

# EET&D MAGAZINE

Quarterly Issue 1, 2023 – Volume 26



**A SYMBOL OF ORGANIZATIONAL  
PROFICIENCY: HOW FIELD SERVICE  
MANAGEMENT SOLUTIONS HELP  
MEET ENVIRONMENTAL, SOCIAL AND  
GOVERNANCE INITIATIVES**



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Intelligent power and digitalization investments are essential to modernize energy delivery systems for a more electrified and low-carbon future. Utility performance today and tomorrow hinges on anticipating and preparing for this energy transition, as well as enabling a grid that can react far faster to changing conditions and dynamic energy sources.

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As a sector, we need to focus on building a talent pipeline for future generations. This means working with schools, colleges, universities, trade schools and communities – where fossil fuel workers live – to strengthen STEM programs and training opportunities.

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## AUTOGRID'S SADIA RAVEENDRAN CHARTS HER ENERGY TRANSITION | Sadia Raveendran, AutoGrid and Elisabeth Monaghan, Editor in Chief

For our Q1 issue, we are proud to feature VP of Industry Solutions at AutoGrid Sadia Raveendreen.



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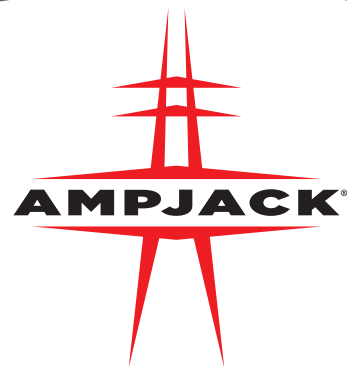
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## PPL CORPORATION SUBSIDIARY RHODE ISLAND ENERGY GAINS REGULATORY APPROVAL FOR \$290 MILLION TO STRENGTHEN NETWORK SAFETY, RELIABILITY AND RESILIENCE

March, 2023

PPL Corporation (NYSE: PPL) today (March 30) announced that the Rhode Island Public Utilities Commission (RIPUC) has approved \$290 million to improve Rhode Island's electric and gas networks in connection with the latest Infrastructure, Safety, and Reliability (ISR) plans proposed by PPL subsidiary Rhode Island Energy (RIE).

The ISR plans are submitted annually and outline proposed capital investments to strengthen the state's electric and gas infrastructure. In addition, the electric ISR plan includes related operating costs for vegetation management, system inspection and other work related to maintaining the safety and reliability of the electric distribution system. The approved plans address proposed spending from April 1, 2023, to March 31, 2024.

***“These approvals are vital to strengthening the safety, reliability and resilience of our energy networks, and we look forward to advancing this work on behalf of the communities we serve,” said Vince Sorgi, PPL President and Chief Executive Officer. “While we believe certain excluded projects are the right projects to better serve our customers, we appreciate the Commission's desire to complete a review of our Grid Modernization and Advanced Meter Functionality filings, as well as its Future of Gas stakeholder proceeding, before approving additional funding in those areas. We look forward to continuing to engage with the Commission, the Rhode Island Division of Public Utilities and Carriers and other stakeholders on these matters.”***

In its decision, the RIPUC approved approximately \$127 million out of \$181 million proposed in RIE's Electric ISR plan. The RIPUC also approved approximately \$163 million out of \$171 million proposed in RIE's Gas ISR plan to continue to maintain a safe and reliable gas delivery system. This includes the replacement of 60 miles of leak-prone pipe. Proposed investments not approved by the RIPUC through the ISR plans and associated cost recovery may be considered in future proceedings.

PPL said the approved ISR plans do not change its overall business outlook. The company today reaffirmed its 2023 earnings forecast range of \$1.50 to \$1.65 per share, with a midpoint of \$1.58 per share, as well as its projected annual earnings per share growth of 6% to 8% through at least 2026.

PPL Corporation (NYSE: PPL), based in Allentown, Pennsylvania, is a leading U.S. energy company focused on providing electricity and natural gas safely, reliably and affordably to 3.5 million customers in the U.S. PPL's high-performing, award-winning utilities are addressing energy challenges head-on by building smarter, more resilient and more dynamic power grids and advancing sustainable energy solutions. For more information, visit [www.pplweb.com](http://www.pplweb.com).





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\* The Elastimold Tru-Break switchgear module is considered maintenance-free because it contains no oil or gas to monitor or maintain.





## FIRST TOWERS RISE ON NATION'S LARGEST ELECTRICITY TRANSMISSION PROJECT

March, 2023

Construction of Australia's largest transmission project critical to the country's clean energy future has reached a major milestone with the first of 1,500 steel towers rising from the ground in the Far West of NSW.

The \$1.8 billion EnergyConnect project will enable the sharing of electricity between NSW, South Australia and Victoria for the first time, integrate renewable energy into the grid, and help Australia achieve its emissions reduction targets.

Transgrid and its construction partner SecureEnergy are building the 700km NSW section of the project from Wagga Wagga to the South Australian border, with a connection to Red Cliffs in Victoria.

"We are getting on with the job of delivering the critical infrastructure needed to provide Australian households and businesses with cheaper, more reliable and sustainable energy," Transgrid CEO Brett Redman said.

***"The raising of our first transmission towers on EnergyConnect is yet another significant milestone in building the energy superhighway to accelerate the nation's clean energy future."***

Construction crews have erected the first guyed towers using a 230-tonne crane at Buronga, near Mildura. Unlike conventional self-supporting towers, which stand on four legs, guyed towers comprise a central mast held in place by four steel cables.

"Importantly, this type of tower requires about 15 per cent less steel and 25 per cent less concrete in construction, achieving a reduced carbon footprint. It is just one of the ways Transgrid is delivering more sustainable outcomes on our transmission projects as we lead the transition to a clean energy future," said Mr Redman.

CREATING  
UP TO  
1,500  
JOBS

***"In addition to providing backbone infrastructure supporting Australia's transition to a renewable energy future, EnergyConnect will save NSW customers \$180 million per year or \$64 per household, on average, as part of our broader efforts to put further downward pressure on customer bills. The project is also creating up to 1,500 jobs, primarily in regional NSW, and contributing \$4 billion in net economic benefits."***

\$4 BILLION  
IN NET ECONOMIC  
BENEFITS



WILL SAVE  
**\$180** MILLION  
PER YEAR

Meanwhile, works are well underway on the expansion of Transgrid's Buronga substation, which will become the main hub for energy sharing between the three states. Earthworks on the substation bench are now complete, with concrete foundations being poured to hold the synchronous condensers and transformers at the heart of the facility.

***"The 16-hectare expansion of the Buronga substation is the equivalent of 20 football fields and, once operational, it will be one of the largest and most complex substations in the Southern Hemisphere," said Mr Redman.***

Following the establishment of a 30-hectare worker accommodation camp and laydown with office facilities at Buronga, construction is also progressing on another two camps on Renmark Rd, west of the South Australia border, and near Lockhart, at the eastern end of the project alignment.

Ultimately, six workforce camps will be established along the EnergyConnect alignment, providing the equivalent of 490,000 nights of accommodation during the project. The camps will relieve pressure on limited housing and accommodation in local communities, reduce travel to construction sites, and ensure the health and wellbeing of workers with high-quality living amenities including gyms and recreation rooms.

For more information about EnergyConnect visit:

**[www.transgrid.com.au/energyconnect](http://www.transgrid.com.au/energyconnect)**

NATION'S **LARGEST**  
**ELECTRICITY TRANSMISSION**  
**PROJECT**



## TVA ANNOUNCES LOCATION OF PROPOSED TRANSMISSION ROUTES IN BOWLING GREEN

March, 2023

The Tennessee Valley Authority has identified preferred locations for transmission improvements that would prepare for growth and increase power reliability in the Bowling Green area of Warren County.

TVA selected the Loving Switching Station location on Sunnyside-Gott Road. Initially, TVA proposed using the Interstate 65 Switching Station site referenced during the Virtual Open House. However, underground issues were found at that location, and it was eliminated from consideration.

The Loving Switching Station will be built in phases with the first phase in conjunction with a power line from the station to the new Transpark East Substation. The new line from the Loving Switching Station to Transpark East would be less than three miles and built using primarily single-pole, steel structures on new 100-foot-wide right of way. TVA has also identified preferred routes for two future lines that would connect to the Loving Switching Station. Those future lines will be built using primarily double-pole, steel structures on new 100-foot-wide right of way.

The selected routes are expected to have the least impact on the area, based on public input from the virtual open house and additional evaluation of other factors, including social, environmental and engineering impacts. A National Environmental Policy Act review is also pending.



The project will utilize new right of way. TVA will meet with property owners along the proposed right of way to obtain easements for construction, operation, and maintenance of the line. Property owners would still own the property and be compensated for the easements at fair market value.

TVA is expected to begin surveys in summer 2023 and start acquiring easements in summer 2024. Construction is scheduled to begin in spring 2025 and be completed in summer 2025. A map of the project and additional information are available at [tva.com/transmissionprojects](https://tva.com/transmissionprojects).

After a decade of nearly flat load growth, TVA has experienced nearly 2.5% demand growth from 2020 to 2022. TVA reports the region's population growth is six times higher than the national rate. To prepare for growth, TVA is investing \$2.8 billion in transmission system improvements across its service area through 2027, to build the energy grid of the future that will continue to provide clean, low-cost, reliable power.

**\$2.8 BILLION**  
IN TRANSMISSION SYSTEM  
**IMPROVEMENTS** ACROSS ITS  
SERVICE AREA **THROUGH 2027**

## SSEN DEPLOYS SMART METER DATA FOR A SMARTER NETWORK

March, 2023

*Scottish and Southern Electricity Networks (SSEN) has developed a new way of improving the visibility of the distribution network, using smart meter data that is analysed using an innovative algorithm.*

Nearly half of SSEN's customers in its licence areas across the north of Scotland and central southern England, now have smart meters installed. The energy consumption data that these meters provide can be useful to households to help track their energy use, but it also has another value. Smart meters log the voltage at each house to ensure customers are receiving the right power quality and this is now being used to create new benefits, which will ultimately help thousands of customers to decarbonise more quickly and efficiently.

SSEN's local electricity cables effectively have three separate wires, termed "phases", with each customer connected to one of these three. Over time, some phases have had significantly more load connected than others, as customers adopt low carbon technologies such as car chargers or heat pumps. This creates a challenge for SSEN as the local network operator, because good quality data about the existing network is essential, to support a smooth, efficient connections process for new customers. To ensure the network can deliver a safe, secure, and reliable service, SSEN frequently uses site visits as part of new connections requests, but these may need more time to complete.

Instead, the teams at SSEN have developed an algorithm which can process smart meter data and identify the minute similarities between the voltage changes in each house. Grouping these together allows SSEN to work out remotely which phase each customer is connected to, without a single mile being driven. This information will support more efficient network management, allow more low carbon technology to connect to the existing network, reduce energy loss from the local system and help speed the location of faults.

**Stewart Reid, Head of Future Networks at SSEN said:**

"The voltage variation of each phase on our network is almost like a fingerprint, a near-unique profile that can allow us to pinpoint precisely which part of our network a customer is connected to. This is allowing us to update our records remotely and automatically, which is a far more efficient way of gathering and maintaining this valuable data set."

***"Customers will see the benefit, through quicker and more automated responses to requests for new connections and upgrades, speedier restoration of local network faults and more accurate supply interruption notifications. Ultimately better data allows us to run our network more efficiently, providing savings which are then shared with our customers."***

Better network data will also support more targeted deployment of new flexibility services which will help support a fully decarbonised electricity system by 2035. Flexibility is the ability to shift the timing or location of generation or demand and will be vital to optimise the existing network. SSEN's improved visibility of its low voltage network will allow the more precise procurement of flexibility services and other new solutions that are emerging. Flexibility has the potential to reduce the costs of the UK energy system by up to £10bn per year by 2050 and could create 24,000 jobs in the process; innovative use of data will be core to delivery of those benefits. →



**Scottish & Southern  
Electricity Networks**

**Victoria Bacon, Director of Communications at Smart Energy GB said:**

"Not only do smart meters put consumers in greater control of their energy use, but every single one of the 31.3 million smart meters already installed across Britain is helping to unlock a cleaner, smarter and more flexible way of using energy."

*"SSEN's use of smart meter data is a great example of the ways in which these clever devices can support innovation and help to build a more responsive energy system."*

#### **About Scottish and Southern Electricity Networks**

- Scottish and Southern Electricity Networks (SSEN) Distribution is the electricity distribution arm of the FTSE-50 energy company, SSE. We serve over 3.9 million customers across the diverse and unique geographies of the north of Scotland, and central southern England.

