EET&D
MAGAZINE

Quarterly Issue 3 & 4, 2025 — Volume 31

ACCELERATING ENERGY INNOVATION

EET&D MAGAZINE

Quarterly Issue 3 & 4, 2025 — Volume 31

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PJM OUTLINES LONG-TERM TRANSMISSION PLAN IN FERC FILING

December, 2025

PJM detailed in a Dec. 12 filing a new process for long-term planning of regional transmission facilities in compliance with the Federal Energy Regulatory Commission's Order 1920.

PJM's proposed long-term planning process (PDF) will achieve the Final Rule's goal to transition transmission planning processes toward a more proactive, long-term planning approach.

Consistent with Order 1920, PJM's proposed long-term planning approach relies on extensive collaboration with the PJM Region's Relevant State Entities - including during the development of the assumptions and scenarios that will be used to identify long-term transmission needs and potential transmission solutions, which will help PJM to proactively plan transmission that will:

- Maintain transmission system reliability.
- Provide economic benefits.
- Advance public policy objectives.
- Meet rising demand at reasonable costs.
- Enable more efficient new generation interconnection.
- Lead to actionable and timely transmission development.

The core elements of PJM's proposed long-term planning approach are supported by the PJM Area Relevant State Agencies Committee. This committee was formed under the Organization of PJM States, Inc. to provide PJM, PJM's stakeholders and the PJM Transmission Owners with the input necessary to comply with the Final Rule.

Among other elements, the proposed long-term planning approach:

- Will be conducted in an open and transparent manner, with more than a dozen points at which PJM will post data, solicit information, or otherwise engage with states and stakeholders
- Develops a Long-Term Regional Transmission Plan using a five-year planning cycle and based on a 20-year planning horizon
- Develops at least three plausible and diverse long-term scenarios that must account for factors within each of seven FERC-defined categories
- Applies a sensitivity to each scenario to ensure the plan accounts for extreme-weather-related events
- Holistically identifies a comprehensive set of long-term transmission needs across the PJM region, inclusive of reliability, public policy, market efficiency, generation deactivations and interconnection-related drivers
- Conducts competitive solicitation windows similar to those conducted pursuant to PJM's existing Order 1000 regional transmission planning processes
- Mandates that developers offering proposals to develop regional transmission facilities in both near-term and long-term planning processes demonstrate that they have considered each of four Alternative Transmission Technologies (ATTs) as identified in the Final Rule
- Requires PJM to evaluate whether regional transmission facilities could address interconnection-related transmission needs →

- Requires PJM to work with transmission owners to determine whether existing transmission facilities that a transmission owner might otherwise replace could instead be "right-sized" to more efficiently or cost-effectively address long-term transmission needs
- Identifies a holistic set of transmission facilities to address long-term transmission needs and relies on specified selection criteria to determine which transmission facilities PJM will recommend to the PJM Board of Managers for inclusion in PJM's Regional Transmission Expansion Plan
- Gives states and third parties the opportunity to voluntarily fund any proposal that was not preliminarily selected, and for states to potentially opt out of cost allocation based on a mechanism that is still being developed in parallel with the PJM Transmission Owners' compliance filing related to cost allocation

PJM emphasized in the filing that it has developed a long-term approach that holistically accounts for all transmission system needs, while accommodating 14 jurisdictions that have disparate public policy goals, requirements and transmission needs. PJM's proposed long-Term Regional Transmission Planning Protocol relies on extensive engagement with states and stakeholders to identify long-term transmission needs and long-term transmission projects.

Southern Company

SOUTHERN COMPANY RANKED AS THE NO. 1 EMPLOYER IN THE US ON 2025 MILITARY TIMES BEST FOR VETS: EMPLOYERS LIST

December, 2025

Southern Company is proud to announce the company has earned the No. 1 ranking in the United States on this year's Military Times Best for Vets: Employers list. This marks the second time Southern Company has earned the top spot on this prestigious list, which recognizes companies that demonstrate exceptional dedication to hiring, retaining and supporting America's veterans.

The Military Times Best for Vets list is a highly respected, independent evaluation that is compiled by surveying hundreds of companies and organizations across the country. The methodology used in evaluating employers includes recruitment and onboarding practices, retention and career advancement programs, and support for veterans and military spouses.

"Southern Company's recognition as the No. 1 Best for Vets Employer is a powerful testament to the strength of our long-standing commitment to those who serve our country," said Chris Womack, chairman, president and CEO of Southern Company. "We believe in the power of our veterans and are dedicated to being a great place for them to work because their leadership, discipline and dedication truly enrich our company and the communities we serve. It is important to us that we support our veterans as they transition into civilian life and grow their careers within our company, and I'm proud that commitment is something shared across our company."

Southern Company has a longstanding commitment to supporting military members and their families through dedicated recruitment, career development and transition assistance programs. The company purposefully partners with military organizations and participates in veteran hiring initiatives to help service members successfully move into civilian energy careers, including a recent agreement with the United States Army Reserve's Private Public Partnership signed in August. Southern Company has repeatedly been recognized by a variety of organizations lauding its efforts in fostering a workplace that values the leadership and technical skills held by veterans, including ranking No. 2 overall on the 2026 Military Friendly® Employer list and earning the status of a Gold Employer for Military Veterans by the U.S. Department of Labor.

Natural Resources Canada

YORK UNIVERSITÉ UNIVERSITY

CANADA RENEWS SUPPORT FOR ENERGY MODELLING HUB

December, 2025

Natural Resources Canada has renewed its support for the Energy Modelling Hub (EMH) activities for a further four years beginning, providing $5 million to strengthen Canada's capacity for transparent, evidence-based energy, climate and energy transition policy development and planning. The new mandate, Reinforcing Canadian Energy Modelling Capacities: Enhancing Tools and Expertise for Canada's Electricity and Renewable Energy Sector, will be headquartered at the University of Calgary and delivered through a four-institution consortium: the University of Calgary, York University, Polytechnique Montréal and the University of Victoria.

The four-year project is led by Associate Professor Blake Shaffer from the School of Public Policy at the University of Calgary, Professor Mark Winfield from the Faculty of Environmental and Urban Change at York University, Associate Professor Madeleine McPherson from the Institute for Integrated Energy Systems at the University of Victoria, and Professor Normand Mousseau from the Institut de l'énergie Trottier at Polytechnique Montréal.

The renewed funding advances NRCan's Smart Renewables and Electrification Pathways Program's (SREPs') capacity building objectives. EMH supports these objectives by providing a national platform for enhanced collaboration and convening to connect policymakers, modellers and other stakeholders working on Canada's clean-energy transition.

Through three targeted capacity-building activities, EMH addresses the real needs of end-users, fostering inclusivity, generating economic and social benefits, and supporting Canada's shift toward a decarbonized, sustainable, affordable, reliable and equitable energy system. This includes strengthening open-source modelling tools, improving access to high-quality open data, and expanding user-centred knowledge sharing and training.

The renewed mandate positions EMH to build a pan-Canadian network of modellers, policymakers and experts working together to guide the transformation of Canada's energy systems in the directions of decarbonization and sustainability. By linking analytical capacity across the country, EMH will help bridge the gap between data and policy, ensuring modelling informs responses to the most pressing energy challenges.

> ***"This announcement demonstrates Canada's support for energy modellers as they address challenges and develop new insights on energy technologies and systems that can help Canada unlock the full potential of the workers, businesses and resources we have right here at home."***
>
> ***– Minister of Energy and Natural Resources Tim Hodgson***

> ***"The University of Calgary is proud to serve as the host institution for the Energy Modelling Hub for the next four years. This is an important national institution, and its presence here reflects our longstanding leadership in energy research, policy, and innovation. We look forward to working closely with partners across the country to advance the Hub's mission and help shape Canada's energy future."***
>
> ***– Associate Professor Blake Shaffer, Department of Economics, University of Calgary***

"The Energy Modelling Hub provides tools and models that are essential to the Institut de l'énergie Trottier's work at Polytechnique Montréal. Future editions of our Canadian Energy Outlook will greatly benefit from the expanding suite of resources now available. Beyond this, the Canadian government's support reflects both a recognition of the strength of Canadian expertise and a commitment to amplifying its impact."

– Scientific Director Normand Mousseau, Institut de l'énergie Trottier at Polytechnique Montréal and Professor at Université de Montréal

"Charting Canadas energy transition is complex; modelling helps by exploring possible pathways and illuminating the most effective decisions. The EMH hosts is Canada's only open-source suite of integrated models, which together enable a comprehensive and transparent conversation about how to move forward. The highly collaborative work at the hub is a catalyst for our transition to a low-carbon, affordable, and reliable energy systema."

– Associate Professor Madeleine McPherson, Civil Engineer and associate director, Institute for Integrated Energy Systems at the University of Victoria

"The federal government's renewed support to the Energy Modelling Hub will reinforce EMH's capacity building work in support of evidence-based policy-making around energy, decarbonization, sustainability and energy systems transitions in Canada."

– Professor Mark Winfield, co-chair, Sustainable Sustainable Energy Initiative, Faculty of Environmental and Urban Change, York University

Avangrid
A member of the Iberdrola Group

AVANGRID HOSTS FOURTH ANNUAL ENERGY INNOVATION HACKATHON

December, 2025

Avangrid, Inc., a leading energy company and member of the Iberdrola Group, celebrated future leaders in the energy industry at its fourth annual Energy Innovation Hackathon, reinforcing Avangrid's belief that talent is the building block of the company and central to its aspiration of "every day for the future." This year's edition brought together 181 students from 16 universities across the United States, demonstrating Avangrid's growing confidence in convening innovative talent nationwide.

"The Energy Innovation Hackathon is a powerful forum for Avangrid to inspire the next energy leaders," said Avangrid CEO Jose Antonio Miranda. "We are connecting with talented students who may be interested in an energy industry career but haven't yet had exposure to real challenges. On top of that, we encourage our own employees to think differently about the challenges we face day in and day out, and this is a fantastic opportunity to work together to solve them."

The 32-hour competition invited students working in teams of three to evaluate three renewable energy projects two wind farms and one solar farm whose original power contracts had expired. Using real Avangrid data, teams built models to determine whether to continue selling electricity at market prices or secure fixed prices through a new power purchase agreement, and what that optimal price should be.

The increase in participation from previous years reinforces a core company belief: talent thrives where opportunity exists, where innovation has real impact, and where Avangrid listens to and empowers talent across the United States.

The first-place team consisted of Pannatat Khumchaisakul, Sukwon Yang, and Elena Bouldin from Yale University. Second place honors went to Ansh Sharma, Diya Bhattarai, and Ryan Edward from University of Texas, Dallas. Third place was awarded to Anup Bhowmik, Amal Dev Cheepra Mailapravan, and Aravindharishi Chenthurvasan from the State University of New York, Binghamton. Judges were impressed by the determination, creativity and teamwork of all participants, which have more than doubled from the previous year.

"Participating in the 2025 Avangrid Hackathon was a stimulating and deeply rewarding experience. As students committed to the clean energy transition, we are deeply grateful to Avangrid for this incredible opportunity and to the judges for their time and insight. We left with a far richer understanding of the industry and with lessons that will shape how we think about our careers in the years ahead," said Elena Bouldin from Yale's first-place team.

"Being part of the Avangrid Hackathon was a blast. We spent so many hours coming up with solutions we really cared about, and it helped us push ourselves way outside our comfort zones to bring our final idea to life. Walking away with a finished solution and the judges' recognition made all the effort worth it," said Diya Bhattarai from UT Dallas' second-place team.

"Participating in this hackathon was genuinely rewarding. The prompt was well-designed, the dataset was engaging, and the overall management made the experience smooth and enjoyable. The office-hour conversations with industry professionals were particularly inspiring, giving us a clearer picture of how these skills translate into real-world problem-solving. It's an experience that not only helped us grow but one we hope to carry forward into our careers," said Amal Cheepra Mailapravan from SUNY Binghamton's third-place team.

A panel of ten subject matter experts from a variety of departments within Avangrid served as judges for the competition. They also interacted with students during "office hours" to answer questions and provide direction.

The Hackathon is a proven concept within Avangrid's broader approach to cultivating intelligence in action. It complements the company's long-standing partnerships with more than 30 colleges and universities on advanced research, its Innovation Forum (now planning its 9th edition), its forthcoming Prompt-a-thon, and its company-wide AI literacy initiative. Avangrid is also rolling out simulation-based, gamified in-person training (Rate Making and Ready Now) designed to prepare employees for the energy system of the future, while continuing to strengthen workplace inclusion reflected in its 2025 Disability:IN score and its aspirations for 2026.

"At Avangrid, talent is not just a resource it is the foundation of our future," said Ignacio Estella, Avangrid Senior Vice President of Talent, Performance, Innovation and Equal Opportunity. "The Hackathon shows that when opportunity and purpose meet, talent everywhere can rise to the challenge. This event reinforces our commitment to listening to students and professionals across the U.S., empowering them to create meaningful impact through innovation."

POWERING THE GRID'S NEXT CHAPTER

ELISABETH MONAGHAN
Editor in Chief

This year, I attended CIGRE Canada for the first time. Typically, when I attend industry conferences, I have a full schedule of prearranged meetings with various exhibitors. For CIGRE, I arrived with no scheduled meetings, which allowed me to meet companies I had not spoken to before, or to connect with the Canadian colleagues of companies I've met at events in the U.S., like DISTRIBUTECH or IEEE PES T&D.

Whenever I attend these conferences, I'm reminded of how the electric energy sector depends on countless experts and innovations working seamlessly to meet growing power needs. The electric energy sector is made up of a wide network of partners, including manufacturers, tech companies, consulting firms, skilled trades, utilities, research institutions, regulators and trade associations. They may be based in the same or different locations, and each may focus on a specific piece of the grid puzzle, but none can operate in isolation. Collaboration across this ecosystem is what ensures a positive future for the grid.

Even though the Trump administration has withdrawn some federal funding for renewables and grid modernization, the need for a resilient grid remains unchanged. State or provincial utility-level efforts continue to advance the grid. These efforts are driven by aging infrastructure, reliability concerns and growing energy demand. For anyone in the U.S. working in this field, maintaining momentum, whether in operations, technology, or planning, is crucial to staying relevant and competitive.

Experiencing the electric utility space from a global perspective has been a great reminder that integration and collaboration extend far beyond the United States, and that staying connected globally is key to understanding and contributing to the evolving grid.

Two examples of leaders in grid transformation

In every issue of EET&D Magazine, we explore not just *what* is changing in the energy sector, but *how* and *why* those changes are shaping the energy landscape and who is leading them. This issue opens and closes with two industry leaders whose stories capture the full spectrum of the grid transformation, the architecture of innovation and the culture that sustains it. Together, our profiles of Kim Getgen, with InnovationForce, and Christina Knowles, with G&W Electric, serve as "bookends" of this issue. Each has a distinct, yet deeply connected story on the impact their insight and ingenuity have had on moving the utility space forward.

At the front of the issue is the Grid Transformation Forum, where we share our conversation with Kim Getgen, co-founder and CEO of InnovationForce. Getgen brings a systems-level perspective to one of electric energy's most persistent challenges, the bottleneck in how new technologies are tested, validated and scaled. Through years of working alongside both startups and utilities, Getgen began to recognize a repeating pattern: promising technology stalling out in the pilot phase, not because the ideas were flawed, but because the process itself was.

Getgen's response was not to create another consulting model, but instead, she completely reimagined how innovation is managed. With InnovationForce, Getgen built a SaaS platform that uses artificial intelligence to match industry challenges with potential solutions, automate pilot workflows and enable utilities and startups to collaborate at scale. In doing so, she reframed innovation as infrastructure, a shared, transparent system that turns isolated pilot projects into a data-driven engine for modernization.

In our Powherful Forces profile, which you'll find in the back end of this issue, Christina Knowles, who is the vice president of North American Operations at G&W Electric, reminds us that the grid transformation is also a human endeavor, one grounded in people, culture and purpose.

For nearly 15 years, Knowles has helped guide G&W Electric's evolution from a 150-person manufacturer to a nearly 1,900-employee global enterprise. Along the way, Knowles has navigated expansions, acquisitions and integrations, while preserving the sense of collaboration and technical excellence that defines G&W's culture.

An engineer by education and training, Knowles approaches leadership as both a technical and human discipline. She frames her work through a method one of her colleagues in marketing developed, called the 3D Model – decarbonization, decentralization, digitalization — while ensuring that progress remains rooted in diversity and integrity. Under Knowles' guidance, G&W's leadership team now reflects a near 50–50 gender balance, a reflection of her belief that diversity is not just a value, but a catalyst for innovation.

Where Getgen builds systems that make innovation scalable, Knowles builds teams that make it sustainable. One develops frameworks that connect ideas and data; the other nurtures the collaboration and trust that help those ideas succeed. Both approaches are essential for driving meaningful and lasting change across the energy sector.

As "bookend" articles, Getgen and Knowles' stories capture the essence of this issue of EET&D, and, in many ways, their similarities and differences also capture the transformation that is occurring across the electric energy sector. Between their stories lies the balance that defines true progress: structure and empathy, systems and people, technology and trust. Their approach to leadership reminds us that innovation doesn't happen in isolation; it takes planning, clear communication and follow-through, and grows when vision is paired with consistent effort and clear intent.

Whether building systems, leading teams, or connecting across borders, the progress we see in this sector depends on collaboration, which is something that everyone in this industry contributes to.

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

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Elisabeth

ACCELERATING ENERGY INNOVATION

KIM GETGEN, ELISABETH MONAGHAN

For this issue's Grid Transformation Forum, EET&D spoke with Kim Getgen, co-founder and CEO of InnovationForce. Drawing on over two decades in the utility and cybersecurity sectors and a career rooted in marketing and innovation, Getgen has developed an SaaS platform designed to help utilities move faster, scale solutions and open the door to broader collaboration across the energy ecosystem.

Getgen and her co-founder, Harvard Business School professor Linda Hill, have a mission to democratize innovation with AI and help corporations solve some of the world's most complex challenges in industries like energy, transportation, smart cities and infrastructure by working collaboratively.

From development studies to energy

EET&D: You earned an MPhil in international development. That seems like quite a distance from energy technology.

Getgen: I'm not an engineer. I was interested in earth studies. At the time, there weren't many formal environmental studies programs, but I had an opportunity to do a visiting year abroad and study with professors at Oxford's geography department. Later, I applied for an international development studies program and completed the MPhil, which is the US equivalent of a master's degree. I had a very specific focus on West Africa, looking at the history of forests, colonization and deforestation. That was a big spark for me.

EET&D: So, you started with an environmental focus. How did that eventually lead to energy and technology?

Getgen: I always intended to work in energy, but the path wasn't direct. I found my way into Silicon Valley, where I started in the cybersecurity industry. I even founded a cybersecurity company that was later acquired. That experience opened the door for me to jump into the energy sector. →


AI
CO_2
PM 2.5

EET&D: After moving from Silicon Valley into the energy industry, how did your experience working inside so many startups shape the way you saw the challenges of commercialization?

Getgen: I started at the bottom, worked my way up, and really started to understand how the industry functioned. Over the course of 12 to 15 years of working with startups, I began to see a pattern: every growth problem, whether it was sales or marketing, came down to the pilot process. Startups had to prove their technology through pilots, but those programs often stalled. I found myself asking the same question over and over: How do we commercialize this new technology faster with utilities?

The pilot problem

EET&D: When did you start to realize the pilot process itself was the real problem?

Getgen: Every startup I worked with ran into the same issue. They'd have a promising technology, but the only way to get traction was through a pilot program. And those pilots were slow, expensive and often ended without a clear path to monetization.

