for having insights into unit costs. The PM should:

- Understand the unit cost impact of decisions made in Asset Management.
- Evaluate the unit cost implications of more tactical planning and scheduling decisions, whether they make them, or others do.
- Monitor the actual unit costs and develop insights into unit cost trends so they can provide those insights to all stakeholders.

That means that as the primary point of contact for a program, the program manager is accountable for being able to provide insights in response to questions about their program. That does not mean the PM is accountable for fixing a problem with unit costs. It means that a PM should be able to confidently explain that rising unit costs are due to material cost increases or that productivity is lower than it was last year, but it is not their responsibility to address the underlying issue.



ABOUT THE AUTHOR:

Duncan Kerr is a managing partner at The Engine Room Group, a utility-focused operational excellence firm that has substantial expertise in the evaluation and implementation of transformational utility projects covering asset management, strategic planning and scheduling, work execution, cost savings and operational excellence.

TURNING THE TIDE ON TIDAL POWER:

INCREASING HYDROPOWER
ENERGY GENERATION WITH
RELIABLE TIDAL TURBINES





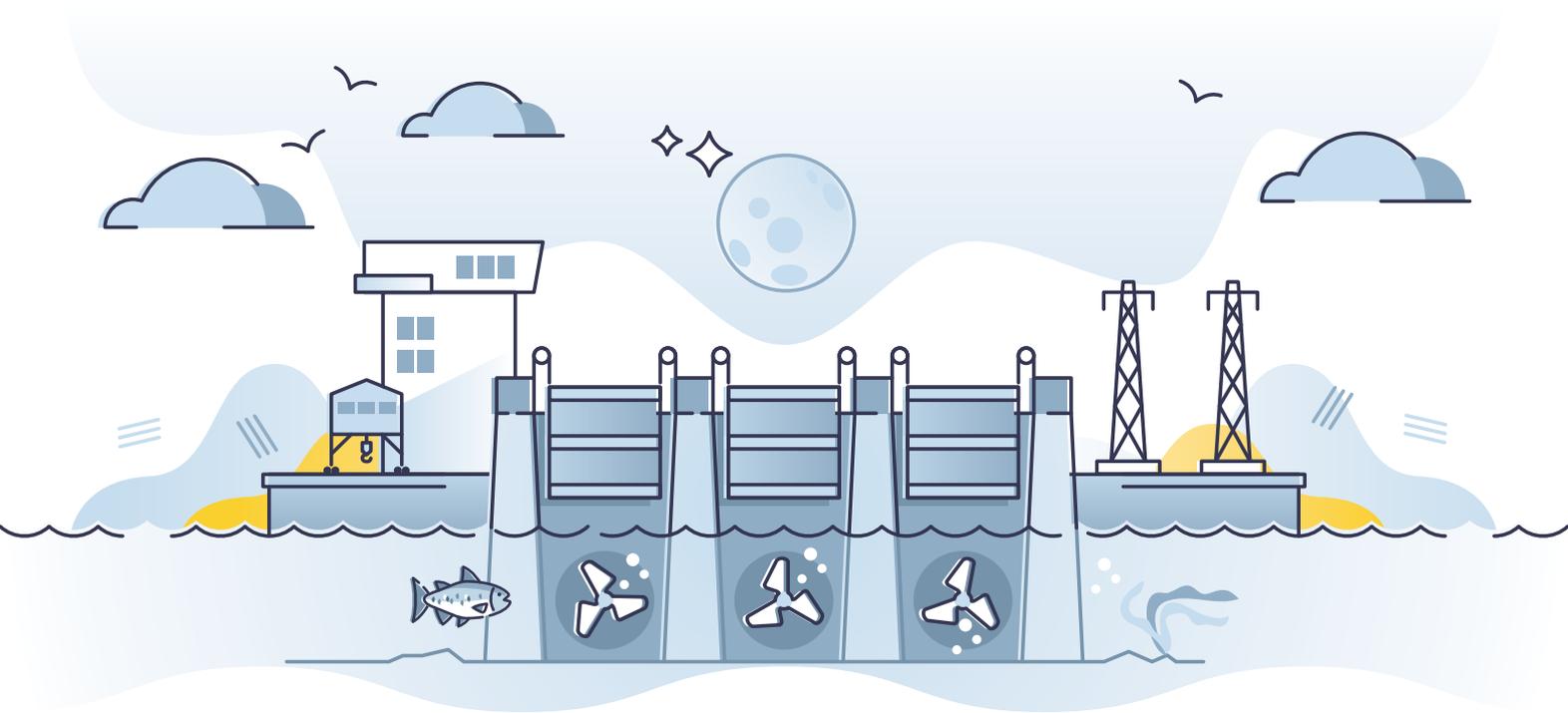
MIKE TORBITT

As the UK aims to reduce its fossil fuel reliance in line with the British Energy Security Strategy, tidal power could meet as much as 11% of the nation's annual electricity demand. Yet, in 2022, tidal power made up just 1.8% of the UK's energy mix. So, what is holding back the UK's tidal power potential, and how can technology play its part in increasing energy generation?

As one of the 195 Paris Agreement signatory countries, the UK pledged in 2015 to limit the Earth's temperature increase to 1.5 degrees Celsius above pre-industrial levels. Despite COP28 President Sultan Al Jaber recently claiming otherwise, a key way of remaining below this threshold is to focus on phasing out fossil fuels.