- Our role has never been more important. The communities we serve depend on us to deliver a safe, reliable supply of electricity to their homes and businesses so they can thrive today. And for us to deliver the infrastructure to create a net zero tomorrow. To do this we're inspired every day by our vision to be powering change with every connection.

- For further information please contact **SSEN's Media Team: 0345 0760 530**

#### **About smart meters and the rollout**

- Smart meters are the next generation of digital gas and electricity meters, providing automatic meter readings and near-real time energy use information for households. Smart meters and the information they provide will help Britain to achieve net zero by allowing for better management of energy demand and supply, providing people with the visibility needed to reduce their usage, and making the best and most efficient use of wind and solar power. Innovative technology and services enabled by smart metering is pivotal in allowing our country to decarbonise and have more electric vehicles.

31.3 MILLION SMART METERS  
ALREADY INSTALLED ACROSS BRITAIN IS  
HELPING TO UNLOCK A **CLEANER,**  
**SMARTER** AND **MORE**  
**FLEXIBLE** WAY OF USING ENERGY

- Smart meters are available from energy suppliers at no extra cost, and the accompanying in-home display shows energy use in pounds and pence. 31.3 million smart meters have already been installed across Britain.
- Personal information such as name, address and bank details are not stored on a smart meter. The meters simply record gas and electricity readings in the same way as a traditional meter.

#### **About Smart Energy GB:**

- Smart Energy GB is the not-for-profit, government-backed campaign helping everyone in Britain to understand the importance of smart meters and their benefits to people and the environment. Our national campaign is reaching homes and microbusinesses across England, Scotland and Wales. For more information visit [smartenergyGB.org](http://smartenergyGB.org)

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# THE CHANGING INDUSTRY LANDSCAPE: MORE THAN NEW TECHNOLOGY



**ELISABETH MONAGHAN**  
Editor in Chief

DISTRIBUTECH International is considered the leading annual T&D industry event. With 17,000 attendees and more than 500 exhibitors, DISTRIBUTECH 2023 broke a record. Even with so many booths and various groups gathered to share or see the latest industry innovations, it was relatively easy to navigate the exhibit floor. This year, the exhibitors seemed to have upped their game. Several booths featured demonstrations of the latest solutions that are moving the industry further toward grid modernization. The event also introduced a few new features.

Not only were the Smart Zone and EV Zone new to DISTRIBUTECH, but this year, the conference also debuted the first Powered by Diversity Luncheon & Award program. Sponsored by S&C, the luncheon included a panel of industry leaders, who discussed diversity in the workplace and shared best practices for diversity, equity and inclusion (DEI) programs.

While DEI is not a new concept, more companies have recently begun embracing DEI programs. For those unfamiliar with DEI, the DISTRIBUTECH website defines it this way: “DEI in the workplace is more than policies, programs or headcounts. Equitable employers outpace their competitors by respecting the unique needs, perspectives and potential of all their team members. As a result, diverse and inclusive workplaces earn deeper trust and more commitment from their employees.”

For years, it has been known that a high percentage of the workforce is over the age of 50, which means the utility industry must fill the gaps left as more of these older workers retire. To draw younger, experienced industry professionals, organizations must offer competitive benefits and a culture that provides all of the tools that job seekers look for when deciding which companies have the best working environment. So, while some may see DEI programs as the latest trend, whether or not a company has a DEI strategy has become a key differentiator for businesses that are trying to attract a talented pool of prospective employees.

Signifying the importance of integrating DEI into a company's strategy, a 2019 ZipRecruiter survey<sup>1</sup> found that 86% of job seekers said it is somewhat or very important that companies have a diverse workforce. And according to a 2022 survey<sup>2</sup> conducted by GoodHire, a provider of employment background screening services, 81% of workers surveyed said they would leave their job if their employer lacked a commitment to DEI in the workplace.

As GPS Insight General Manager, Field Service Management Steve Mason points out in this issue's Grid Transformation Forum, a company's sustainability practices are another component that younger generations of jobseekers consider before applying for a job. According to Mason, both how a company treats its employees and whether the company considers sustainability a priority may also be factors that investors consider before investing in a company.



Mason begins his article by saying, that there was a time when “environmental, social and governance (ESG) standards were merely a public relations tactic, but this has changed immensely in recent years. Today, these standards are a symbol of organizational proficiency. As such, they are a vital part of a company’s long-term competitive achievements. Investors are well aware of this and are increasingly attracted to investing in companies that treat their employees fairly but operate ethically and make significant pledges toward sustainability.”

In The Bigger Picture section of this issue, Katie Mehnert, who is the founder and CEO of ALLY Energy, points to some of the softer skills that will prepare younger generations for the jobs left by retiring utility workers.

While STEM programs help create a talent pool of future industry workers, there are other factors companies must look at. “Some of the most crucial skills of today’s workplaces are communication, leadership, people management, creativity, empathy, critical thinking, and social awareness,” explains Mehnert. “These are human skills, and no amount of artificial intelligence will allow machines to take over anytime soon. Energy needs these as much as any other industry.”

Addressing the need for grid modernization and resiliency, shoring up cyber security protocols and establishing a bench of talented workers ready to fill the deficit left by a retiring workforce are only a few of the challenges the electric energy sector continues to face. Our goal at EET&D is to provide the information and tools that will help utilities and the rest of our industry partners effectively meet those challenges. We recognize the value of industry events like DISTRIBUTECH, along with the invaluable education we receive and the connections we make at them. We are also grateful for the insight that our subject matter experts bring to this publication to help us reach that goal.

If you would like to contribute an article or if you have an idea about interesting technology, solutions, or suggestions, please email me at:

**Elisabeth@ElectricEnergyOnline.com**

*Elisabeth*



**From left to right:** S&C CHRO, Felicia Kohlenberger, Powered by Diversity award winner representing Dominion Energy, Latoya Asia, Director - Talent Acquisition, Workforce Planning, DE&I, and S&C CEO Anders Sjoelin. Image credit: S&C

<sup>1</sup> <https://www.ziprecruiter.com/blog/job-seekers-value-diversity-when-looking-for-a-job/>

<sup>2</sup> <https://www.goodhire.com/resources/articles/diversity-equity-inclusion-survey/>

# A SYMBOL OF ORGANIZATIONAL PROFICIENCY:

## HOW FIELD SERVICE MANAGEMENT SOLUTIONS HELP ORGANIZATIONS MEET ENVIRONMENTAL, SOCIAL AND GOVERNANCE INITIATIVES

STEVE MASON



*For the Q1 issue, we feature an article by GPS Insight Steve Mason, who explains the importance of environmental, social and governance standards in an organization, and how field service management solutions provide the tools to help tackle ESG initiatives.*

It hasn't been long since environmental, social and governance (ESG) standards were merely a public relations tactic, but this has changed immensely in recent years. Today, these standards are a symbol of organizational proficiency. As such, they are a vital part of a company's long-term competitive achievements. Investors are well aware of this and are increasingly attracted to investing in companies that treat their employees fairly but operate ethically and make significant pledges toward sustainability. Not only have approximately 80% of investors stated that ESG considerations have a substantial influence on their investment decision-making, according to PwC, but about 50% have gone as far as to indicate that they would withdraw from investing in a company that did not take appropriate ESG actions.

The spotlight on ESG isn't coming from investors alone. Everyone who is part of the ecosystem – from employees to regulators – are tuned in. More than 65% of Americans consider sustainability when making a purchase or choosing where to work. Because of this, companies everywhere are making swift moves to enhance their equity, diversity and governance, but, perhaps most importantly, reduce emissions to the greatest extent possible. In fact, investors are yearning to connect with companies and understand where they are in their ESG journey.

Suppose companies have no way of communicating through reporting and can therefore provide no quantifiable actions being made. When that is the case, investors will not hesitate to sell their investments and move on without looking behind. →





## Fleet participation

Organizations in many fields are going to extraordinary measures to find ways to reduce their carbon emissions. Fleets have historically been relied upon to reach customers and deploy vital assets. For this reason, field service organizations that utilize fleets are in a position in which they must modernize their critical operations to reach sustainability goals. Without a doubt, fleets keep life moving at a pace we've become accustomed to; we rely on them for many necessities and luxuries. Unfortunately, this means the fleets contribute to air pollution. About 27% of the total U.S. warming emissions get credit as coming from the transportation sector, according to the United States Environmental Protection Agency.

Leaders of organizations that rely heavily upon fleets to run successful businesses may look at the issue at hand and feel like there's no way to effectively reduce emissions. On the contrary, with the appropriate field service management solution (FSM), any organization can take the reins and begin making huge strides toward helping themselves meet all ESG objectives, especially sustainability goals. For instance, doing away with just one on-site service visit each day can reduce the same amount of carbon as more than five acres of U.S. forests absorb every day. This is no small matter. FSM helps with this and more, ensuring organizations meet high ethical standards, lower emissions and reduce waste.

All of this is important, but it takes dedication of time, effort and resources on the part of field service teams. Investing in FSM is not just a move to reach sustainability goals – it can also increase a company's efficiency while providing a sizeable return on investment (ROI).

## Diving into the toolbox

An FSM has many aspects that can directly help a company reduce emissions and drive sustainability. Because in-person visits are standard in field service, it's an important aspect. Take, for example, augmented reality. With FSM tools like this, organizations are arming themselves with essential means to tackle ESG initiatives, as it can quickly and efficiently resolve customer issues. Instead of sending a service technician miles away to a site, they can virtually connect with customers in minutes. This enables the service technicians to assess an issue swiftly, bring in any necessary experts virtually and work together to troubleshoot any problems.

Scheduling is such an essential part of field service work. Field service planners or schedulers typically know the customer territory and the capabilities of their technicians in great detail. Schedulers wear many hats, but because they are knowledgeable, this can create information silos.

It also means they are an extremely active and busy cog in the organization's machine. To successfully chart the course for an organization, the field service teams need time to plan and institute a schedule and establish roots with technicians.

Time, of course, is often the scarcest commodity. Placing so many essential tasks in the hands of one person can lead to delays. Too often, the dispatch center becomes the bottleneck to growing the field workforce and reducing productivity and opportunity for more business. Worse, if there are inefficiencies today, scaling up the operation means scaling up those inefficiencies later, too.

Unfortunately, all of this can amount to a balancing act that can result in schedulers needing more time to plot out work carefully. Lack of time means reacting rather than planning. This can also lead to mistakes, which is how techs end up with inefficient routes and unnecessary or excessive travel time.

## FSM tools

With FSM tools like route organization and smart scheduling, predetermined stops can be created in a way that chooses the best distance, speed and highway preferences. An FSM scheduling tool allows service managers to assign work and route the right technicians to the right job at the precise time, smoothly and seamlessly. Considering scheduling and dispatching will help identify the correct technician for the job and allow the drivers to choose and take the shorter and more efficient route.

Additionally, once the dispatcher approves the job and route, techs are immediately alerted and can access all the job's previous data. All this will save time and prevent unnecessary and excessive fuel burning while also keeping techs from having to make repeat visits.

## Data collection

Not only do FSM tools help to eliminate the high frequency of visits, but they support far fewer physical work orders. With work order management, digitization and paperless office tools, documentation of jobs can be done swiftly and correctly. This one-touch data collection environment gives employees access to job information from anywhere.

But let's say a technician meets a problem that requires an in-person visit. FSM capabilities, like mobile apps, field engineer communications and predictive analytics, will help them better handle the job. Not only does all of this contribute to improved sustainability, but it also makes for a work environment that is a more positive experience for the employee.