Startups didn't want to pilot for free — or forever — but that was the reality. I found myself constantly redesigning pilot strategies for each new company. I had the same experience with every single startup I worked with. I had to start a whole new pilot commercialization strategy. I did that so many times, and I got tired of it because it was getting a little old, and I couldn't figure out how to fix it.

It was really frustrating me because I thought, "This feels like it needs to be fixed."

EET&D: Why do you think the utility remains the only viable path, even with so much innovation happening outside of it?

Getgen: You cannot go around the utility to drive modernization in the energy sector. There's one path, and it is through the utility, whether we like it or not.

Recent research from Berkeley Labs shows that the bottleneck is the utility. Billions of dollars have been invested in demonstration projects. For example, EPIC in California has invested over a billion dollars in demonstration projects since it started back in 2014. But those demonstrations need to then move on to be piloted at a utility if we want to capitalize on that investment. There's more technology than utilities can handle. They can't run these pilots fast enough, so they become the bottleneck to commercialization.

If utilities can't run the pilots fast enough, those investments risk becoming stranded assets. That's the glaring problem. And because I'd seen it from both sides — startup and utility — I knew we needed a systemwide solution.

InnovationForce is born

EET&D: You mentioned your frustration over seeing the same roadblocks repeatedly. What made you decide to channel that frustration and build something new around it?

Getgen: That realization set the stage for InnovationForce. The COVID-19 pandemic provided a pause for deep reflection about what I wanted to do with my career.

Before COVID, I had spent a lot of time working for startups in the energy space that had new cutting-edge technologies.

After COVID, I was contracted to run an innovation program at Portland General Electric. They were building a virtual power plant and needed 5G-enabled use cases. We called it the Connected Utility. I mapped out 200 use cases that were going to need to be enabled with 5G. But Portland really needed it because they were building a virtual power plant, and they needed to harness these DERs through a VPP to overcome not only the growing capacity constraints, but at that time, there was a push for decarbonization goals.

Working inside the utility, I saw the same frustrations they had were the same ones identified during my time at the startups. Too many pilots, not enough resources to run the volume and scale of pilots and no clear process to manage them. I brought my pilot process I'd used at startups, and the utility loved it. I was excited to see what worked for the startups trying to complete pilots, which also made sense to the utility — the management challenges were the same.

This is what led me to create InnovationForce, which is a SaaS platform that uses AI to match industry challenges with potential solutions and then streamline pilots into a manageable workflow. Our AI reads regulatory filings, extracts challenges, matches them to vendor solutions and allows the utility and startup to work together in a repeatable pilot workflow. Instead of one-off, slow-moving pilots, companies can track challenges, test solutions and move them toward production in a systematic way. I could have launched InnovationForce by beginning with the startup, but instead, we built it with utilities from the inside out. That's why I think startups in the utility industry should pay attention to what we are doing. I am saving them time and money by giving them a repeatable pilot process that was proven at the utility first. Similarly,

utilities should pay attention because they have a process their peers are using and it's working for them.

We have shown early results that have cut pilot times in half and reduced decision-making time by 85%. With PGE, they put out their Innovation Impact Report, which showed they greenlit 50% of pilots to move to the production at scale phase, which is unheard of.

Innovation is not just about tools

EET&D: How has the market received your SaaS platform? Can you give an example of how the platform works in practice?

Getgen: InnovationForce has already been put to work in the U.S. and abroad, showing how utilities and partners can use AI to accelerate innovation.

Portland General Electric, which was really our proving ground, is a good example of how the platform works. We mapped out their challenges and used the platform to identify use cases for a virtual power plant. That showed us the scale of the problem and the opportunity to apply AI.

More recently, we've partnered with AboitizPower in the Philippines. They wanted to foster a way to standardize innovation across 1,000 employees, who are all contributing ideas. Using our platform, they've been able to source, evaluate and prioritize those ideas in a structured way, with clear reporting to leadership.

EET&D: When you're running a pilot, what needs to happen for all the stakeholders to feel confident and aligned?

Getgen: It's important to understand that innovation isn't just about tools; it's about strategic alignment. Utilities need to see what ideas are emerging, how they connect to strategy and which ones can scale. When people across the organization — and their vendors and regulators — all see the same information, it builds trust. That trust is what allows a pilot to move forward, because everyone believes in the process and can see where it's going.

Some utilities want us to manage this for them — we call that innovation-as-a-service. That's how we started with Portland. For two years, we built and prototyped the software with them. Once the SaaS platform launched, Portland stopped using us as a service and now only needs a low-cost subscription. I believe it's delivering an 800X ROI, but those are my numbers. →

Competition and differentiation

EET&D: There are plenty of consultants, incubators and platforms that claim to help utilities innovate. How is InnovationForce different?

Getgen: Consultants may produce reports, and incubators may help startups, but utilities need a system that can manage pilots at scale. That's where innovation management comes in.

Innovation management is projected to be an $8 billion market by 2030. Some competitors have been around since the early 2000s and have focused on ideation, but not the pilot management. They're the incumbent, and we're the disruptor. We're kind of coming in and shaking things up a little bit. What makes us different, and I think a stronger solution for utilities, is our background in energy.

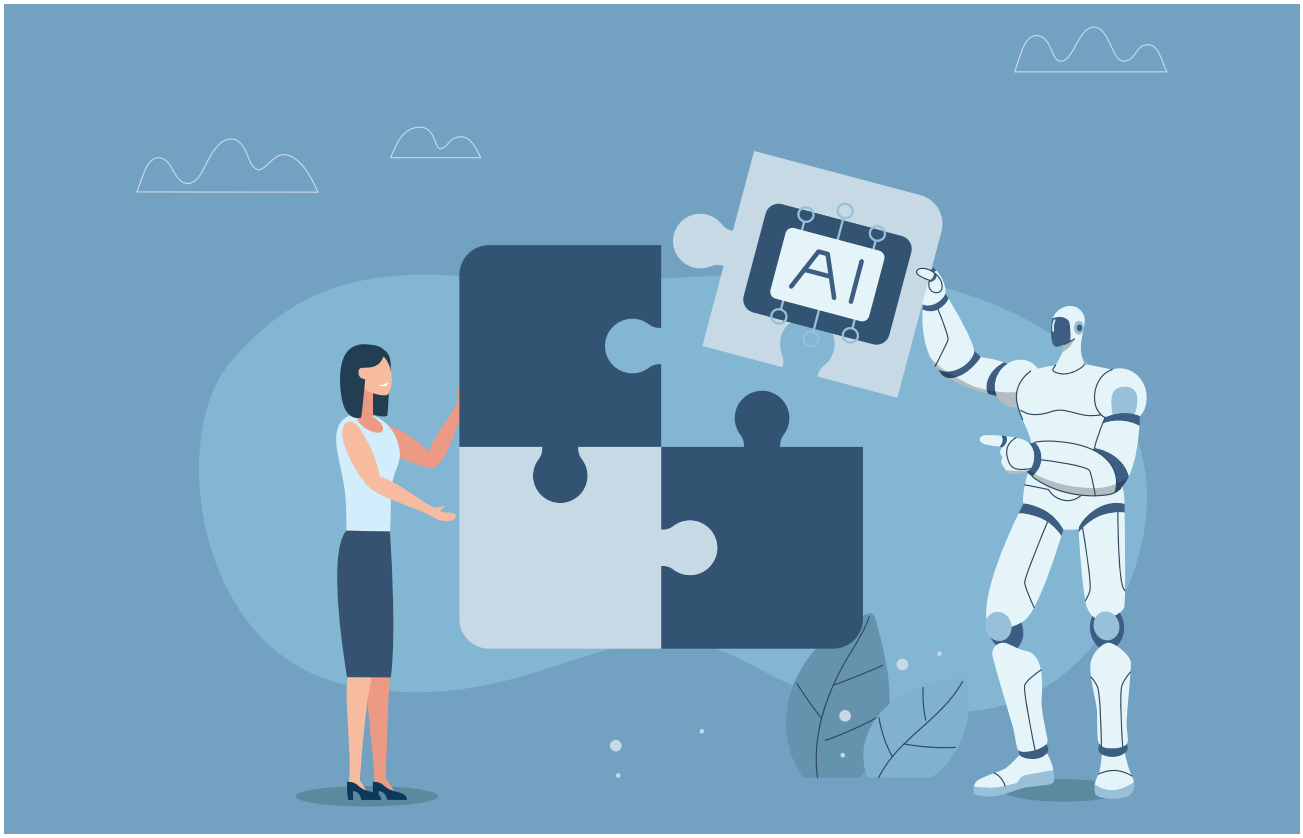
We really wanted to solve this energy problem because we believed it was mission-critical for the planet. We also believe that the energy industry has the advantage of collaboration. It's not as competitive as other industries. And so, what we're trying to enable through software and AI is an ecosystem collaborating to solve problems faster. I didn't want to just build a platform that a single enterprise would use. I really wanted to build something that would drive industry transformation. And we knew because of our other co-founder of InnovationForce, Linda Hill's research, and [her book] "Collective Genius," that ecosystem development around an idea marketplace was the number one thing the successful leaders of innovation did time and time again.

So that is kind of the new thing — the marketplace of ideas is basically a Small Language Model, generating industry-specific challenges, and matching them to solutions ready to be piloted. It's exciting to see the scale we can get with AI to make the dream a reality. And we can create these idea marketplaces with AI on the fly — so any utility or startup can create their own curated marketplace to help sell ideas ready to pilot. That's what stands out between us and everyone else.

The future of innovation in energy

EET&D: Looking ahead, where do you see the biggest opportunities for innovation in energy?

Getgen: We're at an inflection point. The grid is under enormous pressure — electrification, renewables, climate resilience and cybersecurity. Utilities can't solve those problems alone, and startups can't scale without utility adoption. The future is about collaboration at scale.



Innovation isn't just about inventing new technology. It's about getting the right solutions into the right places, quickly. That requires systems. AI will play a huge role, not as a magic bullet, but as a connective tool: It can read filings, track patterns and surface opportunities that would otherwise be missed. That frees up human innovators to focus on creativity, strategy and building trust.

What we've built is a common framework for innovation: identifying challenges, testing solutions and measuring results. The AI gives you scale and speed, but the framework gives you consistency.

EET&D: Do you see utilities becoming more open to collaboration?

Getgen: They have to. The challenges are too big for any one company or person to solve. What excites me is that we now have the tools to make collaboration real — not just talk about it. If we can create systems where ideas move faster, scale faster and prove their value faster, we can transform the grid in time to meet these challenges.

Conclusion

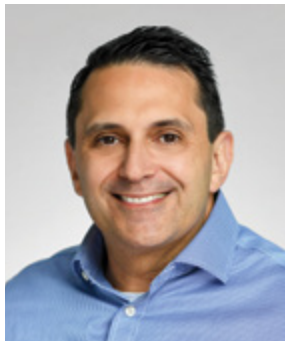
InnovationForce is still a startup, but it has a global presence. Due to Getgen's experience on both the startup and utility side, she has a unique vantage point and understanding of how to unlock the industry's most persistent bottlenecks. By systematizing the pilot process and embedding AI into the search for solutions, her team is aiming to make innovation less of a buzzword and more of a repeatable, scalable practice that anyone can follow.

For an industry facing unprecedented change, that shift could be the difference between incremental progress and true transformation.

ABOUT KIM GETGEN:

Kim Getgen is the cofounder and CEO of InnovationForce. Getgen graduated from the General Management Program at Harvard Business School, received the MPhil in international development studies from Oxford University and has a Bachelor of Arts from Wake Forest University.

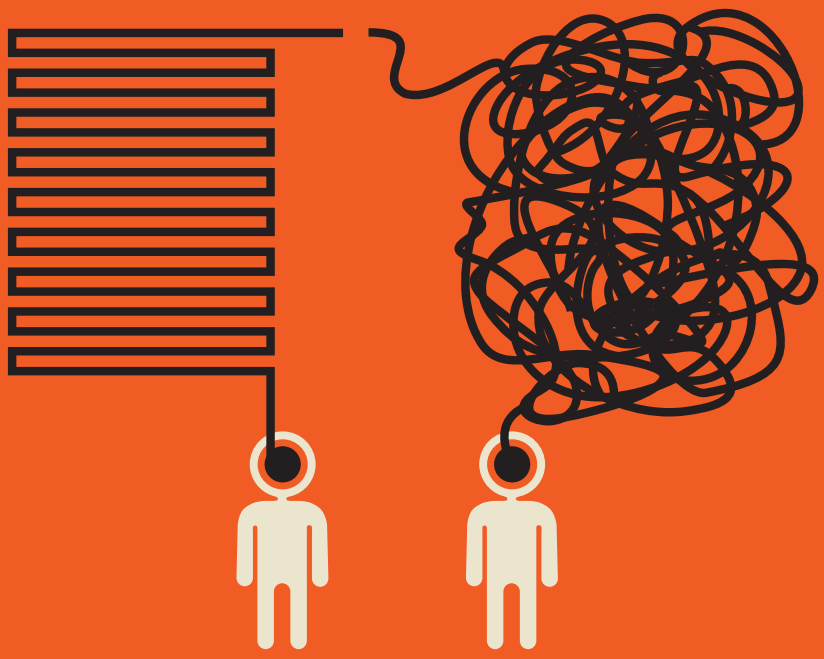
DON'T OVERLOOK THESE SUCCESS FACTORS FOR IT/OT INTEGRATIONS



KATE KOCHENDERFER AND JOHN TOUBASSI

For decades, utilities have carefully maintained a barrier between their operational technology (OT) and information technology (IT) systems. That IT/OT divide has long been a best practice for ensuring the reliability of utilities' infrastructure, protecting against cybersecurity threats, maximizing uptime for critical equipment and ensuring service reliability for customers. But today, the walls between IT and OT are increasingly a liability that make it much harder for utilities to access operational efficiency, increase grid resilience and drive innovation.

There is a growing consensus in the industry that eliminating the divide between IT and OT is a new best practice. When done in a purposeful way with the right strategy, IT/OT integration can unlock major efficiencies, enhance grid reliability and create a pathway to other improvements. Those are major positive impacts on their own. Still, IT/OT integration is also critical for solving many of the biggest challenges we face as an industry, including rapid growth in customer demand, the impact of climate change, the growing number of DERs connected to the grid, the graying of the utility industry's workforce and more. →



IT/OT integration provides the right foundation for accomplishing many of our industry's goals, but the process is complex, and many utilities struggle with these initiatives. Most of the discussions we have heard about successful IT/OT strategy focus purely on technology. IT/OT initiatives also need to have successful strategies for two other areas often overlooked: people and processes.

People and processes are critical because many IT/OT initiatives run into difficulty related to misaligned priorities, siloed departments, fragmented leadership, resistance to change, communications issues and outdated business processes and governance structures. Even if an organization has the right technology strategy for IT/OT integration, momentum can be thwarted by setbacks in these other two areas.

One of the reasons why IT/OT integrations are challenging is that these efforts bring together two sides of the organization that have two distinct mindsets, cultures and sets of business processes. Those differences between IT and OT are by design, after all. To excel in their roles, utility OT teams and IT teams have developed distinct approaches tailored to the specific demands of their respective systems. As a result, they speak their own languages and have their own ways of working. There are bound to be language barriers and cultural barriers when you bring these teams together to do something hard, and that is exactly what happens with major IT/OT integration initiatives.

The key is to have an IT/OT strategy that puts just as much focus on addressing these people and process challenges as it does on navigating technology decisions. In our roles at SRP and TRC, we have been involved in numerous IT/OT integration efforts that provide important lessons for how to do it successfully, including:

1. **Define a clear vision**
2. **Focus on organizational alignment**
3. **Prioritize change management and effective communication**
4. **Simplify complexity through standardization of processes**
5. **Have a smart approach to scaling**

We discuss each of these below to give utilities a blueprint for avoiding areas of friction that would slow progress toward IT/OT integration with the understanding that IT/OT is much more than just a technical project. It is a major business transformation for your organization and for all utilities — a transformation that mirrors the size of the goals it will help achieve: modernizing the grid, expanding clean energy production, protecting infrastructure against climate change, supporting electrification of the economy and more. These are big, bold goals. To achieve them, utilities are transforming themselves in fundamental ways that are hard for any organization.

1. Define a clear vision

For any major organizational transformation, leadership and vision are vitally important. Utilities must start IT/OT initiatives by articulating *why* integration matters. And that vision must come from senior leaders whose support underscores how important the transformation will be for the future of the organization. Without a proper vision and alignment on that vision — including the C-Suite, IT leaders, general managers and other key stakeholders — the goals of your IT/OT transformation will not be achieved.

To achieve that alignment, utilities need a vision that starts with a grounded understanding of where the organization is today and then charts a course toward a compelling destination that will inspire broad, sustained support. This vision should also connect the dots in clear ways between IT/OT convergence and tangible, measurable business outcomes such as grid reliability, cost savings or removing productivity obstacles that employees wrestle with daily. One example that checks each of those boxes is a vision for centralizing control systems under IT to standardize architecture and improve decision-making — a transformation that would enhance grid reliability, drive significant cost savings and remove frustrating inefficiencies to enable employees to work more productively.

One point we should underscore is the critical importance of establishing the right time horizon for this vision. We believe leaders should envision and articulate a 10-year horizon to properly encompass the scope of these transformations, including the significant change management that is required. Having the right horizon will emphasize the true strategic importance of this transformation, while also acknowledging the hard work that will be involved. Employees know how big these changes will be, and they want a vision and plan that is based not only on boldness but realism.

Salt River Project (SRP) is a great example of how important leadership vision can be for an initiative that drives IT/OT convergence. SRP is currently undertaking a significant Customer Information System (CIS) transformation, replacing a 20+ year-old mainframe-based CIS with SAP's advanced Utility Suite. This initiative also includes the modernization of our Meter Data Management System (MDMS) — in partnership with TRC — and the consolidation of numerous legacy and homegrown applications.

This transformation is a critical enabler of SRP's 2035 strategic goals, particularly those enhancing customer satisfaction and loyalty through more personalized products, services and interactions. By modernizing these core systems, we are improving operational efficiency, data integrity and scalability, while laying the groundwork for future technology initiatives such as our advanced AMI (Advanced Metering Infrastructure) roadmap. A dedicated Business Intelligence workstream is embedded within the program to support internal change management and address customer-facing impacts, ensuring a smooth transition for both SRP employees and our customers. Ultimately, this program is far more than a system upgrade — it is a strategic investment in SRP's digital future. By establishing a flexible, scalable and integrated technology foundation, we are positioning SRP to lead in IT/OT convergence, grid modernization and customer-centric innovation.

2. Focus on organizational alignment

Integration requires more than just deploying technology. It requires structural change, from cross-functional teams with IT, OT and business leaders to dismantle silos. Organizational alignment is critical because inadequate alignment is the source of so many of the obstacles that can undermine forward progress.

One of the most important ways to accomplish better organizational synchronicity is to reorganize reporting lines to foster communication and collaboration across the IT/OT line. For example, companies can create an OT organization under their CIO or General Manager to help centralize accountability for all aspects of enterprise systems. This alignment ensures technology investments (e.g., AI-driven grid analytics) are matched by operational readiness, whether for supervisory control and data acquisition (SCADA) or advanced metering infrastructure (AMI) or outage management.

