

EET&D

MAGAZINE

Quarterly Issue 3, 2022 – Volume 25



**SMART GRIDS THAT MAKE EVERY
KILOWATT AND KILOBYTE COUNT:
THE FIRST STEP TO A MORE SUSTAINABLE UTILITY**



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4

INDUSTRY NEWS

14

POWER POINTS

REAPING THE BENEFITS OF RESILIENCE

Elisabeth Monaghan, Editor in Chief

Whether responding to a relentless pandemic, reacting to or recovering from natural disasters or preparing for the next phase of grid modernization, professionals representing all aspects of the electric energy space continue to demonstrate their commitment to stabilizing and securing the electric grid.

16

THE GRID TRANSFORMATION FORUM

SMART GRIDS THAT MAKE EVERY KILOWATT AND KILOBYTE COUNT: THE FIRST STEP TO A MORE SUSTAINABLE UTILITY | Pete Londa, Tantalus Systems

For the Grid Transformation Forum, we are pleased to feature Pete Londa, CEO of Tantalus Systems, who explains why, if they are going to become truly sustainable, utilities must be ready to address the collision of the 'electrification of everything' and the 'decarbonization of everything.'

24

GREEN OVATIONS

FOR UTILITIES, ENABLING ENERGY AS-A-SERVICE DEPENDS ON TWO KEY BUILDING BLOCKS | Raik Kulinna, SAP

As those in the business of providing electricity well know, a combination of market and regulatory pressures, environmental concerns, geopolitical disruptions, consumer preferences and technological advances is fast changing how and where electricity is generated, used and stored.

30

THE ADVENT OF SMART GRIDS, CUTTING-EDGE TECHNOLOGIES, EQUIPMENT AND CONTROLS TO HELP IMPROVE RESILIENCY | Robert Denda, Gridspertise

Searing summer heat, severe drought conditions and an above-normal hurricane season, coupled with a surge in electric demand higher than pre-pandemic levels, electric capacity shortfalls and aging plant infrastructure, will further expose the need for grid modernization to improve resiliency.

34

SMART UTILITY NETWORK ENABLES RESILIENT TORNADO RECOVERY: KENTUCKY CO-OP RESTORED POWER TO 30,000 MEMBERS | Dan Bennett, Xylem

Nothing could have prepared Western Kentucky for the powerful tornado that tore through communities in December 2021. While the damage was immense and difficult to measure, West Kentucky Rural Electric Cooperative knew the community needed their power restored and got to work. Within an hour of when the hurricane touched down, West Kentucky's staff assembled to begin assessing damage to the distribution system.

38

YOUR EQUIPMENT IS NOT GETTING ANY YOUNGER

Kelvin Severin, PE, aeSolutions

Many processing facilities in the United States were built decades ago and have never been upgraded. Maintaining aging equipment can be a challenge as parts for the old equipment are often no longer available or very expensive.

42

IEEE PES T&D CONFERENCE AND EXPOSITION: A HUGE SUCCESS | Wayne Bishop, Jr., IEEE PES, Quanta Technologies

This year's IEEE PES T&D was hosted by Entergy, and Michelle Bourg was the organizing chair. Bourg, her team at Entergy and the entire T&D Organizing Committee did an outstanding job organizing the event, from logistics, to the student program, to technical tours, along with a technical program that was second-to-none.

46

BGE'S CONNECTED ANNAPOLIS ACHIEVES FIRST-EVER ENERGY STAR SHERMS CERTIFICATION | Sam duPont, BGE, Julia Shavit, Smartmark Communications

The EPA and ENERGY STAR stakeholders saw an opportunity to mitigate growing consumption and bring a focus on energy savings opportunities to the smart home market through development of ENERGY STAR certification criteria. The strategy was to leverage the powerful ENERGY STAR brand and partnership to guide smart home systems toward readily achievable energy savings in the near term while working toward the future of a smart home ecosystem capable of acting as a single touchpoint for consumers and utilities to manage energy consumption.

52

GUEST EDITORIAL

THE TRUTH, THE POLE TRUTH AND NOTHING BUT THE TRUTH: USING MOBILE TECHNOLOGIES AND LOCATION INTELLIGENCE TO DRIVE OPERATIONAL EFFICIENCIES

Brandon Raso, Locana

I'm staring at a pole, but what I'm really looking at is a data problem that every utility struggles with. Can the utility trust the information in their operational systems when it says that this pole is here? Can the organization trust the data when it says the neighboring pole is 90 feet away? Can it trust that those underground wires are where they are supposed to be? Which data should it trust when two systems say two different things? Which information is the truth.

56

GUEST EDITORIAL

WE NEED AN ENERGY TRANSFORMATION: HERE'S WHAT IT WILL TAKE TO MAKE THE CHANGE

Michael Sachse, Dandelion Energy

Today, the world derives 80% of its energy supply from fossil fuels, while just 3% comes from renewable sources. Many of our most important technologies, from vehicles to home heating and cooling solutions rely on fossil fuels. However, according to a March 2022 survey by the Pew Research Center, the majority of Americans believe the U.S. should "prioritize the development of renewable energy sources, such as wind and solar and take steps toward the country becoming carbon neutral by the year 2050."

62

SECURITY SESSIONS

MORE EV'S ARE HITTING THE ROAD. IS THE POWER GRID READY FOR THEM? | Robert Nawy, IPKeys Cyber Partners

While there are significant perks to driving an EV, there are also risks that come along with these perks that need to be addressed. Infrastructure around the mobility electrification of America needs a proper cyber security plan.

66

POWHERFUL FORCES

Hamideh Bitaraf, Hitachi Energy and Elisabeth Monaghan, Editor in Chief

Meet Hamideh Bataref, senior advisor Grid Edge Solutions, for Hitachi Energy. Bitaraf provides advisory services to customers interested in grid edge solutions including renewables and energy storage systems.



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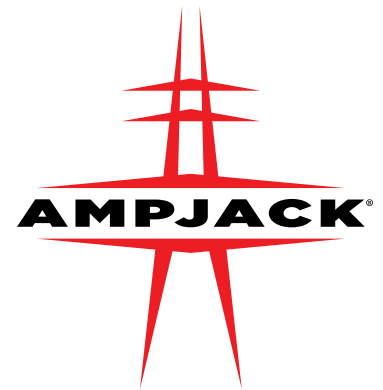
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NYSERDA ANNOUNCES UP TO \$30 MILLION IN FUNDING FOR THIRD ROUND OF FUTURE GRID CHALLENGE TO IDENTIFY SOLUTIONS TO TECHNICAL CHALLENGES OF RENEWABLE POWER INTEGRATION

Up To \$3 Million Per Project Now Available to Study, Develop, or Demonstrate New Technologies that Support Transmission and Distribution

August, 2022

The New York State Energy Research and Development Authority (NYSERDA) today (Aug 17) announced up to \$30 million in funding is being made available in the third round of the Future Grid Challenge for projects that identify solutions to the technical challenges of integrating renewable resources into the electric grid. Up to \$3 million per project is available for single or team providers that propose to study, develop, or demonstrate innovative technologies that support modern transmission and distribution. These efforts support New York's nation-leading Climate Leadership and Community Protection Act (Climate Act) goal to achieve 70 percent renewable electricity by 2030.

Doreen M. Harris, President and CEO, NYSERDA said, “With the release of this latest round of the Future Grid Challenge, we are seeking to support critical technology solutions that will allow the electric grid to continue to handle increasing amounts of renewable energy. Investments in innovation are investments in a grid of the future that incorporates clean energy and allows for dynamic management and operation to ensure resilient and reliable transmission and distribution, even when factoring in the impacts of climate change.”

With today's announcement, NYSERDA is seeking proposals that support implementing advanced technologies that can play a vital role in ensuring reliability of the transmission and distribution system, reducing cost, and allowing for faster integration of renewables, while helping the State to meet its ambitious climate goals. This challenge seeks to address high priority grid technologies including:

1. Power flow control devices
2. Energy storage for transmission and distribution services
3. Tools for improving operator situational awareness
4. Transformer monitoring
5. Advanced high-temperature, low sag conductors
6. Compact tower design
7. Distribution Energy Management Systems (DERMS)
8. Grid impacts from offshore wind interconnection

Solicitation proposals are due by 3:00 p.m. on November 2, 2022. For additional details and associated documents, visit NYSERDA's website.

Rory M. Christian, CEO of the Department of Public Service, said, “Supporting the development of new technology is critically important as we deal aggressively with the need to create a clean energy grid. The new technology that will be created will help ensure transmission and distribution system reliability, while speeding integration of renewables that will assist New York in meeting its nation-leading climate goals.”

The Future Grid Challenge is part of NYSERDA's Smart Grid Program included in the State's Clean Energy Fund (CEF) Grid Modernization Program, which is providing a total of \$110 million through 2026 to further research, develop, and provide funding for innovative solutions that support the advancement of a smart, modernized electric grid, remove barriers and enable the utility investments necessary for full deployment at scale of advanced technologies for the power grid. Since 2016, NYSERDA's Smart Grid program has awarded approximately \$57 million under 100 contracts to grid technology companies and research organizations for projects including low-cost, high-accuracy grid sensors, modeling and simulation tools, and advanced engineering solutions for more effective integration of renewable energy resources. Learn more on NYSERDA's website.

**\$57 MILLION
UNDER 100
CONTRACTS**

Administered by NYSERDA, the Future Grid Challenge offers funding to grid technology companies and research institutions that address challenges ranging from the need for greater real-time system data to incorporating smart technologies and energy storage into power grid planning and operations. Challenges are developed in partnership with the Joint Utilities of New York members Con Edison, Central Hudson Gas & Electric, National Grid, New York State Electric and Gas, Rochester Gas & Electric, and Orange & Rockland to accommodate renewable energy sources and understanding their impact on the transmission and distribution systems. Together, these utilities provide electric service to over 13 million households, businesses, and government facilities across the State.

Nation-Leading Climate Plan

New York State's nation-leading climate agenda is the most aggressive climate and clean energy initiative in the nation, calling for an orderly and just transition to clean energy that creates jobs and continues fostering a green economy as New York State recovers from the COVID-19 pandemic. Enshrined into law through the Climate Leadership and Community Protection Act, New York is on a path to achieve its mandated goal of a zero-emission electricity sector by

2040, including 70 percent renewable energy generation by 2030, and to reach economy wide carbon neutrality. It builds on New York's unprecedented investments to ramp-up clean energy including over \$35 billion in 120 large-scale renewable and transmission projects across the state, \$6.8 billion to reduce buildings emissions, \$1.8 billion to scale up solar, more than \$1 billion for clean transportation initiatives, and over \$1.6 billion in NY Green Bank commitments. Combined, these investments are supporting nearly 158,000 jobs in New York's clean energy sector in 2020, a 2,100 percent growth in the distributed solar sector since 2011 and a commitment to develop 9,000 megawatts of offshore wind by 2035. Under the Climate Act, New York will build on this progress and reduce greenhouse gas emissions by 85 percent from 1990 levels by 2050, while ensuring that at least 35 percent with a goal of 40 percent of the benefits of clean energy investments are directed to disadvantaged communities, and advance progress towards the state's 2025 energy efficiency target of reducing on-site energy consumption by 185 trillion BTUs of end-use energy savings.

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DCPSC APPROVES 15-YEAR RENEWABLE ENERGY POWER PURCHASE AGREEMENT FOR A PORTION OF THE DISTRICT'S DEFAULT ELECTRIC SERVICE

August, 2022

The Public Service Commission of the District of Columbia (Commission) has approved the first long-term power purchase agreement (PPA) for renewable energy to serve a target quantity of 5% of the Standard Offer Service (SOS) electricity supply load beginning in December 2024 (Formal Case No. 1017). This agreement results from the Commission's directive to implement a pilot program to procure renewable energy through long-term power purchase agreements for electricity generated by new solar or wind power facilities located within the PJM Interconnection (PJM) region. The agreement with Invenergy covers the sale of energy, renewable energy credits, and capacity for a term of 15 years with levelized pricing for approximately 154,000 MWh per year, which equates to 73 MW, or about 29% of the solar project's total capacity.

"Approving a 15-year agreement for renewable energy for SOS customers is a significant milestone for the Commission,"** stated Emile C. Thompson, Commission Chairman. **"Today's action marks another aggressive step the Commission is taking to move the District closer to meeting its 2032 100% renewable energy goal, as well as the climate change commitments. By incorporating the long-term renewable energy PPA into the SOS procurement portfolio, we are taking direct action to reduce greenhouse gas emissions by promoting the construction of new renewable energy generation within the PJM Interconnection grid region. This pilot program is the product of a collaborative, comprehensive, and transparent SOS Working Group process. I want to thank all stakeholders, including the Office of the People's Counsel, for their input and participation,"** Thompson added. **"We intend to re-engage the SOS Working Group as we endeavor to continue furthering the District's energy and climate goals by exploring the expansion of the percentage of SOS load served by renewable energy PPAs in the near term."

The SOS program allows District electric customers to buy default electric power generation services through Pepco rather than from about 45 other competitive, unregulated electricity suppliers. About 31% of Pepco's total electricity supply sales were provided through the SOS program in 2021. About 86% of residential customers buy Pepco-supplied default SOS power, constituting about 78% of total residential electric utility sales in the District. The agreement is, to date, Pepco's largest purchase of solar energy for its D.C. customers.

As the current SOS Administrator, Pepco procures 100% of the SOS load as a Wholesale Full Requirements Service (WFRS). With WFRS, electricity suppliers provide not only the energy but also other components such as capacity, losses, congestion, load shaping, credit and risk, ancillary services, and the cost of compliance with the District's Renewable Energy Portfolio Standards.

For more information about the Commission's clean energy efforts, visit dcpsc.org/cleanenergy.

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MINNESOTA POWER AND GREAT RIVER ENERGY TO BUILD TRANSMISSION LINE TO BOLSTER ELECTRIC RELIABILITY IN NORTHERN MINNESOTA

April 2022

Minnesota Power, a utility division of ALLETE Inc. (NYSE: ALE), and Great River Energy today (July 25) announced their intent to build an approximately 150-mile, double-circuit 345-kV transmission line from northern Minnesota to central Minnesota near Becker that will support grid reliability in the Upper Midwest.

The transmission line will run from Minnesota Power's Iron Range Substation in Itasca County to Great River Energy's Benton County Substation in Benton County, and then replace an existing Great River Energy transmission line from Benton County to a new substation in Sherburne County. The Sherburne County substation will be built as part of a separate project.

Minnesota Power, an investor-owned public utility, and Great River Energy, a wholesale electric power cooperative, expect to file a Notice of Intent to Construct, Own and Maintain the transmission line with the Minnesota Public Utilities Commission (MPUC) in early August.

This joint project is one of a portfolio of transmission projects approved July 25 by the region's grid operator, the Midcontinent Independent System Operator (MISO), as part of the first phase of its Long Range Transmission Plan. In total MISO approved 18 projects across its Midwest sub region, with six, including the Minnesota Power/Great River Energy project, in the Upper Midwest.