A GPS tracking solution tied to an FSM can also help monitor and analyze fleets' efficiency and reduce unnecessary idle times. An idling engine can increase

off-site while also giving customers access and tools to resolve issues successfully without in-person help needed. →





### Meeting goals

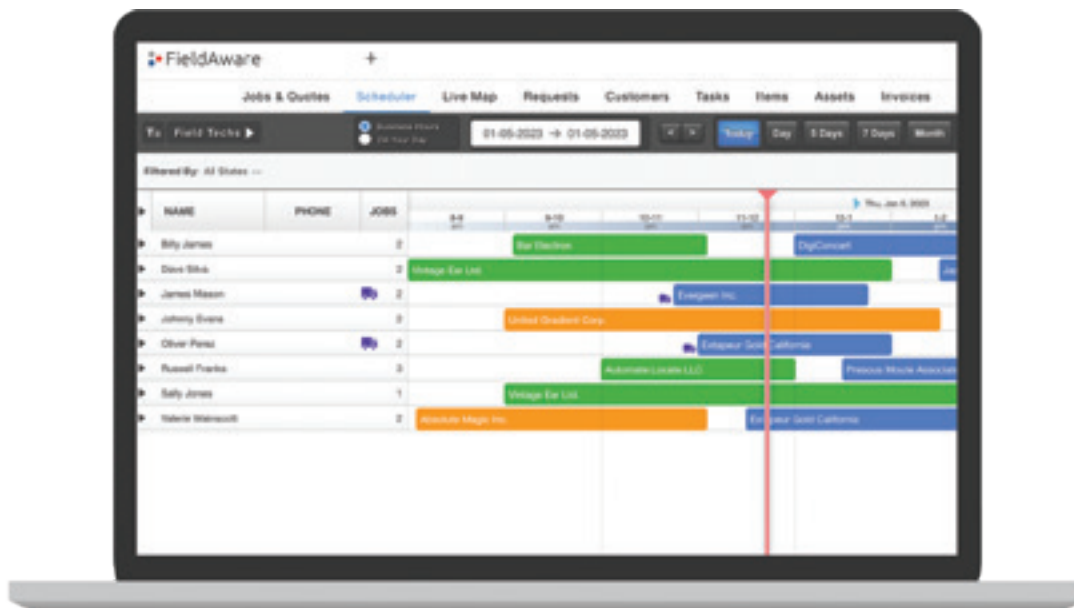
Many field service organizations are already reaping the benefits of utilizing an FSM. For instance, many company leaders have described 5G technologies and self-service technologies, as well as smart scheduling and route optimization, as very effective in helping them reach their sustainability goals. Furthermore, many field service organizations already utilizing augmented reality and remote assistance tools to lessen on-site visits and cost services agree that the tools have been effective in reaching sustainability goals. Evaluating this data suggests that most field service companies taking advantage of an FSM for sustainability has already reduced “truck trolls” by more than a quarter. This amounts to a significant reduction in fuel consumption, which results in cost savings and a worthy contribution to the environment.

### Providing insight through metrics

Improving first-time fix rates, cutting out hold trips, minimizing unnecessary travel and reducing the actual number of miles driven and fuel consumed reduces a carbon footprint and drives savings. The field service industry must do more to make that data more transparent and compatible with ESG reporting.

When the field service industry can make strides to systematize reporting and produce common metrics to measure sustainability improvements, it will establish an environment in which it will be easier for more businesses to participate and be successful in any ESG goals. Merging fleet and field data offers insights into the business, provides data in a format that can be transformed into high-level reporting and allows the information to be applied across an entire organization.





There are several stakeholders when considering ESG goals, but it's also important to think beyond that. For instance, it's obviously of utmost importance to be able to showcase ESG reporting to an investor. Beyond that, it's just as important to communicate how a business is doing from a sustainability standpoint to its employees and customers. When an organization leverages augmented reality for reduced truck trolls and improved safety, it can show its efforts as part of its ESG goals so that it will meet strong employee and consumer demands. This will reinforce why talent and customers have chosen a particular organization, and it will do so while strengthening the company's image and growing its brand – all of which will be important to continue to attract new talent and grow a more expansive clientele base.

In-depth analyses are crucial to successful ESG goals, and an FSM can measure these efforts in a simpler way that is streamlined. Field service organizations play a pivotal role in improving issues of equity and governance by conducting internal analyses of pay disparities and key ESG issues. According to survey research, only 35% of field service organizations currently use software specifically designed for ESG reporting. However, 43% report they are planning on adopting this type of software soon. This suggests that ESG reporting, measurement and action will likely soon become standard across field service organizations.

The field service industry must take into consideration now how to best consolidate key data into a common set of metrics. Once this is achieved, it will be easier for customers and investors to compare reporting and performance when choosing which organizations to work with and invest in. With an FSM platform and its tools in place, field service teams will have all the data they need to form strategies related to tackling key ESG issues.

### Beneficial tools for long-term ESG goals

Successfully executing ESG goals can not only create value, but it can improve lives. It can truly do so much for an organization when it's done intentionally and thoughtfully. Those in the field service industry must step up to take on this important role in organizational sustainability efforts. Yes, ESG is an evolving journey, but we've already seen many field service organizations measuring key sustainability metrics through technological investments.

An FSM is an all-encompassing tool that can help companies do so much to reach these goals. Furthermore, it has all the essential elements to document how this is being done and then showcase the proof to those with a vested interest. ESG goals will be an ongoing endeavor, but the more an organization works towards these, the more they will ultimately appeal to potential talent, customers and investors for the long haul.

**Steve Mason** is general manager, Field Service Management at GPS Insight. Mason has nearly two decades of experience in the field service management industry and an MBA from the University of Sunderland London Campus.

# DIVING INTO ARTIFICIAL INTELLIGENCE AND ITS IMPACT ON THE BUILDING ENERGY MARKET







### **DAN BOUCHER**

Should building owners bet on AI to achieve net zero? Your answer may depend on how you view the energy crisis, the Inflation Reduction Act, interruptions to business or compliance with new energy performance regulations or whether you believe building owners should base their decisions on what they can or cannot control, like new technologies such as Artificial Intelligence (AI).

At a recent gathering, a colleague reacted when he heard two letters pronounced together, “AI” for Artificial Intelligence.

“That is insane,” he said. “It just can’t be!”

Then, at a separate event, another colleague reacted in a very different way, saying “early adopters will leave opponents behind in the smoke.”

Both colleagues are quite clever, but AI is not dogmatic; nor is it just a new buzz term, it’s pure technology. →



### How disruptive could AI be for building owners?

Analogies are great because they relate to something we know versus something we still need to learn. Driving your car without Geospatial Positioning System (GPS) technologies will soon be like operating buildings without AI.

GPS technologies have progressed to the point that 60% of North Americans used it once a week in 2022— thanks to 31 satellites, out of which 24 are guaranteed to provide service by rotating around the earth twice a day. Every year, GPS capability gets more reliable and easier to use. Most importantly, businesses and citizens use GPS – not just to get across town anymore. GPS technologies modernize healthcare systems, fleet management, child or pet safety, asset protection, freight tracking, national defense and more. GPS is now part of our lives.

Organizations managing one, ten, hundreds or thousands of buildings should think of AI the same way. For many good reasons, AI is a technology that will stick. And for those thinking of AI as a threat, come on, anything misused or abused is a threat that requires regulation and oversight to put it in full force.

### What is AI?

Put simply, AI is a field that combines computer science and datasets to create a unique solution. Some think its history started when Robert Nealey lost a chess game against an IBM 7094 computer in 1962.

Artificial Intelligence vs. Machine Learning vs. Deep Learning vs. Neural Networks are sub-fields of AI; however, neural networks are a sub-field of deep learning, and deep learning is a sub-field of machine learning. Reversibly, deep learning is the backbone of neural networks.

The easiest way to think about these scientific fields is to think of them like Russian dolls. Each is, essentially, a component of the prior term.

How deep learning and machine learning differ is in how each algorithm learns. Deep learning can ingest unstructured data (e.g. text or images) to determine automatically a set of features to distinguish different categories of data. Machine learning is more dependent on human intervention to understand the differences between data inputs, usually requiring more structured data.



Neural networks, more specifically Artificial Neural Networks (ANNs), mimic the human brain through a set of algorithms. The “deep” in deep learning is just referring to the number of layers in a neural network, normally more than three layers.


The learning concept of a machine learning algorithm can be broken into three main parts.

*Decision Process* – In general, machine learning is used to make a prediction or classification. Based on input data, the algorithm produces an estimate of the pattern of a model.


*Error Function* – An error function evaluates the prediction of the model. If there are known examples, an error function can make a comparison to assess the accuracy of the model.

*Optimization Process* – If the model fits better to the data points, then weights are adjusted to reduce the discrepancy between the known example and the model estimate. The algorithm then repeats this process by updating weights autonomously until a threshold of accuracy has been met.

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**AI is a field combining computer science and datasets to create a unique solution.**



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Several machine learning algorithms are commonly used: neural networks, linear regression, logistic regression, clustering, decision trees or random forests. In the real world, AI relates to speech recognition, customer service, computer vision, recommendation engines, stock trading, fraud detection and energy management.

### **What can AI do for building owners?**

Many solutions are emerging in the building energy market. Smart thermostats or Building Management Systems (BMS) learn through occupancy, weather, temperatures, location (GPS technologies) and feedback when we change set points. After some time, AI knows when to cool or heat the building or its spaces to keep people comfortable. So, chances are, you already bet on AI for your own building energy.

Building Energy AI (aka “BEAI”) is leveraged across the value chain to predict the impact of tariffs, outages and CO<sub>2</sub> emissions. Do you think replacing a gas furnace with an energy-efficient heat pump will be profitable? Is it more reliable, and by how much is it improving the carbon footprint?

Here is where AI becomes even more important, and a lot more complex. Energy costs are rising and breaking records, windstorms are causing frequent business interruptions, gas is going against net zero targets and the myriad of clean technologies and new equipment complicate drastically how to make well-informed decisions. Building owners now need to consider renewables and energy efficiency to keep energy costs lower, work around power outages and manage Science Based Targets (SBTi) for real.

Concretely, “what if” questions pile up: should we replace a diesel standby generator or go with a battery storage package? How many chargers do we need for electric vehicles? Should we first change windows or go with LED lighting? What could be the impact of electrification on our energy bills? Will we comply with the new building energy performance regulation? Will employees and customers leave us if we are not sustainable? And oh, which buildings should we convert first across hundreds of locations? Does our energy transition represent a burden or a strategic opportunity? Etcetera.

AI can automate simulations and project key benefits like it has never been possible – building owners can often get their answers and results easily ten times faster in comparison with traditional approaches.

Knowing that the operation of buildings accounts for 30% of global greenhouse gas emissions, AI will be a determining factor to manage the 1.5-2.0 °C target by the end of the century.

### **Betting on AI to be net zero**

Building owners have two options to become net zero: a) traditional consulting and contracting approaches, or b) BEAI for a simpler, faster, and better transition.

Then, it will depend on when building owners start and finish. Some move immediately (no excuse), some get prepared (out of the COVID-19 crisis) and others struggle with traditional approaches.

Organizations will continue navigating through a confluence of crises and disruptions. With surging inflation, the war in Ukraine, more energy insecurity and a potential global recession, these organizations will have to draw a starting line. Which priority should be fair advice? Start with resilience, it is a vital “muscle”. →

For building owners, energy independence via self-produced electricity and energy efficiency should be high on the list, if not at the top. Choices must be made. Some may be trade-offs between climate mitigation and climate adaptation – rebuilding versus relocating, investing in better HVAC technologies, versus keeping energy consumption down. Make no mistake, building a business with a net zero business model is no longer optional but urgent. Managing sustainability is an opportunity.

Sustainability should entail three fundamental objectives without any trade-off of one versus another: 1) reducing energy costs; 2) making operations more resilient and 3) getting on a net zero path. Their weight can vary, but in no case, should these objectives be managed separately. Difficult? It sure is, and that is why AI is no longer optional. If your transition plan is not addressing those three objectives together, you are potentially in trouble for a long time.

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For building owners, energy independence via self-produced electricity and energy efficiency should be high on the list if not on top.  
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Governments and the entire financial industry will invest unprecedented sums of money. Building owners will have the chance to rely on historical measures to eliminate direct and indirect emissions from their buildings. Under the Biden administration, the United States pledged to reduce emissions 50% by 2030 and 100% clean by 2035. Canada, the worst in the G20 for emissions per capita, has committed to reducing its emissions by 40%-45% by 2030 on its path towards carbon neutrality by 2050. The conversion of buildings will be encouraged for several more years, but the task is gigantic. Fortunately, AI will be instrumental in making decisions, converting at a good pace, and boosting results.

The answer to the title question is a clear YES. How could AI not be leveraged? How could you cross the city without GPS technologies? It's the same thing.

## Conclusion and takeaways

So, betting on AI is now possible and necessary to remove complexity, reduce delays and improve results.

Indeed, BEAI also includes knowledge digitization and engineering automation and future AI technologies that will be invented to manage the 1.5-2.0 °C target by 2100. By understanding that almost 30% of global emissions are directly tied to the operation of buildings, that we need to audit up to six million commercial and light industrial buildings solely in North America and that it would take 1,500 audits per week until 2030 to know why and how to convert them, building owners are really part of the solution.

In 2023, more CEOs and community leaders will empower people to manage a solid net zero plan. GPS has impacted all of our lives, but BEAI will have an even greater impact on healthcare systems, fleets of vehicles, manufacturing operations, asset valuation, freight carriers, our national defense systems and more. In its 2022 Technology Trend Outlook, McKinsey & Company's scored applied AI and the future of clean energy both as the highest interests out of 14 trends.

That is why a leading energy efficiency company out of Canada was created to be the most powerful BEAI solution, readily available for any commercial and light industrial building anywhere. Think of BEAI as a prerequisite to the future of building energy, or if you will, the new decentralized energy made of connected objects to complement the century-old grid.