It is important to remember that IT/OT transformation is not done in one large step. There are many important steps that utilities can take that move the organization toward greater convergence while also delivering significant other benefits. Over the past decade, we have observed a growing trend among utilities to centralize Operational Technology (OT) systems — such as EMS, SCADA, ADMS, OMS and AMI — under the purview of IT. This shift has aligned the technology stack and implementation lifecycle with IT governance, while the business remains focused on operational outcomes, as highlighted earlier. →

Another way utilities can take incremental but meaningful steps toward IT/OT convergence involves deploying new IT systems to break down siloes. For example, many utilities (including SRP) have made significant IT investments in new Customer Information Systems (CIS) and Graphical Information Systems (GIS), and those implementations are being done in ways that are integrated with OT systems. Having a mindset that prioritizes IT/OT integration helps build a strong foundation for increased IT/OT convergence over time. These steps also deliver other significant benefits to utilities, including faster and more efficient communication, quicker decision-making across departments and successful delivery outcomes.

A great example of this is the way SRP has established a cross-departmental technology governance framework that unites OT, IT and business teams — a strategy that is proving to be a highly effective way to collaboratively address enterprise risks, technology roadmaps and key governance topics. This initiative enhances visibility into company-wide activities and fosters alignment across departments. As IT and OT systems become increasingly integrated, their interdependence is critical to delivering results. With rapid advancements in AI, cloud computing and real-time data, it is critical that cross-functional teams work together to enforce strong internal controls, follow an enterprise technology roadmap and keep lines of communication open. To meet evolving demands in generation, transmission and customer expectations, SRP and other utilities must maintain a robust, adaptive technology roadmap that supports long-term success in a dynamic environment.

3. Prioritize change management and communication

Having a robust change management program is a must. All large organizational transformations hinge on people, and IT/OT integration is no different. Change is difficult, particularly one as significant as in an IT/OT integration that alters how things have been done for decades.

Utilities should therefore invest in training programs that bridge IT/OT knowledge gaps and foster collaboration. One best practice is to partner with change management experts to address cultural barriers and communicate progress transparently. Whether internal tiger teams, committees, or external systems integration organizations, you'll want a plan to help your staff adopt new tools into their everyday work life for maximum return on value.

Implementing a true IT/OT organization can be a challenging endeavor, as utilities often operate within deeply ingrained silos rooted in legacy cultures and systems that have persisted for decades. Overcoming these silos to foster communication and build trust between the business and IT requires dedicated change management (CM) processes and a collaborative, communicative relationship between the IT team, OT team and leaders of core business areas.

The importance of consistent communication from senior leadership cannot be overstated, not only for keeping a spotlight on the end goals, but also for highlighting forward momentum that shows that the hard work is paying off. This progress can often be invisible to teams that are deeply occupied with details and day-to-day complexities of the integration. Another key role for leaders is to be active in monitoring for obstacles that are standing in the way of progress and using their influence to remove roadblocks that will enable teams to make further progress.

4. Simplify complexity through standardization of processes

Another way to achieve forward momentum with IT/OT integration strategies is to reduce complexity by implementing common frameworks for data governance, cybersecurity and system interoperability. For example, unified GIS and ERP platforms can streamline asset management. Leveraging modern tools like TRC's Lemur mobile mapping can harmonize field asset data with IT systems, ensuring spatial accuracy and real-time updates. Wherever standards can be implemented, do it. This will spur seamless interaction and faster, more accurate decision-making while removing obstacles for your IT/OT integration teams.

As an example, SRP's delivery approach provides the flexibility and consistency needed in delivery methodologies, ensuring disciplined execution and successful program outcomes. For large programs, SRP follows consistent methodology with a governance framework that includes standing up Project Management Office (PMO) and Organizational Change Management (OCM) teams to support the process and help ensure success.

5. Take a phased approach to scaling

Doing too much too fast is often the undoing of major organizational transformations. For IT/OT integrations, it is critical to take a phased approach that divides a large program into consumable chunks and multiple phases. To demonstrate value, begin with pilot projects (e.g., deploying smart sensors in a substation), then scale using agile methodologies. And be sure to incorporate feedback loops that enable teams to address roadblocks, refine processes and avoid over-customization.

The benefits of getting it right

Addressing these often-overlooked aspects of IT/OT integrations will eliminate some of the most common reasons why these initiatives struggle. These programs are about far more than having the right technology. You also need to set your teams up for success with the right vision, structure, processes and support — empowering them to apply their talents to meet difficult, but transformational wins, vital to the future of every utility.

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John Toubassi is the managing director of Digital Grid Solutions at TRC, a global professional services firm providing integrated strategy, consulting, engineering and applied technologies in support of the energy transition. Toubassi has over 33 years of global delivery, executive management and industry experience. With deep experience in IT/OT systems integration, advanced metering and other technologies, he is dedicated to delivering data-driven grid reliability and decentralized energy.

POWERING TOMORROW:

UPGRADING THE U.S. GRID FOR DIGITAL TRANSFORMATION AND RESILIENCY

VINAMRATA CHADHA

The new urgency for grid modernization

The U.S. electric grid stands at a critical juncture. The infrastructure that was primarily built in the 1960s and '70s is now struggling to keep up with current technological demands. Our grid is now at risk for catastrophic failures from age-related wear and tear, severe weather events and unbalanced supply and demand.

As industrial automation, artificial intelligence (AI), electric transportation and data centers continue to expand, the grid must evolve to keep up. Electrification and digitalization demand a new kind of infrastructure, one that is flexible, intelligent and resilient enough to keep the digital world powered under any condition.

Utilities and large energy consumers are already grappling with a tough balancing act: meeting rising demand, keeping up with new technologies and modernizing infrastructure, all without breaking budgets. The solution is not to start from scratch but to adopt a layered approach that combines traditional methods with next-generation solutions such as advanced conductors, cable rejuvenation, distributed energy resources (DERs), microgrids and strategic partnerships. The future of reliable power lies in working smarter, not just harder.

Digital demands on the grid

Digital transformation is reshaping every industry, from precision manufacturing to e-commerce logistics. At the heart of this transformation lies one fundamental requirement: uninterrupted power.

According to McKinsey's 2024 U.S. C-suite survey, 92% of companies plan to increase their AI investments by 2027. Yet, only 1% say they have reached maturity in their AI investments. That means a massive expansion in computing capacity and, therefore, electricity demand is on our heels.

The National Electrical Manufacturers Association (NEMA) is well aware of the imminent need and, in a recent study, estimated that electrification of transportation and data center growth will increase U.S. electricity demand by approximately 2% annually over the next 25 years, with total electricity demand rising 50% by 2050. This surge is driven not only by AI and automation, but also by transportation electrification and the growth of hyperscale data centers.

In this digital-first economy, power disruptions are no longer mere inconveniences; they can cause devastating failures in critical facilities. A 2025 Ponemon study states that data center outages, for example, now average more than $500,000 per incident and can easily exceed $1 million.

The message is clear: The modern economy is power-hungry — and it expects perfect service. →

As digitalization accelerates across industries, maintaining power quality and uptime is essential to ensure the reliability of AI, automation and data-driven operations. Source: Southwire

Building resilience: Grid infrastructure under pressure

Delivering digital and power resiliency is challenging in a stable environment, let alone one with an aging infrastructure, extreme weather events and increasing cyber threats.

Many underground and overhead cable networks are reaching or exceeding their design lifespans and cannot accommodate modern power loads. Moreover, storms, wildfires and flooding are now common threats. Undergrounding offers protection from wind and fire, but water can still get into lines, causing widespread outages. Full replacement of a legacy infrastructure is prohibitively expensive and logistically disruptive. According to Deloitte, U.S. grid upgrades could require a $1.4 trillion investment over the next five years, with similar levels of spending projected through 2050. While the need is urgent, few utilities have the resources or budget to accommodate the need. Fortunately, there is a better and easier way forward.

Smarter upgrades, not full replacements

Grid modernization doesn't always require ripping and replacing existing infrastructure. In fact, intelligent upgrades can extend asset lifespans, increase capacity and improve performance while avoiding unnecessary costs and delays. Cable rejuvenation and the use of advanced conductors are two examples where upgrades can be made at a fraction of the cost, so that digital transformation can be supported with optimal power resiliency.

Cable rejuvenation

Cable rejuvenation is a proven technique that effectively doubles underground cable life by injecting silicone into existing cables, restoring dielectric integrity, while also minimizing excavation, permitting delays and capital expenditure in comparison to rip-and-replace.

Case in Point: Dayton International Airport

AES Ohio needed a fast, reliable and cost-effective solution to eliminate repeated disruptions caused by an aging underground main feeder cable to Dayton International Airport. With flight schedules on the line, downtime wasn't an option.

Upgrading legacy infrastructure with cable rejuvenation technologies helps extend lifespan and reduce capital outlay. Source: Southwire

By using cable rejuvenation, they quickly treated over 42,000 feet of 1000 MCM and 500 MCM cables. The result? The project was completed in under a week, cutting anticipated costs nearly in half compared to full cable replacement.

Advanced conductors: For new builds and reconductoring

Another powerful tool in the modernization toolkit is the use of advanced conductors, particularly for overhead transmission lines. These high-capacity, low-sag conductors can double the ampacity of traditional aluminum conductor steel-reinforced (ACSR) lines without major structural replacement or modifications, slashing energization timelines from 7–10 years to as little as 2–3 years. In new infrastructure build scenarios, advanced conductors enable system optimization, reduce costs and maximize performance through enhanced capacity, efficiency and resilience compared to traditional conductors.

Case in Point: River Crossing Clearance in Canada

A Canadian utility faced a critical clearance issue over a river. The existing ACSR conductor provided only 11.8 feet of clearance, well below the required 32.5 feet. Rather than rebuild the line entirely, the utility installed an advanced overhead conductor with high temperature and low sag, resolving the clearance issue without extensive structural changes and dramatically reducing costs and installation time.

Whether it's for new builds or system upgrades, advanced conductors allow utilities to optimize both performance and project ROI.

The rise of DERs and microgrids

To bolster power reliability and flexibility, utilities are also looking to integrate with local DERs and microgrids to help balance power flows, provide peak shaving and serve as critical backup during grid outages.

Distributed energy resources and microgrids provide flexible support for grid resiliency and localized reliability. Source: Southwire

Case in Point: Microgrid in Hot Springs, NC

The remote town of Hot Springs, North Carolina, historically powered by a single line through Pisgah National Forest, was prone to extended outages. Due to environmental and cost constraints, a second utility line was not feasible.

Instead, Duke Energy deployed one of the most advanced microgrids in the country: a 2-megawatt solar array and a 4.4-megawatt lithium-battery system. When Hurricane Helene wiped out the town's substation in 2024, less than a year after integration, the microgrid kept the lights on, shortening a potential weeks-long outage to just days.

By integrating DERs and microgrids, utilities can create a more modular and adaptive grid, one that keeps power flowing even in the face of disaster.

The digital grid infrastructure

The future grid is evolving into a dynamic, data-driven ecosystem where electricity and information flow hand in hand. Beyond predictive analytics, sensor-equipped cables and load-balancing algorithms, utilities are now leveraging digital twin technology to simulate and monitor grid behavior in real time. These virtual models allow operators to test scenarios, anticipate failures and optimize performance without disrupting actual operations. Additionally, AI-powered fault detection systems can analyze vast streams of data from smart sensors to pinpoint issues before they escalate, enabling faster crew dispatch and minimizing downtime.

To further enhance coordination with DERs and demand-side management, utilities are integrating edge computing and blockchain-based energy trading platforms. Edge computing enables real-time decision-making at the grid's edge, reducing latency and improving responsiveness to local conditions. Meanwhile, blockchain facilitates secure, transparent transactions between consumers and utilities, supporting peer-to-peer energy exchanges and dynamic pricing models.

Together, these tools form the backbone of an intelligent grid that is not only upgraded but deeply interconnected, adaptive and resilient from conductor to control room.

Funding the future: Financing grid modernization

Modernizing the grid is a monumental task. For many utilities, securing the necessary budget for these upgrades can be a significant barrier. However, a range of funding opportunities exists to help offset costs. Understanding and leveraging these options can ensure that modernization efforts move forward without undue delay. →

Federal grants and programs

Federal funding plays a pivotal role in supporting grid improvement projects. While programs like the Infrastructure Investment and Jobs Act (IIJA) and Inflation Reduction Act (IRA) have allocated billions of dollars over the past few years towards grid modernization, workforce development and sustainability enhancements, the landscape is evolving under the One Big Beautiful Bill Act (OBBBA). Under OBBBA, developers and utilities face accelerated timelines, exclusion of foreign-influenced entities and stricter domestic content requirements to gain access to grant programs and tax credits.

State and local incentives

Individual states are also stepping up to assist utilities in funding grid enhancements. Many states offer grants, tax incentives, or low-interest loans to encourage investments in renewable energy integration, energy efficiency and infrastructure upgrades. Some states are even investing directly in large-scale projects, such as the construction of new power plants or nuclear facilities, to reduce strain on aging grids. Utilities that proactively engage with state energy offices and local governments can uncover tailored support options that align with their specific needs.

Public-private partnerships (PPPs)

Collaborations between public utilities and private companies can unlock innovative funding mechanisms and operational efficiencies. For example, partnerships with tech companies can help utilities leverage distributed energy resources (DERs) to enhance grid resilience. A noteworthy example is the Guadalupe Valley Electric Cooperative's partnership with Tesla, which enables access to DER capacity through the ERCOT Aggregated Distributed Energy Resource program, improving grid reliability and creating new revenue streams.

Private investment funds

Private equity firms and institutional investors are increasingly drawn to clean energy and grid modernization projects. Utilities can tap into this interest by selling non-core assets, such as non-regulated solar or wind plants, to raise capital for modernization efforts. These funds not only bridge budget gaps but also allow utilities to focus on their core mission of delivering reliable power.

By exploring these diverse funding avenues, utilities can overcome financial challenges and ensure the grid evolves to meet the demands of a digital, electrified future.

Strategic partnerships: Scaling for the future

Despite the growing urgency, many utilities lack the internal bandwidth to implement full-scale modernization on their own. That's where strategic partners come in.

The right partner can augment internal teams and accelerate outcomes, from planning and engineering to field testing, installation and condition assessment. They can also provide specialized services like forensic testing, disaster response and cable rejuvenation that require deep technical expertise.

When choosing a modernization partner, look for:

- A long track record in utility markets
- Proven innovation and R&D
- Comprehensive service offerings
- Rapid mobilization and support capabilities

A trusted partner should not only provide grid components, but also collaborate with utilities as a full-service partner, helping ensure that power systems are built for both today's demands and tomorrow's disruptions.

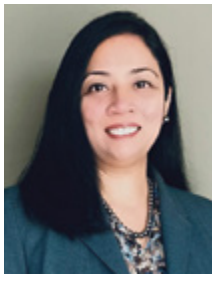
Powering digital progress

The grid of the 20th century cannot power the 21st. But we don't need to start over. We need to modernize and upgrade in a smarter way.

From cable rejuvenation to advanced conductors, from DERs to microgrids, the tools to modernize the grid are already here. What is needed now is just the strategy and action to deploy them at scale.

Utilities and energy providers that act decisively can not only ensure grid resilience but also help boost digital transformation, especially when working in concert with policymakers, technology providers and consumers. This collaborative ecosystem is essential to building a smarter, more responsive and inclusive energy future.

Modernizing the grid is no longer just a technical challenge; it's an economic, environmental and social imperative. The time to act is now.



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Vinamrata (Vinni) Chadha brings over 20 years of expertise in the energy and power industries, with a focus on utilities, data centers, renewable energy and industrial systems. As director of Utility Markets & Industry Affairs at Southwire, she leads strategic planning, business development and market intelligence efforts, driving product innovation in line with emerging industry trends.

Throughout her career at Southwire, Eaton and Siemens, Chadha has spearheaded advancements in smart grid technologies, renewable energy integration and cutting-edge solutions. Her global experience across the U.S., Germany and India provides her with a distinctive perspective on market dynamics and the future of energy infrastructure.

HOW RUGGED TECH HELPS UTILITIES

KEEP UP WITH RISING DEMAND

CHAD T. HALL

The electricity landscape of today looks vastly different from what it did just a few years ago. In the last 12 months alone, we've seen a rapid and unprecedented increase in demand, largely fueled by a boom in data centers and the explosive growth of artificial intelligence (AI) and other compute-heavy technologies. Today, AI and electricity go hand in hand. According to the International Energy Agency, global investments in data centers have nearly doubled since 2022. The same report found that the U.S. accounted for 45% of global data center electricity consumption in 2024 — the largest share of any country. This surge in demand showcases the urgency for scalable, efficient and reliable solutions to modernize and maintain the power grid so the U.S. can keep up with demand.

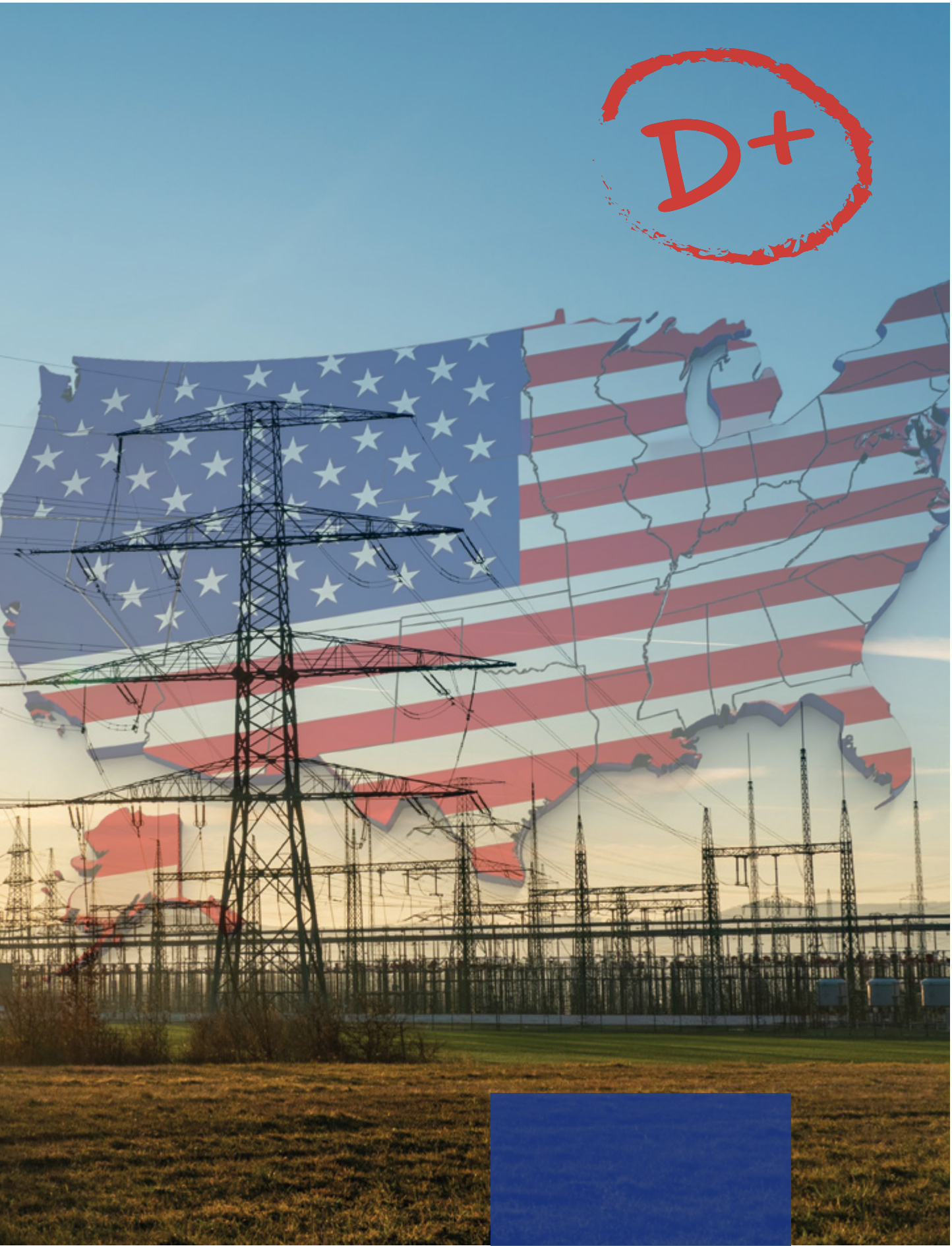
The combination of unprecedented electricity demand and aging infrastructure has created a major challenge for utility providers. The American Society of Civil Engineers (ASCE) gave the U.S. energy infrastructure a D+ on its most recent Infrastructure Report Card, proving that our grid was not built for this level of strain. Without significant grid updates and infrastructure investments, the risk of blackouts, service delays and long-term failures continues to grow. As energy use rises and infrastructure struggles to keep up, utility crews face new challenges that demand faster and smarter solutions.