Proactive investments to maintain a reliable and resilient regional power grid are necessary as more low-cost renewable energy is brought online, existing power plants are retired, electrification continues to grow and extreme weather events become more frequent.

“Investing in transmission resources is a critical component of our EnergyForward strategy for building a carbon-free energy future while maintaining the reliable service our customers and communities expect,” said Josh Skelton, Minnesota Power chief operating officer. “This joint project with Great River Energy will ensure that the regional power grid our customers depend on will continue to be reliable and flexible as we navigate a changing energy mix for Minnesota Power and in the broader MISO region.”

Utilities across the region are significantly increasing the amount of renewable energy they provide to their customers. Great River Energy will more than double the amount of renewable energy, primarily wind energy, in its portfolio by 2025 and reduce its carbon emissions by 80 percent from 2005 levels in the next 10 years. Minnesota Power was the first utility in the state to deliver 50% renewable energy to its customers in 2021 and envisions delivering 100% carbon-free energy by 2050.

“Building the right transmission will ensure continued reliability as we transition our energy mix, prepare for increased electrification and build in more resilience to extreme weather and other consequential events,” said Priti Patel, vice president and chief transmission officer for Great River Energy. “The right transmission will ensure we can make the transition to more low-cost renewable energy and maintain the reliability our members expect.”

MINNESOTA
POWER/GREAT
RIVER ENERGY
PROJECT

Planning for the approximately \$970 million transmission line is in its early stages. Subject to board approval, the two companies intend to seek a Certificate of Need and Route Permit from the MPUC in late 2023. The MPUC will determine need and the final route and separately review cost recovery for Minnesota Power's share of the project. Subject to regulatory approvals, the transmission line is estimated to be in service by 2030.

Minnesota Power and Great River Energy will begin coordinating with landowners, local governments, agencies, Tribal Nations and tribal organizations, and other interested parties in late 2022 and early 2023. Engagement opportunities including open house meetings and workshops will offer the project community an opportunity to ask questions and provide input on the project planning and routing.

Great River Energy, Maple Grove, Minnesota, is a not-for-profit wholesale electric power cooperative that provides electricity to 28 member-owner distribution cooperatives, serving more than 720,000 member-consumers. Great River Energy owns and operates more than 4,400 miles of high-voltage transmission lines. The organization is on track to meet Minnesota's goal to reduce carbon dioxide emissions 80% from 2005 levels approximately two decades before the 2050 target. Learn more at greatriverenergy.com.

Minnesota Power provides electric service within a 26,000-square-mile area in northeastern Minnesota, supporting comfort, security and quality of life for 145,000 customers, 14 municipalities and some of the largest industrial customers in the United States. More information can be found at www.mnpower.com.
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GOVERNOR NEWSOM'S AMBITIOUS CLIMATE PROPOSALS PRESENTED TO LEGISLATURE

August, 2022

Governor Gavin Newsom today (Aug 12) issued the following statement after sharing urgent proposals addressing climate change with the state Legislature.

“Cleaning the air we breathe. Protecting our communities from the harmful impacts of the oil industry. Accelerating California's clean energy future. Each of these actions on their own are monumental steps to tackling the climate crisis - but California isn't waiting a minute longer to get them done. We're taking all of these major actions now in the most aggressive push on climate this state has ever seen because later is too late. Together with the Legislature's leadership, the progress we make on the climate crisis this year will be felt for generations - and the impact will spread far beyond our borders. California will continue blazing a trail for America and the rest of the world on the swift and meaningful actions necessary for cutting carbon pollution, protecting communities and leading the clean energy future.”



The Governor's climate proposals include:

Codifying statewide carbon neutrality goal to dramatically reduce climate pollution

- Establishes a clear, legally binding, and achievable goal for California to achieve statewide carbon neutrality as soon as possible, and no later than 2045.

Ramping up our 2030 climate ambition

- Adopts a more aggressive 2030 greenhouse gas emissions reduction target - going from 40% to 55% below the 1990 level.

Protecting communities from the harmful impacts of the oil industry

- Establishes a setback distance of 3,200 feet between any new oil well and homes, schools, or parks.
- Ensures comprehensive pollution controls for existing oil wells within 3,200 feet of these facilities.

CLIMATECHANGE

Establishing pathway toward state's clean energy future

- Creates clean electricity targets of 90% by 2035 and 95% by 2040 with the intent of advancing the state's trajectory to the existing 100% clean electricity retail sales by 2045 goal.

Advancing natural and engineered technologies to remove carbon pollution

- Establishes a clear regulatory framework for carbon removal and carbon capture, utilization and sequestration.
- Requires the state to develop an achievable carbon removal target for natural and working lands.

Earlier today, Governor Newsom joined the Governors of New York and Washington in applauding the House after it passed the Inflation Reduction Act, which includes \$369 billion in funding to tackle the climate crisis and secure America's energy future.

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DUKE ENERGY SUPPORTS RELIABILITY, GRID OPERATIONS WITH TWO NEW LITHIUM-ION BATTERY SITES IN FLORIDA

August, 2022

Highlights

- Company completes new battery storage sites in Alachua and Hamilton counties to maximize benefits to customers and the grid
- New sites demonstrate Duke Energy's increasing investment in advanced technology and clean energy

Duke Energy Florida today (Aug 17) announced two new lithium-ion battery sites in Alachua and Hamilton counties to enhance grid operations, increase efficiencies and improve overall reliability for surrounding communities.

“At Duke Energy, we are always looking ahead for innovative technologies that can help us better serve Florida customers,” said Melissa Seixas, Duke Energy Florida state president. “These battery sites will help us continue to improve local reliability for our customers and provide significant energy services to the power grid.”

As the grid manager and operator, Duke Energy Florida can optimize the versatility of battery technology to provide multiple customer and electric system benefits, to include balancing energy demand, managing intermittent resources such as solar energy, increasing energy security and deferring traditional power grid upgrades.

- The recently completed Micanopy battery site in Alachua County is 8.25 megawatts and is located 15 miles southwest of Gainesville. The site provides a cost-effective solution for focused power quality and reliability for the town of Micanopy and nearby neighbors.
- Completed in April, the second site is 5.5 megawatts and is located 1.5 miles south of the Florida-Georgia border in the town of Jennings in Hamilton County. This site will continue to improve power reliability through energy storage as an alternative solution to installing new and more costly distribution equipment.

Duke Energy Florida's continued investment in battery technology reflects the company's belief that energy storage plays a significant and evolving role in how energy is delivered to customers now and in the future.

Earlier this year, Duke Energy Florida announced the completion of three battery projects in Gilchrist, Gulf and Highlands counties. The new sites are part of Duke Energy's commitment to have six battery sites, totaling 50 megawatts, in operation in Florida this year.

Duke Energy Florida's commitment to renewable energy

With a combined investment of more than \$2 billion, Duke Energy Florida's solar generation portfolio will include 25 grid-tied solar power plants that will benefit all Florida customers and provide 1,500 megawatts of emission-free generation and approximately 5 million solar panels in the ground by 2024.

Duke Energy remains committed to the deployment of battery technology in Florida. A 3.5-megawatt solar plus storage microgrid site will be added at Pinellas County's John Hopkins Middle School. The microgrid will support grid operations and provide backup electric power to the school when it must operate as a special needs hurricane evacuation shelter. The microgrid consists of a 1-megawatt solar parking canopy array, a 2.5-megawatt battery and associated controls, which will store and deploy clean, renewable energy to the school and grid. The project enhances electric service and grid operations for customers.

In addition to expanding its battery storage technology and solar investments, Duke Energy Florida is investing in transportation electrification to support the growing U.S. adoption of electric vehicles (EV) through the addition of 627 EV charging stations, including 52 DC Fast Chargers, and a modernized power grid to deliver diverse and reliable energy solutions to best serve our customers.

Duke Energy Florida

Duke Energy Florida, a subsidiary of Duke Energy, owns 10,300 megawatts of energy capacity, supplying electricity to 1.9 million residential, commercial and industrial customers across a 13,000-square-mile service area in Florida.

Duke Energy (NYSE: DUK), a Fortune 150 company headquartered in Charlotte, N.C., is one of America's largest energy holding companies. Its electric utilities serve 8.2 million customers in North Carolina, South Carolina, Florida, Indiana, Ohio and Kentucky, and collectively own 50,000 megawatts of energy capacity. Its natural gas unit serves 1.6 million customers in North Carolina, South Carolina, Tennessee, Ohio and Kentucky. The company employs 28,000 people.

Duke Energy is executing an aggressive clean energy transition to achieve its goals of net-zero methane emissions from its natural gas business and at least a 50% carbon reduction from electric generation by 2030 and net-zero carbon emissions by 2050. The 2050 net-zero goals also include Scope 2 and certain Scope 3 emissions. In addition, the company is investing in major electric grid enhancements and energy storage, and exploring zero-emission power generation technologies such as hydrogen and advanced nuclear.



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REAPING THE BENEFITS OF RESILIENCE



ELISABETH MONAGHAN
Editor in Chief

In April, EET&D Magazine Publisher Steven Desrochers and I attended IEEE PES T&D in New Orleans. I know I wasn't the only one there who was thrilled to see so many colleagues in person — especially since the 2020 IEEE PES T&D conference in Chicago was canceled just weeks before it was supposed to take place.

To gear up for the event, we asked Wayne Bishop, Jr. to give a preview of the 2022 IEEE PES T&D in our Q1/Q2 issue. Bishop is a senior member of IEEE and sits on the IEEE PES Governing Board. He also serves as vice president of meetings and conferences for IEEE PES, so we knew he would have the inside track on what to look for this year. As a follow-up in this Q3 issue, Bishop, shares highlights from the 2022 IEEE PES conference, so be sure to read his recap and see photos of the event on page 42.

About three weeks after the IEEE PES ended, it was time to hit the road again for DistribuTECH 2022 in Dallas, TX. The last DTECH conference, which took place in January 2020, wrapped up right before organizations around the world shut down, or requested that their employees work remotely, to prevent the spread of COVID-19.

DistribuTECH, considered one of the leading events for the transmission & distribution industry, draws attendees from all over the world. The theme for this year's DTECH was resilience and innovation, which seems a fitting, way to describe the resolve of industry professionals, during what has been an unusually challenging past two years. Yes, the pandemic interrupted both our personal and professional lives, but it did not disrupt the energy sector's progress and productivity as evidenced by the thousands of exhibitors at DTECH demonstrating their latest innovations and enhanced solutions.

Events like IEEE PES or DistribuTECH are tangible proof of the dedication of the various utilities, software developers, manufacturers and others in our industry — even during a pandemic. But there are also people working diligently behind the scenes to ensure the industry continues to advance. A great example of this is a recent project that SmartMark Communications initiated with some of their utility clients.

Earlier this year, SmartMark, in partnership with Baltimore Gas and Electric (BGE), the Environmental Protection Agency and UL Solutions, announced that BGE's smart home solution received the first-ever Smart Home Energy Management Systems (SHEMS) ENERGY STAR® certification.

The team used a Z-wave hub, ENERGY STAR® certified thermostat and lighting, smart plugs and sensors, in coordination with a hands-on educational support program to ensure customers understood and could easily be engaged with the technology.

According to SmartMark CEO Juliet Shavit, setting this solution apart from the others were two key differentiators — one, that a utility drove the solution and optimized its AMI data to measure use and validate energy reduction, and two, customer education was as critical to the solution as the technology itself.

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SmartMark was responsible for designing and managing the technology demonstration as part of BGE's Connected Communities program, analyzing the role educated and empowered consumers have in demand-side management. Check out the article on page 46, which takes us inside the certification process and experience, with reflections from SmartMark, BGE and EPA.

Collaborations like the one between SmartMark and BGE do not just happen. Instead, they require industry partners to forge and then maintain solid relationships with each other. Such collaboration is another example of endeavors happening behind the scenes that have a far-reaching impact on the utility sector.

The relationship between Sensus, a Xylem brand, and West Kentucky Rural Electric Cooperative is also an example of how established partnerships can benefit all of those involved, along with their customers or end-users. About five years ago, West Kentucky Rural Electric Cooperative deployed a remotely-managed resilient infrastructure from Sensus.

This past December, when a tornado ripped through West Kentucky leaving in its wake devastating destruction, followed by power outages, Xylem sent out a team of experts to assess the communication network and see if it had survived the tornado. The West Kentucky co-op knew they could call upon the Xylem team to troubleshoot the communication network and mitigate any damage it may have sustained. Because the communication network weathered the storm, the co-op was able to identify where they needed to focus their restoration efforts.

The co-op was relieved to know their investment in a reliable communication network paid off, but it was the comfort in knowing they could call upon count on their industry partner to respond quickly at such a critical time that made all the difference. And because there was a relationship already in place with their services provider, the co-op was able to spend their time getting the power back on for their members.

Whether responding to a relentless pandemic, reacting to or recovering from natural disasters or preparing for the next phase of grid modernization, professionals representing all aspects of the electric energy space continue to demonstrate their commitment to stabilizing and securing the electric grid. And as a result, anyone who consumes electric energy reaps the long-term benefits of that perseverance and effort — or what some of us refer to as resilience and innovation.

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

SMART GRIDS THAT MAKE EVERY KILOWATT AND KILOBYTE COUNT:

THE FIRST STEP TO A MORE SUSTAINABLE UTILITY

PETE LONDA



For the Grid Transformation Forum, we are pleased to feature Pete Londa, CEO of Tantalus Systems, who explains why, if they are going to become truly sustainable, utilities must be ready to address the collision of the 'electrification of everything' and the decarbonization of everything.'

Utilities of all shapes and sizes play an increasingly vital role in addressing the environmental challenges facing our world. They're under increasing pressure to be more resilient in the face of extreme weather events and to help their local communities become safer and more desirable places to live and work. But addressing these challenges is becoming increasingly difficult to accomplish as we seek to electrify everything while simultaneously decarbonizing everything.

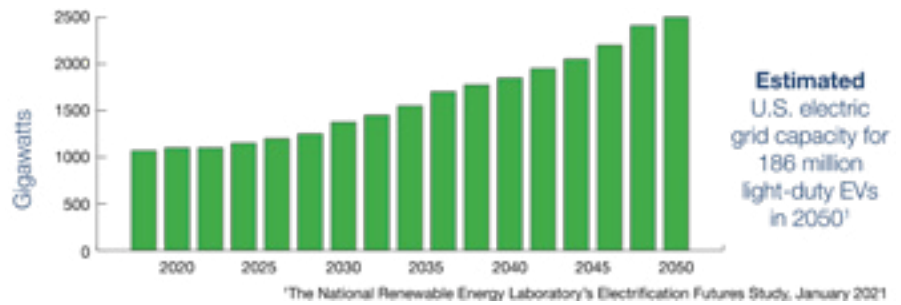
That's why the utility of the future will need to work with data as much as it works with electricity. A truly sustainable utility needs to know what's happening at every touchpoint across the distribution grid, from its headquarters to devices located behind the meter. It has to make every kilowatt *and* every corresponding kilobyte count. And that can only happen when utilities harness a robust and interoperable smart grid — the vital foundation of a

modernized and truly digital distribution grid. By deploying a smart grid, a utility can access and leverage data to reduce greenhouse gas (GHG) emissions, integrate sustainable technologies and mitigate the effects of extreme weather.