Let's remember: "AI cannot replace an expert, but an expert using AI can replace another one."

## ABOUT THE AUTHOR:

**Dan Boucher** has over 25 years of experience in energy and automation markets. He worked with some of the globe's largest international companies in this sector, on a national, North American and global basis. Currently, Boucher leads vadiMAP as the CEO.



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# WELCOME TO THE ERA OF ‘WHAT IF?’

## PREDICTIVE ANALYTICS AND THE GOLDEN AGE OF UTILITY MANAGEMENT

BRANDON RASO

**Editorial Note:** This is the last in a series of three articles by Brandon Raso about the impact that location intelligence is having across the operations of electrical utilities. Location intelligence uses next-generation GIS technology and analytics to deliver actionable insights that utilities could not previously access.

In my prior article, I discussed how Advanced Grid Management enables utilities to do real-time optimization that was not possible before. It enables organizations to not only see what’s truly happening now but also anticipate what might happen next. The latter of those two – predictive analytics – is what I want to focus on in this final article about the impact of location intelligence on utilities. Location intelligence is at the heart of a utility’s ability to create ultra-detailed, accurate digital models of their infrastructure and operations. These digital models – which go by many names, including “digital twins” – enable utilities to do something that they have always wished was possible: answer the question “What if...?”

What if a storm surge knocks out transmission to this sector of the grid?

What if there is a 100% increase in the number of EVs among our customer base over the next two years?

What if lightning strikes start a fire near these circuits?

What if we place the gas main here versus another location farther from the high occupancy areas?

What if there is a one-year break in the drought and vegetation grows quickly because of above-normal precipitation?

The predictive analytics that are possible with digital models driven by location intelligence give utilities the tools to answer these questions not simply with guesses but with data-driven insights that have never been available before. These what-if insights enable smarter, faster decision-making at every level of the organization, from the executive leadership team to operations to the GIS department to field workers. →









Climate change is one of the key challenges that this kind of predictive analytics will help utilities respond to. The impact of climate change on utilities has a multiplicity of layers and variables to it, which makes risk analysis incredibly difficult to use traditional processes without the help of digital models. As an example, let's look at the types of variables that are at play for electrical utilities in the Pacific Northwest, where I live. Fire dangers have increased in general because of hotter, drier summers, but there are also other complicating factors such as die-offs of Douglass Firs driven by climate change that increase fire danger in certain areas. Ice storms are also becoming more common in the Northwest, where heavy ice can wreak havoc on trees as well as transmission lines. Luckily, hurricanes are not a concern in the PNW, but storms in recent years have had hurricane-force winds that utilities should factor into their scenario planning and emergency response. Low water levels in rivers and lakes that would ordinarily be used to fight wildfires, may impact the ability to control fires in certain areas as well. And the cycle of wildfires during the summer followed by heavy rain during the winter creates a high risk of landslides that can impact infrastructure and access during critical situations when they are most needed. And major cities like Seattle and Portland that are ill-equipped for the removal of ice and snow are difficult environments for utilities to plan emergency response during storms.

As you can see, adapting operations for the impact is about much more than just preparing for wildfires. These are multi-layered challenges no matter the geographic region, and utilities have never before had modeling robust enough to play out the scenarios before emergencies as well as in real-time during emergencies. Right now, utilities have limited tabletop-style scenario planning based on past events that they then augment with human reconnaissance by rolling trucks during emergencies. In these situations, field workers serve as invaluable eyes and ears who gather information that can then be used to adapt plans to facts on the ground. Predictive modeling represents a quantum leap forward. When utilities get to the Advanced Grid Management phase of their digital transformations, the digital models of their infrastructure and operations can be continuously bolstered with location-based information from mobile devices including field workers' mobile tablets, geospatial imagery, and the growing number of IoT sensors that are deployed on poles, water pumps, equipment junctions, gas lines, transformers, remote equipment huts and so much more. Utilities are also beginning to use other technologies such as drones, laser-based scanning devices and augmented reality headsets. These devices create richer and richer data sets that enable enhanced risk modeling and asset management over time.

This enhanced modeling is critically important for all utilities, but particularly for electrical utilities because their models for generation, transmission and distribution are being transformed by renewables, distributed energy assets and microgrids. One of the biggest emergency-planning takeaways for electrical utilities from Hurricane Ian in 2022 was the need to prevent widespread outages far from an area directly impacted by a storm. Florida experienced prolonged outages across an enormous geographic area that was untouched by the storm itself. A noteworthy exception to that was a community near Fort Myers whose power was managed through a microgrid that shielded it from the outages that affected so much of the rest of the region. Microgrids that utilize DERs for generation and batteries for distributed power storage will be a vital tool for building more resilience into the grid. What-if modeling will be indispensable for the complex risk modeling that utilities will need to do to determine where to deploy microgrids and how to manage them as part of a far more distributed T&D infrastructure.



The human element too often gets overlooked in discussions of all of this technology, but it is indispensable for this technology to have the impact it is poised to have on the future of our industry.



So much of what I have talked about is about the future of our industry, but I should take a moment to return to where I started with this set of articles. I started with something that is far more humble than the advanced technology of microgrids and DERs and drones: a utility pole. In that article, I talked about the difficulty of knowing exactly where a certain pole is. I discussed how often that information is incorrect in a utility's database and how often that throws curveballs at field workers sent out to do construction or maintenance. In that scenario, field crews equipped with mobile devices use location intelligence-powered apps to confirm and correct infrastructure information as they work. If your organization wants to create digital twins of your infrastructure and operations, you should empower these field workers to be stewards of the information that is the foundation of these models. You also need to give them a stake in the data by ensuring their voices are heard throughout the process of building the models and use cases. No one knows this infrastructure better than this vital part of your organization. The human element too often gets overlooked in discussions of all of this technology, but it is indispensable for this technology to have the impact it is poised to have on the future of our industry.



#### ABOUT THE AUTHOR:

**Brandon Raso** is the director of utility design and engineering at Locana, a location and mapping technology company that provides software products and services that solve the world's most pressing business, climate, and social challenges. Raso has more than 15 years of experience delivering GIS solutions in the utility industry, including his current role working at Locana where he helps utilities leverage location intelligence to solve complex construction and operational challenges related to issues such as sustainability, efficiency, and safety. Before joining Locana, Raso was the GIS and mapping technology supervisor at Puget Sound Energy. Before entering the private sector, he had a successful decade-long career in the U.S. Navy in sea combat operations. He earned his degree at the University of Utah.

# ELIMINATING SF<sub>6</sub> IN HIGH-VOLTAGE SWITCHGEAR:

## PAVING THE WAY FOR MORE SUSTAINABLE GRIDS

MARKUS HEIMBACH, PH.D.

Decarbonization of electricity generation has been and will remain the primary lever for reducing global greenhouse gas (GHG) emissions and driving a successful energy transition. According to the International Energy Agency (IEA), the world added a record 295 gigawatts (GW) of renewable generating capacity in 2021<sup>1</sup>.

While the accelerated build-up of renewable generation will be key to meeting both intermediate- and long-term climate targets, no stone can be left unturned on the quest for net zero. To this end, the energy industry must focus on how the transmission and distribution (T&D) portion of the value chain can contribute to GHG reductions.

Since its introduction in the 1950s, sulfur hexafluoride (SF<sub>6</sub>) has been the gas of choice for circuit-breakers and gas-insulated switchgear (GIS) in high-voltage substations. SF<sub>6</sub> possesses unique characteristics that make it particularly well-suited for electrical insulation, current interruption, and arc quenching. However, its environmental impact is significant if it is released into the atmosphere.

The global warming potential (GWP) of SF<sub>6</sub> is 25,200 times higher than carbon dioxide (CO<sub>2</sub>). If leaked, it remains in the Earth's atmosphere for 3,200 years. While leakage rates in the manufacturing process and during the operation of high-voltage equipment are small, utilities and governing bodies have long recognized the need to minimize the use of SF<sub>6</sub>. The primary challenge has been a lack of viable alternatives.

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If leaked, it remains in the Earth's atmosphere  
for 3,200 years.”

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This is no longer the case, as extensive research and development activities from equipment vendors in recent years have led to the development of a game-changing technology that uses a new gas mixture consisting of fluoronitrile, CO<sub>2</sub>, and O<sub>2</sub>. The mixture's GWP is more than 100 times lower than SF<sub>6</sub> and is a reliable and eco-efficient solution for high-voltage switchgear applications from 72.5 kV up to the ultra-high voltage 1,200 kV. →

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<sup>1</sup> International Energy Agency (IEA)









### Understanding high-voltage switchgear operation

High-voltage circuit breakers are subjected to extreme mechanical, electrical, and thermal stress during operation, which makes their design technically challenging. A 420 kV circuit-breaker, for example, is typically required to interrupt fault currents of up to 63,000 Amps in a fraction of a second. The energy released during the interrupting process is comparable to that of a car hitting a wall at around 100 kilometers (approx. 60 miles)/hour. For a very short time, the temperature reached inside the circuit breaker is hotter than the surface of the sun.

SF<sub>6</sub> is a synthetic fluorinated compound with exceptional properties, including high dielectric strength and interrupting capacity. These properties allow high-voltage equipment to be very compact.

Modern SF<sub>6</sub> circuit breakers utilize GIS technology, which means a gaseous medium is used for both switching (including current interruption) and insulation. GIS technology is reliable and scalable across voltage levels ranging from 72.5 kV up to 1,200 kV. One of the primary advantages it provides when compared to air-insulated switchgear (AIS) technology is a smaller footprint. GIS substations using SF<sub>6</sub> are up to 10 times smaller than AIS substations. The reduced size is important, as installations tend to be near urban centers, where land and space are at a premium.

Finding an alternative to SF<sub>6</sub> that can achieve the same performance, scalability, and size has been a challenge for equipment providers. Developing compact solutions for high-voltage equipment has proved particularly difficult.

Vacuum circuit breakers combined with synthetic air as the insulation gas are one solution that is being explored as a replacement for SF<sub>6</sub>. Although synthetic air has a GWP of zero, the technology does have a non-negligible environmental impact when examined more closely.

Air has modest dielectric properties. As a consequence, air-insulated equipment must be comparatively larger and heavier than equipment using advanced alternative gas mixtures. This necessitates the use of additional high-quality materials and manufacturing, which contributes to a larger carbon footprint, hence offsetting the environmental benefit.

Additional space is also required to accommodate the larger equipment, which competes with other needs for land use, such as the preservation of nature, agriculture and/or urban developments. Ultimately, communities do not want to see high-voltage substations become bigger than they currently are, even less so, given the expansion of power grids needed for the energy transition.

### Game-changing technology

Over the past decade, several SF<sub>6</sub> alternative formulations have been developed and tested in high-voltage equipment none more promising than C4-FN (C<sub>3</sub>F<sub>7</sub>CN).

C4-FN is a fluoronitrile-based gas mixture developed by 3M under the commercial name Novec™ 4710 and is specifically suited for high-voltage equipment applications, including GIS, gas-insulated lines, and other switchgear applications, such as Dead Tank Breakers (DTBs) and hybrid switchgear.

In pure form, C4-FN has twice the dielectric strength of SF<sub>6</sub>. Gas mixtures comprised of C4-FN, CO<sub>2</sub>, and O<sub>2</sub> can be selected for a minimum operating temperature of -30°C to achieve a CO<sub>2</sub> equivalent reduction of the insulation gas of 99+% (that is a factor of 100) compared to SF<sub>6</sub>.

Key advantages include:

- Carbon footprint of the insulating gas is essentially eliminated, while a similar footprint and identical ratings as that of existing SF<sub>6</sub> products are maintained, making it suitable for smaller buildings, including legacy GIS installations
- Standardized gas handling practices and training for customer personnel, similar to what is needed for existing equipment
- Economies of scale for gas suppliers and manufacturers of auxiliary equipment

Significant progress has been made over the past two years to commercialize high-voltage switchgear products that utilize the eco-efficient fluoronitrile-based gas mixture.

In 2021, one global technology leader launched a new line of high-voltage switchgear products that utilize the eco-efficient fluoronitrile-based gas mixture and plans to offer an SF<sub>6</sub>-free portfolio across the entire high-voltage switchgear range in the coming years. A 145 kV SF<sub>6</sub>-free GIS has been commercially available since late 2021.