Fossil fuels such as oil and coal produce a significant proportion of greenhouse gases including CO₂, which has been directly linked to the Earth's warming. This temperature increase is leading to the destruction of coral reefs, polar habitats and significant stretches of coastline.

Yet, despite continued calls for climate action, fossil-fuel CO₂ emissions continue to climb. According to data from the Global Carbon Project, global carbon emissions caused by fossil fuels reached record levels in 2023, with a predicted high of 40.9 gigatons released – a 1.1% increase on 2022 levels. With 2023 also seeing the world's first year-long breach of the 1.5 degrees Celsius benchmark, it is clear that these climate trends are heading in the wrong direction. So, how can tidal power play a role in limiting fossil fuel reliance? →



Harnessing hydropower

As an island nation with the world's second-strongest tides behind Canada, the UK is ideally placed to benefit from tidal power in its bid to reduce fossil fuel reliance. Surprisingly, the potential of tidal as part of the UK's energy mix is relatively untapped, with the possibility to be increased sixfold.

The UK's Environmental Audit Committee (EAC), a group of members of parliament (MPs) from across the political spectrum, [lamented](#) the lack of tidal power inclusion within the [British Energy Security Strategy](#). The plan, which aims to accelerate green energy generation and reduce reliance on energy sources from abroad, only includes one mention of tidal power.

[The EAC](#) also highlighted the multiple advantages that hydropower offers. As currents are highly predictable, it is much easier to manage electricity production than with other renewable energy methods such as wind and solar. Since water is much denser than air, a tidal turbine can produce substantially more energy than a similarly sized wind turbine, even in non-ideal conditions.

Tackling tidal power issues

Although tidal projects come with potential challenges, there are measures that can be taken to minimize these drawbacks.

For example, potential installation sites are often limited by local ecosystems and the environmental impact tidal turbines could cause. However, [recent research](#) on a Northern Irish tidal project using high-precision modeling to map eel swimming patterns has shown that danger to marine life is significantly lower than first predicted. As the marine energy sector continues to develop, these kinds of technical environmental monitoring programs will ensure accurate data for the commissioning of future tidal projects.

The cost associated with water turbines has also limited tidal project development and installation. Since these turbines need to withstand harsh winds and saltwater, they come at a much higher price. However, as more systems are approved and commissioned, economies of scale will kick in, reducing costs. According to an EAC report, the price of a tidal lagoon, which places turbines around an enclosed body of water to capture energy from water movement, is akin to that of offshore wind farms once whole-life costs are included.

A further potential issue is the remote location of these tidal farms, which can make regular maintenance and repairs challenging. Fortunately, there are also opportunities to minimize this drawback. One study found that [blade failure](#) was the most common cause of tidal turbine breakdown, with most of these blade failures being attributed to design flaws.

The study found that loads were frequently underestimated during the design phase. As a result, the turbines would fail when the water was at high velocity, or during sudden changes in water flow. The recent [creation](#) of an innovative type of tidal turbine blade that eliminates adhesive joints typical in rotor blades, will help reduce the likelihood of failure in challenging tidal conditions.

Another way of protecting against excess power generated by strong currents is by including a dynamic braking resistor (DBR) in the generation and control circuit.