The world is changing

Utilities face two colliding trends — the Electrification of Everything and the Decarbonization of Everything. Electrification is plain to see wherever we look — electric vehicle (EV) adoption, online shopping, cloud computing, blockchain and an increasing number of embedded computer chips in every device — virtually every aspect of daily life is becoming electrified and connected. Because of expected EV adoption rates, it is estimated that U.S. power production will need to [double by 2050](#). →





At the same time, decarbonization is driven by government policy, increasing regulations and consumer demand. Communities are investing more in renewable energy and trying to move away from fossil fuels and coal. In addition, the adoption of distributed energy resources (DERs), such as rooftop solar, home battery storage and microgrids are putting more strain on a grid that is already outdated and in dire need of modernization. And although electrification and decarbonization can be seen as complementary — as in the case of EVs — the fact that these two trends are happening now has utilities caught in the middle of their mutual demands on the flow of power.

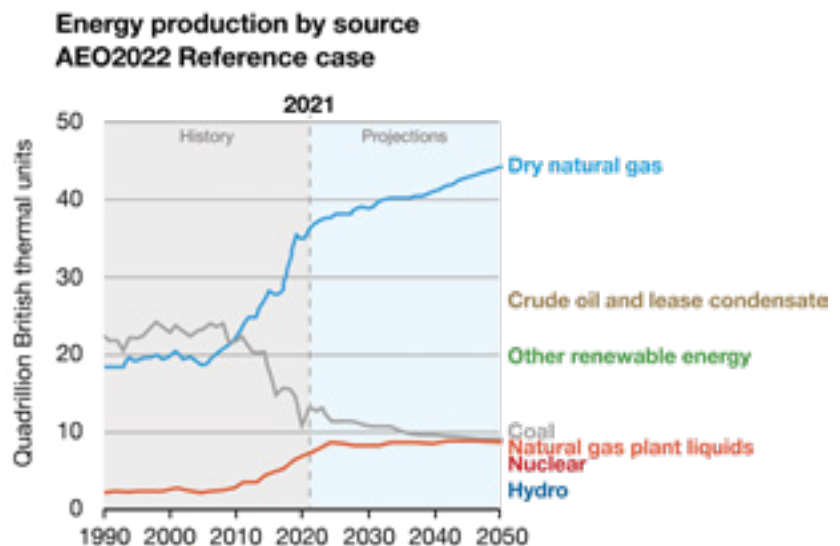
The combined pressure of these forces — electrification, decarbonization and extreme weather — is something the traditional distribution grid was never designed to handle. That's why so many utilities are investing in a new model of true sustainability — a model that operates on the foundation of a robust smart grid network capable of supporting the next generation of AMI and the necessary connectivity to and control of DERs and EVs.

Meanwhile, Mother Nature is serving up increasingly volatile and extreme weather events. We see it every season of every year, with colorful and hard-to-forget names — the Texas Deep Freeze, the California Wildfires, the Heat Dome, the Superstorm, etc. It will only get more intense. Wildfires, hurricanes, heatwaves, winter storms and other extreme weather events are impacting the electric grid on a global scale, resulting in an increasing number of outages that threaten lives and livelihoods. With an 83% increase in extreme weather disasters from 2000 to 2020, grid resilience has never been more important, nor requires more data-driven visibility, command and control at the edge.



83%
increase in
extreme weather
disasters
2000 to 2020¹

¹ Yale School of the Environment, October 2020



A truly sustainable industry

Increased demand for power. A reduced ability to increase capacity to match that demand. New consumption patterns and consumer-generated power at the edge of the grid. A world that is becoming more volatile with each passing year. These are just a few examples of what utilities need to address today and in the future. There is no room for waste. There will be no surplus, and there is less room for error in the face of an emergency.

Utilities must not only become truly sustainable in the face of all this change but they also must become innovative change agents themselves.

The utility of the future needs to achieve true sustainability along five critical vectors:



- **Operational:** Prioritizing workforce safety, improving reliability, managing assets and ensuring the security of the network and grid.
- **Financial:** Reducing costs, offering dynamic pricing, extending asset life and improving ROI.
- **Community:** Securing affordable accessibility to power, safety and security for customers and enabling economic development.
- **Regulatory:** Committing to annual Environmental, Sustainability & Governance (ESG) reporting, adhering to environmental regulations and public safety requirements and supporting emerging technologies such as EVs.
- **Environmental:** Reducing carbon footprint, DERs, ensuring equitable delivery of power and enhancing ongoing ESG efforts.

It is this last vector – environmental sustainability – where a utility's smart grid and next-generation AMI solution can make a particularly meaningful impact. Before a utility can reduce its community's carbon emissions, it needs a direct line of sight into what is unfolding at every point along the distribution grid. Think about it – with an intelligently deployed digital distribution grid, utilities can track both power and data. The only way to make smart decisions to respond immediately to changing conditions, boost grid resiliency and prevent needless outages is by accessing data that can be analyzed and interpreted intelligently. In other words, the only way for utilities to become truly sustainable is to make every kilowatt *and* every corresponding kilobyte count. →





The data-driven smart grid — the key to true sustainability

For years, utilities have been investing in AMI. But now, with so many changing variables, the time has come to rethink what utilities really need. It's not just about advanced metering, and it's not just about accessing consumption data from smart meters. It's about accessing and analyzing granular consumption and power quality data on each interval from every point across the entire distribution grid — smart meters, distribution automation equipment, solar inverters, power walls, microgrid controllers and EV chargers. It's about truly digitizing and modernizing the grid, and that means embracing solutions capable of delivering a truly interoperable smart grid.

A truly interoperable, data-driven smart grid can consolidate and synthesize data from devices through a unified platform, enabling utilities to improve environmental, social and governance (ESG) initiatives. Through the analysis of power quality data, utilities can reduce the risk of wildfires by proactively monitoring the performance of critical assets and appropriately adjusting settings on devices to extend the life of the asset and prevent equipment from putting communities at risk. By proactively managing assets throughout the entire distribution grid, from meters to substation equipment, repair crews can fix equipment before those devices overheat, fail or begin to arch, thereby reducing the risk of fire and unplanned outages.

Similarly, utilities can use power-quality data from connected endpoints throughout the distribution grid to pinpoint locations where trees and branches are continually hitting power lines during windstorms. By pinpointing those locations, utilities can more precisely determine where to send tree-trimming crews, thereby avoiding unnecessary deforestation of their communities while simultaneously reducing CO₂ emissions from the trucks used to trim trees.

Remotely disconnecting power through next-generation AMI systems — coupled with improved management of distributed energy resources — can curtail load on a grid to mitigate imbalances between the supply and demand of power during storms. This mitigates major outages of the size and magnitude of what we witnessed last winter in Texas. While some outages are unavoidable, leaving the grid exposed to massive imbalances between the supply and demand for electricity can lead to widespread and unplanned outages that hamper emergency response teams and hospitals.

A data-driven smart grid can tap into real-time information from every connected device in the network. This data can then be used to proactively create sequenced and managed outages to immediately reduce the load factor of a distribution grid, thereby preserving the necessary power to keep vital services up and running. And when equipment is damaged and needs to be replaced due to extreme weather, data from connected devices can help utilities identify the most critical areas and restore power as quickly as possible.

In the long term, a digitized distribution grid allows utilities to incorporate new technologies like EVs and DERs into their network, thereby improving their carbon footprints. Utilities can leverage a robust AMI system and smart grid network to go behind the meter, literally stitching every EV, solar panel and battery wall into the larger network of connected devices to island areas of their community and become more resilient. Data analytics tools let the utility know when it needs to draw power from these resources at peak demand instead of calling for more power from a carbon-emitting peaker power plant.

And the benefits don't stop there. A truly interoperable, data-driven smart grid can also:

- Educate consumers regarding their energy and water usage to reduce waste.
- Pinpoint the location of water and gas leaks to reduce losses and mitigate environmental impact.
- Facilitate the electrification of transportation and heating at scale by providing active management needed for the grid to accommodate the new demand.
- Enable the grid to embrace more renewable generation by coordinating the storage of excess energy.
- Shift demand to lower-carbon sources, which sends market signals that incentivize investment in renewable generation.

But these benefits are only available when a utility has taken the critical first step of installing a smart grid solution that can access and interpret data across multiple silos, from headquarters to devices located behind the meter. It's the foundation upon which multiple data-driven solutions can be built and delivered. →



Time to embrace the future

For utilities, the time is now to move beyond the one-directional, siloed mentality that permeated electricity providers in the 20th Century. A utility cannot achieve long-term sustainability by simply buying power from generators and then selling it to homes and businesses. Those that continue down that path will not remain operationally and financially viable. Nor will they comply with increasingly stringent environmental regulations. And they will consequently hamper their communities' ability to grow economically and attract the businesses of the future.

Increasing demand for energy, the rise in EVs and DERs, extreme weather events and the ongoing demand for innovative, data-driven services — these trends are not solved by the mere delivery of energy. These trends are answered by a reliable, robust, smart and truly interoperable smart grid network. And the utilities that thrive in the future will be the ones that become truly sustainable by embracing the power of data.

So, as utility leaders look to become part of local and global environmental solutions, many are beginning to ask themselves some hard questions:

What's my path toward becoming a truly sustainable utility?

Where can my utility make the most impact in mitigating environmental disruptions and achieving compliance with increasing environmental regulations?

How can I ensure that my utility — and the communities we serve — will thrive in the long run, both economically and environmentally?

And what role can data from a smart grid play in helping me get there?

ABOUT PETE LONDA:

Pete Londa is a seasoned smart grid technology executive with over 20 years of experience in leadership roles. He joined Tantalus as president & Chief Executive Officer in 2014 and is also a director of Tantalus. Prior to joining Tantalus, Londa served as the independent chair of the board of directors for World Energy Solutions, Inc., a publicly traded company on NASDAQ where he also served as the chair of the Merger and Acquisition Committee. He was actively involved in leading World Energy's sale to EnerNOC (ticker: ENOC), another publicly traded company on NASDAQ. Previously, Londa served as the CEO of BPL Global, LTD., a smart grid company with operations in the U.S., Europe, Middle East, India and China. Londa is a graduate of Emory University and holds a JD, MBA in finance and corporate law and a B.A. in economics.



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RAIK KULINNA

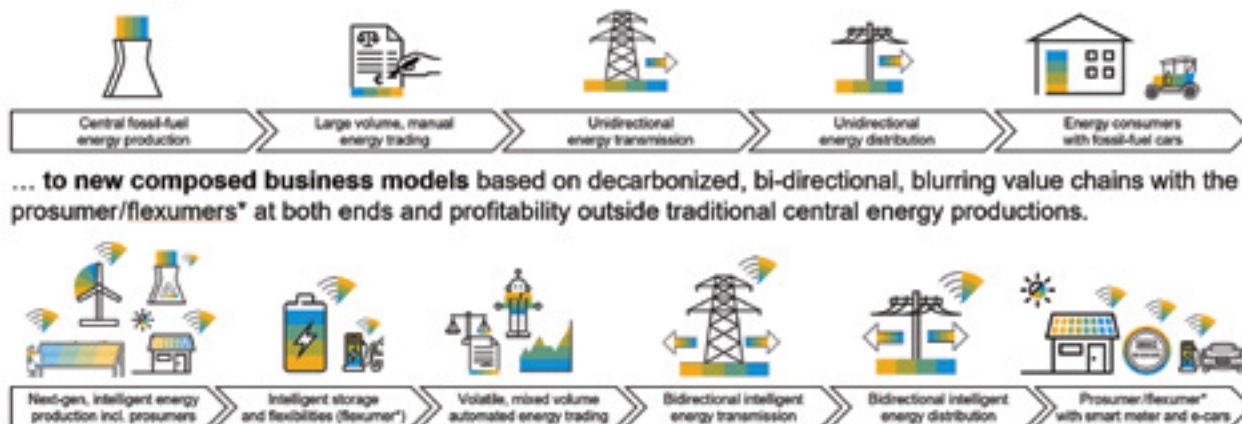
The idea of a regulated utility providing energy-as-a-service (EaaS) may seem redundant. Utilities have been in the business of delivering electricity since the late 19th century, after all. How might this particular wrinkle on XaaS (everything-as-a-service) be different than that pertaining to any other service business just doing what it already does: the transportation-as-a-service of the airline, the dining-as-a-service of a restaurant, or the snipping-as-a-service of a barber, say?

The answer, as those in the business of providing electricity well know, is that a combination of market and regulatory pressures, environmental concerns, geopolitical disruptions, consumer preferences and technological advances is fast changing how and where electricity is generated, used and stored. That, in turn, is altering the historically straightforward relationship between utilities and their customers.

The global push toward distributed renewable-energy generation (as in rooftop solar panels) and, to a lesser extent, storage (such as wall-mounted battery packs) is the primary driver of this evolving relationship. Electricity consumers have forever paid simple bills for power generated centrally and delivered through traditional, one-way transmission and distribution infrastructure. Those consumers are morphing into “prosumers” who use as well as produce electricity — and even into “flexumers,” who not only consume and produce, but also lend flexibility to the grid. →

The Energy Transition Is a Large Change Management Program

Energy utilities are moving from traditional, fossil-fuel-based, one-directional, simple business models with the energy consumer at the end of the value chain...



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* Flexumer = Energy Consumer + Energy Producer + Energy Flexibilities

Energy-as-a-service represents a profound change in the way utilities do business. With that change come challenges – and also big opportunities.

The implications for utilities are hard to miss. If you make your money by delivering electrons, and prosumers and flexumers are using fewer of your electrons because they're producing and storing electrons of their own, you're going to make less money.

The key question for utilities is this: How do you grow earnings despite selling fewer kilowatt-hours amid a rapidly evolving power-generation and consumption paradigm involving the mass uptake of products such as solar panels, heat pumps, battery packs, demand-side management add-ons to cycle air conditioners on and off and energy-efficiency-enhancing hardware such as smart thermostats, to name a few. EaaS for electric utilities is about the servitization of these sorts of products – combined with traditional electricity delivery as well as new service offerings – as a central element of a more sustainable, renewable, efficient and holistic energy production and delivery ecosystem with the utility at its nexus.

A new business model

The International Renewable Energy Agency [has categorized](#) public-utility EaaS opportunities into three general areas. Energy advice harnesses a utility's expertise to help customers identify opportunities

to optimize energy consumption and minimize cost. This drives sales for other services and, potentially, can generate fee-based revenue. Next is the sale and installation of energy assets and end-to-end services related to renewable energy generation and storage systems. Finally, energy management involves the monitoring, control and optimization of a customer's power production and usage over time, again with an emphasis on efficiency and cost savings.

One might ask whether a utility shouldn't simply farm out these sorts of services via energy-services companies (ESCOs, which profit from their clients' energy savings), information and communications technology companies (ICTs, whose technologies provide insights and fine-grained energy management capabilities) and others. It will take a village of players to realize EaaS, after all. But utilities should ask themselves the degree to which they should cede this new terrain to others – as opposed to exploiting both their historic status as natural monopolies and their hard-earned brand equity as energy providers and trusted partners.