In August of this year, a breakthrough was achieved with the introduction of a 420 kV (63 kA) SF<sub>6</sub>-free circuit breaker. The circuit breaker is a key enabler of several high-voltage, eco-efficient switchgear applications that are needed for long-distance power transmission. The circuit breaker has passed all relevant tests described in the IEC and IEEE standards for 63 kA, 5000 A, 50 and 60 Hz. The footprint and dimensions are similar to SF<sub>6</sub>-based 420 kV circuit-breakers. →



World's first SF<sub>6</sub>-free 420-kilovolt circuit-breaker



SF<sub>6</sub>-free 420-kilovolt Gas-Insulated Switchgear



SF<sub>6</sub>-free 420-kilovolt Dead Tank Breaker



The first installation of the 420 kV circuit-breaker in a DTB is slated for mid-2023, where it will be used at a 345 kV substation owned and operated by US-based energy provider, Eversource. Eversource serves approximately four million customers in the New England region. The project will support the company's sustainability goals, including meeting targets to achieve carbon neutrality in its operations by 2030. Using innovative technologies to replace or reduce SF<sub>6</sub> in the 345 kV transmission system will be a key part of that effort.

The first application of the SF<sub>6</sub>-free 420 kV circuit-breaker in a GIS will take place in Germany, where three bays of 420 kV GIS will be installed at a substation for TenneT. The project covers a major grid connection upgrade intended to extend the operating life of existing infrastructure and enable efficient long-distance power transmission. The use of the fluoronitrile-based gas mixture will result in the avoidance of ~2,300 kg of SF<sub>6</sub>, which is equivalent to annual CO<sub>2</sub> emissions from 1,150 passenger vehicles<sup>2</sup>.

### Designing for the future

Given the massive up-front investment required to develop and build new T&D infrastructure and upgrade legacy systems, it is important that any alternative to SF<sub>6</sub> is scalable and suited for widespread global industrialization. Several manufacturers in Europe, China, and Korea have started using the fluoronitrile-based mixture in their equipment, signaling confidence in its long-term potential and ensuring healthy competition among multiple vendors.

Existing IEC switchgear standards govern the ratings, testing procedures and related requirements of any type of high-voltage switchgear regardless of its technology. IEC standards covering the specific aspects of fluoronitrile-based and other eco-gas mixtures have recently been completed or are under development. An industrial supply chain around the technology is established, with many manufacturers offering auxiliary and gas-handling equipment or services for the mixture.

<sup>2</sup> Based on the assumption that a passenger vehicle emits 19 kg CO<sub>2</sub> equivalent per 100 km and drives 10,000 km per year



Additionally, with GHG regulations tightening and evolving around the globe, the total carbon footprint of a product over its entire lifecycle is becoming the commonly agreed upon “gold standard” for judging environmental performance. When it comes to switchgear equipment, looking solely at the gas mixture itself is an oversimplification. Total carbon footprint comparisons favor fluoronitrile-based gas technology, as it allows for a smaller footprint than other SF<sub>6</sub>-free solutions, including GIS using pressurized air as the insulating medium.

The compactness needed for gas-insulated, high-voltage equipment can only be achieved with the high dielectric performance that comes from using small quantities of fluorinated gas in the mixture. This is a fundamental scientific fact that is acknowledged by virtually all independent industry experts.

### **Conclusion: Making sustainable grids a reality**

The impending build-up of renewable generating capacity in the coming decades will necessitate significant adaptations to existing T&D infrastructure across the globe.

As penetration from wind and solar increases, grids will have to be expanded. On average, power from a wind farm travels around five times the distance from the source to the end-user when compared to a conventional generating source. The longer distance will create the need for higher voltage systems and additional substations. These substations will have to be developed sustainably, without compromising established standards for performance, availability and size.

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**As penetration from wind and solar increases, grids will have to be expanded.**

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While SF<sub>6</sub> has long served as the insulation and switching medium of choice for high-voltage switchgear, its environmental impact is such that it should be replaced where possible.

Fluoronitrile-based technology has proven to be a reliable, eco-efficient alternative to SF<sub>6</sub> and has the potential to significantly reduce the carbon footprint of substations. Because it uses reliable and predictable gas insulation and gas circuit-breaker technology, it can be scaled in a straightforward way. Currently, it is the most practical insulating solution for voltage levels above 52 kV and is widely acknowledged by experts as the best available option to enable a rapid phase-out of SF<sub>6</sub> – not only in limited segments but globally for the high-voltage industry.

The development of a 420 kV GIS circuit-breaker using fluoronitrile-based technology represents a groundbreaking achievement that points to new decarbonization pathways for Transmission Systems Operators (TSOs) and utilities. It also paves the way for the technology to be applied at even higher voltage levels and larger ratings in the coming years so that the use of SF<sub>6</sub> can eventually be ceased entirely.



#### **ABOUT THE AUTHOR:**

**Dr. Markus Heimbach** is executive vice president and managing director of the High Voltage Products Business Unit within Hitachi Energy.



# THE STATE OF THE ENERGY INDUSTRY





### **KYRAN MCDONNELL**

After the rampant instability of the energy industry last year, much of the world now wonders what the future of 2023 holds for our industry and the price of their bills. Based on historical precedent, it is unfortunate, but the most realistic view is that the big energy companies will fight to keep the market's prices close to current levels for at least the next two years.

The reason for this is simple: their profits have doubled because of the current prices, and they like profits. The lifespan of their combustible generation assets also approaches retirement due to pressure surrounding their emissions and increased competitiveness from renewables. In order to squeeze as much value out of these assets as possible before the people demand the shift for them, energy companies will resist efforts to lower prices.

However, people have a glimmer of hope on the horizon: battery prices have hit an inflection point and are now economical to install on our grid. These batteries help to create stability, which addresses the primary downside renewable energy has had to date. As the effects of climate change continue to increase, the importance of this timing can't be understated. With more extreme weather events affecting our grids and daily lives, from heatwaves to torrential downpours, the economics of implementing grid batteries to correct the financial and environmental costs of the past are now a reality. →



Renewables are now the countervailing force to the rise in energy prices. Spurred on by the cost of the crisis, local governments, cities, and neighborhoods are making large investments in grid batteries to create more sustainable and cost-effective energy. Even though general prices will maintain themselves for the next couple of years, there will be opportunities for far lower prices for those that seek them out and act upon them.

To further help address the instability caused by the energy crisis, we will also need stronger responses from grid operators and regulators. Regulators should allow additional features to help address the required grid stability to make the transition to renewables faster. Although renewables have increased, the instantaneous effects weather has on all of these generators' output requires better mechanisms for other parties like battery operators to help correct for this increased variability. As these mechanisms are not yet ubiquitous, we will see the addition of solutions like fast-ancillary-response, behind the meter FCAS, and others. Some countries' regulators are far ahead of others in this regard, so if common people are looking for indicators of how willing their country/regulators are to lower energy bills, the introduction of these features is a strong indicator.

Overall, despite the likelihood of energy prices continuing to increase for the next couple of years, I am hopeful that the future of sustainable energy is coming more and more into focus.

#### ABOUT THE AUTHOR:

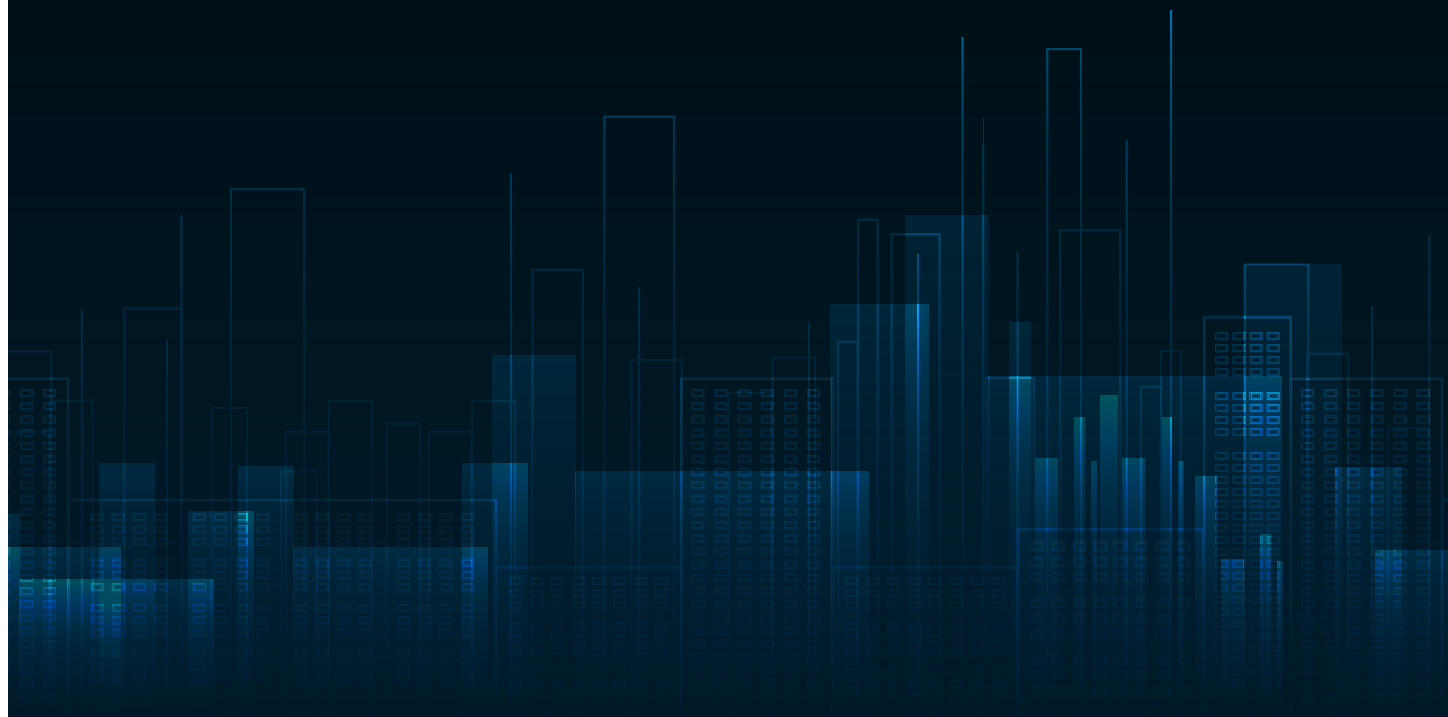
**Kyran McDonnell** is the founder and CEO of reVolt. Under McDonnell's leadership, reVolt is on a mission to provide people the power to decentralise and transition the world's energy grids to green energy before the next decade.

McDonnell also holds advisory roles in numerous fields and has developed original works in Artificial General Intelligence, non-linear language design, and state simulation using biometric proxies, among others. He is also a host of Founder's Club, the Australian organisation for early-stage startup investors to network with founders.





# POWER OUTAGES ARE GETTING WORSE – UTILITIES NEED TO MODERNIZE EXISTING COMMUNICATION SYSTEMS





## **MACK GREENE**

A recent study by Climate Central found that between 2000 and 2021, weather-related events contributed to 83% of major power outages reported by U.S. utility companies. However, in the last decade, compared from 2000 to 2010, the average annual number of weather-related power outages jumped by 78%. The surge in weather-related outages reflects a macro trend of a general rise in the frequency of outages, with the same study discovering that there were 64% more power outages in the U.S. from 2011 to 2021 than the decade before. Whether it is heat waves, droughts, ice storms, floods, wildfires or hurricanes – these extreme weather events are increasing in regularity, intensity and duration, with scientists ascribing human-induced climate change as the primary culprit.

The negative effects of climate change are twofold as it both increases the likelihood of power outages, thereby jeopardizing the electricity supply, and skyrockets the electricity demand, placing an incredible strain on the nation's old and complex electrical infrastructure. Unfortunately, when the U.S. built the current power grid, today's climate crisis was unimaginable. In fact, most of the grid is aging, with some components being over a century old, which is well beyond their 50-year life expectancy. Likewise, 70% of transmission lines are already into the second half of their lifespans. And because of the interconnected nature of the country's grid, extreme weather in one area can lead to power outages across multiple states and regions. →

Until the nation's grid becomes more robust, power outages will get worse. Power companies (PCs) are attempting to build more resilient systems through microgrids and other smart grid technologies. Nevertheless, their reliance on legacy communication systems represents a present (and preventable) threat to the safety of their constituents. Replacing 600,000 miles of transmission and 5.5 million miles of local lines will take decades – but, with the right partner, it could only take a few months to modernize an outdated contact center. It's time PCs took steps today toward upgrading their communication technology to address the issues of our modern climate, like power outages.

### Digital transformation

During the restrictions of the pandemic, customers became more digitally savvy. For the first time, many scheduled an online doctor's appointment, used a food delivery app or shopped online. Companies also began to provide an unprecedented level of service that was fast, personalized and consistent across channels. Today's digitally native (and noticeably more impatient) consumers are not willing to settle for anything less than quality CX, whether they are interacting with their bank or PC. In addition to lower carbon technology and seamless billing integration with other industries, next-generation consumers want PCs to offer the same communication features they regularly enjoy from other brands. Moreover, Americans have become dependent on readily available and unbroken electricity for work and leisure.