The challenges of rising demand and aging infrastructure

Power grids designed decades ago weren't intended to support the recent soaring demand required by AI data centers and widespread EV charging stations. Without accelerated upgrades and expanded capacity, the grid risks being overwhelmed.

In this environment, every minute of downtime and every delay in field operations has broader implications. Utility workers must respond faster, troubleshoot smarter and work more efficiently — all while navigating difficult terrain and unpredictable weather conditions. That's where technology steps in, with rugged laptops and tablets emerging as an important tool in modern utility operations.

These tools let utility crews stay productive in the field, provide instant access to real-time data and keep field teams connected to each other and the central office. Here's a quick look at just some of the ways rugged laptops and tablets are helping utility workers overcome pressing challenges. →


D+

Maintaining and modernizing an aging power grid

A lot of the U.S. electric grid was built in the 1960s and 1970s, with components nearing or surpassing their intended 50 - 80-year lifespans. Maintaining and upgrading this infrastructure is a massive undertaking that requires massive amounts of time and money.

Predictive and preventative maintenance is key to preventing costly outages and ensuring grid reliability across the country. Rugged laptops and tablets play a vital role in this transformation. Field technicians can use AI-enabled devices to analyze historical data and detect equipment anomalies before they lead to full-blown failure. Sensors embedded in the grid feed real-time data into software programs on rugged laptops and tablets, helping crews prioritize repairs and deploy resources where they're needed most.

These devices are also designed to withstand rain, dust, extreme temperatures and rough handling, making them the ideal companion for utility workers operating in the toughest environments. For example, a field crew upgrading legacy equipment to smart grid technology can use rugged laptops or tablets to access digital designs, configure new IoT-enabled devices and run system tests on-site, even in less-than-ideal conditions. By arming workers with mobile tools that double as diagnostic centers, utility companies can transition from reactive to proactive grid management and pave the way for a more intelligent and resilient energy infrastructure.

Navigating the utility labor shortage

The utility industry is also facing a shortage of skilled workers, with research estimating that the U.S. will need to fill around 510,000 new jobs to satisfy the need for additional power. Retirements, difficulty attracting younger workers and the sheer scope of required upgrades have all stretched teams thin. However, the demand for power and the need to maintain uninterrupted service to customers continue to grow.

Rugged mobile computers help utility crews do more with fewer hands. These devices allow workers to instantly access work orders, upload photos and videos from the field and transmit large files directly from remote sites. They're built with multiple connectivity options like 4G, 5G and other industry-specific private LTE networks. The flexibility in connectivity lets utility crews stay connected and able to access valuable details, like GIS information or data analytics, wherever the job takes them.

Rugged laptops and tablets are purpose-built for productivity. All-day battery life ensures crews can work uninterrupted through long shifts in areas where access to power isn't always possible. User-removable expansion areas also allow for customization based on job-specific needs like additional ports for connectivity, barcode scanners to simplify the management of new grid parts and hot-swappable batteries for even more battery life. A wide range of built-in ports makes for easy connection to legacy tools and sensors still in use across many utility operations, which can come in handy when upgrading the grid. With these features built into their devices, crews can stay in the field longer, get more done and spend less time charging, searching for adapters, or dealing with incompatible equipment.

Plus, with advanced software systems, rugged computers can automate routine tasks so that crews can focus their time on critical work. With these features, rugged devices enable utility professionals to maximize their time in the field and get more done with fewer delays.

Strengthening cybersecurity at every level

With an increased reliance on digital tools and connected infrastructure comes the increased need for cybersecurity. The nation's electricity sector remains a target for cyber criminals to exploit vulnerabilities, and cyberattacks are increasing. A successful breach could disrupt service to millions of homes, businesses and critical facilities like hospitals.

That's why built-in and layered security features in rugged mobile computers are more important than ever. Utility companies should look for devices equipped with hardware-level encryption, enhanced firmware protections and compliance with industry security standards. These safeguards help ensure that only authorized personnel can access sensitive systems and data, even when workers are in the field. By securing these endpoints, utility providers are strengthening their defense and protecting the grid as a whole.

Powering the grid of tomorrow

To keep pace with rising electricity demand, utility companies must equip their workers with the right tools that enable faster response times, streamlined workflows, preventative maintenance and stronger security. Rugged computers and tablets are a smart investment for field teams to increase productivity and speed in building a more future-ready grid that's equipped to handle the electricity demands of today and the future.

ABOUT THE AUTHOR:

Chad T. Hall serves as executive business development manager at Panasonic Connect, overseeing the development of rugged mobile solutions to support the utilities sector. He obtained his bachelor's degree in geography and master's degree in geographic information science and cartography from Texas State University.

STOP OPERATING

ON BORROWED TIME

ANDREW BARCO AND NICOLE RIGGLE

Leverage next-gen technology to get the visibility (and security) you need

When you walk into the office, you expect the lights to come on and the computers to whirr to life. At home, you might want to start the day with a hot cup of coffee and close it out with a warm, soaking tub.

None of that is possible if utilities and municipal services aren't running efficiently to keep power and water running. Critical operations rely on uninterrupted utility services; in health care, for example, that could mean life-or-death scenarios. And today, there's a growing risk of not having reliable water, gas and electricity delivery, not to mention the potential of a major system breakdown on the line.

For decades, operators have deployed and relied on wireless radio systems as the backbone for critical infrastructure in utilities and municipal services. From monitoring water levels to controlling energy distribution, these systems provide essential connectivity between field devices and supervisory control and data acquisition (SCADA) systems. In basic terms, these systems let operators keep track of what's happening across that service and at key touchpoints.

However, many of these radio networks were installed some 20 or 30 years ago, leaving them on shaky ground for continued health and functionality, resulting in significant risks today that their outdated technology simply will fail. If a system component breaks, limited replacement parts make repairs tricky. On top of that, regulatory requirements for maintaining and reporting on these systems are rapidly increasing.

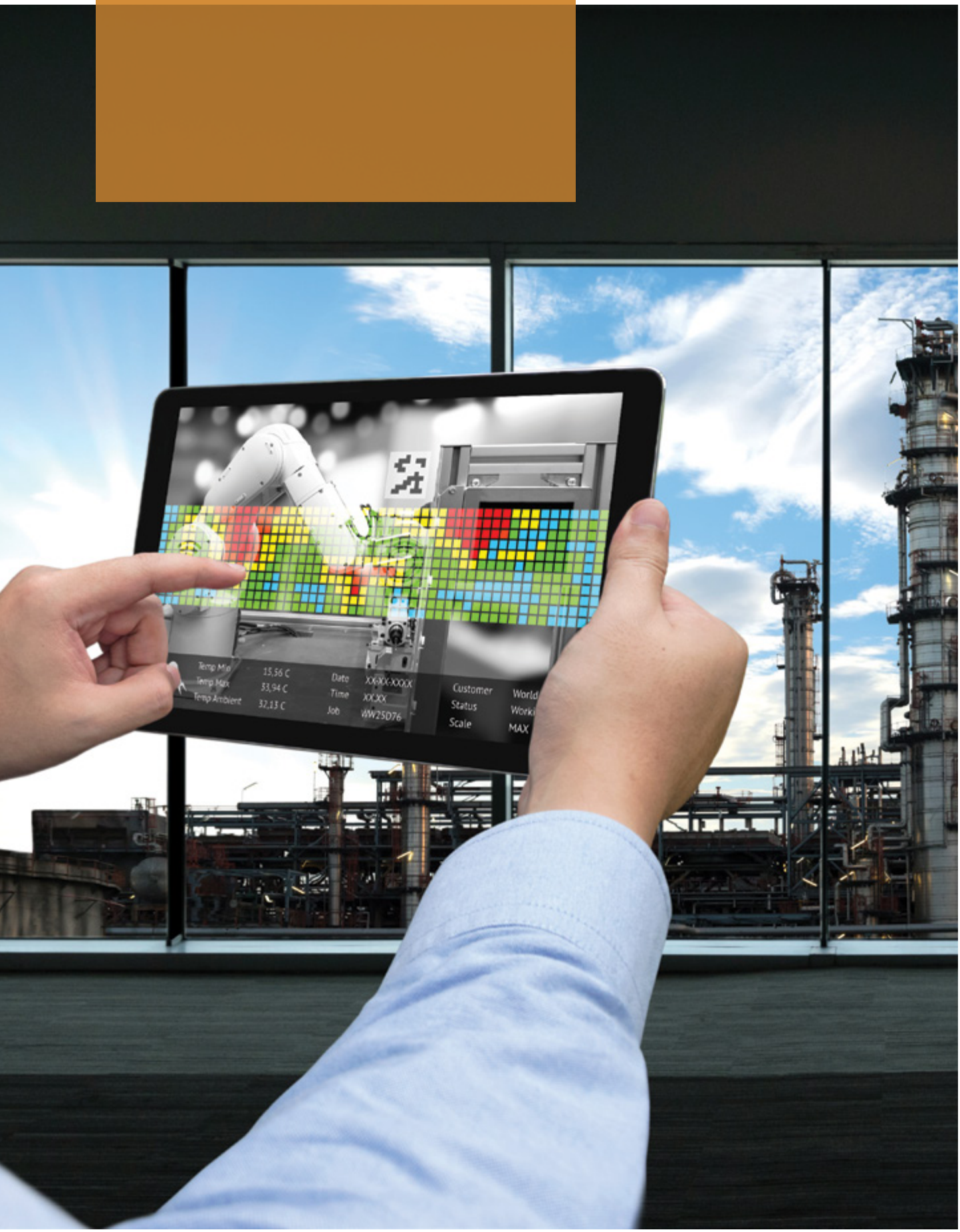
Fortunately, utilities and municipal services can now embrace migration to contemporary radio platforms through easier and less disruptive approaches to meet growing demands for digital infrastructure, cybersecurity and operational reliability. Careful upfront planning can streamline the migration and minimize a host of risks that come with a complex and distributed radio network.

Why legacy radios can't keep up

For many organizations, the wireless radio systems in use today — whether in water-treatment facilities or connected to pipelines running thousands of miles away — were installed decades ago. These legacy systems often rely on analog or serial-based technologies, such as RS232 and RS485. While these devices have provided reliable service, most simply have reached the end of their life cycles, with many operating on borrowed time, which puts critical services at significant risk. Replacement components are becoming increasingly difficult to source as manufacturers have phased out older chipsets, often due to supply chain disruptions and shifts in production following the COVID-19 pandemic.

In addition to obsolescence, these systems lack the capabilities required for today's data-driven operations. Older radios were designed for basic status updates, such as whether a pump was running. Modern systems require high-speed, secure data transfer from a growing variety of field sensors, cameras and controls.

Operators today expect far more from their systems — and rightly so, given the sophistication used in other parts of their functions. They want visibility into environmental data, equipment condition, intrusion detection and real-time alerts — all capabilities that legacy systems simply cannot support. →



Modern radio systems deliver substantial upgrades to legacy infrastructure, with integrated diagnostics, advanced security and seamless interoperability across industrial protocols - enabling real-time asset visibility and control to meet the evolving demands of utility operations. Source: Weidmuller

As aging infrastructure across utility, municipal and industrial sectors faces increasing regulatory pressure, smarter systems have become essential. Wireless radios play a critical role in maintaining the health and uptime of large-scale operations to help identify issues early, before minor faults escalate into major disruptions. Source: Weidmuller

Threats to compliance and public safety

Maintaining visibility and communication with remote infrastructure isn't just an operational goal; these are not just data points for day-to-day functions. Keeping systems running underpins the ability of utilities and municipalities to maintain public health and safety, not to mention reduce environmental risks.

In many cases, operators face strict regulatory oversight and requirements to monitor what's happening at key intervals. Failure to report system status within mandated time intervals can result in steep fines. In Virginia, for instance, the Environmental Protection Agency (EPA) can assess penalties reaching tens of thousands of dollars for each reporting period missed or for failure to comply with mandated monitoring and reporting requirements.

The consequences of outdated systems go beyond fines. Loss of visibility and control can lead to real-world disruptions, including untreated water releases, power failures and environmental hazards. In a recent real-world example, a water authority experienced a major outage due to a failed communication network, resulting in service loss and a regional boil notice for nearly a week in early January. The downstream impact was that businesses and restaurants shut down, and non-emergency medical procedures were deferred.

Beyond replacement: the opportunity in migration

How operators look at a potential migration is important: It's not just a matter of replacing failing equipment. Migration presents an opportunity to deliver step changes that improve system resilience, security and functionality. Today's radio systems deliver an expanding array of advanced features, including Ethernet communication, integrated diagnostics, remote management and support for multiple protocols.

Utilities can also take advantage of modern security features that weren't available when they installed legacy systems. Today's radios support AES 256-bit encryption, advanced IP filtering and multi-level password protection. These capabilities help safeguard critical infrastructure from cyber threats, an increasingly important priority across all sectors.

Additionally, new systems are designed for better spectral agility, enabling them to operate effectively and efficiently even in high-noise industrial environments. They also offer higher throughput, allowing more devices to be connected and more data to be transmitted in real time.

Migrating with minimal disruption

One of the most common misconceptions about wireless migration is that it must be a disruptive, all-or-nothing process. In reality, effective migration strategies are designed to be phased and minimally invasive. This allows legacy and modern systems to run in parallel while transitioning, reducing risk and enabling utilities to control both the pace and budget of the upgrade.

A successful migration plan typically includes four key steps:

1. Site survey and planning

Before any equipment is replaced, a thorough site assessment is conducted to evaluate existing infrastructure, signal quality, terrain and tower requirements. A combination of paper surveys and on-site visits helps determine whether any physical changes — such as increasing antenna height — are needed to maintain or improve coverage.

2. Migration roadmap

With survey data in hand, a migration roadmap is created. Utilities identify the most critical sites for initial upgrades, often starting with areas experiencing failures or where reporting is most urgent. From there, migration proceeds in clusters, allowing for manageable and efficient deployment. Each cluster is tested and optimized before moving on to the next.

3. Hardware and software implementation

New radios are installed at control centers and remote sites, typically running in parallel with existing equipment during the transition. This avoids service interruptions and allows time for configuration and performance verification. Field radios are either swapped into existing enclosures or installed as part of preassembled, plug-and-play panels to minimize downtime.

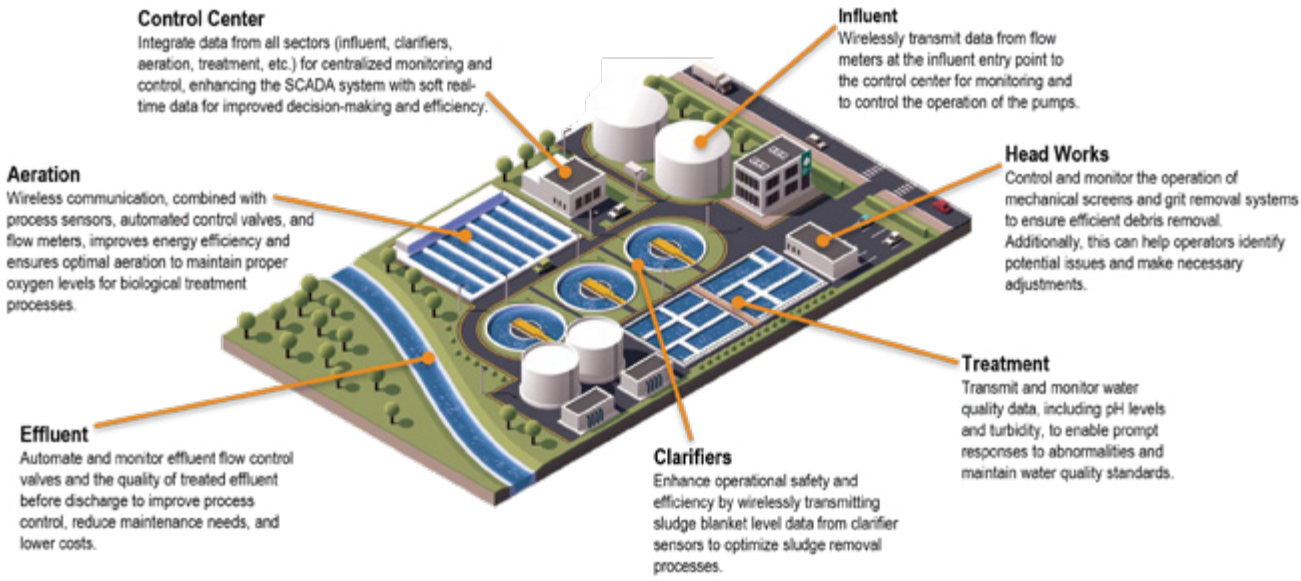
SCADA systems are updated to communicate with the new hardware, and additional sensors or monitoring tools can be added at this stage to take advantage of expanded capabilities.

4. Training and ongoing support

Technician training is vital to a successful migration. Training typically takes place in stages, ensuring that different teams are prepared to work with the new system's hardware and software. Migration partners provide hands-on guidance during setup and offer long-term support to troubleshoot issues and help utilities optimize the new technology.

This phased, collaborative approach ensures continuity of service while upgrading to a system that can meet current and future operational needs. →

Modern radios, together with the base station repeater and intelligent switch, form a comprehensive wireless migration solution, enabling legacy networks to be upgraded in a phased, low-risk approach. This ensures minimal disruption and optimal system performance throughout the transition. Source: Weidmuller



Modern wireless radio systems bring new intelligence to every stage of the water treatment process, from real-time monitoring of pH and turbidity to centralized SCADA integration. As utilities face aging infrastructure and tighter regulations, wireless migration enables smarter, more resilient operations with minimal disruption. Source: Weidmuller

What the modern system delivers

Migrating to a new wireless platform unlocks significant benefits.

Cybersecurity: Water and power lines are a core target for those intent on harming a community. Legacy radio networks have demonstrated their weaknesses to hackers, and utilities need greater visibility into who is accessing often-remote locations.

Multi-level password protection is the first step. Modern radios meet or exceed standards like ISA/IEC 62443 and align with federal mandates under the Cyber Resiliency Act, which requires compliance with new standards by 2027. Coupled with cameras, these next-generation radios protect against unauthorized access, safeguard data and ensure system integrity.

Expanded visibility: Operators can monitor variables such as flow rate, temperature, intrusion, vibration and pressure from a central control system or even a mobile device. Legacy networks faced restrictions on the number of radios that could be deployed, which limited the input of data variables. With that expanded data gathering comes faster speeds as well.

But monitoring goes beyond delivering the end services. In the case of gas pipelines, for example, accurately tracking the product's flow is also critical to a business's bottom line. As gas is handed off from supplier to supplier, a 1% error can be worth millions.

Redundancy and reliability: New base stations are configured with redundant radios to ensure uninterrupted communication. Advanced systems also support plug-and-play installation to minimize service outages. Plus, since many radio networks were installed a quarter of a century ago or more, staff members and technicians with experience in how they work and their history have likely long left the organization, leaving a significant knowledge gap.