The vision should be of a one-stop shop for all things energy-related, and such "shops" are desperately needed. Consumers and businesses are increasingly faced with complex questions related to their energy use and

production: How many and what sorts of solar panels may be appropriate? What's the right heat pump or whole-house fan or wall-mounted battery box? How can different elements of a prospective prosumer's portfolio most optimally combine? What energy-efficiency measures offer the most favorable payback? What financing options and rebates are available? What smart-home options are out there? How might an electric vehicle (EV) alter a household's energy calculus?

A utility pursuing EaaS must be able to do more than just answer these sorts of questions. It must be able to profit from those answers through an ability to assemble bundles of products and services that help the utility make money while benefitting its customers and the planet.

Doing so lets the utility retain and expand upon its natural role at the hub of all things electric — a role that will only grow with the global drive toward the electrification of transportation and space heating. Consider also that the utility's scale and, in a given geography, total market penetration, position it to harvest efficiencies others simply can't.

It alone has comprehensive insights into who's producing and consuming how much energy, when and where. The utility knows the local high school is sipping electricity at midnight even as the factory a few miles down the road is ramping up its third shift. It knows who has wireless demand-side management switches hooked to their air conditioners and how the weather — which can influence not only cooling demand but also the variable production of wind and solar — is likely to influence how many of those switches will need to cycle AC units off to shave summer demand peaks. Machine learning and artificial intelligence (AI) will increasingly be coming into play, and with both, scale is indispensable to accuracy. Consider the potential of AI in managing and fine-tuning the charging of electric-vehicle fleets based on predictive models of individual drivers' behavior, among other potential applications of these technologies.

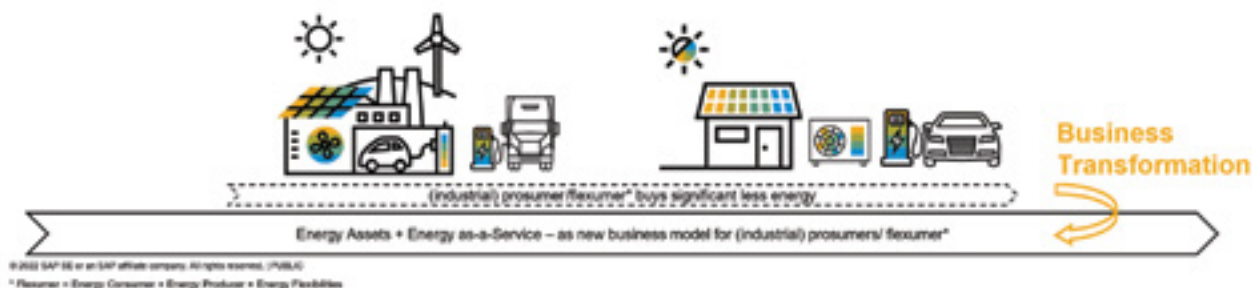
For all these reasons, EaaS appears to be the logical way forward for electric utilities — and, perhaps, the only way forward with a growth path. So how to embark on the EaaS journey? →

Energy-as-a-Service Opportunities in the Energy/Heat/Mobility Transition

Utilities' customers are moving from **classic customers with fossil-based energy**....



... to new **self-sufficient prosumers / flexumers***. Energy-as-a-service is a new business model that refines the sharp drop in energy purchases.



Utilities must adapt to grow revenues despite customers buying less centrally produced energy because they're generating their own.

Two key building blocks

Delivering on the promise of EaaS requires building for a future rife with uncertainties: ever-evolving market pressures and consumer tastes, technological advances in energy production and storage and shifting regulatory environments among them. The good news is, you can address a lot of that uncertainty by focusing on just two aspects of IT infrastructure: the billing system and the customer service portal.

The focus on billing and customer-service systems is not to discount the importance of systems dedicated to logistics, fulfillment, maintenance, supplier- and subcontractor-relationship management, field-technician solutions, purchasing-related systems and other indispensable aspects of a utility's IT portfolio. It's that the changes EaaS bring will manifest primarily in higher transaction volumes for those systems — the functionality, in other words, tends to be there already.

Not so with the billing system, whose upgrading represents an indispensable EaaS investment. Legacy utility billing systems perhaps can handle a few pricing tiers based on seasonality or usage. But they are rarely up to the task of mixing and matching various hardware

and service solutions into products designed for different customer segments — or, ideally, targeting individual customers. And if you can't bill for EaaS bundles, you can't bundle.

Customer-service portals demand similar enhancement in pursuit of EaaS. Today's customer-service portals tend to be visually pleasing but light on functionality, perhaps able to deliver service — and outage-related information, possibly capable of generic price comparisons. Next-generation customer-service portals will have the ability to formulate and display EaaS product-and-service bundles based on a customer's location, usage patterns and other factors.

For example, why not incorporate GIS technologies to identify homes with greater solar-energy production potential and offer them discounts? Why not register that a particular customer was shopping for seven-kilowatt solar-panel packages last time she visited and remind her that customers who shopped for seven-kilowatt packages also looked at 10-kilowatt packages? Why not remind her that, given her tendency to charge her EV during peak hours and high time-of-use rates, a wall-mounted battery would both pay for itself over time and contribute to the stability of the grid, helping her neighbors as well as herself.



A new relationship

This represents a major departure from utility customers' historic relationship with their energy providers, which generally consisted of touching base on those rare occasions when there was a billing issue, a service outage, or a shutoff and restart of power having to do with relocation. A reacquaintance, on mutually beneficial terms, is long overdue.

EaaS-capable billing systems and customer-service portals are, of course, two sides of the same coin, both indispensable in enabling the flexibility to offer customers what they want (or they don't yet know they want). That flexibility will be increasingly important as the consumer-to-prosumer/flexumer transition expands out from highly motivated early adopters — who have made the nontrivial effort to familiarize themselves with the details of energy terminology — to mainstream customers lacking the time or interest in steeping themselves in the vagaries of demand-side management, time-of-use pricing and so forth.

One imagines future scenarios in which AI-augmented solutions tease out usage patterns; dynamically assemble portfolios of hardware, service and software solutions based on individual customers' energy-related expenditures; present bundles of varying ambition and cost to those customers, and then price and bill, based on subscription- or even outcome-based models.

But simpler models supported by upgraded billing solutions and customer-service portals can pay dividends in the near term. Utilities harnessing data available today plus good-old-fashioned human intelligence can manually develop a hierarchy of bundles that nudge reluctant customers — due to financial limitations, unfamiliarity with nontraditional energy technologies, or pure inertia — to dip their toes into renewables. One might start them on a wind-energy package, for example. Then, over time, one can upsell them to community solar, leased rooftop solar, storage systems, smart thermostats, heat pumps, appliances and lighting. As with XaaS in other spheres, the endgame is that the customer doesn't actually own anything. Rather, it's all available on a month-to-month, subscription basis.

This is already happening, of course. For more than a decade now, Sunrun and others have been offering residential customers rooftop solar as a service with zero or minimal up-front cost and manageable monthly lease payments over 20 years. The German utility EWE is working with Bosch, Vaillant, Viessmann and others to avail EWE customers of heat pumps and other climate-control systems to EWE customers at a fixed monthly rate. On the business-to-business side, Australia's AGL offers commercial customers bundles of solar and battery power, energy-efficient lighting, power-factor correction and demand response systems to lower costs and improve overall system reliability. Elsewhere, energy performance contracts (EPCs) and managed energy service agreements (MESAs) are becoming more and more common.

The prospect of rolling out energy-as-a-service can be daunting, but doing so is imperative for future corporate growth and climate stability. Utilities are well positioned in the marketplace and in the public imagination to take advantage of the opportunities that EaaS presents. They can take critical steps in doing so by investing in their customer-service portals and their billing systems — the two key building blocks of the flexibility needed to enable EaaS and thereby position themselves for a future of sustained profitability despite delivering fewer electrons in the name of a sustainable future.

ABOUT THE AUTHOR:

Raik Kulinna is global lead for Energy-as-a-Service at SAP, where he focuses on innovative technologies and new business models within the energy transition, heat transition and circular economy.

THE ADVENT OF SMART GRIDS, CUTTING- EDGE TECHNOLOGIES, EQUIPMENT AND CONTROLS

TO HELP U.S. UTILITIES AND GRID OPERATORS
IMPROVE RESILIENCY

ROBERT DENDA

After experiencing a long, hot summer, utilities and grid operators across the United States are understandably apprehensive. Searing summer heat, severe drought conditions and an above-normal hurricane season, coupled with a surge in electric demand higher than pre-pandemic levels, electric capacity shortfalls and aging plant infrastructure, will further expose the need for grid modernization to improve resiliency.

This is why the nation's power grid must become smarter, digitalized and more participatory through the adoption of new solutions and cutting-edge technologies, equipment and controls like Digital Twin software and advanced distribution automation.

An urgent, aggressive commitment by utilities and grid operators to implement smart grids and new digital technologies, equipment and controls will be key to creating more resiliency. Digitizing the grid takes time and if utilities and grid operators don't act now then the U.S. will only fall further behind. With smart grids and new digital solutions, the U.S. power grid will be better able to withstand more extreme weather and big demand and supply swings while advancing the nation toward a fully electrified, sustainable future.

Climate change and ever-increasing grid vulnerabilities

A focus on grid resiliency is especially critical given the ever-increasing grid vulnerabilities, including impacts of climate change which manifest as extreme weather, heat and drought. These conditions can disrupt electricity flow to households across the U.S. while costs climb and, most importantly, put American lives at risk.

Lake Powell gave us a preview of what is coming this summer when in May of this year, the nation's second-largest reservoir, supplying water and hydroelectric power to millions across the West plummeted to its lowest level ever. The National Oceanic and Atmospheric Administration (NOAA) forecasts that almost all of the contiguous US will experience above-normal temperatures, which combined with below-average rainfall, creates a recipe for ongoing megadrought conditions. →



Beyond the effects of climate change, the U.S. is projected to experience significant electric capacity shortfalls due to aging infrastructure and power plant retirements. In fact, the North American Electric Reliability Corporation (NERC) reported in its summer reliability assessment that the Midcontinent Independent Systems Operator (MISO) in particular, will face a 1.7% increase in peak demand with 2.3% less generation capacity than last year, resulting in high risk for energy emergencies during this summer peak. Other regions NERC flagged for capacity shortfalls due to extreme heat and drought conditions include Texas, the Missouri River Basin and the Western Interconnection.

Climate change and capacity shortfalls are a few of the critical factors underscoring the need to modernize the U.S. power grid with digital solutions, so it can withstand future weather events and mitigate power outages — while also saving lives, protecting property and keeping the economy running.

U.S. utilities and grid operators can improve grid resiliency now

As we move towards a fully electrified, sustainable future, utilities and grid operators need to be armed with intelligent digital solutions that address what is projected to be a summer of historic post-pandemic consumer demand and an increase in extreme weather, particularly hurricanes, heat waves and drought. These include technologies to digitize field operations, network infrastructure, meters and grids, as well as microgrids.

Metering and grid edge digitalization

Advanced metering infrastructure collects data that helps operators anticipate grid maintenance and faults to help keep the lights on when customers need them. Europe and Latin America are ahead of the curve in their adoption of advanced second-generation metering infrastructure and can serve as models for U.S. utilities and grid operators. Italy, for example, carried out a massive rollout of smart meters in the 2000s and is undergoing a second-generation roll-out with very advanced functionalities. The Brazilian city of São Paulo has also been installing smart meter solutions since 2021. Smart meter solutions allow customers more control over their consumption and make their electricity bills more transparent, which includes the ability for customers to manage their accounts and energy profiles through an app.

Network infrastructure digitalization

U.S. utilities and grid operators should also consider embracing virtualization technologies and decentralized computational capability that allow them to run critical grid functions while simultaneously reducing the number of necessary physical components. This, in turn, allows networks to operate at scale more efficiently and sustainably, even in the face of unpredictable weather and capacity shortfalls. Key functionalities for network infrastructure digitalization include metering data management, load profiling, power quality, asset health and performance monitoring and loss minimization.

Field operations digitalization

Digital Twin software for the grid is a new model created through artificial intelligence (AI) and drone scan data to replicate the entire network as well as its individual components and its operations. This specific technology allows for simulated testing of the grid under all possible conditions as well as predictive maintenance through machine learning algorithms. Climate change and increasingly extreme weather patterns pose a challenge in tackling possible fires and trees falling on electricity distribution lines and poles, which might cause outages — that's where Digital Twin software can step in and help.

Microgrids

The island of Puerto Rico has deployed microgrids that integrate solar projects with battery storage. These self-sufficient energy systems can operate independently of the central electric grid, even in the event of power outages. Microgrids create a more participatory grid where individuals may discharge electricity back to the local grid, thereby counteracting extreme weather and outage events by balancing where, when and how electricity is consumed. Microgrids also provide savings on electricity costs by taking power from the grid only when it is cheaper, thanks to distributed generation and batteries to boost self-consumption.

The [installation of resilient service stations at local convenience stores or gas stations](#), for example, incorporates microgrids and can help communities maintain power when the grid goes offline. Resilient service stations provide refueling, water, food, Wi-Fi connections and other essential resources, including critical support to first responders and utility crews during an emergency. Continuous power for service stations near evacuation routes will keep them running during power outages — a major concern for coastal states this hurricane season.



Let the U.S. grid transformation begin

Utilities and grid operators in the U.S. are at a unique crossroads to embrace smart grids, cutting-edge technologies, equipment and controls to improve grid resiliency, ahead of a summer projected to be fraught with high temperatures, capacity shortfalls and an increase in electric demand. Innovation through smart grid adoption

and digital solutions like Digital Twin software, as well as resiliency solutions like microgrids demonstrate it is high time to accelerate grid modernization in the U.S. to create a more resilient grid and better respond to mounting grid vulnerabilities.



ABOUT THE AUTHOR:

Robert Denda is the sole administrator and CEO of Gridspertise. He served as head of innovation and industrialization at the Enel Global Infrastructure and Networks Business Line, and previously, as head of network technology and innovation. In that capacity, he led the development and application of digital grid technologies at the largest privately-owned international operator of power distribution grids, serving 74 million customers. As global head of smart metering solutions from 2014 to 2015, he oversaw Enel's international rollout of digital meters, building on his previous experience in coordinating the rollout of 13 million smart meters for Enel Group subsidiary Endesa in Spain. He is an active participant in European and international energy sector associations.

Denda holds a degree in computer science and business administration and a Ph.D. from the University of Mannheim in Germany.

SMART UTILITY NETWORK ENABLES RESILIENT TORNADO RECOVERY

KENTUCKY CO-OP RESTORED POWER TO 30,000 MEMBERS USING REMOTELY-MANAGED TECHNOLOGY

DAN BENNETT

Nothing could have prepared Western Kentucky for the powerful tornado that tore through communities in December 2021. Homes were leveled. Community landmarks were demolished. Mass power outages.

“The level of destruction was unlike anything I’ve ever seen,” said David Smart, the president and CEO of West Kentucky Rural Electric Cooperative. “...a path 38 miles long and a mile wide in our service territory.”