To keep up with the expectations of modern consumers, PCs must upgrade their outdated methods of interfacing with constituents. One proactive approach is integrating a single automation package, like a communication API platform, into communications operations, empowering PCs to pursue digital transformation and enhance legacy processes. Purely relying on voice and human agents as the primary means of contacting clients during a power outage is insufficient. PCs need to meet customers in the channels they use to interact with brands, such as SMS, social messaging and chat features. And by integrating communication APIs into existing solutions, PCs can support advanced messaging and omnichannel experiences for customers.

With communication APIs, PCs can send notifications and real-time updates through SMS messages, keeping customers in the loop during severe weather and avoiding service disruptions due to disconnects. Likewise, since customers are more likely to respond and read SMS messages, utilities can circumvent late payments and boost revenue by texting bill reminders to drive better performance. Similarly, giving end users alternative channels to connect with their PC prevents one channel,



like a contact center, from getting overwhelmed by callers. For example, artificial intelligence (AI)-powered communication solutions like chatbots and virtual assistants could offset much of the workload human agents would have to address during hectic weather events, allowing customers to answer general service-related questions themselves. Self-service capabilities boost engagement by granting customers the freedom to determine how and when they interact with a PC – even if no live agents are available, someone could still use a chatbot to check for updates on when service will get restored. Additionally, minimizing the instances that agents must speak to concerned and potentially angry customers will reduce stress, curbing burnout and turnover.

Communication APIs and these AI-enabled automation features can likewise handle other mundane tasks that come into the call center environment, including checking a balance, updating account information or requesting service support. Automating these monotonous and repetitive requests empowers human agents to focus on more challenging, creative and value-added tasks. Gartner predicts that conversational AI tools will decrease the costs of labor associated with contact center agents by \$80 billion in 2026. Furthermore, advanced communication features accelerate the resolution time of a customer inquiry. AI can quickly identify a caller's location and intelligently route them to the most appropriate contact center. In the case of a power outage or similar service disruption, the AI would direct the customer to a contact center with a lower traffic volume.



### Field operations

Utilities can utilize these advanced communications powered by communication APIs to support their field operators, boosting efficiency and increasing the bottom line. A small or large utility could have anywhere from ten to hundreds of thousands of field techs. Worker capabilities can be enhanced enormously by having access to, for example, their desktop while on site. One such solution is Unified Communications as a Service (UCaaS), a cloud-based model that, as the name implies, unifies all of a PC's communication applications, like email, chat, audio and voice, into one package accessible from any device. The game-changing ability of UCaaS is that it enables field operators to figuratively take their desktops with them even if they are at a remote site, on a truck or perhaps working on a telephone pole, massively improving efficiency.

Additional communication technologies like scheduling software and automated messaging can boost field techs' effectiveness. Field operators could receive real-time alerts to challenges affecting the grid, allowing them to redirect their attention to much more pressing tasks. For example, some field technicians could be busy upgrading the plant in one location, but a telephone pole could get damaged in another. Through automated SMS, updates get sent directly to the operators' phones, the PC rapidly sends the technicians to the location they are needed most, minimizing the duration and scope of potential damages. These communication and scheduling solutions can also help PCs understand where their people are physically and which tasks they have lined up for the day. Knowing these finer details empowers field operations to work more efficiently with limited time and location constraints. →



Moreover, communication automation would be pivotal to enhancing the success of short-staffed field operators, especially considering labor shortages brought on by the Great Resignation. As it stands, there are still roughly 100,000 fewer oil and gas workers than before the pandemic. Likewise, data from the U.S. Department of Energy revealed that there was nearly a 10% drop in the number of jobs across electric power generation, transmission, distribution and storage during the summer of 2021. Not only have PCs struggled to recruit these vital employees, but they've found it challenging to retain them. In fact, some surveys found that more than 40% of workers in the power and utility sector this past year considered switching jobs rather than staying with their current ones. By automating alerts and using advanced scheduling software, PCs can help their field operators prioritize and maximize their efforts successfully despite a lack of staff and finite work hours.

Modernizing existing communication systems will drive efficiencies and enrich customer interactions to overcome the challenges of intensifying weather conditions and escalating power outages. PCs must coalesce their needs into a single, advanced communications package. By implementing an elastic solution – like cloud queuing – knowledgeable workers and field operators are brought into the same data environment, swiftly resolving the requests of digitally-savvy end users.

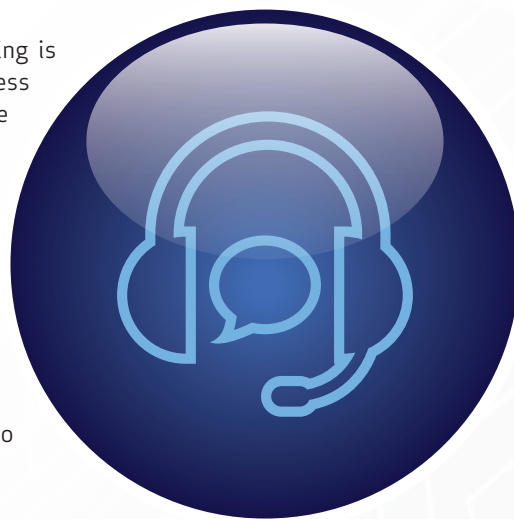
### Cloud queuing

Imagine a major storm comes through an area and disrupts services – the first thing the PC's customers will want to do is report that they have a challenge. The second thing they will want is to know when service will get restored. PCs need an elastic solution that can maintain communications during these extreme weather events and other major disruptions; the customers, likewise, must have the assurance that they can contact their PC to communicate concerns and receive instructions. Cloud queuing is that elastic solution. Simple and flexible, cloud queuing layers over the top of existing contact center infrastructure, allowing the network to absorb mass call events in a meaningful way that prioritizes the safety of the utility's customers.



By implementing cloud queuing, calls from a PC's constituents will pass through a cloud workflow before reaching the contact center. Should the contact center be unavailable due to high traffic or a weather-related outage, the cloud queuing solution will direct incoming calls to a different location or department, ensuring the clients can still resolve their requests. Cloud queuing also manages the influx of calls against a pre-established inbound call volume threshold. If the capacity gets reached, the calls will remain in a virtual waiting room for the next available agent. Cloud queuing is not only ideal for the increase in natural disasters and inevitable power outages, but it can manage mass call events triggered by a data breach, the deadline for a mandatory password update, bill payment issues, etc. Furthermore, cloud queuing lets PCs improve agility, foster redundancy and increase efficiency without having to make significant, costly or disruptive upgrades to their infrastructure.

Another reason PCs need to deploy a modern solution like cloud queuing is mounting pressure from regulators like public utility commissions. Regardless if critical communication infrastructure is at risk, PCs must demonstrate an aptitude to support their constituent base in the face of worsening weather. Usually, when someone smells gas in their home or sees a downed and sparking powerline, they call 911. However, the primary emergency outlet for that type of game theory is to call the power company. But, if the power company is not reachable and the caller keeps getting a busy signal, that could potentially put the customer in danger. Indeed, due to these recent challenges, regulators are scrutinizing PCs at a much higher degree than in the past. Many PCs are looking for partners to help manage their critical infrastructure, empowering them to remain reachable despite mass call events and pursue digital transformation to boost customer experience.



#### ABOUT THE AUTHOR:

**Mack Greene** is senior vice president of digital transformation consultancy, IntelPeer, where he works in partnership with the company's solutions engineering team to facilitate customer experience opportunities with new and existing customers. Previously, Greene was vice president of custom engineering.

IT'S TIME TO FAST-  
TRACK INFORMATION  
TECHNOLOGY

INVESTMENTS: SERVICE  
RELIABILITY, CLEAN  
ENERGY GOALS AND  
MORE ARE AT STAKE





### **THIERRY GODART, PH.D.**

Intelligent power and digitalization investments are essential to modernize energy delivery systems for a more electrified and low-carbon future. Utility performance today and tomorrow hinges on anticipating and preparing for this energy transition, as well as enabling a grid that can react far faster to changing conditions and dynamic energy sources.

We're seeing utilities the world over making critical investments to affordably deliver reliable, safe service and facilitate the transition to more sustainable energy resources. Fossil fuel generation is being retired. Infrastructure is being built to support the rapid deployment of electric vehicle (EV) chargers. Energy resilience plans and actions are underway as extreme weather events occur with increasing frequency and impact. Customers are encouraged to participate in demand response programs. And new technologies are being applied every day to help reduce the cost of electricity.

All the while, the number of smart devices and the amount of data they produce are dramatically increasing. Utilities need their enterprise information technology (IT) systems to work harder and smarter to protect customers and the grid and deliver new and advanced functionality. Powerful utility-industry partnerships are yielding leading-edge approaches that better manage a far more dynamic grid. →



## Digital maturity is essential to a clean energy future

A new study carried out by 451 Research/S&P Global Market Intelligence, "The Intersection of Digital Transformation and the Energy Transition," examined the importance of factoring in the energy transition into digital transformation planning. The research included 1,001 respondents (including 250 utilities), who are involved in digital transformation efforts across four power-critical businesses—utility, building, data center and industrial markets—in North America, Europe and the Middle East.

In general, the research found that businesses need to move far faster on digital transformation to support their energy transition goals. There were three key takeaways for utilities:

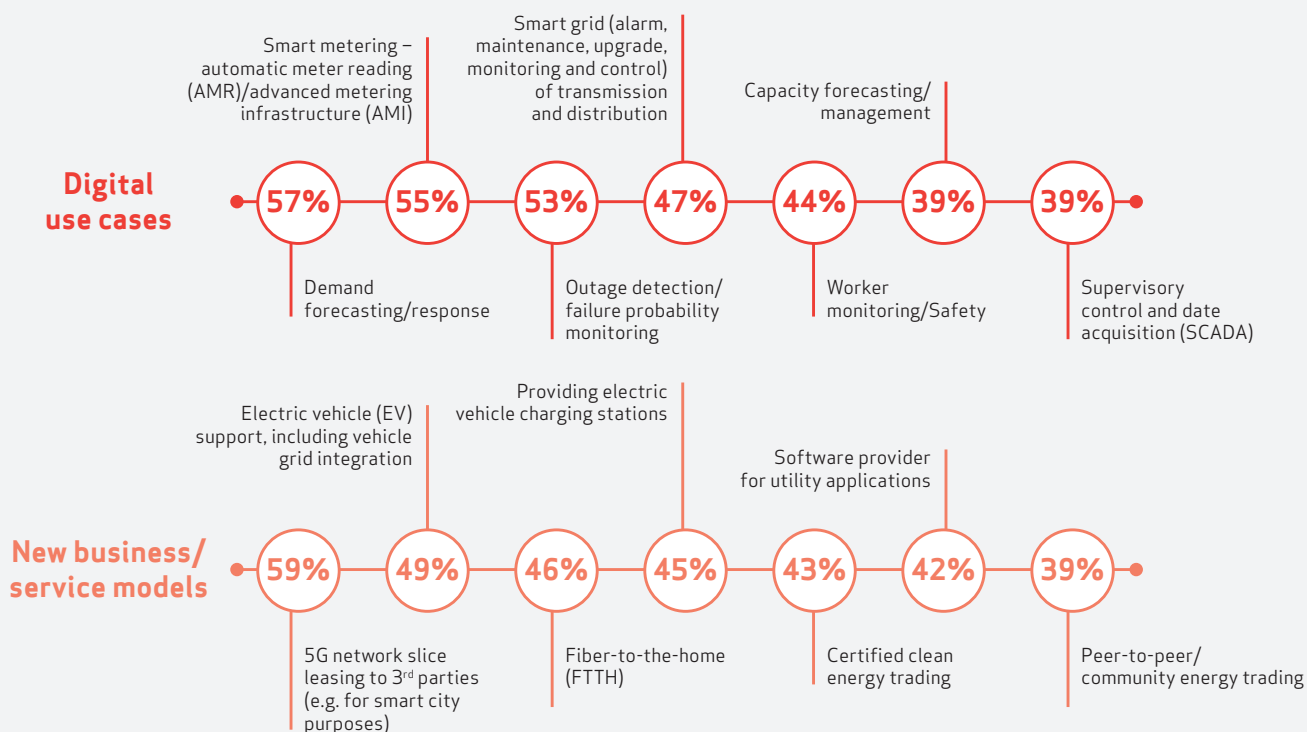
1. *The utility sector is at a critical transition point*—Utilities are faced with increasing electrical demand and aging infrastructure while maintaining service amid climate change and the energy transition.
2. *Utilities are choosing to view digital enablement and transformation through one of two lenses:* (1) Digital progress is essential to meet today's challenges and move the industry forward. (2) There are more pressing challenges that are slowing digital progress.

