

THE ACADEMY | AMERICAN PUBLIC POWER ASSOCIATION

In-Person Meetings are Back

APPA is pleased to announce the return of face-to-face meetings. Start planning now to join the national community of public power professionals for networking and learning at these upcoming events.

Business & Financial Conference

September 19 - 22 | Denver, Colorado

Join your peers for updates on accounting and finance, customer accounting and services, human resources and training, information technology, pricing and market analysis, and risk management and insurance for interactive breakout sessions, informal roundtables, networking receptions and more.

Fall Education Institute

October 4 - 8 | Seattle, Washington

Enhance your industry knowledge through in-depth, interactive courses on accounting, financial planning, cost of service, rate design, overhead distribution systems, and strategic leadership training.

Legal & Regulatory Conference

October 17 - 20 | Savannah, Georgia

Join energy attorneys and regulatory personnel for this unparalleled professional development and networking opportunity. Get updates on federal legislative and regulatory changes impacting public power and ask colleagues how they deal with the legal issues you face every day.

Customer Connections Conference

October 24 - 27 | Scottsdale, Arizona

Join the national network of public power professionals who focus on customer services and community connections. Get the latest in the fields of public communications, customer service, energy innovation, and key accounts, and share experiences and strategies for dealing with key issues.

Virtual Education & Training

The APPA Academy continues to offer convenient, cost-effective virtual resources and programs to meet your learning and networking needs. Visit our web site for more information on upcoming webinars, virtual courses, and on-demand training.

Learn more and register for all events at www.PublicPower.org/Academy



SECURITY OF SUPPLY

You can have the confidence that your order will be delivered on time. To date, Okonite customers have experienced zero delivery or customer service impacts during these uncertain times. This is due to:

- Okonite's early and continuing commitment to employee safeguards.
- Okonite's multiple plant capabilities for all EPR cable products.
- Okonite's acceleration of cable inventory levels to meet anticipated demands.
- Okonite's continuous improvement programs and recent expansions at all facilities, resulting in over 40% increase in EPR cable capacity. Currently, we are expanding our Compound Plant which will mean more than 100% increased output of Okoguard EPR.
- Employee Ownership means every "Okoniter" is vested in our customers.
- Okonite's stability and long-term vision.

Okonite since 1878, that's the last time we changed our name.





PUBLIC POWER MAGAZINE

JULY - AUGUST 2021

RESILIENCE

Modern Utility Resilience

Joy Ditto explores how the term resilience has evolved along with the landscape of utility risk.

6 Reflections on Resilience

Stories of three public power utilities that made it through tough times – focusing on what each learned from the experience and what resilience means to them.

14 Preparing for the Worst

Read how a few public power systems define and foster resilience in the face of increasing threats – in connecting with other emergency responders and the community and investing in protective measures.

20 The Growing Cost of Disasters

View this infographic on how much costs for disaster response and recovery have grown over time – including utility restoration expenses.

22 A Big Boost for Microgrids

A peek into the trends driving different entities toward microgrids, and the motivations behind some recent public power microgrid projects.

28 Managing Increased Cyber Risk

Read how one public power utility recovered from a ransomware attack, and how others are navigating an environment with increased risk of cyberattack.

34 People Make a System Resilient

A discussion of how the pandemic helped utilities focus on the human side of resilience – and how they can keep people first moving forward.

36 Increased Cyber Risk – and Regulation

Why NERC is reexamining its criteria for low and medium risk entities and how certain public power organizations might be affected by changes.

38 How Much Does Resilience Cost?

A breakdown of which activities and items can go into resilience initiatives, what kind of spending on resilience is projected to be needed, and sources of funding.

40 Elements of Preparedness

A visual overview of the key factors and actions necessary for a comprehensive preparedness plan.

EDITORIAL TEAM

David Blaylock Director, Digital Content and Data Analysis

Paul Ciampoli News Director

Tanya DeRivi Senior Director, Member Engagement

Susan Partain Senior Manager Content Strategy

Sharon Winfield Creative Director

INQUIRIES

News@PublicPower.org 202-467-2900

Subscriptions
Subscriptions@PublicPower.org
202-467-2900

Advertising Tima Good, Tima.Good@ theygsgroup.com

Advertising is managed by The YGS Group.

Public Power Magazine (ISSN 0033-3654) is published six times a year by the American Public Power Association, 2451 Crystal Drive, Suite 1000, Arlington, VA 22202-4804.

© 2021, American Public Power Association. Opinions expressed in articles are not policies of the Association. Periodical postage paid in Arlington, Va., and additional mailing offices.

For permission to reprint articles, contact News@ PublicPower.org.



ABOUT THE AMERICAN PUBLIC POWER ASSOCIATION

The American Public Power Association is the voice of not-for-profit, community-owned utilities that power 2,000 towns and cities nationwide. We advocate before federal government to protect the interests of the more than 49 million customers that public power utilities serve, and the 93,000 people they employ. Our association offers expertise on electricity policy, technology, trends, training, and operations. We empower members to strengthen their communities by providing superior service, engaging citizens, and instilling pride in community-owned power.

Postmaster, send all address changes to: American Public Power Association 2451 Crystal Drive, Suite 1000 Arlington, VA 22202

AMERICAN PUBLIC POWER ASSOCIATION BOARD OF DIRECTORS

OFFICERS 2021-2022

CHAIR: COLIN HANSEN, Kansas Municipal Utilities, McPherson, KS

CHAIR-ELECT: ANTHONY CANNON, Greenville Utilities Commission. NC

VICE CHAIR: DAVID OSBURN, Oklahoma Municipal Power Authority, OK

TREASURER: LAYNE BURNINGHAM, Utah Municipal Power Agency, UT

IMMEDIATE PAST CHAIR: JOLENE THOMPSON,
American Municipal Power and Ohio Municipal Electric
Association. OH

DIRECTORS

DAN BEANS, Redding Electric Utility, CA • JOHN BENAVENTE, Guam Power Authority, GU • CHUCK BRYANT, Carthage Water and Electric Plant, MO • **ELLEN BURT, Stowe Electric Department, VT** • BRET CARROLL, Conway Corporation, AR • DAVID CARROLL, Paducah Power System, KY • JIM FERRELL, Jackson Energy Authority, TN . JAMES FULLER, MEAG Power, GA • EDWARD GERAK, Arizona Power Authority, AZ • DAVID GESCHWIND, Southern Minnestoa Municipal Power Agency, MN • HUGH GRUNDEN, Easton Utilities, MD • JOHN HAARLOW. Snohomish County PUD. WA . JONATHAN HAND, Electric Cities of Alabama, AL • EDWARD KRIEGER, Piqua Power System, OH • PAUL LAU, SMUD, CA • NICK LAWLER, Littleton Electric Light & Water Department, MA • DAVID LEATHERS, Jamestown Board of Public Utilities, NY • JOEL LEDBETTER, Easley Combined Utilities, SC • LAURIE MANGUM, City of St. George, UT • GARY MILLER, Bryan Texas Utilities, TX • RUSSELL OLSON, Heartland Consumers Power District, SD • MICHAEL PETERS, WPPI Energy, WI • KIMBERLY SCHLICHTING, Delaware Municipal Flectric Corp., DF • LYNNE TEJEDA, Keys Energy Services, FL • DAVID WALTERS, Grand Haven Board of Light and Power, MI • DARREL WENZEL, Waverly Utilities, IA • STEVE WRIGHT, Chelan PUD, WA

EX OFFICIO

ROBERT LUKE, Chair, Policy Makers Council, and Mayor, City of Burlington, KS

NICKI FULLER, Chair, Advisory Committee, Southwestern Power Resources Association, OK

MODERN UTILITY RESILIENCE: FIGHTING THE HYDRA

BYJOY DITTO, PRESIDENT AND CEO, AMERICAN PUBLIC POWER ASSOCIATION he word "resilience" has become a term of art in recent years, especially in critical sectors like electricity. While many groups have attempted to define the word in precise ways, the essential meaning is simple—how well an electric utility (or system of utilities) can absorb an event that causes an outage in all or parts of its territory and restore power as quickly as possible.