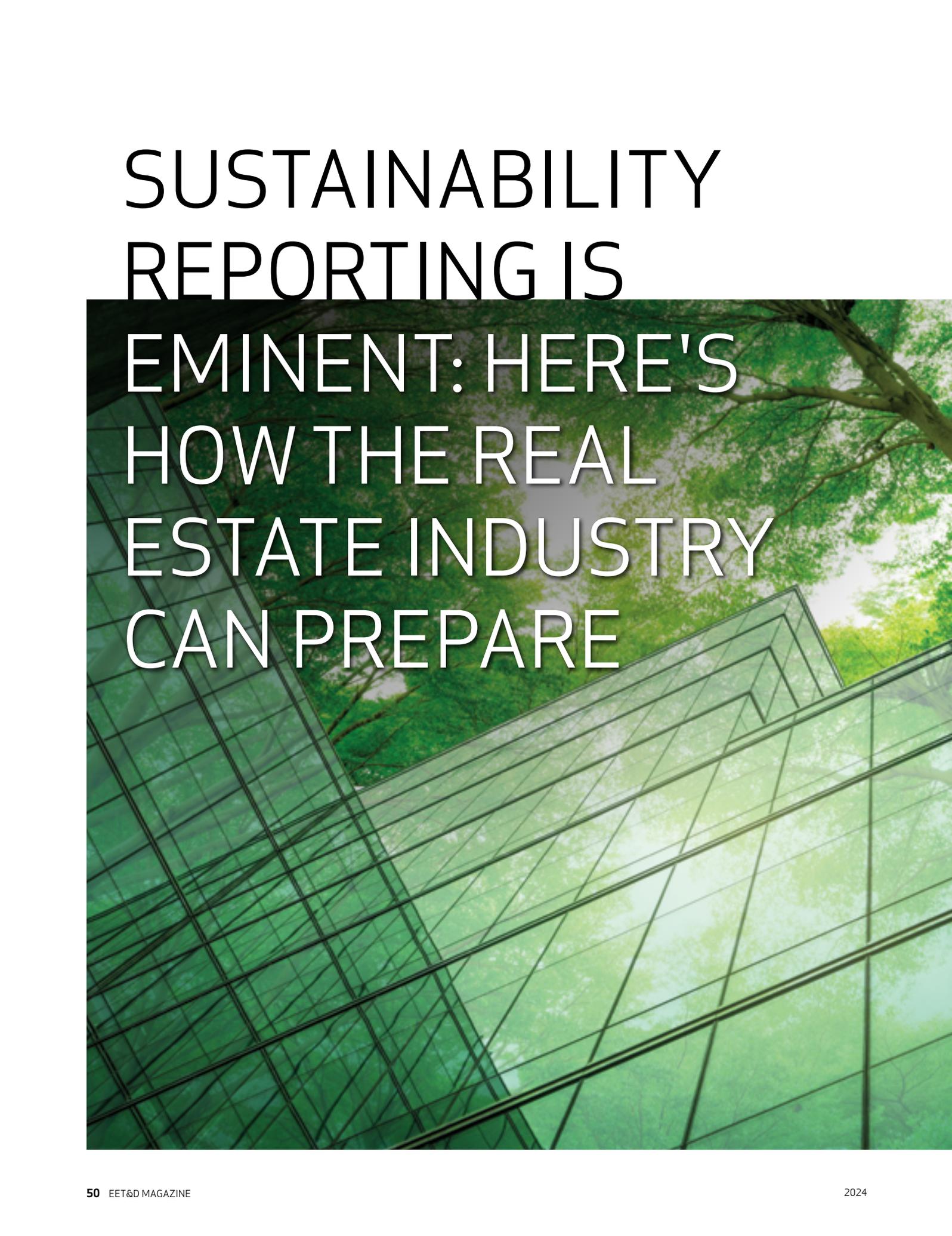
Power disturbances may result in a runaway condition leading to overspeed, which can eventually damage the mechanical structure due to stress in the turbine blade. The resistor acts as an electrical buffer, allowing for the safe dissipation of electricity and preventing the electrical circuit from becoming overloaded. As a result, it'll be less prone to damage and require less frequent maintenance and repair work as a result.

With the threat of crossing the 1.5-degree temperature threshold and suffering from irreversible climate damage creeping ever closer, increasing the amount of renewables in our energy mix is crucial. By making the most of current electronic and design innovations, it is possible that renewables such as tidal power will become our new normal – and we'll wonder what made us stick with fossil fuels for so long.

ABOUT THE AUTHOR:

Mike Torbitt is the managing director for power resistor manufacturer Cressall. He has more than 17 years of experience in key finance and leadership roles across a range of industries including manufacturing, automotive and outdoor goods.



A low-angle, upward-looking photograph of a modern glass skyscraper. The building's facade is composed of a grid of dark window frames, and the glass reflects the surrounding environment. In the background, a dense canopy of vibrant green trees is visible against a bright sky. The overall color palette is dominated by greens and greys, creating a sense of nature integrated with urban architecture.

SUSTAINABILITY REPORTING IS EMINENT: HERE'S HOW THE REAL ESTATE INDUSTRY CAN PREPARE



ANDY ANDERSON

The sustainability reporting landscape is evolving at a rapid pace. Responding to the imminent threat of climate change, governments across the globe have put forward stringent and comprehensive reporting regulations aimed at increasing environmental transparency and mitigating the impact corporations have on the environment.

The new regulations - many of which are slated to go into effect or will otherwise be phased in throughout 2024 and 2025 - are flipping the wild west of voluntary sustainability reporting on its head. The hope is that this consolidation of voluntary frameworks into standardized regulations will usher in an era where firms must be proactive and accurate in their approach to sustainability to ensure compliance and remain competitive.

The real estate sector is responsible for roughly 40% of greenhouse gas emissions globally, positioning this sector at the forefront of change-makers when it comes to sustainability and upping the reporting requirement complexities that the real estate industry specifically faces. Factors such as the diverse nature of real estate assets, the multi-stakeholder environment and the additional investment costs to bring real estate portfolios in line with current regulations are just a few of the nuances the industry must navigate while entering a more stringent regulatory environment.

To understand how the industry can best prepare for those complexities, it's essential to understand the current regulatory environment businesses within all sectors are facing. →

The current regulatory landscape

In 2022, the U.S. Securities and Exchange Commission (SEC) unveiled a proposal that would require all publicly traded companies that meet certain requirements to disclose their Scope 1 and 2 emissions, their decarbonization goals and any climate-related risks alongside their financial filings. The proposal initially included Scope 3 emissions, or emissions that are not the direct result of a company's activities but occur along its value chain. In March 2024, the SEC approved an updated version of this proposal which includes Scope 1 and 2 emissions reporting for large publicly traded companies but removed the Scope 3 reporting requirements and exempted small companies from reporting. While these regulations are currently held up in court, the reporting timeline is still coming soon. Larger companies will start reporting emissions for fiscal year 2026, while smaller companies will have to disclose some information for fiscal year 2027, but not emissions.

At the state level, California passed two groundbreaking climate bills requiring any large public or private company doing business within California – whether they are physically based within the state or not – to disclose climate-related metrics starting in 2026.