3. *Digital maturity will be even more important in the sector looking forward.* Digital insights are being used today to optimize power generation, storage and delivery.

Utilities are reducing outages, becoming more predictive and enabling the clean energy transition through digital tools. The top utility sector digital use cases include demand response and forecasting (deployed by 57%), smart metering (55%), outage detection (53%), smart grid (47%) and capacity forecasting (39%).

On top of those operational improvements, utilities also see digital transformation as a path to new business models and revenue sources, including supporting customer electric vehicle (EV) charging needs (49%) or offering EV charging stations themselves (45%). Peer-to-peer energy trading (39%) and certified clean energy trading (43%) also offer utilities new digitally enabled ways of doing business.

## For utilities, digital drives operational improvements, new business models



Q: Within your organization, which of the following digitally enabled use cases have you deployed today or plan to deploy in the next 12 months?

Q: Where do you see additional revenue or business models developing in the next five years?

Source: 451 Research and Eaton custom survey

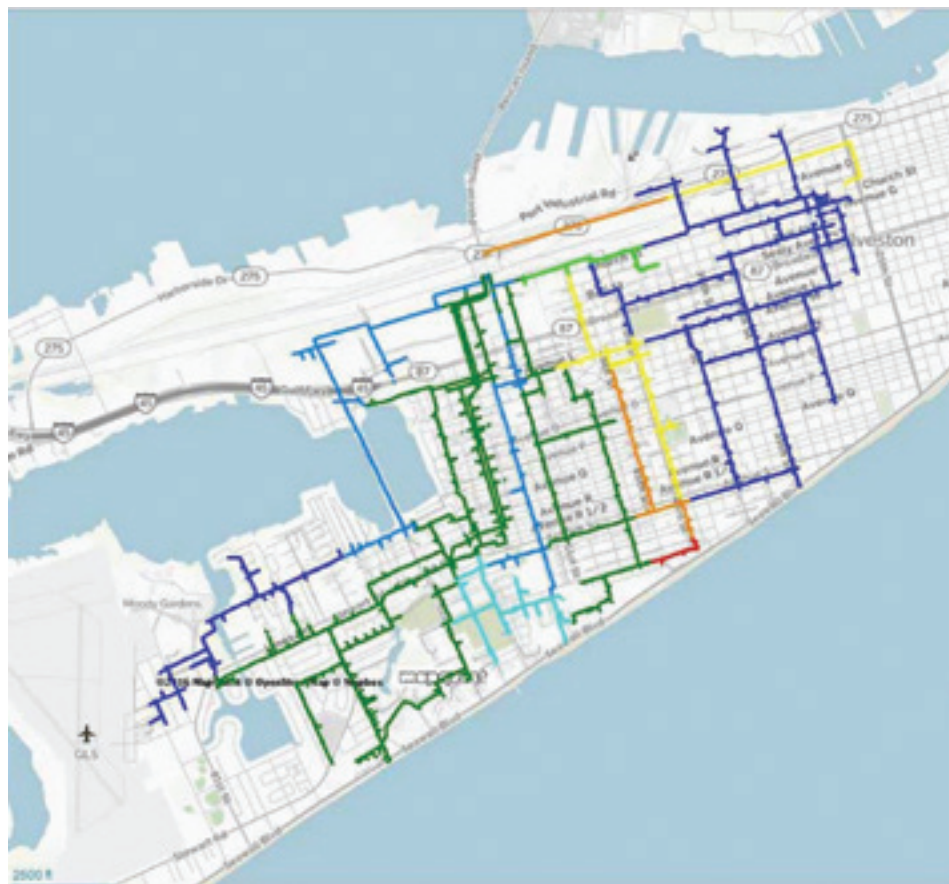
### Enterprise IT investments are crucial

As energy sources change and net demand for electricity evolves, utility and industry partners are delivering new tools that provide advanced functionality essential to support clean energy and electrification.

### Capacity planning tools are streamlining renewable integration

Protecting the grid, minimizing impact and encouraging clean energy sources require quick, easy access to information about the grid's capacity for additional distributed energy resources (DERs). Grid planning and modeling software automates the analysis required, significantly reducing the time and costs of integrating renewables on the grid—reducing complexity and advancing clean energy resources.

Tools that deliver fast, multi-constraint and model-based analysis are a must—helping perform accurate and efficient assessment of generation or load hosting capacity. They provide analysis for multiple system conditions to see if the current infrastructure can support added DERs. →



Capacity planning tools that provide fast, multi-constrained and model-based analysis are helping reduce the time and costs of integrating renewables on the grid. Image credit: Eaton



### **Advanced distribution planning systems support non-wires alternatives**

Automating complex calculations behind load relief projects is increasingly important to meet regulatory requirements and accelerate clean energy projects. How can utilities optimally site and size battery storage systems, dispatchable and non-dispatchable distributed generation? The engineering analysis and technical know-how needed are highly specialized and time-consuming.

Developed and fielded through industry-utility partnerships, advanced distribution planning software provides a centralized view into complex energy systems for prompt and accurate local action, helping maintain and improve grid performance. So, utilities can improve their capacity planning process and

- evaluate multiple scenarios of DERs and load forecast
- conduct hosting capacity analysis
- identify asset upgrades accommodating higher levels of DERs and load growth
- determine DER location and adoption into planning

Simply put, advanced distribution planning software is enabling utilities large and small to design and implement non-wires alternatives for load applications quickly and safely. The complex analysis can take just hours, rather than weeks or even months.

### **Analytics supporting clean energy investments**

Clean energy investments require confirmation from utility planners. How do you know that utility planning models match reality? Utilities must verify that approval of DER interconnection is based on accurate models. Engineering model verification helps support sound decisions that will not impact the reliability or safety of operations.

Analytics can dramatically reduce the cost and time needed to ensure distribution planners use validated models by applying machine learning techniques to identify abnormalities. Data-driven analytics relies on secure connection and efficient data acquisition from all types of devices already deployed, regardless of manufacturer, using standard protocols. This is better achieved using secure gateways installed in the field that are capable of feeding both a real-time SCADA system and the data lake that supports analytics.

## Smart EV charging devices helping advance demand management

Technology demonstrations are showing the potential for EVs to serve as a flexible load that can provide reliable grid services by combining smart home energy technology and centralized DER management.

Utilities anticipate new revenue potential from large-scale EV deployments. They can deploy smart EV charging systems to help reduce peak demand, shift loads to off-peak times and provide ancillary grid stabilization services. Further, smart charging can help utilities and customers alike by optimizing solar self-consumption, enabling peak demand shaving and energy arbitrage and charging EV batteries when rates are lowest.

## Next up: OT system investments for local action

As decarbonization and electrification accelerate and extreme weather events increase, utilities need their IT systems to enable a grid that can manage far more complexity and data. Enterprise IT systems are helping automate crucial business processes with real field data. This will result in better utility planning and optimizing future grid operation.

Grid planning happens on a macro level; action must be local. While IT systems help improve the planning process, utilities also need modern operational technology (OT) systems to implement data acquisition and local control schemes at the substation, feeder and endpoint levels. These OT systems are increasingly connected to both real-time operations in utility control centers and for near real-time asset optimization—to react faster to changes in energy supply and demand. Finally, a closed-loop integration between planning and operation to eliminate information gaps can be achieved through a well-designed system architecture that integrates the IT and OT systems.

### ABOUT THE AUTHOR:

**Dr. Thierry Godart** is vice president and general manager of Eaton's global energy automation solutions business. He leads the teams at Eaton that develop and implement its Brightlayer digital solutions to help utilities.

He holds a Ph.D. in electrical engineering from Georgia Tech and a diplôme d'ingénieur from SUPELEC in Paris, France.





# HOW THE ENERGY WORKFORCE UPHEAVAL CAN SPELL GREAT SUCCESS





### **KATIE MEHNERT**

From the time I launched ALLY Energy as a platform for the entire sector, I've heard from executives at all sorts of energy companies seeking talent. But never has the push for great workers been as voracious and urgent as it is these days.

It's happening on all fronts. Energy companies need people with a vast array of skills – including, suddenly, large numbers of people who know how to *build*.

A slew of headlines from across the country last year showed this profound change: “Manufacturing roars back in 2022,” “Made in America is back,” “A brighter future for ‘Made in ‘America.’” We have moved into a new, golden age of U.S. manufacturing.

A great deal of this revolves around energy. With the push to decarbonize, an influx of capital from private markets, support from Washington and more, opportunities abound. And the new demand keeps growing by the day. The country needs to shore up infrastructure, electrify, fix dams and lakes, upgrade pipelines, plug wells, expand solar and wind farms and hydropower plants and much, much more.

But here's the problem: For decades, the United States has largely outsourced this kind of technical, hands-on work. We moved so many of these jobs overseas that we failed to grow the needed talent pool at home. Fixing this requires both short and long-term solutions. →



Energy companies need to offer training and development to help people who are already in the sector upskill and reskill. Companies also need to help people from other industries learn skills that will allow them to transfer in.

As a sector, we also need to focus on building a talent pipeline for future generations. This means working with schools, colleges, universities, trade schools and communities – where fossil fuel workers live – to strengthen STEM programs and training opportunities.

But it isn't only technical skills at issue. Some of the most crucial skills of today's workplaces are communication, leadership, people management, creativity, empathy, critical thinking and social awareness. These are human skills, and no amount of artificial intelligence will allow machines to take over anytime soon. Energy needs these as much as any other industry. We need grit, which I think of as an acronym for growth, resilience, innovation and transition.

Deane Ilukowicz, chief people officer for wind blade manufacturing company TPI Composites, notes that the rapidly growing field of renewables “will require adaptable individuals, committed, resilient and passionate about a world with cleaner energy. That said, the skill sets that exist across the energy sector are largely transferable between one form of energy and another. As an industry, we need to come together to help showcase our jobs to

a broader talent pool and balance that with the equitable talent transition.”

This task before us may sound daunting, yes. But the good news is that we are not starting from scratch. In this great country, there are already people who have these skills – and many more who are ready to learn them. We just need to find them, reach out to them and help them discover the benefits of building a career in energy. It is the world's most exciting and rewarding profession.

So here's what I tell these executives when they call me, desperate to fill open positions: Believe it or not, fantastic potential employees are out there. They can absolutely be brought into this field. But to attract, retain and nurture them, you have to take a whole new, holistic look at the realities of the workforce. Just about everything about the workforce has changed. How well you navigate this new reality can make or break the future of your company.

It's difficult to overestimate the extent of this seismic transformation. Today's workers have options like never before. They're largely driven by different goals from what used to predominate in business. They need tools and opportunities that they have not been given. And they come from parts of our nation that have, all too often, been overlooked. They also aren't going to just come to you, you have to reach out and engage with them about the benefits of a career in energy.

## Embracing DEI

For years, there has been a lot of talk about the importance of diversity, equity and inclusion in energy. But the numbers show that we still have a very long way to go.

The latest U.S. Energy & Employment Jobs Report finds that women make up only 25% of the energy sector workforce, compared to nearly half (47%) of the national workforce. Only 8% of energy workers are Black or African-American, compared to 12% of the overall workforce.

In some other ways, the energy workforce looks more like America. For example, the percentages of Asian, Hispanic and American Indian or Alaska Native workers are about the same as the overall workforce.

Still, the racial and gender gaps tend to become even *more* pronounced as you look at the higher ranks inside many energy companies. This, in turn, sends the signal to many women and minorities that they may not have adequate opportunities for advancement and promotions in energy.

A great deal of research shows that the more diverse, inclusive and equitable a company is, the more successful it is. People of different perspectives and experiences bring new ideas and innovations. So workplaces need to not only draw diverse staff from across the country and even around the world; they also need cultures that empower employees to speak up and be heard.

The same goes for ridding the industry of problems like harassment and bullying. In recent years, numerous reports have brought attention to the work needed on this front. Increasingly, people are sharing their stories -- including women and members of the LGBTQ+ communities. In one survey, almost 35% of workers in the energy industry said they had “witnessed or experienced discrimination based on gender identity or sexual orientation” over 5 years, Energy Live News reported.

There's also another big step energy businesses need to take to attract and retain people. It's one that the pandemic brought into focus.

## Work-life balance and integration

The “great resignation” of the last couple of years has been driven by multiple factors. The strong labor market and a plethora of opportunities are a big part of it. But so is the desire, among today's employees, to have a greater work-life balance -- or, as some prefer to say, work-life integration.

Some of this revolves around caregiving. People who have children want, and expect, time to care for them -- and this applies to everyone, not just women. It also isn't just children who need caregiving. The “graying of America” means more people than ever have elderly parents who need to be taken care of as well.