The range of possible events that could cause an outage include natural disasters such as ice storms, hurricanes, and tornadoes; accidental physical damage such as a plane crashing into a substation; intentional physical damage caused by a person or people like cutting, shooting, ramming or bombing facilities; a cyberattack that compromises critical infrastructure (to date, a cyberattack has not led to a power outage in the U.S.). It is also possible that other types of "high-impact, low-frequency" events — events that happen rarely, if ever could cause significant problems, including outages. Such HILF phenomena could take the form of electromagnetic pulses caused by detonation of high-altitude nuclear devices, solar flares and, yes, pandemics.

Most of these threats to electric grids have existed since the first interconnections between utilities in 1922. Such is the reason that electrical engineers plan for con-

CYBERSECURITY THREATS

ARE LIKE THE HYDRA OF GREEK MYTHOLOGY — MULTI-HEADED AND MASSIVE

tingencies by creating redundancies, training staff, and exercising restoration in potential outage scenarios. Electric utility managers and planners also stockpile materials such as poles, copper wire, and other crucial equipment. It's also why the electric sector came together in the late 1990s to create mandatory reliability standards for the interconnected bulk power system in the U.S., Canada and parts of northern Mexico. Ultimately passed in the 2005 Energy Policy Act, the new standards regime (formally Section 215 of the Federal Power Act) managed by the North American Electric Reliability Corporation and overseen by the Federal Energy Regulatory Commission is intended to prevent power outages and to promote resilience. Compliance with such standards is not the end of the story, however.

The mid-2000s brought into focus the potential for cyber-

security threats to undermine reliability and test the resilience of our systems. This threat is like the Hydra of Greek mythology — multi-headed and massive, and when you lop off one head, another five grow back to replace it. As an industry, and as public power specifically, we regularly reevaluate how we manage risk in order to combat the Hydra.

We have recognized the need to partner more fully with the federal government and via pan-industry "information sharing and analysis centers" (ISACs), such as the Electricity ISAC and the Multi-State ISAC, because they help identify cybersecurity vulnerabilities — such as those potentially impacting the digital components we use in our SCADA systems — as well as active threats.

We have also learned to think about cybersecurity on the front end of deploying new digital technology onto our infrastructure and to hire and partner with cybersecurity experts. We now know the difference between operational technology (OT) and information technology (IT), with the former giving us the ability to operate our grids remotely and with greater situational awareness and the latter allowing us to conduct business with our customers and others through platforms such as websites, billing systems, and databases. We have figured out that having an extremely good handle on our digital assets and how exactly they interface with our grids (OT) will help us manage and mitigate cyber risk over time.

While this may seem daunting, as public power utilities think about modern resilience, we must rise to the challenge of integrating both cyber and physical security into our planning and risk mitigation strategies. We must also understand and seek to assure the safety of our most critical workers, as the COVID-19 pandemic has underscored. The American Public Power Association has tools and resources to help, including via cooperative agreements with the Department of Energy. We also continue to partner with joint action agencies, state and regional public power associations, and others in the industry and government to empower our public power utility members through knowledge-sharing, education, technical support, and mutual aid. Together, we are resilient.





RELYING ON OTHERS AND SAFETY FIRST

t's unlikely Allen Robbins, general manager and CEO at Sevier County Electric System in Tennessee, will ever forget the night eight of his utility's line workers were in the thick of a raging wildfire.

On Nov. 28, 2016, high winds caused a smoldering fire to erupt in the nearby national park and it spread quickly to surrounding communities. What began as a seemingly normal response to outages quickly escalated, and Robbins and his colleagues wondered if the crews would make it out alive.

"Fire trucks, ambulances, and police could not respond to the areas where they were getting calls because the roads were blocked by downed power lines," Robbins recalled, noting that his crews had to lead first responders into the flames. "Instead of responding to outages, these linemen were actually rescuing people."

One crew led a caravan of tourists — who had been trapped for hours — to safety. When it became clear that the lineworkers needed to manually switch a feed to power a water

pump station that couldn't be reached via the utility SCA-DA system, crew members worked with a bucket truck in the air, surrounded by fire and fighting 90-mile-per-hour winds. They did it without reliable communications. One of the lineworkers would drive until he had a cell signal, get as much information on the switching procedure as he could and drive back to the switch.

"He did this for a couple of hours," Robbins said.

By the time the fire was vanquished, more than 2,400 of the 56,368 premises served by the public power utility had been destroyed. So had 125,000 feet of overhead conductor, 15,000 feet of underground line, 450 transformers, and more than 1,000 power poles.

Fighting this blaze left several workers traumatized. Robbins offered for workers to get psychological help, but he doesn't think anyone took advantage of it. However, several told their stories in a book titled Trial by Fire, which is available on the utility's website.

"That was their therapy," Robbins said.
"They got to tell their story. By the time the book got completed, the cloud that had been over our line department was lifted."

Along with learning just how courageous his crew members are, Robbins said the experience taught him a few technical lessons about resilience. "Our infrastructure was really up to date when this happened," Robbins said.

Replacement devices didn't need to change much in terms of grid automation and sensing equipment, and the utility remained aggressive with vegetation management. "In your budgeting process, don't divert from vegetation management. It's so important to reliability and mitigating issues," he said.

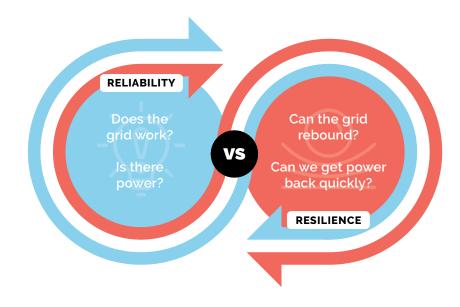
Robbins also stressed the importance of maintaining relationships with state agencies and mutual aid organizations. At one point after the 2016 fire, he had 17 crews helping out. In December 2020, he said mutual aid helped his utility shorten what could have been a seven-day outage into a four-day one.

Communication is crucial, too. "Our communication internally and externally has become better because of this event," Robbins noted.

The utility now participates in a newly created emergency operations center that brings leaders from impacted fire departments, police, medical teams and local governments together in one place for decision-making. "I'm in direct communication with the operations center, which helps them know where there are issues and how to respond."

Most important, Robbins said he's committed to making sure his crews understand that utility policy is safety first. "Linemen have the mentality that they're the ones who go in and fix things, but sometimes that's going to cost you or put you in harm's way," Robbins said.

In a recent windstorm, crews were ready to get power back on, but Robbins nixed it. "Go back to a safe place and respond once this thing passes," he told his team.



COMMUNITY DECISIONS AND ADAPTABILITY

arly in May 2007, Greensburg, Kansas, didn't stand a chance against a tornado that hit level five on the Enhanced Fujita scale. The winds topped 200 miles per hour, leaving 95% percent of buildings in the town of about 1,500 people toppled.

"We had a power plant that was destroyed and all of our overhead lines and infrastructure, too," said City Administrator Stacy Barnes.

The city's water distribution system was underground, and only suffered some damage requiring repair.

Greensburg made a name for itself with a citywide goal to rebuild sustainably. The town now has the most LEED-certified buildings per capita in the world and gets 100% of its power from a nearby wind farm that feeds into the Kansas Power Pool. This way, the utility gets the reliability support of being grid-tied yet still is one of the few communities in the U.S. powered exclusively by renewable energy.

These moves have made Greensburg famous. This town, which now has about 900 residents, has been covered by USA Today and Discovery Channel, and it was featured in President Obama's 2009 State of the Union address.

Barnes noted that the meaning of the word "resilience" has changed for her over time. "It looks different when you're looking at debris and devastation," she said.

Now, she thinks about resilience as many small towns in the U.S. do. "Rural communities across America that are dwindling in population: How do we be resilient, slow that population loss and grow our communities?" she asked.

"Don't make rush decisions. It's easy to want to have a sense of normalcy back, but make sure you're gathering all the information you can to make the best decisions."

STACY BARNES

CITY ADMINISTRATOR GREENSBURG, KANSAS

In Greensburg, the whole process of rebuilding sustainably reflects community input. "There were a lot of community meetings for public projects where people could come and put Post-it notes on layouts and designs to give feedback," Barnes recalled.

The town still operates this way. Earlier this year, Barnes took plans for a new playground to a crowd at the elementary school, so the children — from kindergarten through fifth grade — could pick their favorite design.

Another important town addition came after a nonprofit organization was founded by locals to build and operate a building on Main Street that houses retail and office space as well as a restaurant.

"Nobody builds a town from scratch," said Barnes. "There's no manual you can pull off the shelf that says how to do it."