Local jurisdictions across the U.S. have also committed to implementing Building Performance Standards (BPS). States such as California, Washington and New York have already adopted BPS. Unlike benchmarking ordinances or building codes, BPS are more tangible and far-reaching, placing a greater emphasis on achieving specific performance targets that will drive energy savings and emission reductions.

In Europe, the European Commission adopted the European Sustainability Reporting Standards (ESRS) in July 2023, which guides companies in the scope of the European Union's Corporate Sustainability Reporting Directive (CSRD). While on January 24, 2024, the European Parliament approved a proposal to delay the full enactment of the CSRD by two years, many reporting requirements are still set to be phased in throughout 2024 and will mandate comprehensive sustainability reporting for approximately 50,000 companies – sector-specific reporting standards and non-EU business – including U.S. companies with just one subsidiary or branch in the E.U. – reporting standards will be delayed until 2026.

The United States and the European Union are not alone in their efforts. Governments in China, Australia, Canada and more have adopted sustainability regulations. These global sustainability regulations significantly impact the real estate industry.

What regulations mean for the real estate industry

A primary characteristic of the real estate industry that makes sustainability reporting complex, is the web of varied stakeholders within the industry.

When the final version of the SEC's proposal passes, public real estate companies and real estate investment trusts (REITs) will be required to disclose their carbon emissions and progress toward sustainability goals alongside their financial results. Corporate tenants, real estate lenders and real estate investors who are public entities will also be obligated to the same level of reporting, which will include detailed disclosures about their real estate holdings.

This means, for example, publicly traded tenants within buildings will need to rely on their landlords to share detailed information about the environmental performance of their properties. This shift will require building owners to take the necessary steps to compile and share accurate data for tenants and introduce complexities in tenant-lease agreements, prompting a careful examination of responsibilities for collecting and disclosing relevant data.

The introduction of BPS also adds a layer of costly challenges to the real estate sector. These standards, designed to specifically enhance energy efficiency and sustainability in the built environment, may require retrofits and upgrades to existing structures. Real estate companies must prepare to navigate the implications of these standards, not only in terms of compliance but also in terms of managing the associated costs, communicating the necessity of changes to tenants and investors and carefully monitoring the regulatory landscape to ensure new buildings are developed with compliance top-of-mind.



Ensuring compliance and competitiveness

No matter the situation a company within the real estate sector is in – tenant or landlord, entirely based in the U.S. waiting for the SEC’s final ruling or an international organization with subsidiaries in the E.U. – preparing for regulations as soon as possible is crucial.

Gathering data and establishing processes is an intricate undertaking that requires a significant time investment. Reporting for a specific year will involve compiling climate and sustainability data from the previous year – and companies need to be at least one year ahead of mandates going into effect to be properly prepared. When planning an approach to sustainability reporting, keep these strategic imperatives in mind to ensure success.

Gather accurate data. Generally, companies need historical utility usage and emissions data to generate a benchmark to report against goals. Companies can accomplish this manually by extracting data from utility bills and calculating emissions – but the process can be time-intensive. There are tools available that companies can utilize to backfill historic data and discover trends across electricity usage and emissions data. Once implemented, these tools will integrate directly into utility portals to collect bill data as it becomes available, generating insights automatically as data populates.

Align with stakeholders. Outlining responsibilities and reporting expectations with stakeholders is key within the real estate industry. Tenants and landlords may need to revisit lease agreements to outline responsibilities around reporting and establish how data collection will be shared moving forward. To avoid greenwashing, all parties must be transparent with goal setting and progress, leading with data to set realistic goals. Real estate companies wanting to effectively share their commitment to sustainability and stand against competitors may also want to consider voluntary reporting to frameworks like GRESB, a real estate-focused independent organization providing validated ESG performance data and peer benchmarks for investors and managers to improve business intelligence.

Understand the full picture. If data is not captured correctly, companies with large portfolios and disparate data sources are at risk for noncompliance. These companies should leverage an energy and sustainability management platform to integrate all quantitative and qualitative (location, property size, etc.) property data across a portfolio.

Preparing for these regulations is a strategic imperative for real estate companies. It ensures compliance with evolving standards – avoiding fines and potential legal action – and positions these companies for long-term success by enhancing asset value, attracting investment and meeting the expectations of a socially conscious market.

ABOUT THE AUTHOR:

Andy Anderson is the chief sustainability officer and EVP, energy & sustainability for Tango. In this role, he advises some of the largest real estate portfolios across the US on their energy and sustainability management practices. Anderson graduated with a B.A. in economics from Franklin & Marshall College and holds an MBA with Dean’s Graduation Honors from Columbia Business School. Anderson also is a professor at NYU’s Center for Global Affairs (graduate school), teaching Energy Management for Portfolios, as well as a frequent guest lecturer at Columbia.

BRIDGING THE SKILLS GAP:

HOW SKILLS MANAGEMENT SUPPORTS INNOVATION





KELLY HUNTER

The energy industry is undergoing a fundamental transition, catapulted by unprecedented technological advancements, increasing stakeholder and regulatory demands and the push for Net Zero. While this change is fueling massive infrastructure investments and creating new operational service offerings, it is putting a strain on the capabilities of the current workforce and widening a skills gap that's already reaching epic proportions.