While the damage was immense and difficult to measure, West Kentucky Rural Electric Cooperative knew the community needed their power restored and got to work. Within an hour of touchdown, West Kentucky’s staff assembled to begin assessing damage to the distribution system. Within 24 hours, 115 line personnel were out in the community restoring power and helping their neighbors. →





The reliable FlexNet communication network enabled the co-op to remotely determine which meters were without power and move quickly toward recovery.



West Kentucky Rural Electric Cooperative got right to work following a devastating tornado. Within an hour of touchdown, the co-op's team began assessing damage to the distribution system.

Preparedness ensures prompt restoration

Electricity was restored to more than 30,000 co-op members across Graves and Marshall Counties within just eight days. The utility and its membership had the distinct advantage of remotely-managed, resilient infrastructure from a North Carolina-based provider of smart technologies and services for utilities.

Just five years earlier, the co-op had deployed the same provider's communication network, which is a reliable, point-to-multipoint system that enables near real-time meter data monitoring that allowed them to pinpoint how many meters were damaged.

Following the storm, experts from the services provider traveled to the region to confirm the system had survived. All network gear withstood the catastrophe and the network's outage notifications helped target where restoration efforts should begin.

"The network helped us determine if there was still a meter without power in the field, as opposed to us sending out a truck," said Smart. "It allowed us to pinpoint outages quicker and we restored power to all our co-op members in almost a week's time."

It also helped identify the 218 homes destroyed beyond repair in the co-op's service area.

A tale of precaution

Smart recalled asset and data backup as one of the most important lessons learned. The co-op's main office remained structurally intact, but directly across the street, a candle factory was leveled by the tornado. Just down the road, the provider's operations center somehow avoided destruction.

"Our main office and our operations center are only two miles apart," said Smart. "We were dangerously close to losing all of the trucks and equipment that make the emergency recovery efforts possible."

The ordeal led Smart to consider opening a secondary, offsite IT, data and operations center to ensure that local weather emergencies would not affect it. He was relieved to know that the provider had backed up and managed all data from their customers' smart utility devices in a secure location. This hosted solution provides an insurance policy for data in times of emergency.

"This time we were able to access our own data, but it's nice to know we have a safety net," said Smart. "You can never have enough redundancy when it comes to resilient operations."



As part of the co-op family, we're committed to service, and we'll return the favor when another electricity provider needs mutual aid. We are truly stronger together.



Line personnel and mutual aid crews from across the region displayed a heroic dedication to service and community while working to restore power to all members within eight days after the tornado in Marshall and Graves counties.

Kindness in times of crisis

Community is defined as fellowship with others who share common goals. In the wake of this tragedy, line personnel, first responders and volunteers across the region came together for one common goal: to help their neighbors in need.

Disaster relief agencies rushed to the area's aid. Volunteers lent a hand wherever needed. Mutual aid crews from across Kentucky, joined by teams from Tupelo, Mississippi and numerous contractors partnered with West Kentucky's crews to replace 250 transformers and stand up nearly 500 poles. The communications network services provider stepped up once again, partnering with Americares to set up a charitable campaign that yielded \$28,000 in relief funds.

"This is the epitome of what America is all about," said Smart. "As part of the co-op family, we're committed to service, and we'll return the favor when another electricity provider needs mutual aid. We are truly stronger together."



ABOUT THE AUTHOR:

Dan Bennett is the vice president of product management, energy solutions with Xylem. He has nine years of service with the smart technology company. He earned a Bachelor of Science degree in both electrical engineering and computer engineering from North Carolina State University in Raleigh.

YOUR EQUIPMENT IS NOT GETTING ANY YOUNGER

KELVIN SEVERIN, PE

Time is constantly working against operating equipment in a plant. Over time, components of the equipment reach the end of their useful lifespan and need to be replaced. Manufacturers go out of business or are no longer producing parts for antiquated equipment. Technology advances and new and improved standardized models are developed, causing components to become outdated or obsolete. Industry standards are revised resulting in non-compliant components. Many processing facilities in the United States were built decades ago and have never been upgraded and maintaining aging equipment can be a challenge as parts for the old equipment are often no longer available or very expensive.

If aging equipment is not managed properly in relation to its expected lifespan, it can result in avoidable safety incidents, or maintenance and reliability issues. Most equipment has a specified life expectancy, and pushing it beyond its useful life can put an operating facility at risk. Some older systems and instrumentation do not have the technology for diagnostics, and therefore, have no ability to query or troubleshoot the operating issue, resulting in extended shutdowns. Additionally, companies may face a loss of production and revenue in the event of mechanical issues with a piece of antiquated operating equipment, systems or instrumentation that causes the process to go offline.

When one Germany-based infrastructure technology company discontinued its popular automation controller in 2017, many of its customers were confronted with the decision of whether to continue operating with the obsolete controller or upgrade to a new control system. For example, a boiler at a petrochemical facility operated on single-loop controllers that were linked together. If the facility continued to run with the obsolete controller, means of future replacement were limited to a used warehouse, salvage dealer, or eBay. The refurbished equipment shop presented options for new controllers to replace the obsolete controllers, however, the configurations were different and incompatible with the existing configuration and linking. Furthermore, if the obsolete controllers were retained and the boiler went offline due to operational issues, there would be longer downtime to resolve the problem since there were few qualified personnel at the facility who could reprogram or troubleshoot the potential issue with the obsolete controllers. This potential operational interruption translated to loss of revenue and greater operating risk while the boiler was down. →





The petrochemical facility's solution was to update the boiler with a new control system. Rather than trying to retrofit antiquated controllers, the company elected to replace the single loop controllers with a safety Programmable Logic Controller (PLC) system while also closing gaps with the current standards. This new integrated system had higher reliability and easier diagnosis if there was a process upset in comparison to its obsolete components, and it brought the facility in compliance with current NFPA standards.

At a separate chemical plant, a company was confronted with the decision of how to replace a failed actuator on the air inlet valve with a process furnace that had been originally acquired from a third-party source. The manufacturer had gone out of business in the 1970s, and the company could not find a replacement-in-kind for the failed actuator or replacement parts to recondition the valve. Instead, they bought a third-party actuator which required a homemade linkage to tie the actuator to the air inlet valve to make it work. However, shortly after being installed, the valve lost its functionality, and the process had to be shut down to recalibrate and adjust the homemade linkage. After multiple iterations of manipulating the valve assembly to regain its functionality, the air inlet valve began to leak, due to its age and frequent cycles of adjustments to the actuator and valve linkage. Maintenance costs increased, as the chemical plant needed to routinely shut down the furnace and production to re-adjust the faulty valve.

Although a valve replacement was certainly necessary by this point, the original 12" valve had not been manufactured to any ANSI standards from a flange dimensional perspective, so no new valve would fit into the current location of this particular valve without piping rework. Significant expenditures became necessary for both a new 12" valve — one that used current technology and control mechanisms matching the original functionality — along with expensive air piping reconfiguration. The maintenance cost and downtime could have been minimized had the obsolete valve and associated actuator been replaced sooner. The upside for the chemical plant was that future replacement of the newly installed standardized valve will be much easier and less costly than the effort that had been required to change out the custom-built valve installed pre-1970.

Older fired equipment can be repaired, inspected and fit for service, but an outdated control system may be unrepairable and unsafe. Refurbished pieces have no guarantee of reliability and are often as old as the part being replaced. Possible failures of any obsolete piece or part could cause an incorrect and dangerous operation with potential damage to the equipment, facility, or people in the area. Delaying an upgrade of aging equipment or replacement of obsolete parts may have costly long-term implications, as additional reconfiguration and solutions may be required if an older unit cannot be easily converted into newer technology. The best solution is to proactively

take the opportunity to improve safety by replacing outdated systems and bringing them up to current codes and standards.

A cost-effective first step to address aging equipment is a conceptual level screening checklist that evaluates equipment systematically to identify deficiencies in the components. Facilities may be unaware of serious issues, and this checklist allows companies to make informed decisions and prioritize potential upgrades to aging equipment. This applies to both long-standing operating facilities as well as companies who recently purchased an existing facility, as they may not recognize the condition of all assets and/or older equipment they acquired.

After identifying areas of improvement, a plan can be developed for replacing the obsolete components that are approaching the end of their useful life. This plan should assess the safety concerns, mechanical concerns and operational risks to the facility. It should also include a timeline for how soon the antiquated components should be replaced. The best replacement option is provided with qualities such as reliability and resilience to assure a long lifespan, aligning with regulatory codes and adaptability to future system upgrades installed at the facility.

Entire systems may not necessarily need to be replaced. Not all components of a fired equipment system may need to be upgraded to newer technology, only the critical instrumentation that is dedicated to the safety and operation of the boiler such as the Burner Management System (BMS). If the Combustion Control System (CCS) is well-maintained and does not challenge the BMS, it can be reasonable to assume its reliability and replace only the BMS. Fired equipment systems should be assessed comprehensively and by individual subsystems to determine which antiquated parts should be upgraded to newer technology to ensure dedication to the continued safety and operation of the unit.

Every facility should review its equipment to verify its life expectancy and ensure it is safe and reliable for continued operation. Just because a piece of equipment has been running for 50 or more years does not mean it is safe. Suppose a facility is unable to find replacement parts or utilizes replacement parts sourced outside of the normal supply chain from the manufacturer to adapt to the existing system. In that case, this short-term solution could potentially perpetuate the mechanical and reliability issues. A conceptual level screening checklist can assess the status of aging equipment components, and proactive replacement measures can be taken to create a resilient system going forward.



ABOUT THE AUTHOR:

Kelvin Severin, PE is a senior project engineer with aeSolutions and has more than 26 years of project management, project engineering, electrical instrumentation and control design engineering experience with petrochemical clients. Project types range from grassroots facilities and plant expansions to control system upgrades, safety systems, Boiler BMS systems and control, new electrical systems and upgrades, and electrical and instrumentation design for equipment and process additions. He has served as an electrical / instrument / controls project engineer, electrical / instrument / controls maintenance engineer.

IEEE PES T&D CONFERENCE AND EXPOSITION: A HUGE SUCCESS

WAYNE BISHOP JR.

The IEEE PES T&D Conference and Exposition was held from April 25-28, 2022, in New Orleans. For many, this was their first in-person conference and trade show since the shutdown caused by the COVID-19 pandemic.

New Orleans, fondly known as the Crescent City, was the perfect location to celebrate being back in person as an industry. There were 10,450 attendees from 63 different countries. The exhibit floor was jam-packed, with 660 exhibiting companies displaying the latest technologies and solutions. The technical program included 128 presentations with 606 presenters. Panels were a particularly popular format, which included three Super Sessions. The Super Sessions included:

- Exploring the road map of data analytics and artificial intelligence for the future grid.
- Preparing for anything: resilient system design.
- Decarbonization and grid modernization.

I recently caught up with IEEE PES T&D Conference Director Carl Segneri, who has been leading the T&D Conference and Expo for over 10 years. As Segneri said about the event, “I was thrilled to see the 2022 T&D Conference attendance exceeded our projections. I was happy to see many utility attendees, as utilities bought more than 170 of our new Utility Saver bundle discount packages we introduced this year.

“The exhibits and technical program were as good as ever, kicked off by our opening panel (Ed Schweitzer, Allison Silverstein, Damir Novosel and Paul Hinnenkamp, and moderated by PES President Jessica Bian.) Their discussion of ‘The Past Powering the Future’ was provocative and inspiring. The T&D Conference highlighted why it is so awesome to be part of this industry and stressed how T&D is so vital to the US and global economy.” →



The event kicked off with the opening reception at Mardi Gras World. Thousands of T&D attendees enjoyed the entertainment, music, local New Orleans cuisine and some of the country's best hospitality. The opening reception was a great way to reconnect with PES Members and industry colleagues while having a lot of fun too.

This year's IEEE PES T&D was hosted by Entergy, and Michelle Bourg was the organizing chair. Bourg, her team at Entergy and the entire T&D Organizing Committee did an outstanding job organizing the event, from logistics, to the student program, to technical tours, along with a technical program that was second-to-none.

We added several new initiatives to this year's T&D including:

- **Innovation Stages**

The new innovation stages were located in two places on the Expo floor. These innovation stages featured 12 different companies giving Tedtalk-style presentations lasting 30 minutes. Presentations were about current industry trends and new technologies happening in the industry. There are so many changes happening in our industry and so this was a good way for attendees to bring themselves up to date on some of these changes and new technologies.



• IEEE Smart Cities Pavilion

The IEEE Smart Cities Pavilion was a new feature on the exhibit floor. Developed in partnership with IEEE Smart Cities, this dedicated Pavilion featured a variety of presentations and case study exhibits, showcasing the effective collaboration necessary to make smarter cities a reality. Attendees were given access to the latest in new technologies and real-world applications meant to promote business and connect thousands of attendees from around the globe, with best practices for urban planning and smart city innovations.

• Utility Super Saver Program for Registration

To encourage more utility attendees, we added the new utility bundle registration package. Utilities could register 10 employees for only \$1000, which was an incredible savings. Utilities could buy as many bundles of 10 as they wished.

According to Barbara Powell, T&D operations manager, and one of the event's organizers for over 30 years, "The IEEE PES T&D Conference has always been 'the one you cannot miss.' The 2022 event in New Orleans proved why. The depth of the technical program was appreciated by the attendees who could choose from the accepted papers, panels and the three Super Sessions. The excitement in the exhibit hall did not disappoint, either. The products and services of the 650 exhibiting companies gave the attendees the close-up look that they have missed in the four years, since the last T&D. Also, in the exhibit hall, the introduction of the Innovation Stages and the Smart Cities Pavilion were extremely well received. The last word should go to the first event, the opening reception at Mardi Gras World was the best ever. Congratulations to the New Orleans Local Organizing Committee for a great show!"

Plans are already underway for the next IEEE PES T&D Conference and Exposition, which will be held in Anaheim, California from May 7 through 9 in 2024. The host utility for the next IEEE T&D will be Southern California Edison.



ABOUT THE AUTHOR:

Wayne Bishop Jr. has worked in the electric power industry for more than 30 years.

He is currently the senior director of industry outreach at Quanta Technology. Bishop is also IEEE PES vice president of meetings and conferences and a member of the IEEE PES Governing Board. Additionally, he is a senior member of IEEE.

Previously, Bishop worked at OMICRON electronics where he was the head of marketing for North America for 13 years. Before that, he was employed at Doble Engineering for more than 16 years in several senior management positions. Bishop is a graduate of Merrimack College, Harvard University and the Executive MBA Program at Suffolk University in Boston, graduating with honors.