Businesses need to give workers as much flexibility as possible. Some jobs can be done at whichever hours are most convenient for the employee. Some can be done from home. Others require on-site work at specific hours, but workers may wish to job share for these positions.

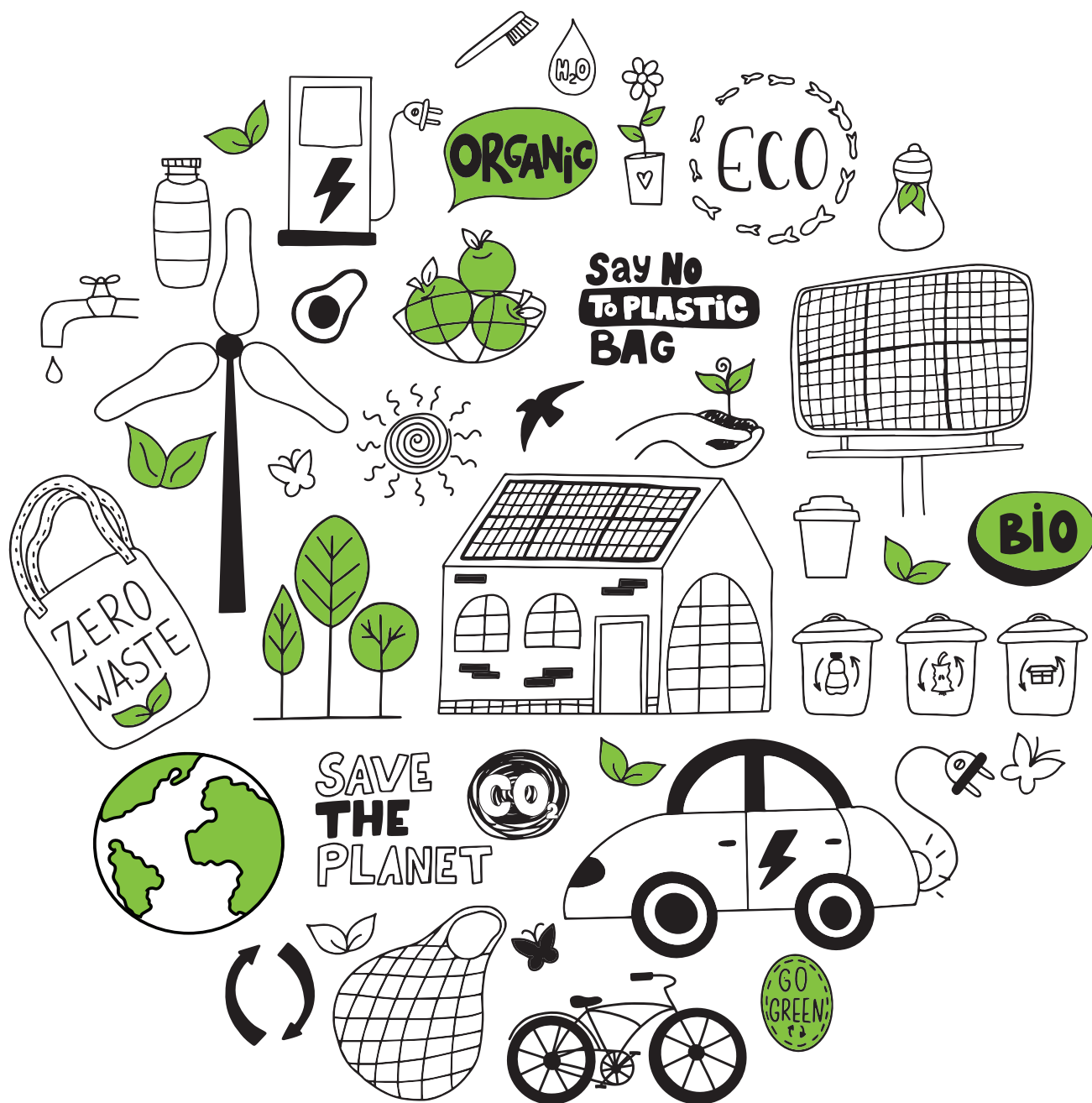
Increasingly, people are also seeking contingent work, consultancies, project work and freelance arrangements as well. Building the workforce means allowing people as many different kinds of opportunities as possible and making those opportunities both desirable and rewarding.

There's more. Sometimes, people take off a block of time from work for caregiving, whether for parental leave or family leave. It's crucial to never give up on these workers. A great many want to come back. But at the breakneck pace of today's business and technology, they can't simply pause their careers and then resume as though they were never away. In the time they take off, a lot can change.

So people need “returnships” and career reentry programs. Organizations need to invest in training opportunities to help get these folks up to speed on the daily ins and outs of business. Fortunately, businesses don't have to “reinvent the wheel” to make this happen. Small businesses, like Houston-based Parents Pivot, can be engaged to help people resume their careers -- and to help businesses usher those employees back in. →







### It's a marathon

The pressures on the energy sector are unprecedented. It's not just that the world needs more power than ever; it's that the world is also demanding that we lead toward a better future. We are transforming how energy is harvested, provided, distributed and used. It's no exaggeration to say that billions of people are looking to energy leaders to play a major role in saving the world as we face climate change.

With all that pressure, we can quickly become overwhelmed. This is why we need to take on a very different mindset. We have to accept that we're not sprinting, we're running a marathon.

Having run marathons in the past, I've learned crucial lessons about what it entails. If you try to sprint, your body and mind will give out long before you reach the finish line. You have to pace yourself. You have to set small goals along the way and commit to achieving them. You also have to tune out the "noise" and focus on your goals. Don't let anyone or anything distract you.

These days, proverbial “noise” is all around us. It’s in the news, social media, political debates and more. It’s not that these things don’t matter. It’s crucial to be educated and aware and to listen to numerous perspectives. But we can’t let all this distract us. Any day, we can give in to the latest battles and squabbles that suck up our time and energy. This is what we need to avoid. Setting goals for each stretch and staying laser-focused on them is essential.

There's another piece of this mindset that's crucial: understanding that we're running as a team.

### Uniting to forge ahead

In the ultra-competitive business world, organizations tend to work separately. In the energy sector, we’ve long operated in silos, with different businesses focusing on different forms of energy keeping distance. This needs to end.

Tackling the challenges ahead of us requires teamwork. All of our organizations have the same goal: to build the energy workforce of the future.



#### ABOUT THE AUTHOR:

**Katie Mehnert** is founder and CEO of ALLY Energy. Mehnert has held global leadership roles with BP and Shell in safety and environment during periods of financial crisis, spills, divestment and globalization. She was appointed Ambassador to the United States Department of Energy in 2020 and has testified before Congress on the clean energy workforce of the future. Mehnert was most recently appointed by the Biden administration to the National Petroleum Council. She’s also an Energy Institute Fellow and an advisor to Clean Energy for America.

# AUTOGRID'S SADIA RAVEENDRAN CHARTS HER ENERGY TRANSITION



**BY SADIA RAVEENDRAN AND ELISABETH MONAGHAN**

*For our Q1 issue, we are proud to feature VP of Industry Solutions at AutoGrid Sadia Raveendran.*

One in four college students graduates without knowing where they will land. But Sadia Raveendran, VP of Industry Solutions for AutoGrid, not only knew that she wanted a career in clean energy but began actively planning her path when she was 17 years old.

As a high school student in the International Baccalaureate (IB) program, Raveendran was encouraged to research local solutions to global problems as part of her graduation thesis. She investigated energy equity and clean energy and wrote her final essay on how biomass could be used to meet rural energy needs sustainably by generating clean methane.

"As part of my research, I remembered reading that the biomass you generate in a typical farm is enough to serve 75% of the energy requirements for that community," said Raveendran. "That blew my mind. It was so long ago, but I still remember that. That was when the bug hit."

In the years since that early project, Raveendran's professional journey has paralleled the global energy transition – from utility-scale renewables to cutting-edge clean tech.

## **Chasing the mission**

Raveendran opted to major in physics and economics at Wellesley College for her undergraduate degree – the former so that she could have a solid STEM foundation, and the latter to understand more about the micro and macroeconomic context for clean energy.

When she graduated, the global economy was reeling from a recession, and jobs in the energy sector were difficult to come by. However, Raveendran remained undeterred and landed her first job at Tata Power, the largest power generation company in India.

Raveendran credits her experience at Tata Power with kick-starting her career in clean energy, as it allowed her to be involved in the company's first utility-scale solar power projects, including the then-largest 25 MW solar project in India. Through her work there, Raveendran realized the importance of policy in catalyzing the growth of clean energy. After a couple of years, she returned to the U.S. to pursue her master's degree in technology & policy at MIT. While there, she continued her work in clean energy through her research in Carbon Capture and Sequestration (CCS) in Howard Herzog's group, to better understand how to reduce emissions from traditional sources of energy at scale.



### Scaling up renewable energy supply

Raveendran then joined GE in the Renewable Energy Leadership Program, where she had the opportunity to work across functions. Drawn to the product management function as it required collaboration across sales and marketing, engineering and supply chain, she had the opportunity to lead product management for one of the company's key products. Shortly thereafter, she was chosen to be a part of the first class of the GE-wide Accelerated Leadership Program (XLP) where she focused on product management for wind services.

### Shifting to demand & distributed energy resources

After focusing on the supply side of clean energy, Raveendran accepted a position as solutions architect at AutoGrid to build her experience on the demand side. She has been at AutoGrid for nearly five years, during which she has been promoted twice and now leads the team she joined. She was asked by Autogrid Founder and then CEO, Amit Narayan to manage and grow the relationship with various Schneider Electric businesses since their first investment in AutoGrid in May 2019. She credits Narayan for helping to challenge and inspire her to deliver her best in some tough roles. The Schneider engagement ultimately culminated in Schneider Electric acquiring Autogrid in May 2022.

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Looking back on her career path, Raveendran emphasized the importance of working in a field where she felt true passion. “If I'm going to spend more than a third of my life working, I want my job to be something that I thoroughly enjoy a job that challenges me intellectually and helps me develop my knowledge base and skill set. It must also be a job, where I like working with other members of the team.”

Raveendran also highlighted the challenges of building her team almost entirely through the pandemic, which meant not only finding the right candidates through entirely online interactions but also helping them to ramp up while continuing to engage the new hires virtually. Her experiences at AutoGrid have given her a model for what a modern, flexible, and effective workplace can look like. →



## Paying It forward

Raveendran also underscores the importance of having professional mentors and hopes that she can “pay it forward” for people who are trying to navigate their career paths. “My first professional mentor was Banmali Agarwala, who I met during my first job at Tata Power. His career path has been inspiring to me, and I have sought his advice during critical junctures in my own path. Then, my first manager at GE, Lauren Thirer, also mentored me through and after GE. I was always struck by how well-regarded she was across the organization and aspired to be that kind of leader – highly credible and damn good at my job! And finally, Rahul Kar, who was my manager until recently, has been instrumental in enabling me to do my best and challenging me to step it up when I needed to. Through the people I have met along the way, I have understood the importance of surrounding yourself with people who are better than you in one way or another – it is inspiring and helps you bring your A-Game!”

## SADIA RAVEENDRAN EXPLAINS HER ROLE AT AUTOGRID

“I lead the tech pre-sales function at AutoGrid. We work with our customers to understand the problems they are trying to solve today, where they want to be tomorrow, how we can collaborate with them as a technology partner in delivering their business plans and how we can enable them to be leaders in this space.

When you look at EVs, utilities are thinking about how to service and manage the additional load created by the addition of these assets to the network. Meanwhile, as OEMs prepare to shift entirely to EVs, they must figure out new streams of recurring revenues because EVs do not need to be serviced as frequently. This makes for a very interesting dynamic and unique opportunity for our team to deliver industry-leading solutions that meet the needs of the utility, the OEM, and of course, the EV driver.”



## ABOUT SADIA RAVEENDRAN :

Sadia Raveendran is VP of Industry Solutions at AutoGrid. Raveendran has over a decade of experience in clean energy across technologies, regions and functions. Prior to joining AutoGrid, she worked at GE Renewable Energy in product management roles for equipment, services and digital products (internal tools) for the onshore wind business. Before that, she conducted research on carbon capture and sequestration at the MIT Energy Initiative and helped build Tata Power's solar power portfolio in India. At AutoGrid, her work focuses on the demand side of clean energy and effective management strategies for the ever-evolving electricity grid. She works closely with AutoGrid's customers to design and implement energy flexibility management programs that make them leaders in the energy transition. She graduated from Wellesley College with majors in physics & economics and completed her master's degree at MIT in technology & policy.

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