According to an international tech consulting and engineering company's global survey of energy and utility leaders, 83% had under-invested in the technical skills of their employees. Meanwhile, 39% reported a skills shortage as a top threat. When looking specifically at oil and gas, studies show that by 2025, the industry will experience a shortage of up to 40,000 competent workers, and up to 85 million unfilled jobs due to skill shortages. In an industry where skills are an enabler of operational execution, the lingering skills gap is now creating a barrier to innovation and costing the industry billions. Moreover, the implications extend beyond profitability; they encompass workplace safety, project efficiency and workforce satisfaction.

There is a way forward, but a skills-based operational strategy must play a central role in any reskilling, upskilling or training program. →



What is a skills-based strategy?

A skills-based operational strategy is the business process of identifying critical skills, assessing organizational capability and developing a workforce to meet current and future demands. This begins with developing a standardized framework of existing customer requirements, business processes, regulatory compliance and critical job roles. The framework then provides transparency and alignment across the organization and serves as a guidepost for current and future initiatives. By identifying existing skills within the workforce and evaluating future needs based on industry trends, companies can pinpoint areas where skills shortages are most acute and tailor their strategies to address specific challenges effectively.

Traditionally, organizations have managed this data through paper files, Excel spreadsheets and HR systems — all of which struggle to handle the complexities of the operating environment, making it difficult for HR leaders to quickly access reliable and accurate records. However, those prioritizing efficiency and effectiveness are digitizing this data by leveraging skills management platforms designed specifically for the energy sector's unique and complex operating environments. Skills management platforms also guide strategic decision-making by producing validated skill insights on demand, guaranteeing that employees have the skills to operate safely and effectively.

Identify skills gaps

The energy sector's widening skills gap is impacting organizational capability and performance on a monumental scale — a problem that is only going to get worse as the industry evolves and new technologies are introduced. Skills development, therefore, plays an integral role in gaining critical insights into an organization's skills taxonomy, helping to identify existing skills and those needed for operational excellence.

The data not only informs a company's hiring and employment practices but also directs strategic training programs. With access to precise, validated skills data, executives and managers can pinpoint gaps and establish clear pathways for employees on their reskilling and upskilling journey — without wasting resources and time on misdirected training programs.

According to PwC, upskilling is not just about providing access to training. It identifies the most valuable skills for the future, finds and supports the individuals excelling in their roles and creates an optimal employee experience. Skills management, therefore, provides a roadmap for both the employees and the company, ensuring all training programs and hiring practices are implemented holistically across the organization and align with current and future demands.

Ensure operational safety

There is no room for error in operating environments like those within the energy sector. A single mistake can lead to damaging costs and lives lost. This reality is why it is so critical that employees not only have the knowledge, training and skills required to perform but are proficient in their roles and truly capable of doing the job. This is where skills management becomes invaluable, offering granular insight into each employee's skills, compliance and on-the-job training. By integrating this information with risk assessment and scheduling platforms, organizations ensure the most qualified team member is deployed to the job site, thereby, mitigating health risks and avoiding safety hazards.

Master efficiency

The energy sector's path toward Net Zero will be marked by efficiency, both for the technology that powers the industry and the workforce that operates it. Skills management's data-driven approach is critical to enabling efficiency by arming decision-makers with key insights to deploy the correct resources for every project the very first time, every time. No matter the dispatch scenario, but especially in crises, deploying the right person ensures a faster and more reliable service delivery, ultimately reducing unnecessary costs and curbing downtime.

Organizations navigating the current and future states of the business of energy will be faced with many challenges, including the ongoing transformation of technologies and expectations, aging and retiring workforces and increasing pressure to perform from society and governments alike. Leading the charge with a skills-based operational strategy will be vital to ensuring workforces remain skilled and capable in the coming years and decades. By utilizing skills data as a guide, organizations position themselves for efficient, compliant and safe operations, forging a path towards growth and resilience.