To other communities facing a massive rebuilding process, Barnes said, "Don't make rush decisions. It's easy to want to have a sense of normalcy back, but make sure you're gathering all the information you can to make the best decisions."

As an example, she pointed to the facilities in town that put in their own wind turbines, then took them down again once they realized how much maintenance and upkeep they require. These include the local school, hospital, and a retail outlet.

Barnes also cautions that devastation will bring change, and communities should embrace it. "Be ready to evolve and change as part of resiliency," she said. "If you're not changing, you're dying."

"We couldn't have done any of this without our community coming together to make it happen," Barnes said.



CLEAR PROCESSES AND HELPING HANDS

atural disasters aren't the only threat to a utility's operations. The town of Newberry, Florida, which has nearly 7,000 residents, experienced a COVID-19 outbreak in late 2020. At one point, the entire customer service department and a portion of finance department personnel needed to be isolated, thus straining continuity of services.

The outbreak occurred during an especially busy season for the utility. "Because of Florida homestead laws, we have a number of new customers seeking to close on their home before Dec. 31 with new service," said Dallas Lee, the city's finance director. "By doing so before the start of the year, it can save money on property taxes."

December also comes with more planned time off, so when staff started testing positive they found themselves stretched even thinner.

How did the city manage to get through it? Staff had already begun to work from home months earlier when the utility shut down in March 2020, said Tammy Snyder, customer service supervisor for the city. In fact, she assisted with complicated procedures multiple times a day while working from home.

The pandemic-related shutdowns also prompted the utility to jumpstart a transition to online services, such as paperless applications, a chat feature on the website, and online outage reporting. "COVID prompted us to move into certain technologies faster than anticipated, but it was something we wanted to do," Lee said.

Snyder has created what staff in the customer service department call "the bible," extensive documentation that outlined how to perform any customer service task. "It may be the easiest thing to do, and it is 42 steps in our bible, but

you could give it to a 4-year-old and they could process a utility bill for you," Lee quipped.

This copious documentation may have been helpful to those who stepped in to support the customer service team. Many calls went to ENCO Utility Services, the call center service Newberry uses.

Lee stated that two employees — one who had previously worked in the department years ago — came to assist at the service counter and drive-up window.

"Everyone from the fire chief to the city manager offered their assistance. It was very heartwarming" Lee commented.

Lee said the experience taught him that cross-training — which already existed departmentally — should go beyond department divisions in a smaller utility like Newberry's.

"Our experience proves that old motto, that we really are stronger together," Snyder replied. "We truly have emerged stronger and wiser as a team on the other side of this pandemic."



Aerial Cable Systems by Hendrix: Navigating tough environments

Power providers around the world rely on Hendrix, the Aerial Cable System originator, to help overcome these obstacles.

- Heavily Treed areas
- Wildfire Mitigation
- Limited Right-of Way
- Long Spans
- Substation Exits
- Underbuilds
- Overbuilds

We can design, supply, install, and maintain your Hendrix Aerial Cable System.

Contact us today for a customized quote.





PREPARING FOR THE WORST:

FOSTERING RESULTING RESULTS OF THE STATE OF

BY SUSAN PARTAIN, SENIOR MANAGER OF CONTENT STRATEGY, AMERICAN PUBLIC POWER ASSOCIATION PublicPower.org / #PublicPower 13



oles that do not burn in wildfires or snap in extremely high winds. Facilities that won't flood. Fuel sources that won't freeze. Equipment that can withstand heat waves. Water that will remain flowing through hydroelectric facilities. Utilities must think

through all possible threats and prepare for how to recover when a severe event pushes electric infrastructure beyond its brink.

As community-centric entities, public power systems also play a vital role in supporting community resilience in the face of increasing threats — in connecting with other emergency responders, providing information to the community, and making choices about which investments will yield adequate protection without compromising energy affordability.

Here's how a few public power entities define and foster resilience for the people they serve.



INTRODUCING MILSOFT FIELDSYTE™



Put the full power of Milsoft's engineering and operations solutions in the palm of your hand with Milsoft's latest product, FieldSyte. FieldSyte includes a robust set of tools to help you work efficiently and effectively from wherever you are, no matter your network coverage. Search and trace your electrical model, work outage tickets, integrate with AVL and AMI systems, document a tailgate meeting, or perform inspections and right of way tasks. FieldSyte currently has over a dozen different modules with many more on the way, allowing you to build out the solution that fits your needs. Available for use on iOS, Windows, and Android devices.

Your customers expect more, and they get more with Milsoft Find out more: www.fieldsyte.com • 800-344-5647





LEARNING FROM OTHERS

aron Melda, the Tennessee Valley
Authority's senior vice president of
transmission and power supply, said
that when it comes to weather events,
TVA distinguishes resilience as how to prepare
for and respond to events that affect infrastructure beyond design standards. In the Tennessee
Valley, such events can be anything from tornadoes to flooding and wildfires.

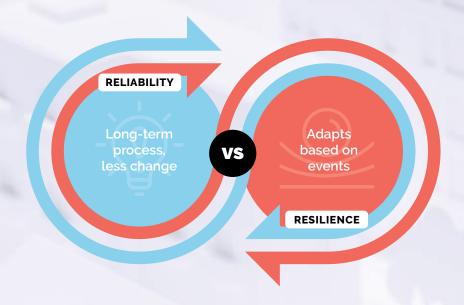
"It's a lot of learning from others," Melda said. "As we experience actual events, on our system or neighboring systems, we are constantly modifying what are the critical components that we need to have on hand and where do we need to have them such that we can restore things most quickly."

TVA has worked with local utilities throughout the region to identify priority facilities — such as hospitals, military bases, food distribution centers, and wastewater treatment plants — and then make sure that the right materials, personnel, and training are in place to quickly restore such facilities in high-impact, low-frequency events.

Melda acknowledged that weather volatility seems to have picked up over the past five to 10 years, especially in terms of severe wind events and drought leading to wildfires. As such, he said that TVA has been focused on bolstering risk mitigation for these types of events.

Part of this mitigation is the Regional Grid Transformation, an initiative for which TVA is working with public power utilities in the area to better understand the distribution system and technologies that can aid in faster restoration and higher resilience, such as microgrids.

At the transmission level, which TVA manages, Melda mentioned three key investments that are helping to enhance the region's



resilience: (1) a new system operations center that is designed to be resilient to a variety of events; (2) a new energy management system that can take in more acute data on weather and other factors; and (3) a doubling of the valley's fiber-optic network to enable the added data sharing and analysis.

Melda said these investments will provide system operators with greater situational awareness and enable utilities on the grid to use the latest technology.

A BLURRED LINE

esiliency is about how to prepare for the emergencies that may happen, how to address the emergency while and immediately after it occurs, and then how to recover," shared Tracy Sato, power resources manager for customer partnerships and strategies at Riverside Public Utilities Department in California. In Riverside, the threat of a potentially catastrophic event — such as a major earthquake — has long been part of the preparedness culture of the community. However, changing state and local regulations, paired with an increasing incidence of extreme weather events, is shifting RPU's approach to emergency and resilience planning.

The public power utility is working with other local agencies, such as the fire department and the office of emergency services, to reexamine and in some cases establish processes and roles for each entity during various emergencies. For example, as extreme heat waves become more common, Sato mentioned that RPU has been in discussion with other local agencies about what and who should be involved in setting up community cooling centers and what kind of contingencies the utility should have in place to ensure the centers can remain in operation, even during extreme conditions or rolling blackouts.

Sato also mentioned that RPU has engaged more with the fire department in recent years, and that each entity is helping to educate each others' staffs about elements related to fire risk and safety.

PREPARING FOR THE WORST: FOSTERING RESILIENCE IN PUBLIC POWER

"Before, you'd have a fire break, and you'd keep your lines clear. Now, you have to think further out from those lines," said Sato, who added that RPU is exploring the use of drones to help monitor for fire risk.

A line is also blurring between traditional emergency planning and this distribution planning.

One new factor for Riverside — as with other communities across California — is to be able to avoid subjecting customers to rolling blackouts when there is high demand in a heat wave or a public safety power shutoff (PSPS) in an adjoining area. RPU has a few well sites in Southern California Edison territory that lost power during PSPS events last year.

Scott Lesch, a power resources manager who heads the development of Riverside's integrat-

ed resource planning, said that the process is increasingly about distributed resource grid planning. And this shift presents a challenge in getting historically disparate teams and entities together to coordinate.