Data-driven decision making: Enhanced connectivity allows organizations to deploy AI-based tools for predictive maintenance, optimize system performance and respond to issues before they escalate. These new radio networks integrate seamlessly with the organization's SCADA platform, making it easy to access greater information at a few keystrokes.

Consider a water pump, where the basic question has long been "Is it running or not?" Now, these radios can answer increasingly more granular questions that drive specific action: Has someone come in to change the program? What is the optimal time for the pump to be on? Are there any blockages? Are there any potential overflows?

Future-Proof Design: Dual protocol support (serial and Ethernet) ensures compatibility with both legacy and modern SCADA and PLC systems. Modular hardware allows easy expansion and supports integration with edge platforms and cloud analytics. Modern wireless radios are built for scalability and expansion, with plug-and-play functionality.

When emergencies strike

While a full migration typically takes 6 to 12 months, emergency upgrades can be completed far more rapidly. In situations where legacy radios have already failed, utilities can install new radios and restore SCADA communication in as little as one day — provided power is available and no programming changes are needed.

These rapid deployments serve as a critical stopgap, stabilizing operations while a long-term migration plan is developed. Having this capability in reserve provides reassurance that service disruptions can be addressed quickly and safely.

Building a smarter infrastructure

SCADA systems have evolved significantly over the past three decades. Once built on command-line interfaces and limited by data bandwidth, today's systems are fully graphical and increasingly AI-enabled. They provide operators with a comprehensive view of infrastructure health and allow automated control actions based on real-time data.

With more data available from upgraded field devices, utilities can now shift from reactive maintenance to predictive operations. This increases uptime, extends the life of assets and enables more strategic capital planning.

A trusted partner in migration

The success of any migration depends on the strength of the planning, the quality of the hardware and the depth of support. A complete solution includes not just radios, but also routers, switches, network configuration and SCADA integration.

One Richmond, Virginia-based provider of smart industrial connectivity and automation solutions approaches migration opportunities as a solution partner, not just a supplier. The company offers systems that are modular, scalable and secure, with the flexibility to fit the unique needs of each customer. Whether through wired, wireless or cellular options, the Richmond-based company provides the architecture that supports secure, uninterrupted communication.

More specifically, this provider's wireless radio system migration solution is comprised of Ethernet/serial modems and I/O radios — or a combination of both — along with Intelligent Switch (IAS) and Base Station Repeater (BSR). The IAS, a fully redundant RF antenna switch, pairs with the BSF to deliver a robust, reliable and redundant hot standby solution for base or repeater sites. Additional pre-configured systems streamline migration.

Most utilities cannot shut down their networks for extended periods. That's why this solution supports running legacy and new systems simultaneously, which reduces downtime. This makes migration more accessible and allows teams to modernize infrastructure without jeopardizing operations.

A call to action

The time to modernize is now. Regulatory pressure is mounting, the risk of failure is rising, and the opportunity for improved performance has never been greater.

Migration isn't just about replacing what's broken: It's about preparing for the future.

With the right strategy, partners and tools, utilities and municipal services providers can turn a daunting challenge into a transformative opportunity. Whether needing to eliminate legacy bottlenecks, protect against cyber threats or gain deeper operational insight, a modern wireless infrastructure is the foundation for smarter, safer service delivery.

Today's technology offers a streamlined strategy for gaining that critical peace of mind that operators can keep the water treatment continuing, oil and gas pipelines flowing, and the lights turned on for every customer.

ABOUT THE AUTHORS:

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Nicole Riggle has more than 26 years of experience with Weidmuller. She focuses on automation solutions that support critical infrastructure and a wide range of industry applications. Riggle holds an Associate of Applied Science degree in computer electronics technology with a major in microelectronics technology from ECPI University. Riggle has received certifications in Industrial Electronics Technology and automation software platforms from accredited training programs.

HOW UTILITIES CAN BUILD RESILIENCE AGAINST UNPLANNED EVENTS

WITH AI AND AERIAL TECHNOLOGY

JAMES PIERCE

As the leader of Ameren's drone and inspection programs, I have seen firsthand how the changing environment is reshaping the way we prepare for the unexpected. Wildfires are burning hotter, storms are hitting harder and the grid must withstand ever more extreme conditions. Our job as utility professionals has not changed. We still strive to keep the lights on and protect our communities, but the tools we use to do so are continually evolving.

Artificial Intelligence (AI), deep learning models, reality capture, digital twin creation, GIS and drone-based visual intelligence have moved from interesting and niche innovations to core parts of our operational strategy. These technologies allow us to work safer, smarter and more reliably when conditions turn dangerous. They are not just about gaining efficiency. They are about resilience, and in our industry, resilience can be described as a quick post-storm recovery and maintaining the quality of life for the communities we serve.

The growing risk landscape

Wildfires are not something most people associate with states like Missouri and Illinois, yet as a utility serving this region, we live and work alongside dense wilderness, national forests and farmlands that present unique challenges when performing inspections and carrying out our work process. We have seen examples of how drones and AI can be used to prepare for and mitigate wildfire potential in areas such as California. Utilities in that region have taken to leveraging digital technology to produce invaluable analytics that are shaping the way those companies make decisions and manage their assets.

The risks utilities face are no longer unique to regional areas. Flooding is hitting areas that never used to flood. Wildfire risk is creeping eastward. Ice storms are showing up in places that historically saw mild winters. Derechos producing hurricane-force winds, heavy rains and flooding are fast becoming a regular event across the Great Plains, and Missouri experienced more tornadoes in the first half of 2025 than are normally expected throughout the entire year. For us as field operations and innovation professionals, the message is clear. The conditions we face today will not be the same ones we face 10 years from now, and our approach to inspections and maintenance must keep pace.

This truth has pushed many of us to rethink our risk models. Resilience cannot be reactive. It must be built into how we operate every day. →

The role of drones and AI for better, faster insights

Ameren's drone program started in 2015 and went fully operational in 2017. In the early days, it was a pilot project with only two operators and a lot of questions about how the technology would fit into our work. Today, our drone program is run as a centralized service, supporting electric transmission and distribution, gas transmission, storage and distribution, our electric generation portfolio and an innumerable amount of supporting corporate services. The centralized structure provides strong governance and provides a single source for standards and trisk mitigation across the company. Safety, airspace compliance, data handling, digital processes relating to remotely sensed data and cybersecurity are also provided with a single point of contact related to UAS and robotics operations within Ameren.

Before drones, inspecting certain lines meant climbing structures or using manned aircraft. Now, we can pilot a drone, capture high-resolution imagery, Infrared, LiDAR and other unique sensor data. The result is a complete view of an asset in a minimally intrusive and highly efficient manner.

Early on in our program development, a major storm swept through one of our service territories, taking down lines and damaging equipment in multiple locations. Leaders in the service territory decided to take us up on the offer to perform damage assessment using drones. We were already beginning our programmatic cyclical inspection of distribution voltage overhead assets, so we had some capability to get into the field and deploy very quickly. Historically, damage assessment was often performed with the use of boots on the ground damage assessors and in extreme cases, helicopters were hired and deployed to cover long distances with efficiency.

Teams were deployed to key circuits with difficult terrain; it quickly became apparent that the use of drones in combination with Ameren's GIS mapping systems could provide a comprehensive and visual assessment of damage within minutes of arriving on site. In comparison to traditional methods, which would have taken multiple hours to accomplish the same result. That allowed us to feed information quickly to storm management teams to make the most critical repairs and get crews where they were needed first. Drones and analytics allow for potentially shorter restore times when deployed following a storm event and routine inspections can assist in system hardening that can prevent outages altogether.

Over time, drones have moved from being a specialty tool to a part of our regular inspection workflow. We use them on clear days for routine assessments, after storms for emergency response, and in planning phases for infrastructure projects. The more we integrate drones and more importantly, the sensors they carry, the more value is exposed to the operations.

Over time, drones have moved from being a specialty tool to a part of our regular inspection workflow.

Most flights aren't post-storm; they're "blue-sky" inspections aimed at spotting early signs of wear, establishing asset baselines and reducing the odds of future outages.

AI-powered insights

Capturing images is only part of the story. A single inspection flight can generate thousands of photos; a major post-storm survey can generate tens of thousands. Manually reviewing that much data is time-consuming, and we strive to deliver insights to field crews and management in an efficient and timely manner.

This is where AI and automated processes become essential. With the proper digital architecture in place and key models deployed, AI can potentially process images at a scale and speed no human team can match, detecting defects, tracking asset conditions and flagging anomalies in minutes instead of days. Our near-term vision is to deploy a "co-pilot" compute box that operates alongside the drone pilot in the field, allowing us to ingest SD-card data immediately after a flight and return prioritized findings in minutes instead of hours. For utility drone operations, that is effectively real-time, and it keeps our pilots in the air while AI handles the first pass. We work with internal partners and external partners like Buzz Solutions, Esri and EPRI to explore how AI can translate inspection data into clear, prioritized maintenance actions.

Imagine a crew coming off a flight with a full set of inspection images. Instead of sending those into a manual review queue or stopping to review and organize imagery in the field, AI processes them immediately, highlights the top priority issues and provides GPS coordinates, pole tag, asset information and access assessments for each. Decision-makers can dispatch repair crews directly to the most critical points. AI does not replace people. It ensures our skilled inspectors and line workers focus their time on the work that truly matters.

GIS & 3D modelling: A force multiplier

As a career GIS professional, adjunct professor in GIS and certified project management professional, I spent many hours painstakingly designing and integrating geospatial principles into every aspect of our drone and inspections program. The integration is aided by the fact that every image and remotely sensed data output we capture, and every anomaly flagged by AI is geospatially anchored. That means we are not just finding problems; we know exactly where they are, how they have changed over time and how they network within the larger grid.

By integrating drone imagery into our enterprise GIS, we can shorten storm restoration by showing decision-makers exactly where outages are occurring and how to reach them. GIS also supports wildfire risk mapping, vegetation management prioritization and incident modeling. In practice, it turns visual intelligence into operational intelligence, providing the context needed to act with speed and precision. Esri Field Maps and Survey 123 are at the center of every operation, providing real-time information to drone pilots and operators and collecting information critical to fulfilling regulatory requirements. →

That means we are not just finding problems; we know exactly where they are, how they have changed over time and how they network within the larger grid.

Lessons & results from the field

Implementing UAS, GIS and AI programs has not been without challenges. We have faced procurement delays, strict cybersecurity requirements, and even years after launch, some people in the company were still not fully aware of how our program can benefit their area of the business.

From day one, I have implemented strict data gov-ernance rules. Drones never connect to our network. Media comes in via SD cards, passes through malicious file scans and goes to high-capacity on-prem servers. Cloud use is limited and bound by federal compliance requirements, so we design workflows with those guardrails in mind.

If there is one takeaway for other utilities, it is that technology alone does not solve problems. Programs like ours need executive leadership support from the start, a centralized governance model and close collaboration across operations, digital, legal and cybersecurity. Without that alignment, even the best tools will not deliver their full value. Some key lessons we've learned:

- Secure top-down executive sponsorship early; grassroots efforts will not sustain a corporate program.
- Keep a centralized governance model with representation from operations, digital, legal, sourcing, cyber and other stakeholders.
- Continue to run awareness roadshows and demos to build demand and internal understanding.
- Plan for procurement and hardware constraints tied to unexpected changes like tariffs and supply chain shortages — similar to what we experienced during the pandemic — and diversify sourcing early.

Even with AI and automation still in pilot stages, our storm recovery times are improving because we can assess damage faster and more safely. We are also using imagery and LiDAR to create a detailed reality capture and digital twin models of substations and other sites, improving both planning and training.

Toward a predictive, resilient grid

Whether it's regular infrastructure inspection or a rapid post-storm assessment, our mission is to deliver safe, reliable power and strengthen the grid for the long term while powering the quality of life for our millions of customers. The combination of drones, sensors, GIS, AI and sheer human ingenuity isn't just about reviewing images faster; it's about embedding resilience into every layer of our operations.

With the FAA's newly proposed BVLOS (beyond visual line of sight) rules and our own series of nationwide BVLOS waivers that we have obtained, we're already aligning our training, data governance and field operations to scale those capabilities alongside emerging regulatory changes. At the same time, we're continuing to work with partners like Buzz Solutions, Esri and EPRI for AI, automated reporting and photogrammetric solutions that can turn raw inspection data into actionable insights.

The grid of the future will demand a predictive, data-driven approach that anticipates problems before they cause outages. Resilience isn't a project with an end date; It's a daily practice, built into how our department plans, inspects and responds. That commitment will ensure the communities we serve have safe and reliable power, no matter what the future brings.

ABOUT THE AUTHOR:

James Pierce is the manager for UAS Operations and Inspection Services at Ameren. He has directed and managed Ameren's corporate UAS and Robotics department, working to create and maintain a successful top-tier utility UAS and inspections program. He is an SME in UAS, automated technology, robotics, safety, AI and Deep Learning development, GIS and all aspects relating to spatial data.

GRID RESILIENCY STARTS WITH SMARTER PREVENTIVE DIAGNOSTICS

Source: Doble Engineering

MATT CARRARA

The term “resiliency” has become shorthand for disaster recovery in the energy world. Utilities are judged by how quickly they can restore power after a storm, wildfire or blackout. Grid modernization, response time and weatherization dominate the conversation, and for good reason. Climate-related disasters have doubled in the past 20 years, and surging demand from that, electric vehicles and AI-powered data centers are placing unprecedented stress on infrastructure that, in many regions, is over 50 years old. These facilities, often clustered near cheap land or water sources, consume vast amounts of energy and can overwhelm nearby transmission and substation capacity if not planned for in advance

But resilience isn’t just about bouncing back. It’s about avoiding failure in the first place. While utilities invest heavily in response strategies, many remain behind when it comes to preventive diagnostics: the quiet, behind-the-scenes effort of monitoring asset health, identifying early warning signs and acting before failures occur. As electricity demand accelerates and equipment procurement becomes more costly and complex, with transformer lead times reaching 12 to 30 months in 2023, a wait-and-see approach is no longer viable.

Resiliency starts long before the lights go out. It begins with visibility — knowing which transformer is nearing the end of its life, understanding how aging equipment is responding to load demands and using predictive diagnostics and historical data to prioritize action over routine maintenance. →

The blind spots in grid resiliency

Despite growing investments in grid modernization, one critical element is often overlooked: how utilities assess and respond to asset health before a failure occurs. This omission can introduce avoidable and compounding risks.

Many of today's systems are operating well beyond their original design parameters. Transformers that once handled predictable base loads are now subject to frequent peaks, higher temperatures and prolonged stress from factors like AI-driven data center demand and distributed generation. These conditions accelerate wear and reduce expected lifespan, but the signs of degradation can be subtle and cumulative.

Annual testing isn't enough. A single snapshot of dissolved gas or insulation condition may miss the early development of faults. Effective risk detection requires pattern recognition, pulling from dissolved gas analysis (DGA), thermal and electrical profiles and operational history to identify changes in behavior and emerging anomalies. Without this kind of contextual visibility into asset health, utilities risk misjudging priorities like replacing healthy equipment or overlooking units on the verge of failure. Both outcomes lead to higher costs, greater outage risk and missed opportunities to optimize aging fleets.

The problem often lies in reactive or time-based maintenance, where issues are addressed only after alarms trigger. Even when data is available, it's frequently fragmented — isolated across systems or lacking the context needed for confident decision-making.

In addition to operational risks, there's growing reputational pressure. Communities affected by repeated outages, particularly in regions prone to wildfires or extreme weather, are demanding greater accountability from their utilities. Regulators are increasingly focused on outage frequency, SAIDI/SAIFI scores and infrastructure transparency. In this environment, relying solely on reactive strategies risks trust, credibility, and in some cases, regulatory penalties, beyond just equipment failure.

Preventive diagnostics can no longer be treated as a secondary function. They must be central to how utilities forecast risk and plan for long-term performance. Knowing where your vulnerabilities are is the first step in preventing failure, and that starts with how you use your data.

From raw data to action: The role of predictive diagnostics

For many, the challenge isn't collecting test results from data. It's connecting them, interpreting them and translating them into action before failure strikes.

Every day, asset health data is generated from field tests, condition monitoring devices, maintenance logs and operational systems. But when this information is siloed across departments, stored in disconnected platforms, or missing key historical context, it's nearly impossible to make confident decisions.

That's where predictive diagnostics can drive transformation. Unlike traditional assessments based on fixed maintenance cycles, predictive diagnostics combines historical data, real-time monitoring and expert insight to model asset risk dynamically — helping operators anticipate failures before they happen.

The goal is not to flood teams with more alerts or dashboards. It's to surface meaningful patterns and trends: changes in gas composition, correlations between operating temperatures and test results, emerging stress patterns across transformer fleets, the types of signals that help utilities act before risk turns into reality, rather than simply monitoring.

For example, a rise in acetylene in a dissolved gas analysis (DGA) could be benign or could signal a serious arcing fault; context determines interpretation. If the unit has shown similar signs in the past, if load conditions were atypical, or if thermal indicators are stable, the urgency changes. Predictive diagnostics helps connect these dots faster and more accurately.

The most effective utilities are moving beyond point-in-time assessments and investing in condition-based strategies that let them assess risk dynamically. They're layering diagnostic data with asset history and operational context to forecast performance more accurately. In many cases, they're applying machine learning to enhance these forecasts, using models trained on large volumes of field data to identify which assets are most likely to fail and when.

Combining human expertise and intelligent systems

But automation alone is not the solution. For example, a transformer might show early signs of overheating according to a predictive model, but without context, it's unclear whether this is a sign of failure or just a temporary anomaly. The most effective utilities are those that pair data science with domain expertise. Predictive models can flag unusual behavior, but understanding whether that behavior represents true risk often requires human judgment, especially when data is incomplete or borderline.

This approach doesn't just avoid failures. It builds confidence in decision-making, in resource prioritization and in long-term planning. When equipment is aging and replacement timelines are measured in years, knowing exactly where to intervene can make the difference between resilience and disruption.

The pressure is mounting, fast

It is no longer a question of whether the grid is under strain. The question is how much longer aging infrastructure can carry the load without a more proactive strategy in place.

Generative AI is fueling a rapid and permanent shift in demand. A single data center project can require up to 100 megawatts of power, the equivalent of the electrical usage of 100,000 homes or hundreds of thousands of electric vehicles. And we're just at the beginning. By 2030, data centers could account for up to 15% of total U.S. electricity consumption, up from 8% today.

Meanwhile, EV adoption continues to rise, and the re-shoring of American manufacturing is creating pockets of new industrial demand. These trends are converging in areas that often lack the grid infrastructure to support them, driving the need for better planning, earlier investment, and smarter use of what already exists.

At the same time, utilities face long permitting timelines, regulatory hurdles, supply chain challenges and persistent workforce shortages. Many critical components, like large power transformers, now carry multi-year lead times. The margin for error is shrinking.

Preventive diagnostics as a strategic imperative

To navigate these pressures, utilities need more than modernization funding or new technologies. They need to adopt a preventive mindset.

This means shifting from fixed maintenance cycles to condition-based strategies that reflect asset reality, not just time on the calendar. Operators need a dynamic view of where vulnerabilities exist today, instead of relying on static timelines or past load assumptions. It means moving beyond gut-feel replacement planning to risk-informed prioritization. And it means making diagnostics not just an operational task, but a strategic pillar.

At its core, predictive diagnostics is a way to future-proof investment. By combining historical insights with real-time data, utilities can know what's at risk and when, meaning they can allocate resources with precision, not just guessing which asset might fail, but understanding why, when and how to mitigate it. This kind of foresight helps utilities stay ahead of outages, reduce costly emergency repairs and make the most of limited capital resources.