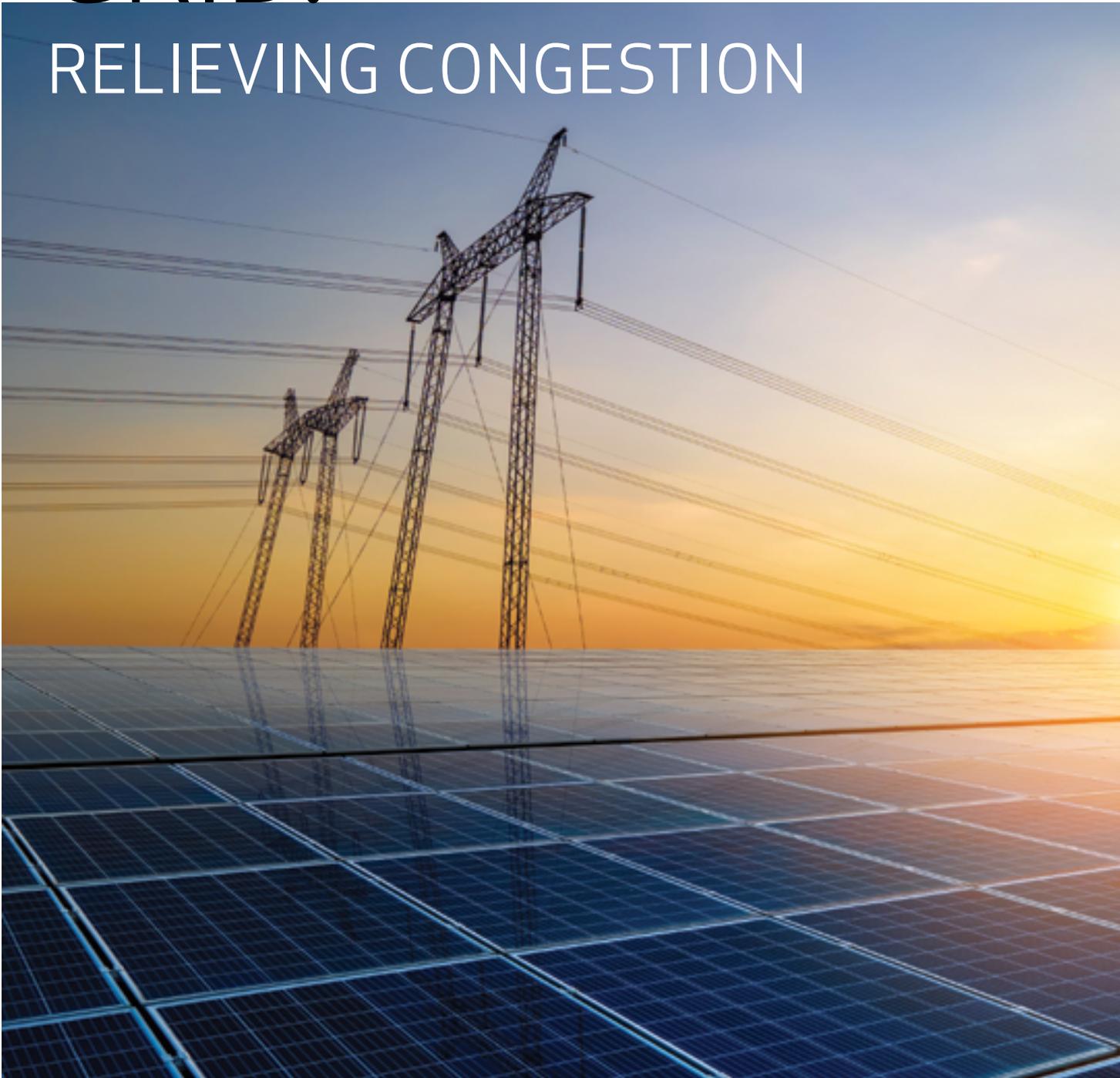
ABOUT THE AUTHOR:

Kelly Hunter is the director of Oil & Energy Practice at Kahuna Workforce Solutions, where she manages a portfolio of clients across oil and gas, energy and field services. With a background in consulting and 15 years in oil and gas, Hunter believes in combining the power of people, process and technology to help organizations enhance operational effectiveness while keeping safety at the forefront.



OUR OVERLOADED GRID:

RELIEVING CONGESTION





ERAN INBAR

You can't open a newspaper or magazine, or listen to a podcast these days without hearing about the dire circumstances our electric power grid – grids, actually – are in. Even in regions with sufficient generation, limits on the capacity of the transmission system may make it impossible to get electricity from where it's generated to where it's needed. This is especially concerning given the urgency of the transition to a clean economy.

Beyond location, the U.S. is well into the early stage of the energy transition, slowly but consistently closing coal plants, adopting the use of electric vehicles and “electrifying” society: replacing technologies or processes that use fossil fuels, such as gas boilers, with electrically powered equipment such as heat pumps. On the power side, there is a large number of new generation projects – the majority of them renewables – waiting in so-called interconnection queues in regional transmission areas to plug into the grid. If even a fraction of them is built, it will overtax an already inadequate grid. That will result in “stranded electrons:” electricity that's available but cannot be transmitted. →

A third, pressing issue is simply the age of the bulk power system, the series of steel towers and heavy transmission lines that form the backbone of our energy infrastructure across the country, often clear-cutting through wide swathes of forest. Much of it was built in the 1960s and 1970s, and some are even older; most of its lines, called conductors, are from earlier generations. This limits the amount of electricity that can be imported into certain areas, causing problems with supply in “load pockets” and costing ratepayers millions in transmission congestion costs. That has created what the U.S. Department of Energy called our [grid’s “vulnerability.”](#)

The solution may sound as simple as “build more transmission,” but that is expensive, can take a decade or more if it happens at all and requires hundreds of miles of easements (“rights-of-way”) and other state and federal permits. Apportioning new transmission costs, which are inevitably passed along to ratepayers, often pits utilities against each other, state regulators and ratepayer advocates, a very contentious and time-consuming process. And that’s to say nothing of withering local NIMBY opposition, which can upend even financed and permitted projects.

Recognizing that challenge, in December 2021 the Federal Energy Regulatory Commission promulgated Order 881, which requires that transmission providers use a conductor rating methodology called Ambient Adjusted Ratings (AAR), a more granular set of temperature assessments, to help determine more accurately how much electricity can be transmitted across overhead power lines. AAR is a welcome start in expanding grid capacity, while another real-time, sensor-driven technology, [Dynamic Line Ratings \(DLR\)](#), goes a step further in determining a transmission line’s actual safe carrying capacity. But neither go far enough — literally as well as figuratively, as they can typically assess conductor conditions only from tower to tower — one span.