The challenge is in trying to forecast distribution needs for grid planning without a full picture of the data. Lesch said that RPU is working to beef up the distribution system to be able to handle an expected influx of electric vehicles in the next few years, while Sato added that state legislation and changing business customer plans are making forecasting murky. She mentioned planned changes to California's building code toward "energy neutral" buildings and pushes to electrify residences that make it uncertain whether the utility should plan for an increased or flat load in the future.

"We are constantly modifying what are the critical components that we need to have on hand and where do we need to have them such that we can restore things most quickly."

AARON MELDA

SENIOR VICE PRESIDENT OF TRANSMISSION AND POWER SUPPLY TENNESSEE VALLEY AUTHORITY

NISC has been a valuable partner in listening and responding to our needs.

~ **Theresa Slominski** General Manager Elk River Municipal Utilities



www.nisc.coop

national information solutions cooperative

"We're all emergency responders, and one thing that we've learned is we need to make sure we are cross-training people to understand how to manage these things."

TRACY SATO

POWER RESOURCES MANAGER
FOR CUSTOMER PARTNERSHIPS AND STRATEGIES
RIVERSIDE PUBLIC UTILITIES DEPARTMENT, CALIFORNIA

that we do to prepare our workforce is periodic drills on multiple kinds of events," said Melda.

As TVA gains intel and lessons from other entities at the national level, it incorporates those lessons into the drills and other training programs offered to local power companies, he said.

"Ultimately, what you want to be able to do is, when one of these things happens, is to know that your folks are trained and ready to respond," Melda added.

Despite this uncertainty, there is a clear need for increased capacity. Lesch mentioned that during the last heat storm of 2020, the California Independent System Operator was unable to meet its net peak. Current restrictions and impending planned retirements — such as the Diablo Canyon nuclear power plant — are putting battery storage at a premium, since it's one of the only viable options for capacity additions in Southern California.

"We're driving toward a more renewable future, and that is putting stress on the bulk transmission system," Lesch said. "There is going to be a lot of storage coming in the system that is going to affect prices. But then you have the whole other side, which is, 'How do you make your distribution system more resilient?'

"The cost for resource adequacy has almost tripled in the past four years, and it's not getting any better," Lesch added. "We can make this transition, but we are going to need to spend money to do it."

And while customers in Riverside have been adding rooftop solar panels on their homes and storage at businesses, RPU has also been looking at possibilities for storage and self-generation, especially at critical facilities. The utility received a pair of grants for energy storage services and self-generation that just got approved by its city council.

READY TO RESPOND

PU has spent more time and money in responding to heat storms and wind events in the past few years, Sato said. Fortunately, it has avoided incurring substantial recovery expenses related to a major event.

That does not mean the utility isn't preparing for one. Sato said RPU is involved in increased hazard planning, specifically in developing formal procedures for rolling blackouts.

Lesch and Sato also noted that RPU is participating in more exercises, such as the Great ShakeOut. These organized earthquake drills bring together emergency responders to practice and test out whether response plans and protocols include the right allocation of resources and communication. RPU also participates in exercises such as GridEx, which tests utilities' responses to cyber incidents.

Sato acknowledged that responding to incidents puts a lot of pressure on utility staff. "We're all emergency responders, and one thing that we've learned is we need to make sure we are cross-training people to understand how to manage these things," she said. "Or else you end up with one person needing to be on-call 24/7 for three weeks — and that wears thin."

"One of the most important components

SETTING THE COMMUNITY UP FOR SUCCESS

aving community networks to rely on helps keep people resilient through tough times.

"The nice thing that we have is that we can work very closely with our customers," Sato said. "And we can work through a fairly extensive communications network through our city council."

She said that RPU works with the city's public information officer to help the flow of correct information, including on social media channels, where many people turn for information during emergency events.

Part of the connection to city communications means that RPU has been able to tap into the city's emergency notification system regarding potential for rolling blackouts. This has helped prevent misinformation from spreading across the community about how residents might or might not be affected. RPU also works with several community groups that have reach into portions of the community that do not have access to technology — such as older, marginalized, and lower-income residents.

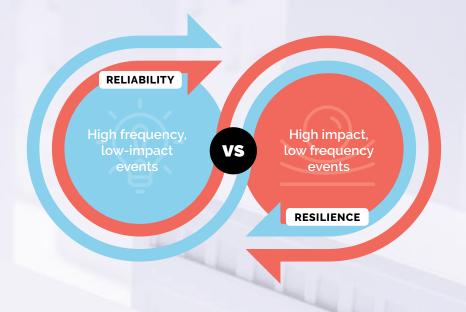
Both Lesch and Melda highlighted how the public power model allows for increased resilience.

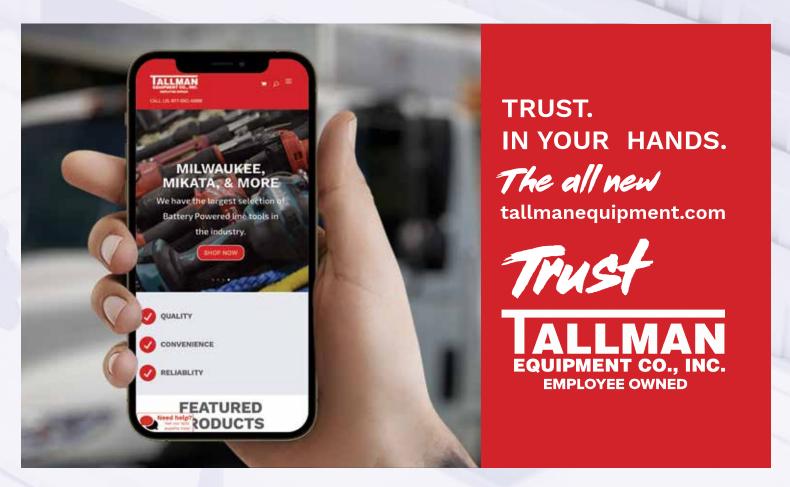
PREPARING FOR THE WORST: FOSTERING RESILIENCE IN PUBLIC POWER

"In some cases, because we are locally regulated, we have a little more flexibility in how we try to address these planning needs — in choosing the local constituents we work with and tackling the problems," Lesch said.

"We have a model that allows us to look holistically at all components necessary to ensure reliability and resiliency," Melda said. "We can put rules, criteria and planning in place to make sure those are going to be the outcomes of our investments.

"If you contrast that with a market model, where they rely on price incentives, energy incentives, or different incentives and hope for an outcome, it is fundamentally different," he said. "We are better positioned to ensure that the lights stay on at the least cost because we have a model that is integrated."





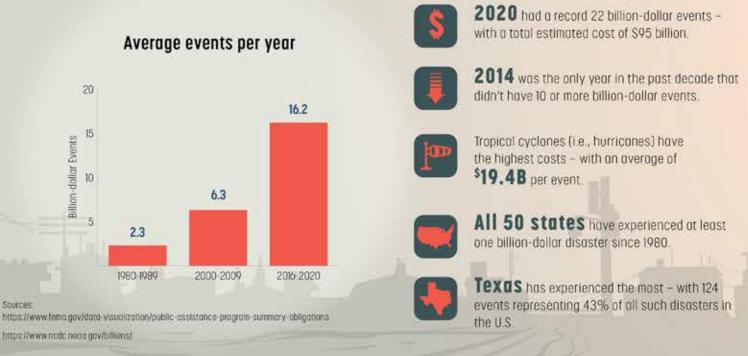
The growing cost of disasters

Disasters such as hurricanes, floods, fires, and tornadoes are becoming more catastrophic – and costly.

The National Oceanic and Atmospheric Administration tracks climate and weather disasters that have caused an excess of \$1 billion in loss and damages in the United States.



The number of billion-dollar events has also increased.



Utility restoration costs have increased over time, too.

Factors increasing costs can include increased customers (leading to more assets that can be damaged), increased cost of labor, and price increases in materials and equipment.