Building a preventive culture: Four steps to take now

The most resilient utilities are those that treat asset diagnostics as a core capability, not a support function. Here's how to make that shift actionable:

1. Break down data silos

Diagnostic insights are only as valuable as the visibility they provide. Too often, critical data lives in silos that are split between departments or buried in disconnected systems. Centralizing asset health data and enabling collaboration across engineering, operations and planning teams enables faster decisions and a shared understanding of system risks. Tools alone won't fix this — organizational collaboration is key.

2. Shift from fixed schedule maintenance to condition-based maintenance

Instead of relying on time-based intervals, utilities should use real-time asset insights to guide maintenance and replacement decisions. Condition-based strategies use diagnostic trends, such as gas levels, load data and thermal performance, to identify which assets need attention and when. This approach reduces unnecessary maintenance, targets the highest-risk equipment and helps prevent failures before they escalate.

Condition-based maintenance also helps stretch limited budgets by targeting capital expenditures to the most at-risk or high-impact components, a critical advantage in today's resource-constrained environment. →

Source: Doble Engineering

3. Balance Predictive Tools with Expert Oversight

AI and analytics can highlight risk patterns and flag emerging issues, but they shouldn't operate in a vacuum. Pairing predictive diagnostics with human expertise ensures decisions are grounded in operational context and system-wide priorities.

For example, a machine learning model may flag anomalies in gas levels or temperature fluctuations, but only a field engineer with historical fleet knowledge can interpret whether the change reflects a true fault or operational variance. Pairing both perspectives ensures action is calibrated, not reactionary.

4. Make Resilience a Leadership Responsibility

Preventive planning must start at the top. Utility executives should treat diagnostics programs as essential to business continuity, ensuring they are properly funded, holding teams accountable and reinforcing the value of early action across the organization.

Yet, despite the growing awareness of grid strain, diagnostics programs are still often siloed. It's time for executive teams to treat preventive maintenance not as an expense, but as a long-term investment in reliability, resilience and reputation.

Planning for a better grid starts now

Grid failure is not inevitable. With the right visibility, the right tools and a shift in mindset, utilities can prevent small issues from becoming major disruptions, starting with how risk is measured, understood and acted on.

Predictive diagnostics and asset health data should be utilized as decision-making tools. And the utilities that embed them into planning, operations and leadership strategy will be the ones best equipped to deliver consistent, resilient power in the years ahead.

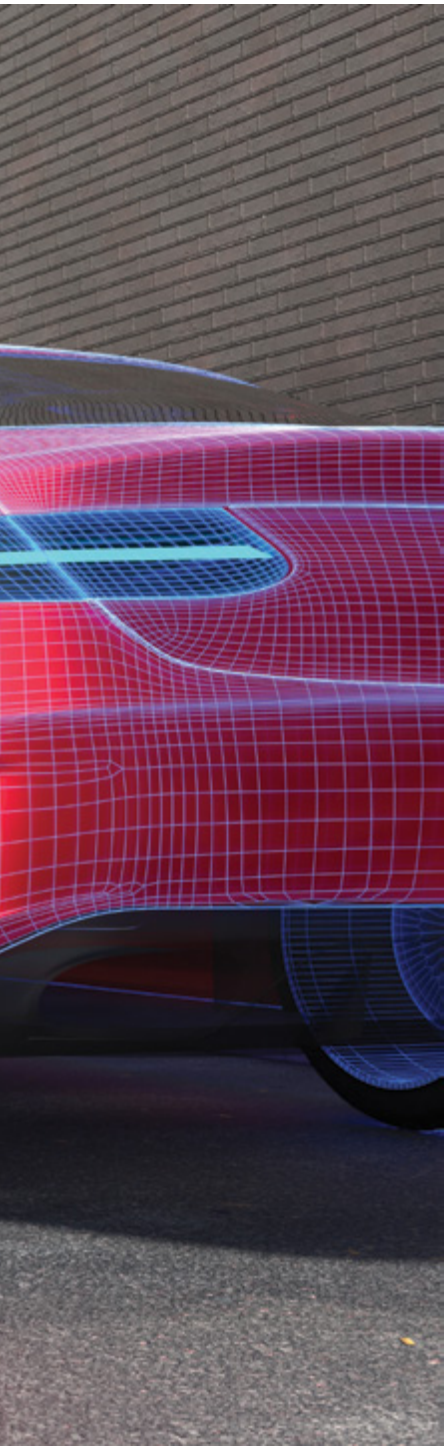
The path forward isn't about replacing everything. It's about knowing what matters most and acting before it fails.

ABOUT THE AUTHOR:

Matthew Carrara is the president of Doble Engineering and president of ESCO Technologies Inc.'s Utility Solutions Group (USG). Carrara has over 30 years of experience across the process control, measurement and materials properties analysis industries and leads Doble's vision and growth strategy.

POWERING THE ENERGY TRANSITION:

ENABLING THE NEXT WAVE OF ENERGY EFFICIENCY



HENRIK MANNESSON

Semiconductors moved to the center of the energy transition about 10 years ago — a shift rivaled only by the invention of the alternator nearly 200 years before that. And while the alternator made AC power the dominant technology, today it's DC sources that dominate energy generation, storage and consumption in solar panels, batteries and data center processors.

The next 10 years will be about interconnecting more sources and consumers of energy by making the high-voltage AC transmission grid smarter. Although semiconductors have played a significant role in driving down the cost of clean energy, breakthroughs will be necessary as areas with the best opportunities for solar and the cheapest grid connections start to reach saturation. From a semiconductor perspective, the technologies already exist for the large-scale adoption of clean energy. Making AC-to-DC conversion more efficient improves the return on investment (ROI) in solar inverters, while also improving charge and balance energy stored in batteries to drive higher penetration in mature solar markets. Doing so will improve the monitoring of energy supply and demand, and enable new technical and commercial arrangements to better balance the grid. →

Source: Texas Instruments

Making it easier to integrate solar energy with the existing grid

According to the International Energy Agency (IEA), solar energy is the fastest-growing source of energy in the world, growing 35% year-over-year in 2024. By 2030, solar will be the largest source of energy globally. This means that solar inverters are employing the grid-forming strategy as high-voltage semiconductor-based power converters replace electromechanical alternators in coal- and natural gas-fired power plants.

Texas Instruments (TI) has a long history of partnering with the solar energy market, as our analog and embedded portfolio make this transition affordable and easier to integrate with the existing high-voltage grid. New power topologies based on our microcontrollers (MCUs), gallium nitride (GaN) field-effect transistors (FETs), gate drivers and power supplies help improve efficiency in the conversion between AC and DC power and shrink the size of passive components like inductors, capacitors and heat sinks, which make up most of the size and cost.

Efficiency improvements make solar more cost-competitive by converting more energy with fewer losses, which then enables smaller heat sinks and cooling fans. As shown in **Figure 1**, single-stage topologies, as shown in the 600W GaN-based single-phase cycloconverter reference design, reduce the need for some passive components and, with higher switching frequencies, make other components smaller. The precise control offered by our combined MCU, gate drivers and FETs helps designers implement a cycloconverter while keeping electromagnetic interference low.

Historically, solar inverters using the grid-following strategy output a waveform that follows the frequency set by synchronous generators on the grid. Inverters employing this strategy have fast-frequency response capabilities that define the waveform and can respond to changes in frequency by injecting additional power from solar inverters or batteries. South Australia is the first energy market in the world to test this at a large scale, and the TI C2000 real-time MCUs runs fast current and voltage loops that adjust current and voltage in real time.

Current and voltage sensing aided by edge AI

Measuring current and voltage has always been fundamental to an energy system. In a system with both AC and DC power, measurement takes new forms such as arc detection, residual current detection and insulation monitoring. These types of measurements require system solutions where everything from the sensor to the signal chain and processing will determine the uptime of end equipment, and thus its reliability and cost of ownership. TI helps accelerate the adoption of technologies such as edge artificial intelligence (AI) and new sensor types to help improve system performance and drive down costs.

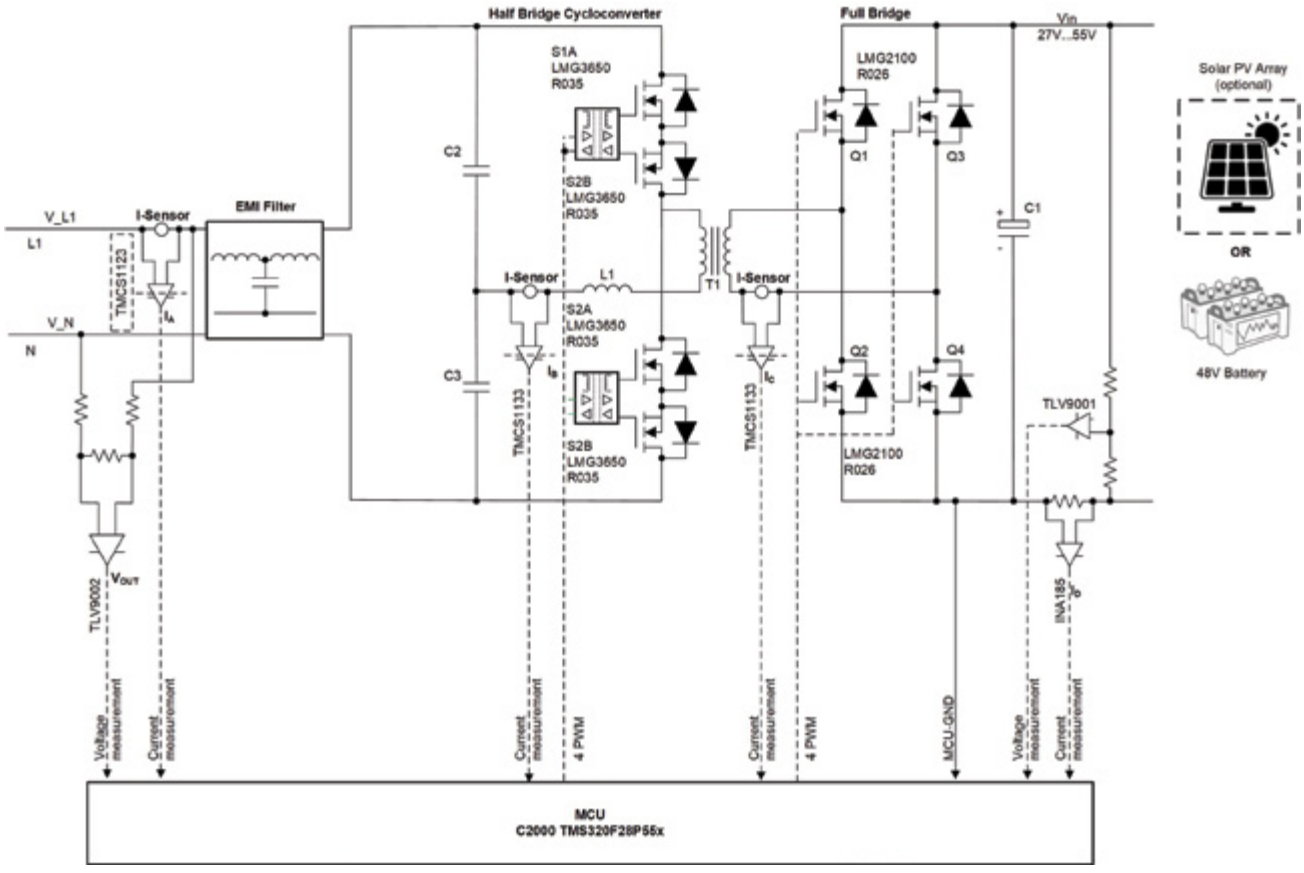


Figure 1: 600W GaN-based single-phase cycloconverter reference design schematic. Source: Texas Instruments

It's important to closely collaborate with the solar industry to drive standards designed to improve safety, as well as the quality of service that the equipment is delivering. Arc detection, which is a primary safety function in any solar inverter, is an example where a combination of analog and embedded processing devices helps improve systems over time. Our analog signal-chain devices enable customers to build the best analog filter, from current sensors to analog-to-digital converters. Breakthroughs in process technologies have also improved accuracy over time. Increased processing power and the addition of AI accelerators reduce false trips and adapt readily to new environments, making management easier without manual reconfiguration.

Energy storage enables solar 24/7

As solar energy becomes more abundant and costs drop, users want to be able to access it constantly. This is where energy storage through batteries has become an unsung hero. There are energy markets where batteries are the single largest source of energy at certain times of day. Batteries comprise thousands of individual battery cells that all need monitoring in real time, as they will charge and discharge several times a day in order to better align energy supply and demand. Batteries also stabilize the grid during normal operation, as they can sink or source power within milliseconds to help compensate for short-term and local variations in supply and demand.

Electrochemical impedance spectroscopy (EIS) is an example of a technology being developed in a collaboration between semiconductor manufacturers, system integrators and battery cell vendors. The benefits of EIS include better state-of-charge and state-of-health calculations and improved battery safety. EIS, combined with pack and cell balancing, demonstrated in TI's serial resonant converter dual bridge (SRC DB) for energy storage systems (ESS) pack balancing reference design and active battery cell balancer reference design helps improve power density in ESSs and increases battery cell lifetimes, further improving ROI for ESS installations. →


EV CHARGING
COMPLETE
83 %
ELECTRIC CHARGER
Data Report
01:36
EV STATION

Data centers are driving growth in power demand

The primary drivers of increased energy demand in the coming years will be the electrification of transportation and manufacturing and data centers. According to the Electric Power Research Institute (EPRI) study, data centers are expected to consume 8.4% of all power in the U.S. by 2030, up from about 4.5% in 2024. Semiconductors improve data from a remote node in the grid, such as an electric vehicle (EV) charger, a robot-equipped factory or a server in a data center. Each node — if connected and aware of network information such as future demand, prices and local storage capabilities — can help better align supply and demand and lead to lower costs for everyone.

Edge processing with low power, the ability to run applications, high security, wired and wireless connectivity options and TI's commitment to contribute to and support standards such as Wireless Smart Utility Network (Wi-SUN) and ISO15118 help designers integrate both hardware and software. Edge AI enables an MCU or microprocessor in an edge node-like circuit breaker or electricity meter to run a trained model with the help of onboard accelerators at very low cost and power. This capability helps enable load disaggregation so that users can make smarter decisions about when to charge an EV or make data center calculations to better align supply and demand.

Conclusion

It should not come as a surprise that the energy transition is starting to feel difficult. The progress made in the last couple of years includes conquering the easiest challenges. It's now time to apply high-voltage power conversion, current sensing, battery management and edge processing at a large scale. This phase will require making the conversion between AC and DC more efficient and affordable, and improving the ROI on batteries to enable more solar in mature markets and support peaks in developing markets. Edge AI has the potential to better align supply and demand, eliminate false trips in safety systems and improve the user experience.

ABOUT THE AUTHOR:

Henrik Mannesson is the general manager for Energy Infrastructure at Texas Instruments. He works alongside his team to help customers solve design challenges in smart meters, solar energy, EV charging and grid automation with the goal of making the grid greener, smarter and more resilient.

SMART COLLABORATION AND SMARTER CHARGING SOLUTIONS WILL BUILD THE FUTURE OF ELECTRIC FLEETS

DIVYA BRINLEY

The electrification of commercial fleets is rapidly unfolding. As fleet operators transition to electric vehicles (EVs), they're faced with a challenge: in addition to continually monitoring, managing and planning their fleet operations, they must also suddenly become aware of grid infrastructure as they become significant energy consumers. Doing so requires a strategic approach to managing charging infrastructure, optimizing energy costs and ensuring grid stability.

Thankfully, owners and operators of newly electrified fleets aren't left to figure this out entirely on their own. They can collaborate with utility providers and lean on smart EV charging and energy management software to optimize the usage of existing energy while minimizing costs.

Fleet electrification momentum

Electrification of commercial fleets is accelerating globally, driven by favorable long-term economics and the need to clean the carbon-intensive transportation industry. This momentum applies globally to commercial fleets with various use cases, including service, delivery and corporate fleets. In China, electric heavy-duty trucks have achieved a 14% market share, with over 100,000 units on the road as of early 2025. In the United States, most fleets expect to own an EV in the near-to mid-term future. A recent survey found that 87% of fleet owners expected to have EVs in their fleet in the next five years. The global light-duty vehicle fleet is expected to account for a total of 2.21 billion vehicles by the end of 2025. →

Fleet electrification is a critical solution to reducing greenhouse gas emissions from the transportation industry. The transportation industry in the United States is the largest source of total greenhouse gas emissions, accounting for about 28% of total GHG emissions. Fleets play a significant role in the United States economy, especially when you consider that over 70% of all U.S. goods are transported by delivery shipments supported by fleet vehicles. Continuing business-as-usual with internal combustion engine (ICE) fleets not only deepens environmental harm, but it also exposes companies and supply chains to growing financial, regulatory and reputational risks. Change in the transportation industry isn't just necessary, it's urgent.

While fleet EVs generally have higher upfront purchase prices, their operating costs are significantly lower. Over the lifespan of a vehicle and at the scale in which fleets operate, these savings can rapidly accumulate. Amazon has reported that its Rivian electric delivery vans cost less to operate on a per-mile basis than diesel alternatives. The Zero Emission Transportation Alliance reports that fueling a vehicle with electricity can be between three and five times cheaper per mile than gasoline. Additionally, EVs can require fewer repairs than ICE vehicles, as they have fewer mechanical considerations — with no oil changes needed, fewer brake replacements required and more simplified drivetrains. Across this range of factors, it's clear that electric fleets are an increasingly smart financial decision.

With favorable long-term economics and ongoing developments in charging infrastructure, vehicle and battery technology, the electrified fleet is the fleet of the future. It's only a matter of time, and as we get there, we create a future that benefits businesses, the economy and the environment, sustaining our industry for generations to come.

But how can fleet operators and utility providers bring robust charging environments and the electric fleet future to fruition? By working together and adopting smart EV charging management solutions that enable scalable, reliable and cost-effective infrastructure.

Collaboration between utility providers and fleet operators

Proactive, data-informed collaboration between utility providers and fleet operators is extremely essential to successful fleet electrification.

The first step is assessing grid capacity at proposed depot locations. Fleet operators must be able to share projected load profiles that include expected charging schedules, accurate peak demand forecasts and long-term scaling plans.

Utilities should conduct site-specific analyses that include the evaluation of transformer sizing, feeder capacity and substation proximity. Shared visibility into demand and existing power constraints allows both parties to make informed decisions.

The next step is outlining cost and timeline assessments for necessary upgrades. Permitting, engineering design, construction and commissioning are all factors that can cause timelines to run from several months to multiple years. Some forward-thinking utilities offer fleet electrification teams or dedicated experts to help streamline this process and maintain schedule and cost transparency. It's very important that collaboration and planning occur around infrastructure investments, as who pays for these investments and how much is being paid is often negotiated on a case-by-case basis.

Early in the process and collaborative engagement between fleet operators and utilities leads to better outcomes across the board. Faster timelines, lower costs and a more resilient localized grid all result from treating fleet charging infrastructure planning as a joint venture.

Solving for complexities

Fleet electrification can be complex. It requires planning and precision, both of which are nothing new to fleet operators.

Successfully electrifying a fleet involves a comprehensive strategy that addresses grid capacity, peak demand charges and time-of-use (TOU) rates. Fleet owners and operators must understand the costs associated with charging under peak demand and make charging and vehicle deployment scheduling adjustments to avoid these substantial costs. This comes on top of navigating the various TOU rates throughout the day, while still charging fleet vehicles on schedules that won't hamper deliveries and services. Vehicles must remain ready-to-deploy; it's a complicated and delicate balance to find favorable rates while accommodating driver schedules.