Fortunately, a new, sensor-free technology is available that can “see” thousands of circuit miles after a short substation deployment of an optical interrogator. This system uses the installed fiber-optic ground wire (OPGW) running along conductors and connects it to an optical interrogator that analyzes signals from the fiber to “sense” what’s happening on the grid. The analyzer detects and classifies events, pinpointing them down



to individual tower locations in real time with unprecedented accuracy, removing the serious nuisance of false alarms. The Interrogator transmits optical pulses that propagate down the fiber, reflecting a minute fraction of the light along each point. It then measures the reflected light to determine the strain, temperature, pressure and other line attributes over hundreds of miles, turning the fiber into a continuous acoustic sensor, as though there were tens of thousands of microphones spanning hundreds of miles.

Unlike other, purely DLR systems attached to towers or mounted on power lines, this technology provides unparalleled scalability, continuity and verifiability. It measures the wind on every power line span, covering 100% of the network, as opposed to other technologies which cover 5%-10%. This way DLR is calculated accurately, taking changing wind patterns into account in real time. The quality and quantity of the signals that the systems gather and provide to the analyzer unit allow the AI engine to accurately classify events rather than just detect excursions. This provides utilities with a cutting-edge tool to identify specific problems and plan preventative maintenance, improving both reliability and resilience. Analyzers can identify power lines' health at an impressively granular level including weather-related conditions — line galloping, sagging and icing; high winds; and even vandalism and wildfires. They also identify potentially catastrophic events including flashovers, short circuits, partial discharges, vegetation strikes and even tower climbing. Analyzers are placed at substations, and units can connect to a single command and control interface, while operators can integrate existing or new SCADA, Digital Twins or other central control systems.

In March of this year, a detailed story in *The New York Times* acknowledged the severity of the surge in power use threatening U.S. grids and climate goals: "Over the past year, electric utilities have nearly doubled their forecasts of how much additional power they'll need by 2028 as they confront an unexpected explosion in the number of data centers, an abrupt resurgence in manufacturing driven by new federal laws and millions of electric vehicles being plugged in. Many power companies were already struggling to keep the lights on, especially during extreme weather, and say the strain on grids will only increase."

The bottom line? We need to maximize the efficiency of our existing grid, as we electrify society, fight climate change and move the energy transition forward.

ABOUT THE AUTHOR:

Dr. Eran Inbar has been the founder of Prisma Photonics since 2017. Previously, he founded and managed V-Gen (2001-2016), a dominant player in the fiber laser field. Eran holds a Ph.D. in physical electronics from Tel-Aviv University with many novel laser patents. He is also an enthusiastic triathlete in his diminishing free time.

POWERFUL FORCES: ESEN KACAR, BENTLEY SYSTEMS



BY ELISABETH MONAGHAN

In her role with Bentley Systems, Esen Kacar focuses on software products and solutions for customers in the electric energy sector. She also is a solution architect and builds tailor-made solutions for specific user needs, but regardless of her title, Kacar spends her time working closely with her customers to assess the challenges they are facing, and then, she tailors a solution for them to overcome these challenges.

We are pleased to introduce our readers to Kacar in this Q2 issue.

How I ended up in the utility industry:

I always enjoyed looking into problems with an analytic approach, so I became a software engineer with a master's degree in data management, data mining and analysis. After graduation, I worked in various industries as a software developer and architect. Then, in my home country of Turkey, the natural gas distribution business started to be privatized. With a few close friends, we identified a software gap supporting geospatial data management and utility network design. So, we started our own company and developed custom applications on top of Bentley products, for the gas utilities and later transitioned to the electric industry as well. I have been working with utilities for 16 years, and I enjoy the industry because they serve their community, and they take their job very seriously. They have a vast range of information about their assets, they need to be proactive and analytically look at that for anything the future brings.

Marrying technical know-how with users' needs

With my educational background and work experience, I can marry the technical know-how with the business and user needs. I'm very good at building relationships with our users and love to listen and learn from them. After understanding their main issues, their pain points and business workflows; I can translate that problem into a technical language as a software requirement for my development team. Therefore, I can be a conduit between the user and the developers, who in general prefer to deal with their development codes rather than people.



Keeping an eye on the energy transition

The main topic on everyone's mind is the changing climate and the overall energy transition. We are seeing an increase in the need for energy while having to be conscious of the pollution we are causing. Globally we are seeing an increase in renewable projects like wind and solar, but we are also realizing that these new sources have their challenges, like being costly or not being resilient as traditional sources. So, we need reliable sources, but we also need to reduce our reliance on sources such as coal. Newer research into nuclear, hydrogen and smaller microgrids could be a path forward to energize local communities. This is something to keep an eye on as we wade through the energy transition.

Utilities will face new challenges with all these changes and those that adopt new technologies sooner could be a step ahead.

The next wave of industry challenges

Increasing electricity demand will be the biggest challenge. After Covid, we brought most of our work life home. So, everybody is consuming more power and requiring increased bandwidth, even in more rural areas. Therefore, both electric and communication networks are changing. Utility companies need to adapt to new technologies quicker than their usual pace. They need to provide better and more resilient service to their customers.

We also see that there is a big talent shift in the industry. Many experienced engineers and designers are either retiring or moving out of the sector. That means a younger and more technologically adapted generation is filling those positions. The expectations and experience of this new group are completely different than those of their predecessors. Companies need to adapt to the change in their own employee's demands and need to close the skills/experience gap quickly.