Since 2003, the Federal Emergency Management Agency has obligated more than

\$25.8 billion

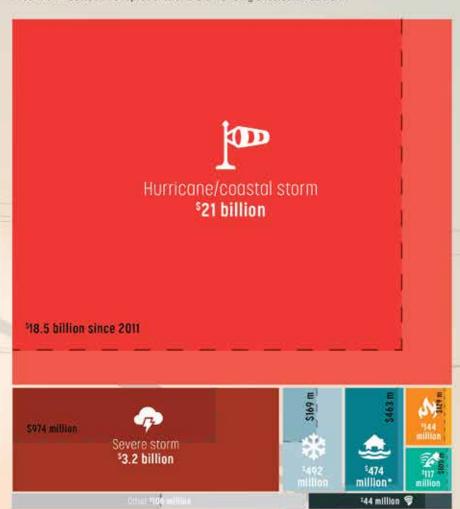
to public utilities through its Public Assistance program for more than 36,000 events.

About 80% of these funds — \$20.4 billion — has been obligated since 2011 toward 13,851 projects at an average cost per project of \$1.47 million.



FEMA funding to public utilities since 2003, by disaster type

Area within dotted line represents share of funding allotted since 2011

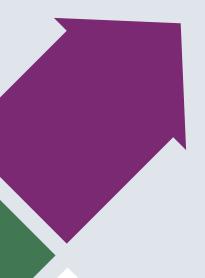


Share of funding and projects since 2011 (out of total since 2003)



*Flood data since 2005





A big boost for microgrids:

RELIABILITY, RESILIENCE AND FAVORABLE ECONOMICS

BY JOHN EGAN, CONTRIBUTING WRITER

hether offering backup
generation for a hospital
or demonstrating
potential attributes of new
technologies, microgrids are a frequent
part of the conversation on reliability
and resilience. With drastically changing
economics for generating resources
and storage technology, microgrids are
seeing growing interest from utilities and
businesses alike as they weigh the potential
costs of various risks and benefits of
increased resilience.

Defining microgrids

onsultancy Wood Mackenzie defines microgrids as a set of distributed energy resources with unique capabilities that include:

- Providing power and energy services within a geographic perimeter in both grid-connected and islanded mode
- Supporting loads totaling more than 100 kilowatts in single or multiple buildings for at least 24 hours

Controlling the DERs as a single entity

What constitutes the "typical" microgrid is also changing. Most microgrids in operation today are powered by fossil fuel generators — typically diesel or natural gas — but a growing number are being configured with solar plus storage. As costs for wind, solar and storage continue to decline, and public interest in sustainability keeps rising, a growing share of the microgrid market is expected to be from renewable generating resources paired with storage.

Rebuilding for resilience

few years ago, two of the costliest hurricanes on record, Irma and Maria, devastated the U.S. Virgin Islands, including a significant portion of its electric infrastructure. Even with help from mutual aid crews from the mainland, it took months to fully restore the electric system.

The Virgin Islands Water and Power Authority (WAPA) is working to make sure the lights stay on the next time a hurricane blasts through the islands.

"We know it is not a question of if, but rather, when, another hurricane will hit us," said Jean P. Greaux Jr., director of corporate communications for the agency. "We can't be without power for months at a time."

That's why the authority, which serves about 55,000 customers across five islands — St. Croix, St. Thomas, St. John, Water Island and Hassel Island — plans to invest about \$258 million over the next decade to build a series of microgrids across the territory.

In April 2021, WAPA received a \$4.4 million grant from the Federal Emergency Management Agency to cover the design and engineering for a microgrid system on the western end of St. Croix, near the island's airport. It will cost an estimated \$129 million to construct the Adventure Hill Microgrid, which is expected to begin operating in 2025.

That first project will include 18 megawatts of solar generation, 20 megawatt-hours of battery energy storage, and an intelligent control system. No new distribution line will be laid as part of the project. All told, WAPA plans to construct four microgrids with total generation of about 50 MW and total energy storage of

A BIG BOOST FOR MICROGRIDS: RELIABILITY, RESILIENCE AND FAVORABLE ECONOMICS

approximately 82 MWh. All of the microgrid equipment will be above ground and will be built to withstand sustained winds of 200 miles per hour, as specified by FEMA.

WAPA has been working to harden its electric infrastructure to make it less vulnerable to hurricanes and other disruptions, including economic disruption, for more than two decades.

"We have been trying to transform and harden our electric system, at an acceptable cost and with minimal environmental impact," said Marquis A. McGregor, WAPA's interim manager for system planning.

The power and water agency began undergrounding some transmission and distribution lines in the mid-1990s, after Hurricane Marilyn devastated the main airport.

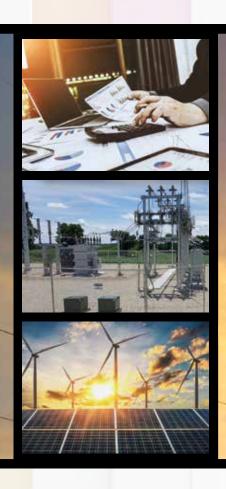
"When clouds come, it leads to decreased solar generation and grid instability," explained Ashley M. Bryan, WAPA's interim director for transmission and distribution. "That's why we're going to renewable energy backed by energy storage and liquefied petroleum gas (LPG, or propane), which is cleaner and cheaper than diesel," the fuel that provides the islands with most of their electricity today.

On a delivered cost basis, diesel fuel costs nearly \$20 per MMBtu, roughly double the per-MMBtu cost of LPG, according to an assessment conducted for WAPA by Black & Veatch. While the cost of both fuels was projected to rise during this decade, Black & Veatch forecast that LPG's 2-to-1 cost advantage would continue.

"We have been trying to transform and harden our electric system, at an acceptable cost and with minimal environmental impact."

MARQUIS A. MCGREGOR

INTERIM MANAGER
FOR SYSTEM PLANNING
VIRGIN ISLANDS WATER
AND POWER AUTHORITY



Power System Engineering

Forward-Thinking Solutions for Business, Infrastructure and Technology

- Economics, Rates & Load Forecasting
- Renewable Energy Services
- Distribution & Transmission Planning
- Custom Control Panels
- Substation Design & Line Design
- Communication, Technology & Automation

FULL SERVICE CONSULTANTS 866-825-8895

Visit our website and find an expert today!

www.powersystem.org



Improving value

icrogrids are a still-small, fast-growing and important aspect of the energy transition, driven by improving economics and concerns over resiliency and sustainability, commented Isaac Maze-Rothstein, a grid edge analyst for Wood Mackenzie.

"Costs are falling for natural gas, renewables and computing power, but the cost of low reliability is going up," he said. "Environmental, social and governance (ESG) factors are another driver for microgrids — everyone wants clean power. And more extreme weather — such as the Texas deep freeze, wildfires in the West, and hurricanes in the southeast and Caribbean — that knocks out the grid underscores the need for reliable power."

Society's need for highly reliable electric power was further demonstrated during the COVID-19 pandemic, he continued: "Many people said, 'How am I supposed to work remotely without my computer and the internet?"

Through the end of 2020, according to Wood Mackenzie research, nearly 4,400 MW of microgrids were operating in the U.S., and nearly 800 MW more are expected to begin operating this year. Maze-Rothstein noted that the growing interest in microgrids with solar plus storage and other cleaner sources is taking market share from diesel generation.

According to Maze-Rothstein, most microgrids are installed as an emergency backup for grid power that may be having reliability challenges, such as rural communities at the edge of a long existing distribution system, police stations, military bases, food stores or educational institutions.

The Virgin Islands' microgrids would be an exception to that trend, as they are expected to be operating 24/7/365.

Solar plus storage is more expensive up front than conventional generation or transmission and distribution solutions, but low operational costs offset the higher upfront costs. Storage costs are declining rapidly and are expected to continue falling over the next few years, following the declining cost curves of wind power and solar generation. These trends buttress the economic argument for microgrids powered by renewable and storage.

The improving economics is a big reason why financial institutions, investor-owned utilities and international oil companies like Shell and Total are getting behind microgrids, typically solar plus storage. The attention on microgrids is driving deployments up and costs down, Maze-Rothstein noted.

In their early years, microgrid control systems were proprietary and customized, but now they are moving toward standardization and modularity, which Maze-Rothstein said should further accelerate a fast-growing business.

"There are clear opportunities for microgrids to provide value as a premium reliability service that rides on top of traditional electric distribution service," he said.

A strong business case

igh reliability has long been important to businesses, and the standard expectations are getting even higher.

"It's a major inconvenience to lose power for several hours or days, but momentary voltage sags are also a problem for many businesses, particularly manufacturers, data centers, or those relying on power-sensitive equipment," Maze-Rothstein said.