BGE'S CONNECTED ANNAPOLIS ACHIEVES FIRST-EVER ENERGY STAR SHEMS CERTIFICATION

UTILITY COMBINES REAL-TIME REPORTING OF ENERGY USE WITH SMART HOME TECHNOLOGY, PAVING THE WAY FOR UTILITIES TO LEAD THE WAY IN THE FUTURE OF CONNECTED HOME

SAMUEL DUPONT AND JULIET SHAVIT

ENERGY STAR is the gold standard for energy efficiency and is most frequently awarded to best-of-breed products that have demonstrated energy reduction. The Environmental Protection Agency (EPA) and ENERGY STAR stakeholders saw an opportunity to mitigate growing consumption and bring a focus on energy savings opportunities to the smart home market through development of ENERGY STAR certification criteria. The strategy was to leverage the powerful ENERGY STAR brand and partnership to guide smart home systems toward readily achievable energy savings in the near term while working toward the future of a smart home ecosystem capable of acting as a single touchpoint for consumers and utilities to manage energy consumption.¹

Baltimore Gas and Electric's (BGE) certification of the first smart home energy management solution breaks numerous barriers, including demonstrating that utilities and energy companies have an active role to play in commercial solutions development.

In March 2020, when the world was mostly shutting down due to COVID-19, BGE launched its Connected Home and Small Business Demonstration (CHBD), also known as Connected Annapolis. The purpose of the Demonstration was to understand the role connected customers played within a connected community. More specifically, the utility wanted to explore the combined impact of smart home technology and education on energy reduction. The technology demonstration offered exclusively in Annapolis, MD (BGE service territory), allowed four user groups to receive a combination of smart home devices as well as support from a robust education and outreach program designed to empower customers to take control of their energy use through SHEMS technology. The four user groups were intentional so that the utility could identify potential differences and opportunities in engaging with each kind of customer: Early Adopter, Small Business, Low Income and Senior. →

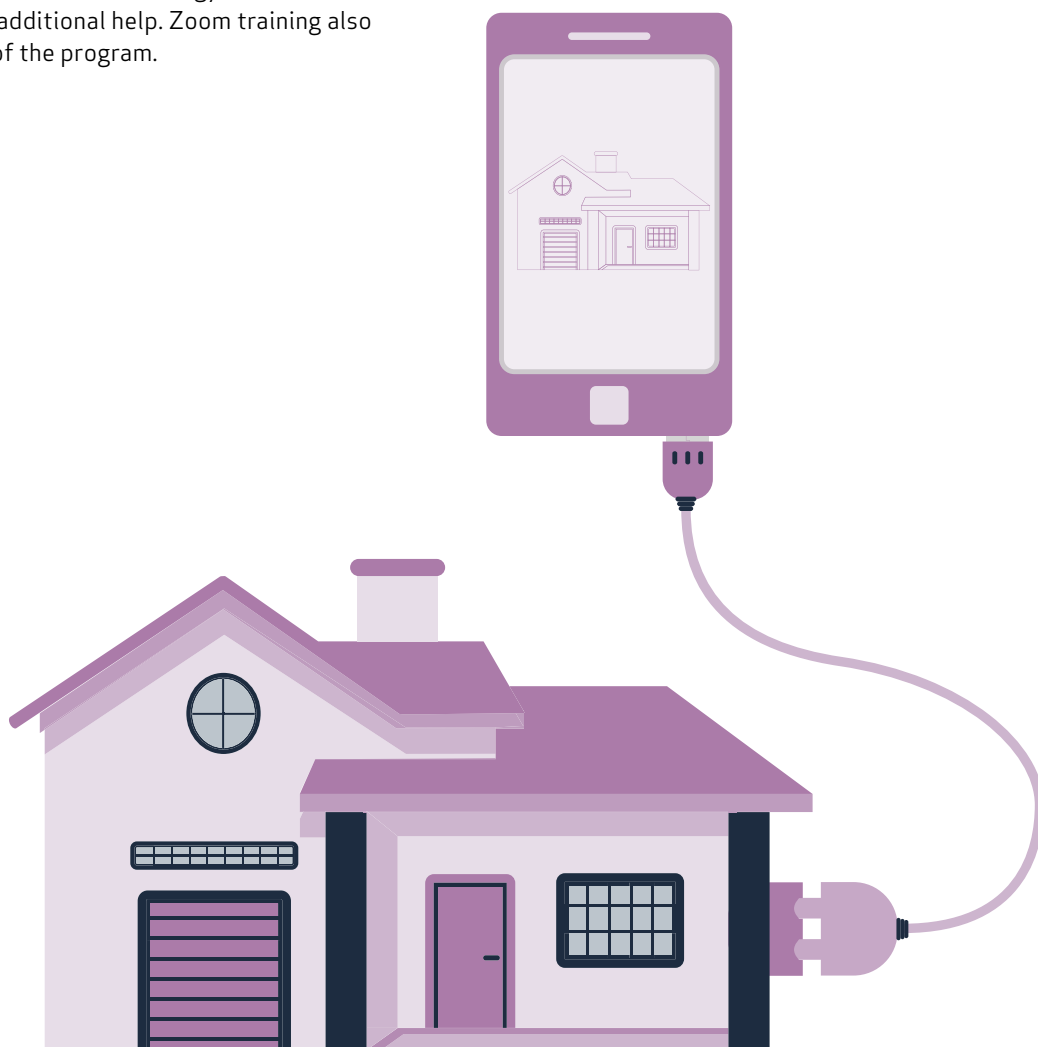
¹ Environmental Protection Agency, *ENERGY STAR® Certified Smart Home Energy Management Systems Energy Efficiency Program Sponsor Frequently Asked Questions*, 1.



Demonstration participants received a package in the mail that was designed for their user group. These devices were a combination of a z-wave hub, instructions to download the compatible app, door and window sensors, motion sensors, water leak detectors, smart plugs and Energy Star-certified lighting. Initially, participants received a coupon for a free installation of a smart thermostat when the climate was safe again for installers to enter homes. Later in the Demonstration, when installation restrictions were lifted, participants could call and schedule this free installation at their convenience. All groups except the small business group received an Amazon Dot, and the Senior group had the added benefit of receiving a tablet.

Because of the unexpected pandemic, BGE had originally designed the program to have more in-person support and training; yet the new environment brought about a unique opportunity to engage with customers remotely. It made the emphasis on education and technical support that much more important. The Connected Annapolis team developed an online community whereby participants could watch video tutorials, download step-by-step instructions, learn about the technology and contact program managers for additional help. Zoom training also became a regular part of the program.

The ENERGY STAR team at the EPA learned about Connected Annapolis through its Smart Home Energy Management Systems working group (SHEMS). In discussions between EPA and the BGE Connected Annapolis Team, it became apparent that there was a unique opportunity to demonstrate real kWh reduction because of the way the program was conducting its own internal analyses leveraging AMI data. The 15-minute interval data became an important baseline for measurement and the Connected Annapolis team analyzed it three years before the technology deployment as well as the 12-month period after. To better correlate reduction to smart home device usage, the Connected Annapolis team was able to work with the technology vendor to collect real-time usage information for the different devices in the home. This data included thermostat adjustments, frequency of use of lighting and the additional smart devices as well as specific information about home/away programming and pre-configured room setups.



Integrating technology with utility programs

One of the things BGE was keenly interested in was the integration of smart home technology solutions with other existing energy efficiency programs. As a result, the Demonstration made an effort to market to and sign-up participants for the utility's demand response program, Connected Rewards. Because the utility was moving towards a "Bring Your Own Device" (BYOD) model, the Connected Annapolis team used thermostats that were compatible with the program. By doing this, the team was able to fulfill additional EPA requirements of ENERGY STAR certification including, demand-side events and targeted communications notifications, available by both text and email.

In addition to the demand response program, the Connected Annapolis team at BGE also utilized programs designed for small business thermostats and first-time smart thermostat residential customers.



We were pleased to see that the systems deployed in the pilot, while supported by substantial virtual training, successfully delivered both consumer amenity and savings



The role of utilities in SHEMS

BGE was excited to see how it could leverage its AMI network in the smart home demonstration, so designing measurement criteria around energy reduction and analysis through AMI data was critical from the start. In addition, participants were encouraged to view their data and understand energy patterns on BGE's My Account.

"BGE is proud to be a leader in showing how our industry can optimize AMI network investments and smart technology to provide our customers with cutting-edge tools that allow a greater degree of control over their energy usage and costs," said Alex Núñez, BGE senior vice president of Strategy & Regulatory Affairs

EPA was excited to see the successful deployment of ENERGY STAR-certified SHEMS through careful delivery of a program that provided valuable insights into small businesses, aging in place and low-income participant segments. "In the Connected Annapolis pilot, we saw how smart home can successfully bridge the gap between

the utility goals and consumer interests with key target audiences. We were pleased to see that the systems deployed in the pilot, while supported by substantial virtual training, successfully delivered both consumer amenity and savings," said Taylor Jantz-Sell, SHEMS Program Manager, EPA.

This use of AMI data led to an ongoing dialogue between BGE and EPA about the role of utilities in collecting and analyzing the usage data. It is important to note that Connected Annapolis was an opt-in program where customers received free technology in exchange for making their usage data available to BGE. Personal data was not shared with the EPA, and information was provided in aggregate and by average, with outlier information removed from the analysis.

It was important that BGE communicate to the industry that it was not focused on collecting or sharing personal data information of its customers. Rather, the utility was focused on understanding how and why people might benefit from such technology.

More importantly, the Connected Annapolis team was looking at aggregate data among users and sub-segments of the user groups to determine patterns and trends. Individual customer usage was looked at in conjunction with device usage, but this was reported anonymously to all stakeholders. No individual customer information was shared for privacy reasons.

Furthermore, the Connected Annapolis team conducted significant qualitative research to help put the data story further together.

Proving energy reduction and the unique role of the utility

Throughout the process of certification with the EPA it became more apparent that the utility was uniquely positioned to provide proof of energy reduction of the SHEMS devices in a way that, perhaps, product manufacturers had been struggling. As owners of the AMI data, utilities can produce evidence of energy reduction when coupled with the specific device usage information. In addition, as owners of many energy efficiency programs like demand response, the utility can conduct events that enable customers to save automatically through the SHEMS devices and subsequently demonstrate results through kWh and GHG reductions. →



BGE has a long history of innovating through advanced technologies, so when the opportunity to empower customers through smart home technology arose, it moved forward in trying to really understand the motivations for such technology use and the potential long-term impact of providing these devices to its customers. In particular, it also wanted to better explore the impact of these devices on lower-income customers who may not otherwise be motivated or able to spend more money on smart devices in the home. It turned out that this segment of participants yielded strong results, particularly during the summer high bill months.

Lessons learned

The ENERGY STAR certification process really allowed BGE to push the sustainability narrative forward. The Connected Annapolis team translated its energy reduction to greenhouse gas emissions helping bridge the objectives of both DOE and EPA. By focusing on customers and behavior instead of device specifications, the Connected Annapolis initiative brought home the power of *why*, and the critical importance of engaging with customers to educate and empower them.

Customer feedback was an important part of the Demonstration. Highlights of that feedback include:

- An interest from participants to purchase more smart devices to add to their setup.
- Looking to the utility as an advisor in smart energy technology solutions.
- Many customers who initially doubted their ability to engage with the technology, thrived with it.
- Many customers indicated a lack of awareness and understanding of smart home technology — why to purchase it, how to use it, etc.
- Many customers believed that if the utility had not offered this technology to them, they would not have purchased it on their own. Education played an important part in the process.

Some of the joint learnings between EPA and BGE focused on the critical ingredient of AMI data and the unique role utilities had in utilizing SHERMS for energy reduction. While utilities may not be the long-term distributor of such technology, it was clear that there is an important role to play in the deployment of these technologies for energy reduction specifically.

As utilities continue to innovate and expand energy efficiency programs as well as develop consumer marketplaces and BYOD programs, smart home technology is clearly an important piece of the future of energy management.

“We are proud to align technology and the needs of our customers with our Path to Clean goal to achieve net-zero operational emissions by 2050. As we push toward this goal, we will continue to experiment with new technologies, offerings and platforms to empower our customers as they seek to improve their energy efficiency and help to address the climate goal, added Nunez.”

ABOUT THE AUTHORS:

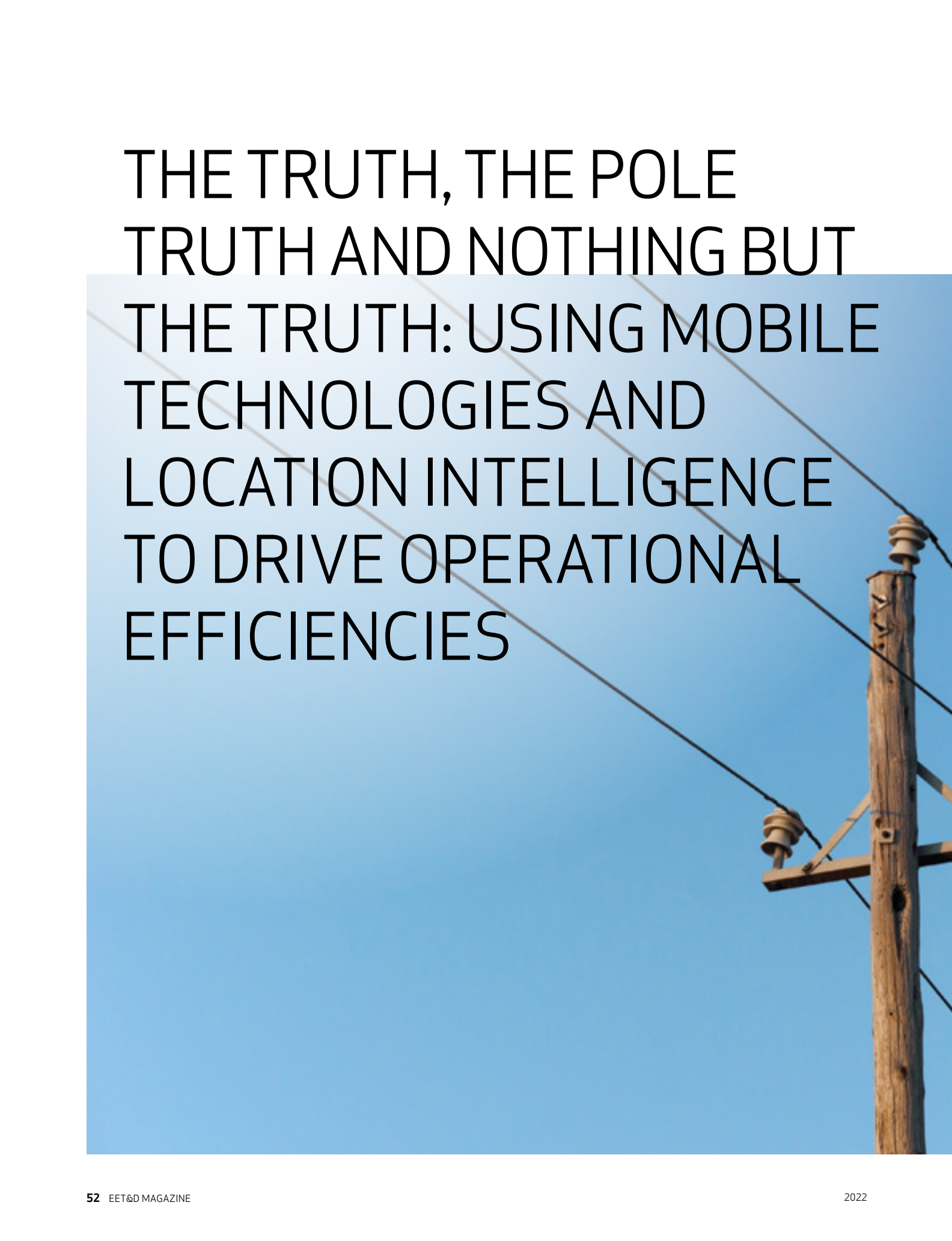


Sam duPont has a variety of utility-related experience, including strategy, smart cities, transportation electrification, political affairs, and a variety of smart grid-related assignments. Since joining BGE in 2018, he has been heavily involved in stakeholder engagement and product development for the Company's smart city and connected community initiatives, with school bus electrification, and in the management of the BGE political action committee. Before BGE, he held various positions at another IOU and a utility-telecommunications consulting firm and spent four years on Capitol Hill working for a Member of the U.S House of Representatives.