Without additional expertise and visibility afforded through real-time data to manage these complexities, fleet operators will run into unforeseen costs and operational inefficiencies. They need proactive tools that help keep vehicles on the road, with charging that doesn't overload the grid or break budgets.

The role of smart energy management software

Drivers of EV fleet vehicles need a seamless charging experience that produces a vehicle that is always fully powered, when and where they need it. Fleet managers must have charging that works around their schedule, as opposed to needing to build their schedule and routes around charging. Incoming vehicles must be efficiently matched with available chargers to ensure that all EVs can charge and depart on schedule.

A software solution for EV smart charging and energy management is crucial in realizing these outcomes. It can even help drivers after they depart their fleet-owned depot. Advanced software systems and apps can aid drivers and fleet managers in locating charging stations adjacent to planned routes, minimizing delays for on-the-road charging.

The right EV fleet management platform will optimize fleet utilization, save charging and planning time, reduce costs and maintain operational excellence. It'll also allow the flexibility and scalability that lets fleets grow without outgrowing their charging infrastructure. And it'll do all of this without needing to be a stand-alone platform.

The right smart energy management software platforms provide:

Seamless integration for operational efficiency

Centralized EV charging and energy management platforms need seamless integration. The right platforms can manage EV fleet charging while being compatible with other systems already being used by fleet managers to control operations and plan vehicle routes and availability. Choosing a platform with maximum interoperability is also recommended to ensure that charging stations can reliably communicate with a variety of vehicles, leading to a higher rate of successful first-time charge attempts. As fleets scale and vehicle and charger technology continues to develop, fleet managers will want platforms that work across as wide a range of charging hardware options, both to retain flexibility when selecting vendors during deployment and to ensure compatibility across diverse hardware in day-to-day operations. →

To integrate charging management, platforms must use intuitive tools that let fleet managers and drivers create plans for the entire vehicle journey, which truly begins at the charging pump, before a vehicle departs a fleet depot. This holistic view is possible with API integrations between the EV management platform and legacy fleet solutions. Doing so allows fleet managers to develop fleet schedules that cover arrivals, departures, energy requirements and route mapping, and do so under one unified and interactive system.

For all fleets to be operational, all chargers need to be as well. With hundreds of various models of chargers available from dozens of manufacturers, chargers can be fickle and subject to unique malfunctions. An integrated EV charging management platform can help a fleet's chargers remain ready at all times by using 24/7 monitoring to detect malfunctions. This allows a fleet manager to adjust the charging schedule as needed. Seamless integration of these platforms makes charging a natural part of the journey, and less of an addition to fleet managers' already complicated workloads.

Cost savings

Electrified fleets managed with EV charging and energy management platforms are ripe for cost savings opportunities. To realize these benefits, fleet managers need to be strategic in balancing load and optimizing usage while managing consumption to minimize costs.

Solutions should balance energy demand during peak charging periods while also maximizing the use of local energy resources to offset peak charging costs at the same time. Knowing when to tap into on-site battery storage and renewable energy to achieve cost savings is a key component of smart EV charging and energy management software.

These solutions can use dynamic load balancing and peak shaving to optimize TCO by increasing the number of EV charging stations a depot can handle by up to 6X more than unmanaged stations, all on existing electrical infrastructure. Additionally, fleets that use managed charging to charge overnight on lower-power chargers generate as much as 20% cost savings on energy. This off-peak charging strategy not only lowers electricity costs, but also helps avoid expenditures on charger or infrastructure upgrades.

The maturation of emerging flexibility markets will create opportunities for profit for fleet operators using smart energy management. With this approach, fleets can opt out of charging when energy is unavailable and receive compensation from utility demand response programs for doing so. These programs enable aggregators to discourage charging during certain hours of the day and allow utilities to balance and distribute energy without undertaking infrastructure upgrades or added power generation. Using reliable and smart EV fleet management software will turn the demand response challenge into an opportunity for both fleet managers and utility-side stakeholders.

Fleet vehicles must be kept charged on a predictable rolling basis, and fleet managers must get the most out of their existing depots and facilities in doing so. Cost savings paired with operational efficiency are vital, and software solutions that naturally facilitate this are game-changers.

Network health

Charging infrastructure must be secure, steadily functioning and have enough energy available to charge the vehicle when the driver arrives. To ensure this is the case, fleet managers need real-time visibility into the health and availability of their full charging network. They can use clear views of charger operations and utilization to ensure that everything is working properly and that charger stability and availability are maintained.

Self-healing capabilities are an especially crucial component of an efficient fleet EV charging and energy management platform. This allows charging network issues to be remotely identified and resolved. With the right platform, up to 80% of operational-related EV charger issues can be solved proactively and automatically. That's a huge benefit in both improved network uptime and lowered maintenance costs.

Integrated real-time visibility coupled with self-healing capabilities produces operational excellence and a stable and reliable charging environment for commercial EV fleets.

Conclusion

Fleet electrification presents a transformative opportunity for operators to reduce emissions and operating costs, while also increasing control and creating side revenue streams within flexible energy markets. But without the right solutions and partnerships, the transition's challenges can be daunting. By collaborating closely with utility providers and embracing smart energy management software, fleet operators can ensure a cost-effective and sustainable electrified future.

ABOUT THE AUTHOR:

Divya Brinley is a senior fleet product manager at Driivz. She has more than 14 years of experience in the energy sector, including leading-edge roles at Siemens Energy and Stem before joining Driivz. Brinley partners with major mobility industry players to design and deliver scalable EV fleet management solutions. She holds both a B.S. and an M.S. in engineering from the University of Central Florida.

AMERICA'S ENERGY WORKFORCE CRISIS: NUMBER OF POWER ENGINEERS MUST DOUBLE

Engineers examining solar panels at alternative energy power plant. Source: Adobe Stock

MARIA BERIO

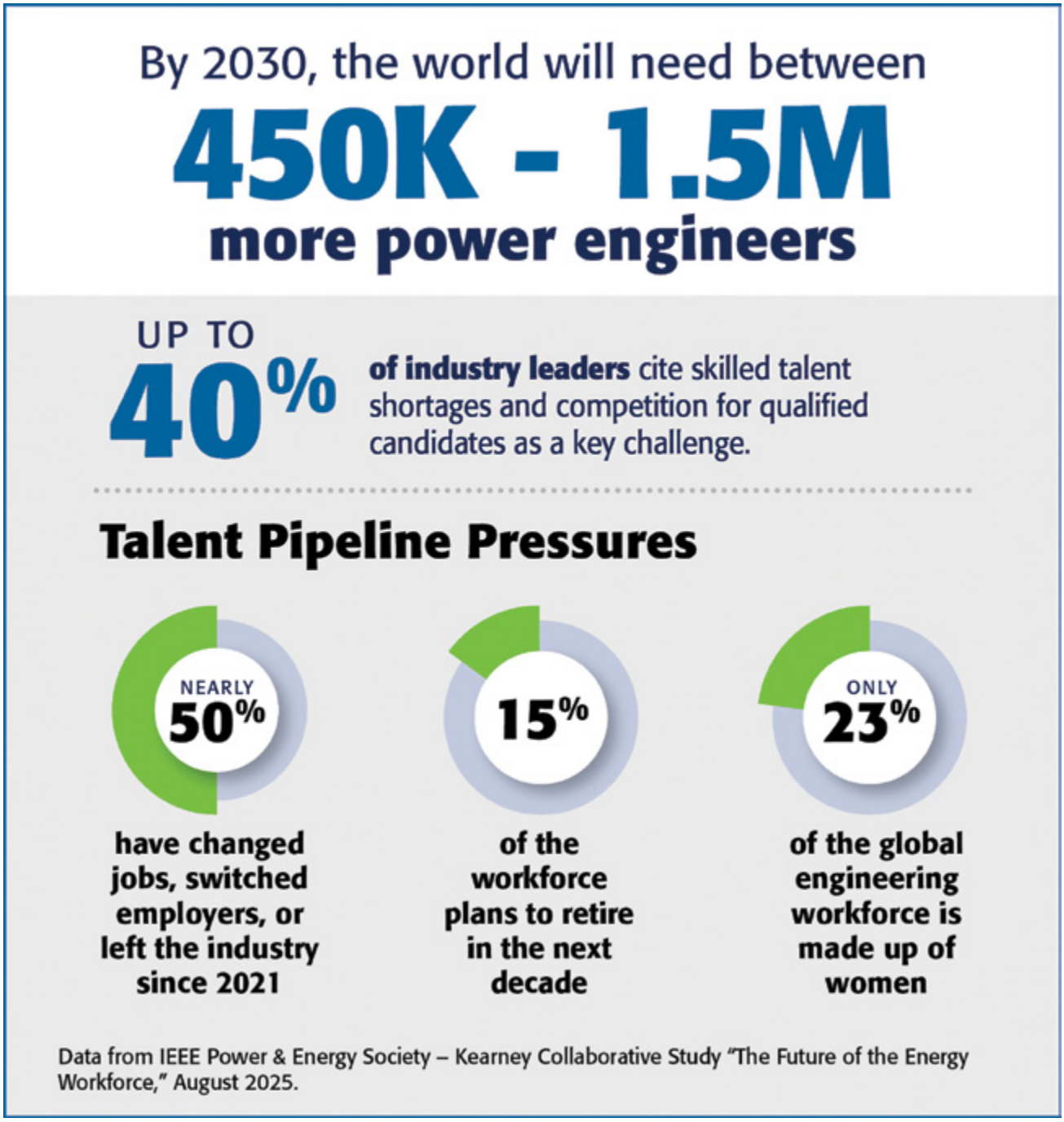
With a historic energy transformation underway, the U.S. power industry faces a series of profound challenges. From the growing energy demand of new technologies like AI, to the rising impact of extreme weather events, and the urgent need for modernized electric infrastructure that can integrate a wide range of energy sources, America must take bold actions to secure its energy future. One challenge that has yet to garner enough attention is a looming workforce crisis and the need for more engineers to build our energy future.

As outlined in a new study, The Future of the Energy Workforce, the world will need up to 1.5 million more power engineers to design, operate and maintain the increasingly advanced systems of tomorrow. The joint report by IEEE Power and Energy Society (PES) and Kearney reveals the engineering field is facing pervasive professional stress, posing a growing threat to the reliability, resiliency and affordability of our power grid. Report findings highlight a concerning energy workforce trend, as nearly half of all power engineers have changed or left jobs in the last three years, citing issues such as workplace burnout, limited professional mobility, or the lack of engaging or meaningful work. Adding to this workforce challenge, an estimated 15% of the current workforce plans to retire within the next decade — a higher rate than previously forecast by industry executives. →

Electrical engineer conducts inspection of equipment control station. Source: Adobe Stock

Why does this matter now? This generational and professional turnover coincides with the explosive global demand for more engineers to meet this historic energy moment. Some estimates, for example, indicate the industry will need to more than double the size of the current energy workforce within the next five years. If left unaddressed, this gap could severely hinder the ability to meet the growing complexity of America's energy needs, let alone the world's.

To address these profound challenges, IEEE PES — the world's largest association of power and energy professionals — is leading cross-industry efforts to recruit, train and empower the next generation of engineers. Given the magnitude of the task ahead, industry leaders, universities and policymakers must not only be active participants, but also vocal advocates for the development of this critical workforce to sustain the strength and security of our nation's energy future. As difficult as this challenge may be, there are tangible steps we can take together to meet this moment. →

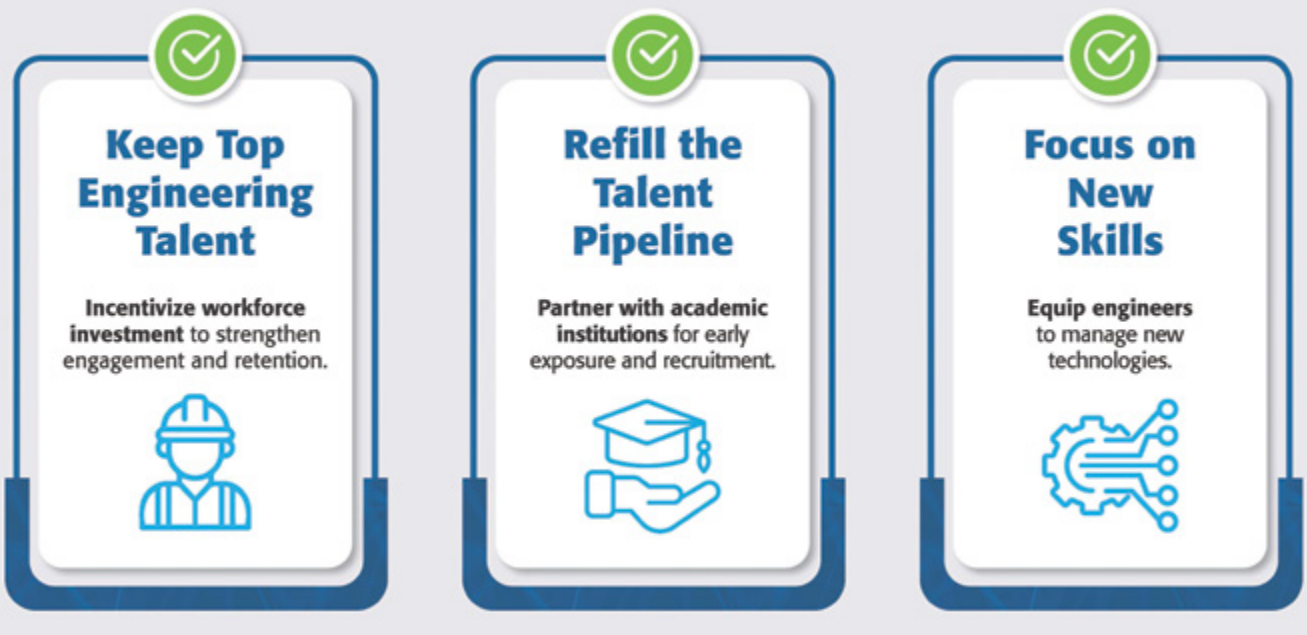


Source: IEEE PES

1. Help power companies keep talented workers. Mitigating workforce attrition must remain one of the industry's most pressing priorities, as underscored by the report. To accomplish this, employees must further prioritize the values that matter most to employees: engaging work, purpose and meaning, positive culture, work-life balance, competitive compensation and professional development opportunities. At the same time, new incentives can help encourage power companies to invest more in their people for long-term success. By doing so, the industry can increase professional engagement, improve retention and prepare more individuals for lasting careers in electrical engineering.

2. Refill the talent pipeline today. To expand America's future energy workforce, the number of students pursuing careers in electrical engineering must grow substantially, particularly within regions where the need is most urgent. Although the number of STEM degrees earned in the U.S. has doubled in the last decade, most of those degrees are concentrated in areas like IT, computer science, or software-related fields. As an industry, we must renew efforts to encourage more students and young professionals to pursue careers in electrical engineering to rebuild and sustain this critical talent pipeline. By partnering with universities, community colleges, career resource centers and K-12 institutions, we can create early exposure opportunities that reinforce awareness of these high-demand engineering roles and the positive impact they have on defining our future.

3. Focus on new skill sets. As the energy landscape evolves, future engineers need a broader, more adaptive set of skills, including fluency across a multitude of new digital technologies. For example, new skills in AI, big data analytics and cyber security will be critical capabilities over the next 5 to 10 years. Equally important, however, are soft skills like project management, teamwork and communication — all essential for engineers to think technically, strategically and creatively on solutions. In collaboration with energy and industry leaders, we can help advance progress by aligning workforce development programs with the realities of a rapidly evolving system to develop the next generation of engineers.



Source: IEEE PES

The future ahead

Even as America and the rest of the world face a defining moment for our energy future, engineers can help lead us forward. What we cannot afford is a reality without a significant increase in workforce headcount, a stronger focus on future skills and a modern and supportive workplace environment, or the energy systems we all depend on will suffer the consequences.

Meeting this moment requires a new and shared sense of urgency and purpose. There's no time left to wait. It is up to all of us, *working together*, to ensure our current and future engineers have the tools, training and resources needed to build a more reliable, more resilient and cleaner energy future that future generations will depend on.

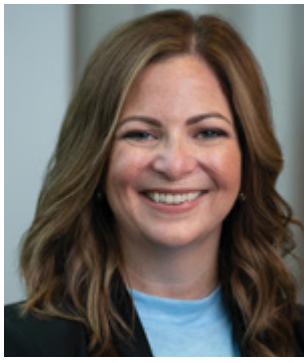
ABOUT MARIA BERIO:

Maria Berio is a transformational leader with a proven track record in the energy and utilities sector in the United States, Central America and the Caribbean. She currently serves on the IEEE Power and Energy Society Governing Board as Member At Large for Women in Power. She holds a juris doctor and a master's degree in environmental law and public policy from Vermont Law School.

ABOUT IEEE POWER & ENERGY SOCIETY (PES):

The IEEE Power & Energy Society (PES) is the leading provider of scientific and engineering information on electric power & energy for the betterment of society and a trusted resource dedicated to the technical, informational, networking and professional development needs of its members. With nearly 40,000 members around the globe representing every facet of the electric power and energy industry, PES is at the forefront of the rapidly changing technological advancements that impact everyone's future. Additional information on IEEE PES can be found at ieee-pes.org.

LEADING THE CHARGE IN MANUFACTURING AND ENERGY



CHRISTINA KNOWLES

The paths of female executives in the energy industry are as unique as the women themselves. Some arrive by accident, some through their knowledge of math and science and others by a mix of both. For Christina Knowles, her passion for engineering and manufacturing, combined with her ability to navigate through the complexities of the utility sector, is what led her to a meaningful career in an industry she considers impactful.

"The space is always growing and evolving, and I was drawn to that," Knowles explains. "The fast-paced growth and the complicated ways that our product is engineered to match a customer's needs. I thought it was really interesting, and it played to that engineering part of my brain."

Knowles, who is vice president of North American Operations at G&W Electric, has been with the company for nearly 15 years. She has served in her current role for the past three years.

In general, my role is to align our manufacturing and supply chain teams to ensure that we're delivering reliable, high-quality solutions to our customers, while scaling for future growth.

From Michigan to G&W Electric

Knowles studied engineering at Kettering University in Michigan, where, like many engineering programs, the majority of students were men. She began her career as a co-op student at General Motors, where she completed engineering and manufacturing rotations. After graduating in 2007, she found herself at a turning point.

"The trajectory of the auto industry at that time was unclear. I left Michigan for a job in Illinois, working for a manufacturer of water filtration equipment," she says.

She recalls her first impression of G&W Electric when she visited it in 2011. “At the time I started at G&W Electric, the company was a small, privately held manufacturing company based in Blue Island, IL. It was very high-mix, low-volume, and the products were engineered to order for the energy industry, and that industry and family-oriented company caught my attention.”

Problem-solving

Knowles’ first project at G&W Electric was working with their Viper Recloser product line, where the goal was to double the product line’s capacity. Looking at what seemed a tall order then, Knowles says that today, G&W Electric is managing 10 to 12 times more than what her team was trying to do then.

> **At the time, it seemed like an insurmountable challenge. But it laid the foundation for every challenge that comes after that.**

Earlier in her career, Knowles took on opportunities that required significant personal investment, including relocating her family. “When my children were young, we moved to our Toronto plant as part of an expansion and acquisition,” she recalls. Facing that challenge helped set the foundation for what I came back to in Bolingbrook, expanding into different product lines, different buildings and different countries.