He cited a 2015 study from the Pew Charitable Trust and ICF, "Distributed Generation: Cleaner, Cheaper, Stronger," that estimated power outages cost American businesses about \$150 billion per year.

A growing number of commercial and industrial customers operate power-sensitive equipment that requires "five nines" of reliability — meaning that power remains on at least 99.999% of the time.

"Availability of at least five nines, or 99.999%, in terms of both reliable and resilient power, is the general standard that companies within the telecommunications industry, including data centers, strive to achieve," noted a Cleveland State University report.

The study estimated that the local investor-owned utility, which serves a number of large commercial and industrial customers, has 99.93% reliability, or "three nines."

To better meet the reliability and sustainability needs of these current and future power-sensitive customers, Cuyahoga County is working with some local businesses and Cleveland Public Power to create what it calls the Cuyahoga County Utility — essentially, a series of microgrids outside the boundaries of the city of Cleveland.

"At first, we thought of microgrids as a tool to attract new businesses to the area, but we quickly saw many existing customers were having reliability and power quality problems," commented Mike Foley, director of the department of sustainability in Cuyahoga County.

Foley emphasized that the proposed county utility would not be taking over the poles and wires of either the IOU or of the community-owned Cleveland Public Power. Rather, the first phase of the Cuyahoga County plan would be to set up microgrids in four to six commercial districts outside the Cleveland city boundaries to provide more reliable electric service to C&I customers who require it and are willing to pay for it. The county is confident of its legal ability to do that, but it expects legal challenges.

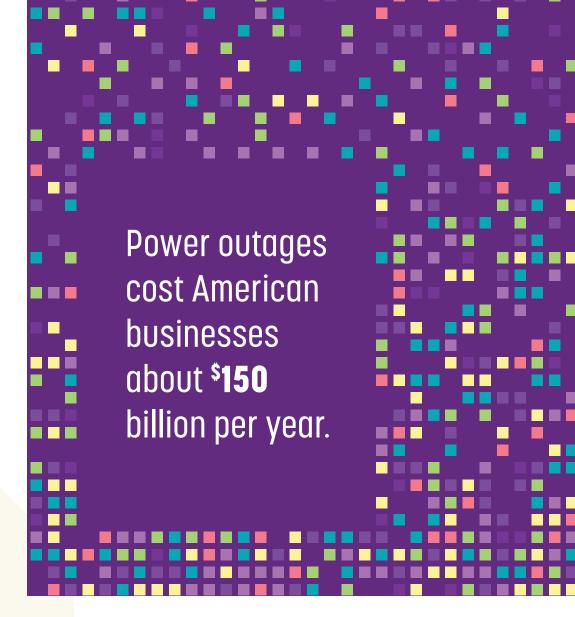
If the proposed county microgrid utility is established, Foley projected it would serve about 25 C&I customers and have about 100 MW of generation. Local sustainable generation would be used whenever possible, but the microgrids also could take power from the PJM Interconnection.

It's music to the ears of Cleveland-area C&I customers like Nestlé and PPG.

Rose Hanzlik, CEM, is the U.S. energy business partner manager for Nestlé, which employs about 3,000 people at its food manufacturing and corporate site in Solon, Ohio, just outside Cleveland. In a May 2021 hearing, she told the Cuyahoga County Council about some of the effects of electric reliability on the site's operations and how a microgrid might help.

"It's very disruptive having employees standing by because machinery has tripped offline, or having to restart production lines," she said. "Sometimes our equipment has been damaged by power blips which causes further startup delays."

Hanzlik mentioned that since the beginning of 2021 the site experienced multiple momentary interruptions in service, which resulted in lost production for four to six hours for each event.



"There's a delicate balance between cost and reliability, and having more reliable electricity would be valuable to us," she continued. "We're very interested in a microgrid if it can increase the reliability of service."

As a company, Nestlé has a goal of using 100% renewable energy at all its facilities by 2025, and Hanzlik told the Cuyahoga County Council that having the microgrid powered by renewable energy could help the company to achieve that goal.

At that same hearing, Scott Rinehart, a plant manager at a PPG site in Euclid, Ohio, told council members about two full-day outages that his plant, which manufactures metal pretreatment products, experienced in late 2020. Employees were sent home for those two days (they were paid), but nothing was produced. The facility couldn't even ship the product it had because the loading dock was locked — by an electric lock.

While he said two full-day outages in a space of about three weeks was unusual, "even small power blips can be disruptive to the paint and coatings industry: We'd have to restart equipment, reset the variable speed drives, and restart the boilers, scrubbers, and dust collectors.

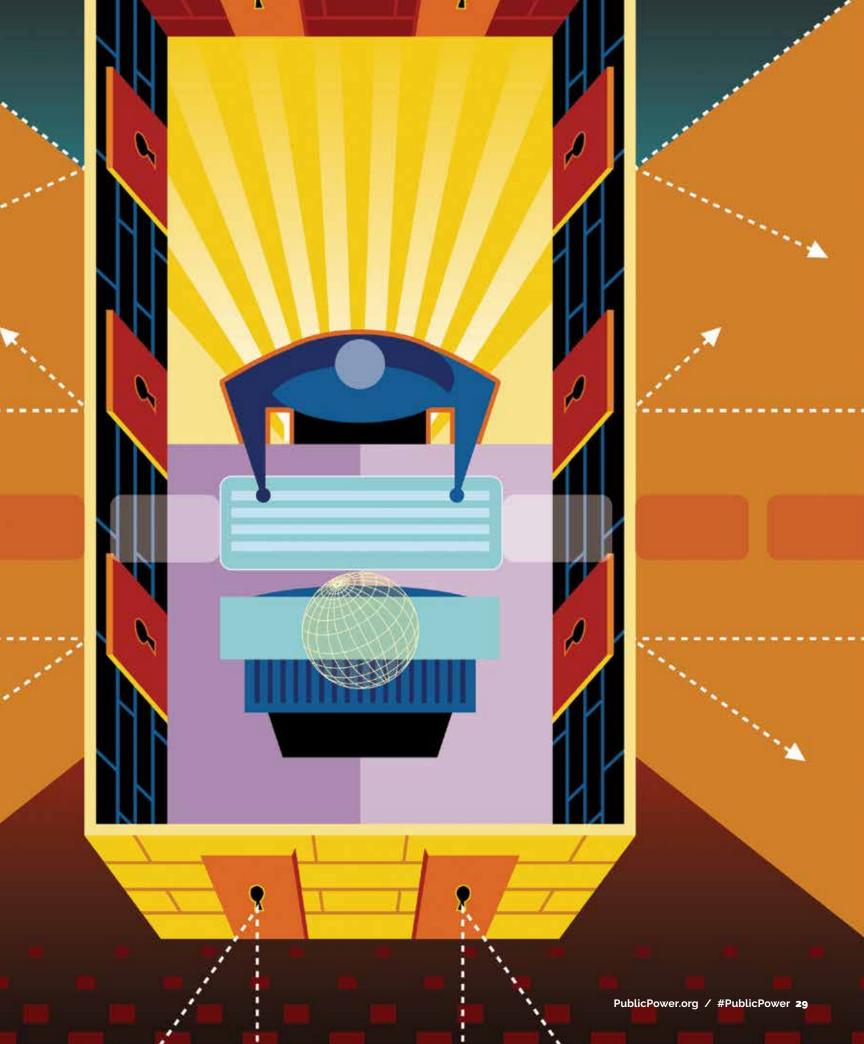
"A microgrid could be very helpful to us from a reliability and sustainability standpoint," Rinehart told the Cuyahoga County Council in May 2021.

While supportive of microgrids, Rinehart was not willing to write a blank check. "It all depends on the cost of the microgrid," he said.

COLLECTIVE OFFENSED CYBER RISK

BY SUSAN PARTAIN, SENIOR MANAGER, CONTENT STRATEGY, AMERICAN PUBLIC POWER ASSOCIATION

everal years ago, the superintendent of a small public power utility in the Midwest was going through a usual routine of catching up on emails. He clicked on an email about invoices, and before he could take in all the information about the email, his screen went red. The utility was soon locked out of its accounting and billing systems, and an attacker was demanding \$300 for the utility to regain access to its data.