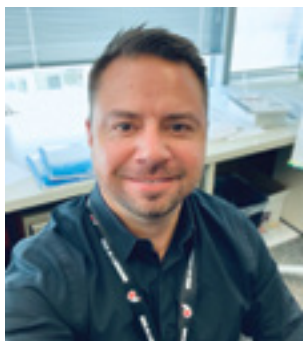


Juliet Shavit is the president and CEO of SmartMark Communications, LLC a global leader in strategic communications and customer experience. For more than two decades, she has been at the forefront of the conversation around technology innovation and the impact of those decisions on industry transformation. She has been widely recognized for her contributions to the energy industry and was instrumental in founding the DOE smart grid customer education working group.

Today, she works with utilities to optimize their AMI investments and build customer-centric programs around technology adoption.

A photograph of a wooden utility pole with several power lines stretching across a clear blue sky. The pole is on the right side of the frame, and the lines run diagonally from the top right towards the bottom left. The background is a solid, clear blue sky.

THE TRUTH, THE POLE TRUTH AND NOTHING BUT THE TRUTH: USING MOBILE TECHNOLOGIES AND LOCATION INTELLIGENCE TO DRIVE OPERATIONAL EFFICIENCIES



BRANDON RASO

On more than one occasion when I've been out for a family walk, my kids have caught me staring at a utility pole with a funny look on my face. "I bet they have no idea that pole is there...and not there," I'll be saying to myself, while my kids are no doubt saying to themselves, "My dad is so weird." Yes, I'm staring at a pole, but what I'm really looking at is a data problem that every utility struggles with. Can the utility trust the information in their operational systems when it says that this pole is here? Can the organization trust the data when it says the neighboring pole is 90 feet away? Can it trust that those underground wires are where they are supposed to be? Which data should it trust when two systems say two different things? Which information is the truth?

This philosophical-sounding question has massive practical importance because so many aspects of utilities' operations depend on something that is in very short supply: accurate information about the location and status of infrastructure such as utility poles, vaults, circuit length, transformers, DERs, underground cables and more. →

That utility pole I was staring at up above caught my attention because it looked like the crew installing it had to make an adjustment on the fly to locate it across the street to work around an obstacle — rather than on the side of the street where all of the other poles were lined up. But there is a high likelihood that the decision never made it accurately into the utilities' GIS systems, which rely on multiple layers of manual, paper-driven processes to record information. That GIS system likely thinks the pole is 30 feet the other way, doesn't take into account the additional circuit feed used to reach across the street and back again, and other details that would only be discovered when a truck comes out for a service call and realizes nothing matches the information in their work order.

When you multiply that by all of the infrastructure in a utility's inventory, which is a massive amount of unreliable information — so much, in fact, that it undermines the trustworthiness of all the data sets. As a result, the GIS teams, operations teams and work crews at utilities do not have a single body of data that they can trust. They often have to interpret multiple data sets across multiple systems to make their best bet about the truth. But even then, so often it is not until a truck hits the road and crews look at a site with their own eyes that there is solid enough information for teams to make decisions. This causes massive inefficiencies across the organization, with a lack of trustworthy information paralyzing processes ranging from day-to-day maintenance tasks to high-stakes emergency response efforts.

This data accuracy problem has been an intractable one for decades, but a combination of next-generation technologies and analytical best practices — which provide a foundation for true location intelligence — finally provides a way for utilities to solve this data trust issue. Location intelligence refers to real-time actionable insights from location-based data and analytics that enable organizations to make faster, smarter decisions and solve problems that other technologies cannot address. That includes the pole dilemma and other data trustworthiness challenges that I discussed above, which utilities can now solve with a two-step process driven by work crews in the field.

The first step is to equip work crews with location intelligence-powered mobile devices that can validate data in the GIS system each time they are on a work assignment. That device uses a variety of spatial technologies to make a note of exactly what I saw on that walk with the family: that a pole was across the street from the expected location, that the distance between poles was therefore different than what was

in the GIS system, and so on. But rather than requiring a paper-driven process to submit those observations and measurements by hand (requiring a lengthy and perhaps inaccurate process of data entry that may take weeks), the work crew can submit an update to the GIS system in real-time using digital tools that make the process accurate and instantaneous. This provides a trustworthy source of digital information that is immediately available to the entire chain of decision-makers involved in that project. It provides truth where doubt previously clouded decisions, and that leads to faster, better decisions.

The second step is equally important for transforming utilities' data sets into more trustworthy assets. After a work crew carries out work orders that involve maintenance or construction, they can register the updated information using those same mobile devices to ensure that the GIS system accurately captures those changes. This is a dramatic change from the paper-driven processes that involves hand-written notes and red lines on project paperwork that so often led to erroneous information being recorded, for example, with that pole that I was staring at so intently during the family walk. Using the same mobile devices that work crews use to validate information when they first arrive on-site, they do another round of validation at the end of projects to ensure that there is an accurate picture of the infrastructure entered into the enterprise asset management (integrated with GIS) system before they hop back in their trucks and move on to the next work order.

These two steps use location intelligence-based mobile devices to turn every work crew (including subcontractors) into a "trust task force" that steadily makes utilities' data sets more accurate every hour of the day. With every truck that rolls, they are giving every department in the organization something they have never had before: a unified data set that is a single source of truth, the whole truth and nothing but the truth.

That leads to enormous efficiencies for electrical utilities. In the case of a crew heading out to conduct a repair, it can lead to multiple efficiencies, including eliminating the need for preliminary visits to visually inspect a site and multiple subsequent sequential steps that involve filing written reports for engineering and GIS teams to review before decisions can be made. Location intelligence makes it possible for those decisions and actions to take place faster, with fewer steps, and less opportunity for confusion or mistakes. But at the macro level, having more trustworthy data and real-time access to updated information enables efficiencies across the entire organization.



In my next article in this series, I will discuss the impact of that on the complex planning, implementation and management process for delivering power to new developments like new neighborhoods, large apartment complexes and other real estate projects. This will provide another view into the way location intelligence can solve complex challenges that also deliver transformative efficiencies.

Editorial Note: *This is the first 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 have not previously had access to. In this first article, Raso discusses how location intelligence transforms location-based data into a reliable, accurate foundation for far more efficient field operations and decision-making.*

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. 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.

WE NEED AN ENERGY TRANSFORMATION: HERE'S WHAT IT WILL TAKE TO MAKE THE CHANGE





MICHAEL SACHSE

After decades of low-level warnings and unpopular assertions that the U.S. needs an energy transformation, it's now abundantly clear and undoubtedly imminent that the country's energy future will look different than its past. This outlook is both popular and far-reaching.

Today, the [world derives 80% of its energy supply](#) from fossil fuels, while just 3% comes from renewable sources. Many of our most important technologies, from vehicles to home heating and cooling solutions rely on fossil fuels. However, according to a March 2022 survey by the [Pew Research Center](#), the majority of Americans believe the U.S. should “prioritize the development of renewable energy sources, such as wind and solar and take steps toward the country becoming carbon neutral by the year 2050.” →



“
Burning fossil fuels changes the climate more than any other human activity.
”

What's more, while stakeholders view potential solutions very differently, there is an emerging consensus that change is coming. That's why, whether motivated by the frightening climate implications of inaction or worried about unstable supplies and unsustainable prices, it's clear that we need an energy transformation.

What's motivating change?

The impending energy transformation isn't a new topic. Politicians, climate activists and others have been lobbying for change for decades, but today's consensus is unprecedented, powered by a confluence of factors motivating change.

Climate change

Climate change is complicated, as man-made and natural factors contribute to a warming planet. However, as the [U.S. Environmental Protection Agency](#) (EPA) explains, “Burning fossil fuels changes the climate more than any other human activity.”

A [2017 Vox headline](#) captured the complicated but obvious next step: “electrify everything.” This includes replacing gas-powered vehicles with their electric counterparts and switching fuel-burning furnaces with electric-powered heat pumps. For example, people's homes consume a lot of energy and [heating and cooling are the primary causes, collectively contributing 441 million tons of greenhouse gasses](#) into the atmosphere annually.

Incredibly, many homes, especially in the Northeast United States, rely on propane and fuel oils to heat their homes. For instance, [almost a quarter of New York households](#) use heating oil to keep their homes warm in the winter, undermining one of the most populous state's ambitious climate change agendas. Conversely, as the [U.S. Department of Energy](#) asserts, "today's heat pumps can reduce energy use by 30%-60%, control humidity, are sturdy and reliable and fit in a wide variety of homes."

Simply put, we cannot solve climate change without altering our energy sources, and the technologies are readily available to empower that transition. Many people are ready to take action. A [report by Pew Research Center](#) found that 80 % of people are willing to make changes to blunt the impact of climate change.

Energy costs

While climate change is increasingly top-of-mind for scientists, government leaders and everyday citizens, the need for energy transition isn't just climate-related. Energy costs have soared in the past year, [increasing by 4.3% year-over-year](#), the fastest rate since 2008. As a result, continuing or even expanding reliance on fossil fuels is a financial non-starter for many families and government leaders. These price increases have many causes, meaning no single solution will alleviate this trend.

For starters, Russia's invasion of Ukraine, and the global sanctions that followed, have driven up the price of oil and natural gas, making everything from home heating to unleaded gas more expensive. At the same time, other factors, including severe weather events, like the major winter storm impacting Texas, contributed to rising prices as freezing weather disabled wind turbines and restricted the flow of natural gas.

Consequently, rising energy prices are contributing to near-historic inflation. According to a [Times analysis](#), "Energy prices — including not just gasoline but home heating and electricity as well — accounted for more than a sixth of the total increase in the Consumer Price Index over the 12 months ending in January."

Unfortunately, this reality is unlikely to abate anytime soon. While acknowledging the uncertainty of this unique moment, the [U.S. Energy Information Administration's](#) short-term energy outlook estimates that the nominal energy price will increase by 3.9% in 2022.

Regulatory implications

Recognizing that climate change trends and energy price increases are unsustainable, many governments are implementing new regulatory standards to force families, companies and government organizations to make a change. For example, by December 2023, [New York City builders](#) will need to phase out natural gas line installations on new constructions under seven stories. This new standard, passed as part of the All-Electric Building Act, reflects the state's increasing willingness to use its regulatory power to enact change.

Similarly, states like [California are investing in net-zero home constructions](#), planning to add 100,000 new homes each year to meet climate demands and housing shortages. While this practice doesn't prevent builders from constructing less efficient homes, it incentivizes green energy homes.

Of course, [President Biden's executive order on the country's clean energy economy](#) will guide regulatory efforts for the foreseeable future. Built upon an ambitious set of emissions reduction and energy production goals, we should expect additional regulatory standards to support these outcomes.

How we make change happen

Envisioning a sustainable energy future is certainly simpler than making it happen. However, there are certain levers we can pull to encourage change and transformation.

Government investment

Disrupting the energy sector is difficult and expensive. The upfront costs of research, development and disruption will be enormous, and it's a cost that only the federal government is truly capable of bearing.

An energy transition will require significant government investment across multiple sectors. This is not a new dynamic. Globally, the fossil fuel industry receives \$11 million in subsidies every minute, according to an analysis by the International Monetary Fund. As [one analysis](#) acknowledges, "not a single country pricing all its fuels sufficiently to reflect their full supply and environmental costs" →



We need to similarly invest in green energy solutions to transition our energy supplies. According to [The International Energy Agency](#) (IEA), global green energy investment will need to more than triple by 2030 to reach zero emissions by 2050. The recent failure of the Build Back Better Bill was a significant setback in this regard, but an ongoing effort to pass pieces of the law could serve as seed money for the energy transition.

In the meantime, leveraging the [Investment Tax Credit](#) (ITC) can empower people to make needed changes with financial support from the federal government. Specifically, this tax credit allows homeowners to claim a 26% tax credit for green energy systems installed in 2022 and a 22% credit in 2023. Even so, more investment is needed to make transformational aspirations a reality.

In many ways, the solar power revolution serves as a proof of concept for federal investment. Significant investments in and subsidies for solar energy have increased solar energy production from .34 gigawatts (GW) in 2008 to 97 GW today. Meanwhile, solar panel installation prices fell more than 70% since 2014, empowering more people and businesses to adopt this renewable energy technology. Similar investments in geothermal, wind and nuclear can further accelerate a more sustainable energy future. It also ensures that green energy is accessible to more people, including low-income earners.

One analysis of New York residents found that 84% of low-income homeowners rely on natural gas, propane, or fuel oil to heat their homes, making them a critical demographic for accelerating an effective energy transformation.

In response, as The Los Angeles Times recently reported, “Congress could offer generous financial assistance to make sure that low-income families can afford to go electric and don’t get stuck paying for ever-pricier gasoline.”

Taken together, it’s clear that investments by the federal government will be a major catalyst for energy transformation, ensuring that green energy is accessible, affordable and equitable in the years and decades ahead.

Local incentives

Of course, the federal government isn’t the only institution that can help facilitate an energy transformation. State governments and local municipalities can similarly incentivize change with subsidies, tax credits, or other inducements to accelerate change. Already, several states, including New York, Connecticut, Massachusetts, Pennsylvania, Maryland and New Jersey are providing financial incentives for renewable energy solutions, like geothermal heating and cooling, that make green energy solutions a priority.

It's not just state governments and local municipalities that can provide incentives to hasten our energy transition. Utility companies can also offer compelling opportunities to embrace renewable energies. In the Northeast, Con Edison, National Grid, Central Hudson, Orange and Rockland, NYSEG, Eversource and United Illuminating are modeling incentive structures that can support green energy solutions across the country.

Together, local investment and utility incentives can make green energy solutions more accessible for communities, initiating a trend with far-reaching repercussions for short and long-term energy outcomes.

Consumer demand

To be sure, the green energy transition is, in a way, predicated on consumer buy-in. For example, millions of homes are burning fossil fuels for heating and cooling. Ushering in an energy transition will require people to retrofit their homes with electric solutions, which requires a personal and financial investment that many can't or won't afford.