Therefore, there is a big change in expectations from both the customers as well as the employees of the utility companies.

Additionally, I think standardization is becoming more important in the energy industry. There are new challenges and ad-hoc solutions are offered because they are quick and easy. However, in the long run, those solutions cost more and create disparate systems. That ends up being the biggest challenge for utility companies, with multiple versions of the same information in completely non-interoperable products and databases. That's why we value the efforts of industry organizations like EPRI and others. My company is actively participating in this industry standardization and trying to offer more robust and open systems for our users. →

Addressing these challenges

For the changing expectations from the clients, utility companies are working hard. We are seeing many new projects focusing on upgrading the aged network, adding new microgrids and increasing the reliability of the old utility power plants while building brand-new ones. The task is huge and will be expensive. One area that has accelerated project delivery, as well as lowered costs, has been the practice of digital design. We provide tailor-made solutions for different aspects of the digital transformation and digital design workflows, either empowering our users to use engineering precision tools or running the important design analysis automatically by removing the time-consuming redrafting. Utilities are carefully planning their next decades from an infrastructure and software landscape point of view.



Our product vision for AI for design is shaped by the belief that AI will assist rather than replace engineers.



The new workforce will be expecting the software to be more efficient, more intuitive, and easier to use, in other words, intelligent. The usage of Artificial Intelligence is not new. For example, AI has been part of our product capabilities for some years now. But recently, we have added more AI capabilities to our software products, to satisfy the changing user profiles and to close the capacity and skill gaps in the industry while also aligning with our clients' needs. Our product vision for AI for design is shaped by the belief that AI will assist rather than replace engineers. AI agents will generate concepts and design alternatives and provide in-product feedback on design work-in-progress, where the final decisions will come from engineers.

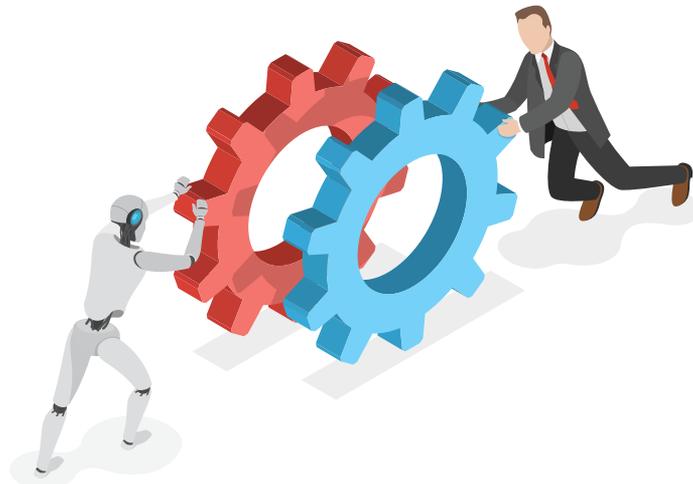
Overcoming personal challenges

As I mentioned previously, I'm originally from Turkey. When I first started working with different utility companies, I was very young, and my clients were predominantly older and experienced men. It was very challenging for them to accept that a young woman could help them build more efficient workflows and, in the end, be more profitable. Many times, they would prefer to ask questions to my male colleagues, who generally had less experience and knowledge on the topic. My colleagues would be required to re-direct the question to me and reassure them that I had the necessary experience and understanding.

How did I overcome it? I think I just persisted and continued answering the questions and explaining the issues, even when they were not directed at me. After a while, my clients realized that I did in fact know what I was talking about.

Current projects

I'm currently working on grid digital twin technologies. We are working on software products and standardizations to enable our users to bring their data from disparate systems under one true digital twin platform. Which basically represents everything a utility has in the real world in a digital platform. Not only would the design or engineering departments benefit, but any department in the company can contribute and also benefit. I'm not only talking about visualization of the network in a digital platform to be viewed in an immersive environment like HoloLens or Apple Vision Pro. But I'm talking about everything related to a network, visualizing an asset, inspecting if there is any corrosion, investigating all the maintenance records, analyzing and predicting possible failures before they happen, and bringing all the possible changes in the digital world before actually making them in reality. To accomplish this, it is very important to utilize all the information the utility company has in multiple systems and make it available in a standardized platform.





Women as industry leaders

I think the industry is becoming much better at accepting women in leadership positions, and as a matter of fact, in every position. Many young and very talented girls chose to become engineers and prefer further enhancing their career in business administration perspective as well. That allows them to move to the manager and director positions. The companies' DEI (Diversity, Equity, and Inclusion) initiatives also paved the way for this kind of change. At Bentley Systems, we have our own IDEA (Inclusion, Diversity, and Equity Alliance) organization, and we are proud to have strong female leadership representation within our energy team too. This diverse leadership brings unique perspectives and insights and is a testament to our commitment to fostering inclusivity and equality. By embracing the evolving roles of women in energy leadership, we advance our industry and inspire future generations of leaders.

ABOUT ESEN KACAR:

Esen Kacar is the director of product management at Bentley Systems specializing in utility transmission and distribution design and analysis software. After graduating as a software engineer, she also got a master's degree in data management, data mining and analysis. For more than 16 years, Kacar has been working closely with companies in the utility industry for architecting, and developing engineering software for electric and gas networks, recently focusing on the grid digital twin technologies to address the industry challenges and standardization issues.



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