COLLECTIVE DEFENSE: HOW PUBLIC POWER IS MANAGING INCREASED CYBER RISK

Fortunately, the utility had backups of all its data on tapes stored in a fireproof vault and did not suffer any data loss or compromise from the incident. Plus, the technology related to system operations was not accessible from remote locations, and it was distinct from the utility's informational technology systems, so there were no service or operational interruptions as a result of the event.

However, it did take five business days to fully restore the data and caused extra work for the utility staff, including working with the Federal Bureau of Investigation, Department of Homeland Security, and several state-level agencies to try and determine where the attack originated.

"It was a warning shot fired across the bow," said the utility's current superintendent in an interview. (The utility requested to remain anonymous in this article.)

He mentioned that while the measures that had been in place saved the utility and its customers from a more serious outcome, the event spurred the utility to become more proactive on cybersecurity and in replacing equipment more frequently.

The wake-up call came at a time when ransomware was less sophisticated — the malware attached to the email merely encrypted the utility servers, but the attackers did not actually access utility information or customer data.

Now, attackers are often trying to access sensitive company information and customer data to demand higher ransoms. Even though experts recommend that victims do not pay ransoms to cyber criminals, a report from the Institute for Security and Technology estimated that victims of ransomware paid an average of \$312,000 in 2020, and that overall these payments were up four-fold from 2019, shelling out about \$350 million total.

Calculated costs based on operations needs

VS

Uncertain calculated risk

RESILIENCE

Attackers also took advantage of the increased usage of and rapid switch to remote connections during the COVID-19 pandemic, with reports from various security software estimating anywhere from more than double to five times the number of ransomware attacks in 2020 compared to 2019.

Nick Lawler, general manager of the Littleton Electric Light and Water Departments in Massachusetts, stressed the need for utility leaders to take this increased threat to heart. He noted that while utility leaders are often aware of cyber threats in the aggregate, it can be easy to backburner cyber risk management while focusing on solving more immediate, tangible problems for the utility.

"It's really a cultural change in how we perceive threats to our industry," said Lawler, who believes cultural change and appreciation of the risk of cyber threats needs to come from the top.

As the Midwestern utility that faced the ransomware attack years ago can attest, any utility or organization can be attacked.

"The larger or more sophisticated a utility is, the more exposed it is to different types of attack, but being smaller doesn't mean you aren't a target," Lawler said. "People talk about not having SCADA systems or systems that control their distribution equipment, but it doesn't need to be a sophisticated attack. A ransomware attack can happen to anybody."

He noted how recent attacks on other types of critical infrastructure systems have drawn national attention. Even a minor but successful attack on a small system could bring a flood of questions from national news outlets.

"We want to be in the papers to show why we're relevant and why public power is great for the community we serve — and being in there for a negative reason does not help our cause," noted Lawler.

A REAL THREAT

awler recalled how the attack on Ukraine's electric grid at the end of 2015 made the threat of a cyberattack feel "real" to many electric utilities — and it hit home how simple changes, like strengthening passwords, can make a difference.

Lawler offered a number of steps that utilities can take to keep their cyber risk management programs up to date, such as training and testing employees to spot and avoid phishing attempts; assessing infrastructure for any vulnerabilities; and sharing information with utility peers.

The Midwestern utility that experienced the ransomware attack took several similar steps. When the utility's current superintendent came into his role (a few years after the attack), he enrolled the utility in a service that sends simulated phishing emails to employees. He didn't tell any of the employees about the service, and he was pleased that after the first email went out — which was meant to look like it came from the superintendent — he received a few calls from employees asking if the email was legitimate.

He also said that making moves to simplify and update the utility's servers and software programs has helped reduce the amount of spam employees receive, making it easier for employees to assess for potential threats.

"It's really easy, if you're 40 emails behind, to not look at who sent it before opening," he said.

"THE LARGER OR MORE
SOPHISTICATED A UTILITY IS,
THE MORE EXPOSED IT IS TO
DIFFERENT TYPES OF ATTACK,
BUT BEING SMALLER DOESN'T
MEAN YOU AREN'T A TARGET."

NICK LAWLER

GENERAL MANAGER
LITTLETON ELECTRIC LIGHT AND WATER DEPARTMENTS,
MASSACHUSETTS

Changing the Joint Use Game

Respond to Broadband Initiatives with **Joint Use 365**













erage your World-class osoft Office Security



varasset

Simple. Effective. Secured.

www.jointuse365.com

Simple to Implement

Integrates with NJUNS

INCREASE YOUR CYBER KNOW-HOW

The American Public Power Association has several guides to help public power utilities create and enhance their cyber risk management programs.

- KNOW WHERE YOU ARE: Axio360 for Public Power
- PLAN YOUR JOURNEY: Public Power Cybersecurity Roadmap
- ESTABLISH A PROGRAM: Cybersecurity Essentials
- RESPOND TO AN EVENT:

Public Power Cyber Incident Response Playbook

- STRENGTHEN YOUR SUPPLY CHAIN:
 Cyber Supply Chain Risk Management
- JOIN THE CYBERSECURITY DEFENSE COMMUNITY:



INVESTING IN DEFENSE

ven for a small utility, getting information technology updated can mean a big expense.

Previously, the Midwestern utility had been using computers and other equipment for business needs that were a bit out of date. After the cyberattack, it switched from a part-time IT provider to a full-service vendor.

"It was a rude awakening in how much money you have to invest in this," recalled the superintendent.

He said that the first two years of transitioning to the new vendor and approach were expensive, largely due to the volume of equipment that needed to be replaced right away.

"It was not just to have the newest, latest thing; it was because some of the older devices weren't properly supported anymore," said the superintendent.

He noted that the utility previously took a "least cost" approach, which means it had gotten behind the curve on where it should have been.

"Once we got there, it was just a matter of keeping the ball moving down the road," he said. He estimates that the utility now spends about five times the annual budget on IT that it did before the attack. The added cost comes not only from equipment and enhanced services, but also from increased prices over time.

"It's one of those expenses that 15 years ago wasn't a big thing, but now it's a lot of money. But it is a cheap defense ... if it prevents something from happening, [it is] still cheaper than what it would cost if you were compromised."

The utility now benefits from getting more information in real time about threats or necessary updates, as well as more redundancy in data backup.

Even with all the enhancements on the back end, the superintendent stressed that investing in people to know how to remain vigilant is key.

"If [a phishing email] made it through the firewalls, through that screening process ... they are the last line of defense before it gets opened," he said, crediting his staff for being diligent at taking a careful look at emails before opening them.

Lawler echoed the sentiment about staff training and shared that his utility uses a similar third-party service to simulate phishing emails as a way to test employees. He said that when the utility first started running the tests, a handful of employees would routinely fail. Now, several years later, he can't recall the last time there was a fail. And the service changes up its approaches to mimic the latest tactics used by hackers.

STAYING INFORMED

taying ahead of threats is also about continual learning and connection.

Both Lawler and the Midwestern utility's super-

intendent receive alerts from the Electricity Information Sharing and Analysis Center and the Multi-State Information Sharing and Analysis Center.

The superintendent also participated in cybersecurity training through the American Public Power Association's Academy. "For those of us [for whom] IT is not our specialty, it is good to have the training that can bring it down to our level," he said. "I could take it back and feed it to our IT company to make sure we were meeting some specific requirements."

COLLECTIVE DEFENSE: HOW PUBLIC POWER IS MANAGING INCREASED CYBER RISK

Lawler takes part in APPA's Cybersecurity Defense Community, which he said offers public power professionals with opportunities to collaborate on cybersecurity challenges and discuss related topics of interest.

Even outside of the community, Lawler pointed out that there are additional opportunities for public power utilities to coordinate to avoid getting overwhelmed while managing cyber risk. "Any policy I create could be tweaked and utilized across other systems," he said. "If we work together, it's not that big of a lift, but if we try and do it all by ourselves, then it is."

Lawler also stressed the importance of maintaining good relationships with local law enforcement and emergency personnel.

"The better the connections, the better prepared you will be to handle an event after it happens — whether that's after a hurricane or another event," said Lawler. He shared how, in Massachusetts, a state agency holds briefings and mock events that allow utility leaders and others to get a view into what kind of threats other agencies are seeing and how they are mitigating various cyber risks.

As for the utility that previously experienced the ransomware attack, the superintendent remains cautiously optimistic.

"I feel good where we are now, but I don't ever feel 100% safe," he said.