Local businesses can support these efforts by advertising the benefits of green energy solutions and accompanying financing options that make change affordable and accessible. This dynamic can drive business growth, job creation and energy transition, making it a rare win-win-win for companies, customers and the country. This is also true for new constructions. When home builders install natural gas-powered appliances in new homes, they are enshrining these systems for decades, forcing buyers to rely on existing energy sources to power their homes. In contrast, building new, zero-emission homes hastens the energy transition by equipping homeowners with the infrastructure to capitalize on an electric-powered future. Fortunately, many buyers [view renewable energy installations as an upgrade worth paying for](#), which is why homes with renewable energy installations sell for more than 4% more than their traditional counterparts.

Likewise, making electric cars more capable and accessible to ordinary buyers can alter the energy landscape for years to come. For that to happen, electric cars need to become cheaper, the charging infrastructure more accessible, and the buyer interest more expansive.

In this way, today's energy transformation is a circular premise. We need greater investment to make change a reality, and that investment must enhance consumer demand. This will help make renewable energy solutions sustainable.

Ready for action

We know that today's energy supplies will not solve tomorrow's challenges. Continuing to rely on fossil fuels has too many climate implications, costs too much money and doesn't account for shifting regulatory standards.

That's why we need an energy transformation. With so many people on the same page, we can't afford to miss this moment. We are ready for action, and it's time to take the next step.

ABOUT THE AUTHOR:

Michael Sachse is the CEO of Dandelion Energy. Before joining Dandelion, Sachse was the Entrepreneur in Residence at New Enterprise Associates, a position that allowed him to cultivate growth opportunities in the startup space. A graduate of Amherst College and Harvard Law School, Sachse has served in multiple leadership positions across various organizations where he facilitated growth and operational maturation during his tenure.

MORE EVS ARE HITTING THE ROAD: IS THE POWER GRID READY FOR THEM?





ROBERT NAWY

Quite a lot has happened in the last couple of years, but one of the biggest pushes we've seen come from our government is encouraging our nation as a whole to shift towards the use of electric vehicles (EV). Environmentally speaking, it's the correct move as it is central to the decarbonization measures needed to stave off permanent impacts. EVs can provide quite a few benefits, such as improved fuel economy, lower fuel costs and maintenance (significant with gas prices hovering at record highs), better long-term performance, and arguably, the greatest benefit of significantly reduced emissions. While there are significant perks to driving an EV, there are also risks that come along with it that need to be addressed. Infrastructure around the mobility electrification of America needs a proper cyber security plan. →

The return of electric vehicles

Electric vehicles reached their peak in the late 19th century, as they made up 33% of all vehicles. But once Henry Ford implemented his moving assembly line, gasoline-powered engines became cheaper and much more mainstream. It wasn't until the 1990s, amid gas shortages and a broad emphasis on clean air initiatives, that EVs finally reemerged. But once again, high prices and looser environmental restrictions pushed EVs to the sidelines.

In the early 2000s, a small group of engineers made it their mission to revolutionize electric vehicles. In 2008, Tesla unveiled the Roadster, the first 200+ mile EV. Soon after, numerous automobile manufacturers began experimenting with new EV models, aiding their rapid adoption.

Making the EV push

There's no doubt that we've seen far more EVs on the road in the last two years. In fact, an important piece of the recently announced [Inflation Reduction Act](#) designates \$60 billion to move the nation toward clean energy for the future of our country and everyone in it. The idea is to do this by growing access to clean and efficient energy for all, then building the supporting technology that can demonstrate these actions. This agenda seeks to provide more Americans with affordable, clean, reliable power. For instance, the plan invests \$2 billion to help auto manufacturers retool facilities to increase EV production and an additional \$10 billion in tax credits to build other EV facilities, wind turbines and solar panels.

The Biden Administration [aims](#) to create 100% carbon-free electricity by 2035 and a net-zero carbon economy by 2050. It's clear that the time for bolstering a life by prioritizing clean energy is here. Americans seem to be falling in line, too: In the last 10 years, the domestic EV marketplace has grown from 16,000 to more than two million vehicles, and automotive executives predict that more than 50% of vehicles on our roads will be all-electric by 2030.

Charging ahead

[Charging stations](#) are a necessity for EVs, and they can be found in private or public places, as well in the home — but depending on where an EV driver is traveling, the consistency in finding a charging station is not quite there yet. The number of charging stations [increased](#) from 3,394 in 2011 to more than 63,000 in early 2019. The issue is that, while this increase is good, it still is not enough to account for the amount of EVs already on the road, much less the wave anticipated in the coming years.

A nationwide system of EV charging stations will require thorough planning and a significant investment. Last year's record [infrastructure funding plan](#) allocates \$21.5 billion will be used for clean energy research hubs and demonstrations focused on next-generation technologies that are needed to achieve the goal of a net-zero carbon economy by 2050. According to the Department of Energy, the funding bill provides:

- \$500 million for demonstration projects in economically hard-hit communities, while \$1 billion will be used for projects in rural areas.
- \$2.5 billion for advanced nuclear. This is meant to provide 24/7 clean electricity and create well-paying jobs.
- \$8 billion for clean hydrogen, which, ideally, will progress toward heavy trucking and industrial sectors that run without producing carbon pollution.
- More than \$10 billion for carbon capture, direct air capture and industrial emission reduction, which will provide opportunities for fossil fuel workers.

Significantly, a key part of the infrastructure plan allocates [\\$7.5 billion](#) to plan and build an extensive network of stations across the country. These are all monumental goals, and while exciting in some respects, one issue must be discussed: the cybersecurity infrastructure in relation to EVs, charging stations and the power grid.

EV charging stations and the grid

Due to the connection EV charging stations have to the electric grid, potential cybersecurity threats are finally being taken seriously. In general terms, the EV charging infrastructure is made up of a device (or set of devices) that waits for another device to connect and begin communicating — without the benefit of a third-party firewall or any other cybersecurity devices to act as protection.

Electricity generation and delivery are essential to everyday life in our country. Additionally, the U.S. electric grid [is made up of](#) all power plants and other means of generating electricity, with transmission and distribution lines and infrastructure that bring everyone the power they need. As it stands, our electric grid is up against cybersecurity risks from many different angles, including terrorists, criminals, foreign governments and hackers. A significant hit to the grid could bring devastating and widespread blackouts, which would impact EV charging stations, hospitals, gas stations, banks and families everywhere, among others.

Cybersecurity risks

Living in a world where we are constantly connecting increased items to the internet, so many things we use are always “connected”: appliances, industrial sensors and even our vehicles. The connectivity of vehicles has been a major leap forward for the automotive industry, but the problem is that the Internet of Things (IoT) opens everything connected to the potential for cybersecurity threats.

Earlier in 2022, a young information technology security specialist said he [found flaws](#) within a part of third-party software used by some owners of leading EV manufacturers’ vehicles that might allow hackers to control some of the vehicle functions remotely. The specialist stated that the flaws in the software allowed him to unlock doors and windows, start vehicles without keys, turn on the stereo system, flash headlights and disable the security systems. He added that he could also tell if a driver was present in the car. He claimed to have had access to more than 25 of these vehicles in at least 13 countries.

Additionally, in 2021, a U.S.-based pipeline came face-to-face with a foreign-fronted cyberattack that came about from a single password that was compromised. Not only did it halt the fuel supply process on the eastern coast, but it cost the company \$4.4 million in ransom money. Even the most sophisticated of companies can fall victim to hackers.

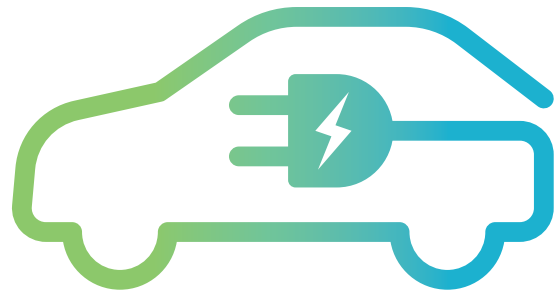
Even though cybersecurity is a severe issue for EV manufacturers, their systems are still vulnerable to hackers, who found a way through open doors via a third-party vendor. As we watch the number of EVs grow on the roads, thousands of charging stations are at risk of being targeted by cyber attackers. With this growth, charging stations are expected to rise from 1.6 million units in 2021 to 2.1 million units this year. Imagine if a hack crippled charging stations everywhere. The more entry points there are, the more opportunities hackers have to break into and control even the most sophisticated EVs.

Addressing the risk

These stations are attached to America’s primary grid, so it’s emergent that they are equipped with the most extreme cyber security measures. Traditional automotive safety regulations and security standards simply do not safely cover the cyber threats that come with modernized connected vehicles. This complex and swift evolution has put charging stations especially at risk. Yet because charging stations are connected to the electrical grid, it’s crucial to ensure cybersecurity so that it remains reliable and robust.

To that end, cybersecurity technology should be built directly into charging stations themselves. An outside party is often required to secure tech, as it tends to lack necessary cyber protection. The growing adoption of EV charging stations also contributes to technology’s vulnerability, and certain key security measures may be overlooked. Currently, vehicle charging stations appear [highly vulnerable to hackers](#). As more people choose to drive EVs, there must be heightened awareness and solutions for the cybersecurity weaknesses associated with EV charging stations. That should include everything from the devices and charging points to the infrastructure providers and operators of the energy distribution networks.

The bottom line is this: As the use of EVs increases and there are more charging stations planted nationwide, it’s more important than ever that we focus on implementing advanced cybersecurity measures that will secure all data that our EVs contain, as well as keep drivers safe.



ABOUT THE AUTHOR:

Robert Nawy is CEO of IPKeys Cyber Partners. The company is headquartered in New Jersey and has offices in California, Louisiana and Texas. Nawy grew up in Highland Park, New Jersey, where he went to high school (and was an All-State quarterback). From there, he earned his MBA, CPA and Civil Engineering credentials from Rutgers University. Nawy oversees all internal corporate services functions of IPKeys and has successful capital raising, merger and acquisitions, strategic partnership and solution implementation and delivery experience in evolving IP technologies in the commercial sector.

HAMIDEH BITARAF

HITACHI ENERGY



BY HAMIDEH BITARAF AND ELISABETH MONAGHAN

We are pleased to have the opportunity to introduce EET&D readers to Hamideh Bitaraf, senior advisor Grid Edge Solutions, for Hitachi Energy. Bitaraf provides advisory services to customers interested in grid edge solutions including renewables and energy storage systems. Following, are the transcripts from the interview we conducted earlier this year with Bitaraf.

EM: Describe your role at Hitachi Energy.

HB: I am a senior advisor for Hitachi Energy's Grid Edge Solutions business. I help customers develop microgrids and energy storage systems. For instance, I have analyzed the energy quality for a utility in the Bahamas and determined how we could use 10 MW energy storage to improve their power quality and fluctuation issues. The energy storage was installed in 2019, right before Hurricane Dorian. It helped the island utility initiate a black start and restore power. In the commercial and industrial segment, another example of my work is that I conducted an analysis for a car manufacturer to calculate the energy storage size needed at different dealership locations. The company has sustainability goals to reduce carbon emissions and I looked at energy storage to shave the peak load and enable the dealerships to participate in the ancillary services market.

EM: What inspired you to work in this industry?

HB: I have always been fascinated by how renewable energy and energy storage are the future of sustainable energy. I wanted to make a lasting impact by helping to move the world away from carbon emissions and provide affordable energy for all. Affordable energy plays a critical role now not only in modernization but also in access to information and education considering the remote learning opportunities. I want to help build the grid of the future, which relies on energy storage, and renewables. and I received a Ph.D. in electrical engineering to help do this.

EM: What was one of your greatest challenges early in your career and how did you overcome it?

HB: I joined the industry in 2017, and at that time, customers were not prepared and knowledgeable about the pros and cons of energy storage. I had to educate them and work with their budget to show them the value of these grid edge technologies. There has been so much development in educating the industry, like with your publication. Now, customers are more knowledgeable and require multiple simulations and hardware-in-the-loop demonstrations before making the decision. We are all still learning about the possibilities of battery energy storage.



EM: Is there any industry trend you think we should be paying closer attention to?

HB: Demand for renewable energy is increasing as we work toward a more sustainable future globally. It requires a new grid — one with more flexibility and that's decentralized and distributed. This will make it easier to incorporate renewables, reduce large-scale outages and deliver electricity to remote areas.

Microgrids and battery storage play a critical role here. They allow the energy network to evolve and address the new challenges of electrification and extreme weather. Today's hybrid microgrids integrate renewable energy, storage technology and robust grid-management software. Microgrids and battery energy storage systems can help businesses and enterprises like hospitals, police stations and college campuses stay online during wildfires, storms and other drivers of unplanned power outages. Increased inverter-based resources will replace synchronous machines and force us to rethink how we operate the grid under a new paradigm. Increased demand for electric vehicles is another trend everyone should be watching that requires additional grid infrastructure upgrades.

EM: What are you currently working on that interests or excites you?

HB: I am currently working on grid-forming inverters for batteries. My latest project was in the UK, where a utility was experiencing power outages. The company needed to install energy storage to create resiliency and a backup system. This is part of the "grid of the future" — everyone from islands to urban grids needs flexibility. Many utilities are focusing on this.

EM: What technology do you think has had the greatest impact on the electric grid?

HB: It's hard to say one thing. The impact of renewables relies on energy storage, and coordination between them requires advanced controllers. All these technologies together are impacting the grid in big ways. Utilities need to upgrade their infrastructure to address climate changes by adding transmission lines that connect remote wind or solar plants to the grid, and upgrading transformers to be able to manage larger loads.

EM: What do you consider the greatest challenge the electric energy industry currently faces?

HB: The greatest challenges are caused by climate change and the increased demand on the power grid. The power outages caused by the big freeze in Texas, and the chaos left by hurricanes, and wildfires show the need for more renewables and upgraded infrastructure. Last year, these disasters caused \$95 billion in damages, and power outages cost the U.S. economy up to \$70 billion annually. Electrification is going to increase. Our grid will require a strong electricity backbone to meet the increased demand for electricity by customers as they integrate renewables, mobility and e-charging.

EM: How does the industry prepare to meet that challenge?

HB: More renewables and power electronic technologies like energy storage inverters can balance the intermittency of renewables — this is a key challenge to improving the resiliency of the grid as it deals with climate change and more demand. Energy storage acts as load and generation whenever it is needed. Customers are now prosumers and can participate in demand response programs while they have diversified their energy resources from only utility to also include rooftop PVs.

EM: As a woman in electric energy, do you see the industry becoming more/less accepting of women in leadership positions?

HB: I work with women at my company, but in my experience, the customers I have always worked with are men. It's a traditionally male industry, but our GES business unit is managed by women. I am sure any professional will be successful with good knowledge and self-confidence, no matter their gender or race.

ABOUT HAMIDEH BITARAF, PH.D.:

In her role as senior advisor at Hitachi Energy, Hamideh Bitaraf helps customers achieve their renewable goals and reduce carbon emissions by providing insights to grid edge solutions and data analytics. Bitaraf's customers include island and mainland utilities, as well as developers and organizations in the commercial and industrial sectors. She specializes in battery energy storage solutions and power quality and reliability. Bitaraf earned her Ph.D. in electrical and electronics engineering from Virginia Tech.



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