Experience as a foundation

Over time, Knowles has seen how early challenges often become the groundwork for future success. “When you look back, the things that once felt like the toughest hurdles often turn out to be the most valuable,” she explains. “The effort you put in then becomes the foundation you build on later, giving you the baseline to take on the next set of challenges.”

What excites Knowles most about her work is its ever-changing nature. “We have some of the most complex problems to solve for our industry that have ever existed,” she says. “Growth in the industry is exciting — it’s something that everybody uses. I work on the operation side of things, so it’s about scaling for that growth, managing the complexity of our make-to-order business and satisfying all the various utility companies and C&I customers that have constantly changing needs.

Any time she speaks with job applicants, Knowles underscores the dynamic pace of the work. “When I talk to prospective employees, I emphasize that no two days are the same. There’s an interesting blend of strategy, day-to-day floor leadership, continuous improvement and solving technical challenges that come up with building custom products. That’s what makes it fun.” →

Industry challenges: The 3Ds

As the industry evolves, Knowles sees the biggest challenges framed through what G&W Electric calls the "3D Model."

"One of our VPs of marketing put together a model that I find resonates: the 3D model — decarbonization, decentralization, and digitalization. I'm more operations-focused, but that model helps bucket the complexity."

Expanding on that idea, Knowles explains that these forces reflect a broader shift toward grid modernization and energy resilience across the global power sector.

"Our demand for power is skyrocketing. We are under pressure to shift to cleaner energy sources, manage a multidirectional grid and harden infrastructure against storms, fires and other challenges — with AI, data sets and electrification — all layered on top. The challenge is building a smart, resilient grid, but the pace is what makes it most challenging. It ties back to manufacturing: we're constantly working on growth and capacity, just scaled up to the industry level."

Growth and culture

From 150 employees when Knowles started to just under 1,900 today, G&W Electric's expansion has been dramatic. "When you think about 150 employees versus 1,900, the culture hasn't changed, per se. The ownership and values have been consistent. But the complexity in which we navigate has changed. We've had to become more nimble, maintain that culture across borders and keep the family feel," she says.

"Before COVID, we had quarterly town halls where everyone would hear directly from the owner and executive leadership. We've restarted those globally. Employee recognition, connection points between sites — all of it matters. Being privately held gives us one consistent voice, which makes a difference."

Trends and transformation

Describing the industry trends she feels we should pay attention to, Knowles says her expertise goes more into the internal side of operations. "I think on the internal operations side of things, the same trends we see across the industry are shaping what we do as well. Things like digital transformation and the need for real-time data monitoring and analytics — whether it's inside our factories or on the grid — the need is the same, and the trend is the same.

Of course, there's the universal push for more, better, and faster — that will always be the case. It's just happening at a faster pace than it used to. But that technology, that reshaping of the grid, it's not just changing the grid itself — it's reshaping how we design, how we build, and how we deliver our products."

Decarbonization
Decentralization
Digitalization

Christina Knowles in Plant 1. Source: G&W Electric

Inspiration and diversity

Inspiration, for Knowles, often comes from the shop floor. “I love going out on the shop floor,” says Knowles. “Our employees are proud of the work they do, and it shows. Every product has a customer name on it — it’s engineered to order. Employees know which design they’re working on and the utility it serves. That’s both unique and very cool.”

Knowles also emphasizes the role of diversity in driving success. “The best ideas come from teams that don’t all think the same way. Our leadership team is roughly 50% women, which is notable in an industry where women are underrepresented. Diversity of thought drives better outcomes. These voices matter, whether in a boardroom, on the factory floor or out in the field. We embrace that, and it makes the industry stronger.

“Everything I just said applies regardless of industry or background. To serve the public, you need people who understand different perspectives. Limiting diversity limits outcomes.”

ABOUT CHRISTINA KNOWLES:

With nearly 15 years at G&W Electric, Christina Knowles has seen firsthand how growth, technology, and resilience shape the future of the energy industry. From doubling production capacity to leading teams through rapid expansion, she has helped steer the company’s operations through transformation while maintaining a strong, people-centered culture. Her work reflects both the evolving landscape of modern utilities and the leadership required to keep pace with it.

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ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS - COMPRESSION, DISTRIBUTION

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS - GROUNDING

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS - PLUG-IN

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS - SUBSTATION

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS - TECK CABLE

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONNECTORS, UNDERGROUND - TERMINATING

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CONSTRUCTION - POWER LINE AND SUBSTATION - 25 TO 735KV

ASPLUNDH INFRASTRUCTURE GROUP
Tel: 1-888-884-5426
https://www.asplundhconstruction.com

PRIMORIS SERVICES CORPORATION
Tel: 214-740-5600
https://www.prim.com

CONSTRUCTION SERVICES

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

PRIMORIS SERVICES CORPORATION
Tel: 214-740-5600
https://www.prim.com

CONSULTANTS - CABLE TESTING AND FAULT LOCATING

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

KEMA LABS
Tel: 215-822-4200
https://www.cesi.it/labs/chalfont/

CONSULTANTS - SUBSTATION DESIGN & ENGINEERING

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

CONSULTANTS - T&D ENGINEERING

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

CONSULTANTS - UNDERGROUND AND UNDERWATER CABLE

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

CONTAINMENTS, INDUSTRIAL & RADIOLOGICAL

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

CONTRACTORS - CONSTRUCTION

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

PRIMORIS SERVICES CORPORATION
Tel: 214-740-5600
https://www.prim.com

CONTROLS - VAR

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

CROSSARMS, WOOD - LAMINATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

CURRENT SENSORS

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

CYBER SECURITY

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

D

DATA CONVERSION

RAMTECH SOFTWARE SOLUTIONS, INC.
Tel: 651-342-1780
https://www.ramtech-corp.com

DISTRIBUTION AUTOMATION SYSTEMS

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

VIZIMAX INC.
Tel: 1-450-679-0003
https://www.vizimax.com

E

ELECTRICAL SOFTWARE

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

ELECTRONIC MAPPING AND PINNING

FULCRUM
Tel:: 801-690-1194
https://www.fulcrumapp.com/

EMERGENCY STORM SERVICES

ASPLUNDH TREE EXPERT, LLC
Tel: 1-800-248-8733
https://www.asplundh.com

PRIMORIS SERVICES CORPORATION
Tel: 214-740-5600
https://www.prim.com

ENCLOSURES - METERING EQUIPMENT

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

ENCLOSURES - NEMA TYPE

HINDLEPOWER
Tel: 610-330-9000
https://www.hindlepowerinc.com

ENGINEERING - DESIGN

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 I 866-269-8275
https://www.albarrie.com

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

ENGINEERING - PROCUREMENT - CONSTRUCTION (EPC) SUBSTATIONS

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

ENGINEERING - PROFESSIONAL SERVICES

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 I 866-269-8275
https://www.albarrie.com

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

ENGINEERING - SERVICES - T & D

OSMOSE UTILITIES SERVICES, INC.
Tel: 770-632-6710
https://www.osmose.com

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

ENGINEERING - SOFTWARE

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

ENGINEERING - STRUCTURAL

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

ENVIRONMENTAL SERVICES

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

F

FACILITY - DESIGN

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

FIBERGLASS - PIPE, TANK

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

FIELD INSTALLATION SERVICES

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

FILTRATION SYSTEMS - OIL

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 I 866-269-8275
https://www.albarrie.com

FUSES

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

G

GENERAL CONTRACTORS - CONSTRUCTION

PRIMORIS SERVICES CORPORATION
Tel: 214-740-5600
https://www.prim.com

GIS - ENGINEERING SERVICES

RAMTECH SOFTWARE SOLUTIONS, INC.
Tel: 651-342-1780
https://www.ramtech-corp.com

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

GIS - SOFTWARE

RAMTECH SOFTWARE SOLUTIONS, INC.
Tel: 651-342-1780
https://www.ramtech-corp.com

GRIPS - CABLE-PULLING

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

GROUND RODS - COPPERWELD

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

GROUNDING - EQUIPMENT

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

H

HARDWARE - TRANSMISSION LINE

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

I

INDICATORS - FAULT

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

INFRARED - IMAGING

SYSTEMS WITH INTELLIGENCE INC.
Tel: 289-562-0126
https://www.systemswithintelligence.com

INSTRUMENTS - ON LINE MEASURING

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

INSULATORS - GLASS

SEDIVER CANADA INC.
Tel: 514-739-3385

INSULATORS - PIN-TYPES

HENDRIX BY MARMON UTILITY
Tel: 603-673-2040
https://www.marmonutility.com

INSULATORS - POLYMER

HENDRIX BY MARMON UTILITY
Tel: 603-673-2040
https://www.marmonutility.com

L

LABELS

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

LABORATORY EQUIPMENT AND SUPPLIES

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

LADDERS - INDUSTRIAL

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

LADDERS - TOWERS

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

LANYARDS, SHOCK ABSORBING

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

LOCKOUT SYSTEMS

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

M

MAINTENANCE - PREVENTIVE MAINTENANCE EQUIPMENT

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

MARKERS

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

MARKERS - CABLE

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

MARKERS - FIBER OPTIC

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

MARKERS - POLES

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

MARKERS - TRANSMISSION POLES

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

METERS - PHASE

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

METERS - VOLT

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

MONITORING - TRANSFORMERS

DYNAMIC RATINGS, INC.
Tel: 262-746-1230
https://www.dynamicratings.com

SYSTEMS WITH INTELLIGENCE INC.
Tel: 289-562-0126
https://www.systemswithintelligence.com

MONITORING SECURITY SYSTEMS

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

MONITORS - TEMPERATURE

DYNAMIC RATINGS, INC.
Tel: 262-746-1230
https://www.dynamicratings.com

O

OIL - CONTAINMENT EQUIPMENT

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

SOLIDIFICATION PRODUCTS INTERNATIONAL, INC.
Tel: 203-484-9494 | 800-758-3634
https://www.oilbarriers.com

OIL SPILL EQUIPMENT

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

ON-LINE MONITORING

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

P

PANELS (POWER DISTRIBUTION)

HINDLEPOWER
Tel: 610-330-9000
https://www.hindlepowerinc.com

PARTIAL DISCHARGE ANALYSIS, DETECTION

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

DYNAMIC RATINGS, INC.
Tel: 262-746-1230
https://www.dynamicratings.com

PHASE IDENTIFICATION

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

PLATFORMS - LINEMAN'S

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

POLE LINE HARDWARE

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

POLES - DISTRIBUTION - WOOD, LAMINATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

POLES - LIGHTING - WOOD, LAMINATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

POLES - TRANSMISSION - WOOD, LAMINATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

POWER SUPPLIES - UNINTERRUPTIBLE

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

PROJECT ENGINEERING

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

PROJECT MANAGEMENT AND CONSULTING

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

PROTECTION AND CONTROL

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

PULLERS - CABLE

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

PULLERS - CABLE, AERIAL

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

PULLERS - CABLE, UNDERGROUND

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

PULLERS - CONDUCTOR

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

PULLERS - ROPE

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

R

RECLOSERS

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

RECLOSERS - SINGLE-PHASE

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

S&C ELECTRIC COMPANY
Tel: 773-338-1000
https://www.sandc.com

RECLOSERS - THREE-PHASE

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

REELS - CONDUCTOR STRINGING

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

REELS - HANDLING EQUIPMENT

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

REELS - WIRE, GROUNDING

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

RELAYS - PROTECTION

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

KEMA LABS
Tel: 215-822-4200
https://www.cesi.it/labs/chalfont/

REMOTE - SITE MONITORING

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SYSTEMS WITH INTELLIGENCE INC.
Tel: 289-562-0126
https://www.systemswithintelligence.com

REMOTE TERMINAL UNITS - COMMUNICATIONS

MAISVCH TECHNOLOGY CO, LTD
Tel: 15271087515
https://www.maisvch.com

REMOTE VIDEO INSPECTION SYSTEMS

SYSTEMS WITH INTELLIGENCE INC.
Tel: 289-562-0126
https://www.systemswithintelligence.com

ROPE - WIRE

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

S

SAFETY - CONFINED SPACE

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

SAFETY - ENVIRONMENTAL - EQUIPMENT

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 | 866-269-8275
https://www.albarrie.com

SAFETY - LINEMEN EQUIPMENT

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

SAFETY - SUPPLIES

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

SENSORS - CURRENT

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SENSORS - CURRENT + VOLTAGE

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

SF6 GAS INSULATED SWITCHGEAR

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SHEAVES - CONDUCTOR - STRINGING

CONDUX TESMEC, INC.
Tel: 507-387-8069 | 1-888-980-1209
https://www.conduxtesmec.com

SIGNS

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

SIGNS - WARNING

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

SMART GRID SOLUTIONS

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

SISCO, INC.
Tel: 586-254-0020
https://www.sisconet.com

SOFTWARE - DATABASE

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

SOFTWARE - T&D LINE DESIGN

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

SOFTWARE INTEGRATION

SISCO, INC.
Tel: 586-254-0020
https://www.sisconet.com

SPLINTS - POLE-REINFORCING

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

STATIC - VAR COMPENSATION

VIZIMAX INC.
Tel: 1-450-679-0003
https://www.vizimax.com

STICKS - DISCONNECT

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

STICKS - HOT

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

STRUCTURE - PREFABRICATED

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

SUBSTATION

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SUBSTATION - CAD DRAFTING SUPPORT

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

SUBSTATION - COMMUNICATION EQUIPMENT

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SUBSTATION - COMMUNICATIONS

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

SISCO, INC.
Tel: 586-254-0020
https://www.sisconet.com

SUBSTATION - MOBILE

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SUBSTATION - UNIT

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

SUBSTATION - WOOD, TREATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 | 1-800-949-3526
https://www.lwsinc.com

SUBSTATION AUTOMATION

VIZIMAX INC.
Tel:: 1-450-679-0003
https://www.vizimax.com

SUBSTATION CONTROL BUILDINGS

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

SUBSTATION DESIGN & CONSTRUCTION

EASI-SET WORLDWIDE
Tel: 540-439-8911 | 1-800-547-4045
https://www.easisetbuildings.com

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

SWITCHES

EMSPEC INC.
Tel: 450-430-5522
https://www.emspec.com

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - AIR, GROUP-OPERATED

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - CAPACITORS

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - CAPACITORS BANK

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - DISCONNECT

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - DISCONNECT 25 TO 800KV

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - HOOKSTICK, DISCONNECTING

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - ISOLATION

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - LOAD BREAK

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - MOTOR-OPERATED

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - PADMOUNTED

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SWITCHES - SUBMERSIBLE

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SWITCHES - SUBSTATION, DISCONNECTING

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - THROWOVER, AUTOMATIC

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

SWITCHES - TRANSMISSION DISCONNECT AND LOAD BREAK

SOUTHERN STATES, LLC
Tel: 770-946-4562
https://www.southernstatesllc.com

SWITCHES - VACUUM

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SWITCHGEAR - ARC RESISTANT - MEDIUM VOLTAGE

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SWITCHGEAR - HIGH VOLTAGE

MINDCORE TECHNOLOGIES
Tel: 450-477-5959
https://www.mindcoretech.com

SWITCHGEAR - MEDIUM VOLTAGE RANGE UP TO 44 KV

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

SWITCHGEAR - SF6

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

ABB INSTALLATION PRODUCTS (CANADA)
Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SWITCHGEAR - VACUUM

ABB INSTALLATION PRODUCTS
Tel: 1-800-326-5282
https://www.tnb.abb.com

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Tel: 1-905-635-7855
https://www.tnb.ca.abb.com

G&W ELECTRIC CO.
Tel: 708-388-5010
https://www.gwelectric.com

SYSTEMS INTEGRATOR

RAMTECH SOFTWARE SOLUTIONS, INC.
Tel: 651-342-1780
https://www.ramtech-corp.com

SISCO, INC.
Tel: 586-254-0020
https://www.sisconet.com

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TAGS

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TAPE - MARKING

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

TAPE - UNDERGROUND MARKING

ALMETEK INDUSTRIES, INC
Tel: 800-248-2080
https://www.almetek.com

TECH PRODUCTS, INC.
Tel: 718-442-4900 | 1-800-221-1311
https://www.techproducts.com

TEST EQUIPMENT

OMICRON ELECTRONICS CORP. USA
Tel: 1-713-830-4660
https://www.omicronenergy.com

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

TEST EQUIPMENT - AERIAL LIFT

VON CORPORATION
Tel: 205-788-2437
https://www.voncorp.com

TEST EQUIPMENT - GLOVE

VON CORPORATION
Tel: 205-788-2437
https://www.voncorp.com

TEST EQUIPMENT - HIGH VOLTAGE

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

TEST EQUIPMENT - HV TEST SETS, PORTABLE

HASTINGS FIBER GLASS PRODUCTS, INC.
Tel: 269-945-9541
https://www.hfgp.com

VON CORPORATION
Tel: 205-788-2437
https://www.voncorp.com

TEST EQUIPMENT - MICRO-OHMMETER

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TEST EQUIPMENT - RELAY

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

TEST EQUIPMENT - SLEEVE, RUBBER

VON CORPORATION
Tel: 205-788-2437
https://www.voncorp.com

TEST EQUIPMENT - TRANSFORMERS

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TEST SYSTEMS/COMPONENTS - HIGH VOLTAGE, HIGH CURRENT, HIGH POWER

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TESTING - REGULATORS

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

TESTING - TRANSFORMERS, LIQUID

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TESTING SERVICES

KEMA LABS
Tel: 215-822-4200
https://www.cesi.it/labs/chalfont/

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

TESTING SERVICES - ELECTRICAL

KEMA LABS
Tel: 215-822-4200
https://www.cesi.it/labs/chalfont/

KINECTRICS INC.
Tel: 416-207-6000
https://www.kinectrics.com

TESTING SERVICES - OIL

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

THERMOGRAPHIC - EQUIPMENT SALES

SYSTEMS WITH INTELLIGENCE INC.
Tel: 289-562-0126
https://www.systemswithintelligence.com

TOWERS - EMERGENCY T & D

LINDSEY SYSTEMS
Tel: 626-969-3471
https://www.lindsey-usa.com

TOWERS, TRANSMISSION - STEEL

VALMONT UTILITY
Tel: 205-968-7200 **I** 1-800-VALMONT
https://www.valmontutility.com

TOWERS, TRANSMISSION - WOOD, LAMINATED

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 **I** 1-800-949-3526
https://www.lwsinc.com

TRAILERS - CABLE REEL

CONDUX TESMEC, INC.
Tel: 507-387-8069 **I** 1-888-980-1209
https://www.conduxtesmec.com

TRAINING

SARGENT & LUNDY
Tel: 312-269-2000
https://www.sargentlundy.com

TRANSFORMER MONITORING

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

DYNAMIC RATINGS, INC.
Tel: 262-746-1230
https://www.dynamicratings.com

TRANSFORMERS - MAINTENANCE

ALBARRIE GEOCOMPOSITES LIMITED
Tel: 705-737-0551 **I** 866-269-8275
https://www.albarrie.com

TRANSFORMERS - POWER

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TRANSFORMERS - TEST EQUIPMENT

DOBLE ENGINEERING
Tel: 617-926-4900
https://www.doble.com

TRAVELERS - CONDUCTING-STRINGING

CONDUX TESMEC, INC.
Tel: 507-387-8069 **I** 1-888-980-1209
https://www.conduxtesmec.com

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UTILITY AUTOMATION

RTDS TECHNOLOGIES, INC.
Tel: 204-989-9700
https://www.rtds.com

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VAULTS - CONCRETE - REPAIRS

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 **I** 1-800-949-3526
https://www.lwsinc.com

VAULTS, UNDERGROUND - CONCRETE

LAMINATED WOOD SYSTEMS, INC.
Tel: 402-643-4708 **I** 1-800-949-3526
https://www.lwsinc.com

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