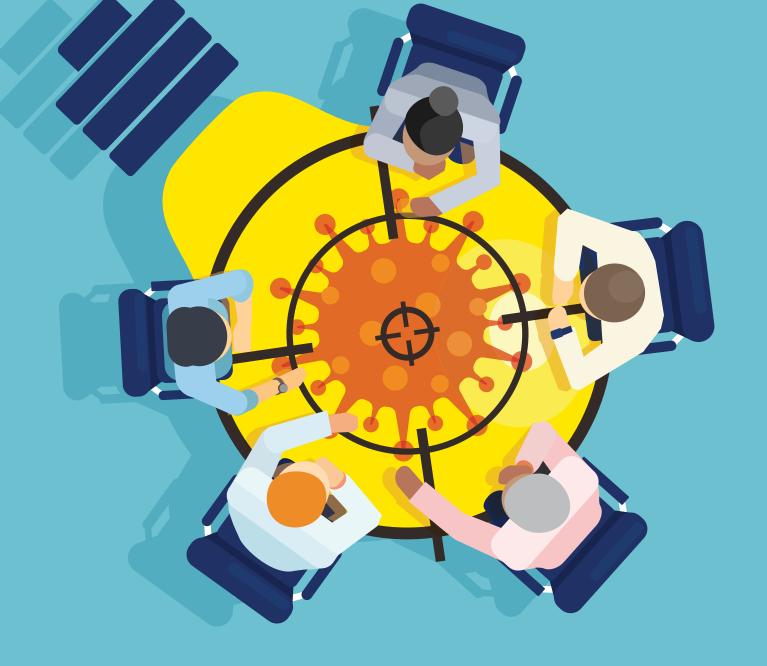
"IT IS A CHEAP DEFENSE ... IF IT PREVENTS SOMETHING FROM HAPPENING, [IT IS] STILL CHEAPER THAN WHAT IT WOULD COST IF YOU **WERE COMPROMISED."**



It's a tool that identifies high priority maintenance needs before there's trouble. **Contact Tantalus today to learn more.**



www.tantalus.com | 1-900-919-8970 | TantalusSales@tantalus.com



PEOPLE MAKE A SYSTEM RESILIENT

BY AMY RIGNEY-GAY, VICE PRESIDENT
OF HUMAN RESOURCES AND ADMINISTRATION
AMERICAN PUBLIC POWER ASSOCIATION

hen electric utilities talk about resilience, it is usually in reference to storm restoration or cybersecurity attacks

— with a focus on the "technical" as-

pect of operations. But given all that we've been through since early 2020 with the COVID-19 pandemic, many utilities have taken a more serious look at the "human" side of resilience and what that means for their organizations.

The pandemic stretched us in countless ways
— requiring us to balance constant change
and challenges in both our professional and
personal lives. Many of us had to pivot quickly
last spring to learn how to work remotely while
keeping the lights on for our communities.
Judging from the questions and exchanges (in
listservs, webinars, and virtual events) over the
past year, it's safe to say that all the intricacies
of running a utility in a year-long pandemic
weren't adequately covered in many utility incident response or business continuity plans. Nor
would we expect them to be — adaptability is
key to thriving in such circumstances.

We got through when people came together to learn how to adapt to new conditions. We navigated changes in state and local mandates — from wearing masks and keeping people at least six feet apart to limiting occupancy in our buildings — and are now drifting back toward some level of pre-pandemic normalcy thanks to the vaccines. We retrofitted our office spaces to protect our workers and customers. We bought hand sanitizer, bleach, and personal protective equipment by the caseloads. We adapted quickly to new technologies and ways of communicating with each other, perhaps going from never having used any sort of video platform to becoming a whiz at Zoom or Microsoft Teams. Plus, while trying to figure out all the ways to shift to a remote work environment to serve our customers, many also navigated the intricacies of personal demands — such as how to support kids' virtual schooling or safely take care of our elders.

In short, we have proven our resilience on a new level. What once might have seemed impossible is not only doable, it's paved a new way of working and living. For example, having the option for regular telework wasn't always the norm for utilities prior to the pandemic. Leaders have seen their office-based staff rise to the occasion and keep operations going, which has opened the door for many utilities to implement a regular telework policy to provide the flexibility and life-work balance many employees crave. Utilities have found creative solutions for field workers, too, such as scheduling pods of crews to limit contact to keep people safe.

Resilience ripples across the community. By keeping your people working, that keeps the community going — and not just from keeping the electricity flowing. Public power utilities can help local businesses weather the pandemic storm by making it a point to order lunch for staff from local restaurants, buying supplies from the local mom and pop store, or providing opportunities for local businesses to provide services for employees on-site. Such steps mean local workers keep working, which keeps local businesses in business and dollars flowing through the local economy. It's a cycle of resilience that goes hand in hand — to stand strong, help one another, and support the community — which really is the backbone of public power.

As we continue to move past the challenges of the past 18 months, it will be continually important to acknowledge the resilience of our people and how it contributes to everyone's well-being. In the HR world, there's a lot of talk now about increased burnout, turnover, and resignations. As people take stock of their values and reflect on what they want to be doing, they might be also reflecting on how their employers stood by them as they stood by you. Our onus as leaders of organizations is to figure out how to keep the humanized perspective alive in our organizations. Because if we learned one thing, it is that no matter what happens, it is your people that will help you through.





very utility faces cyber risk, and as utilities manage more suppliers and assets, the boundaries for each utility's mitigation focus also expand.

In March, the Government Accountability Office reported that the grid, particularly distribution systems, are increasingly at risk from cyberattacks. This heightened risk stems from increased remote accessibility to utility industrial control systems (ICS) and

when those systems are connected to utility business networks. An emerging concern is the risk of coordinated, simultaneous attacks on multiple utilities, such as the SolarWinds event.

This issue has the attention of the North American Electric Reliability Corporation, which enforces mandatory reliability standards for electric utilities. Jim Robb, NERC president and CEO, remarked to members of the American Public Power Association's board of directors in

February: "Recent cyber activity has raised our awareness of the need to rethink the bright-line criteria we use to describe high/medium/low impact assets with a focus on external access. We are seeking input from all parties, including APPA, to develop a model that provides for rigorous and difficult-to-defeat access controls from third parties to protect against coordinated attacks or supply chain compromises, while being sensitive to the additional complexity such controls may create."

The designation as medium risk would bring higher costs without necessarily aligning with a higher risk profile.

These remarks reflect a February decision by the NERC board to reconsider one of its critical infrastructure protection (CIP) reliability standards, CIP-002-6, which defines whether facilities pose a low, medium, or high impact potential if compromised by a cyberattack, and therefore, what compliance actions they are required to follow.

A specific focus of NERC's review is the requirements for transmission owner control centers, or TOCCs. There has been much debate - reflected in changes to the standard — about whether TOC-Cs should be classified as having low or medium risk. The concern comes from entities who might have an ownership stake, but not operations control, of transmission assets. The designation as medium risk would bring higher costs - in the form of needing more staff and hiring consultants and third-party services to manage the added compliance activities without necessarily aligning with a higher risk profile.

Who's who in review

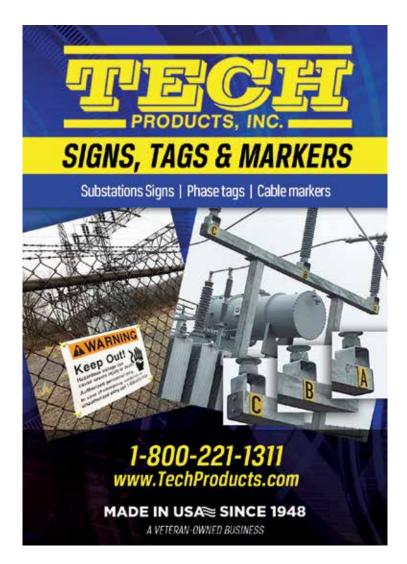
In May, the NERC Standards Committee approved a slate of industry nominations to form the team that will look at the TOCC piece. The review group includes several public power representatives, including Russ Noble from Cowlitz Public Utility District in Washington and Robert Croes from the city of Homestead in Florida, plus industry consultants Brian Evans-Mongeon from Utility Services and Terry Volkmann. The group will look at thresholds for medium and low impact in CIP-002-6 and whether there is a need for further revision. The team might conduct technical field tests that include load flow studies to investigate the thresholds. The expectation is that the team's findings might lead to registration changes for TOCCs that perform some transmission operations functions.

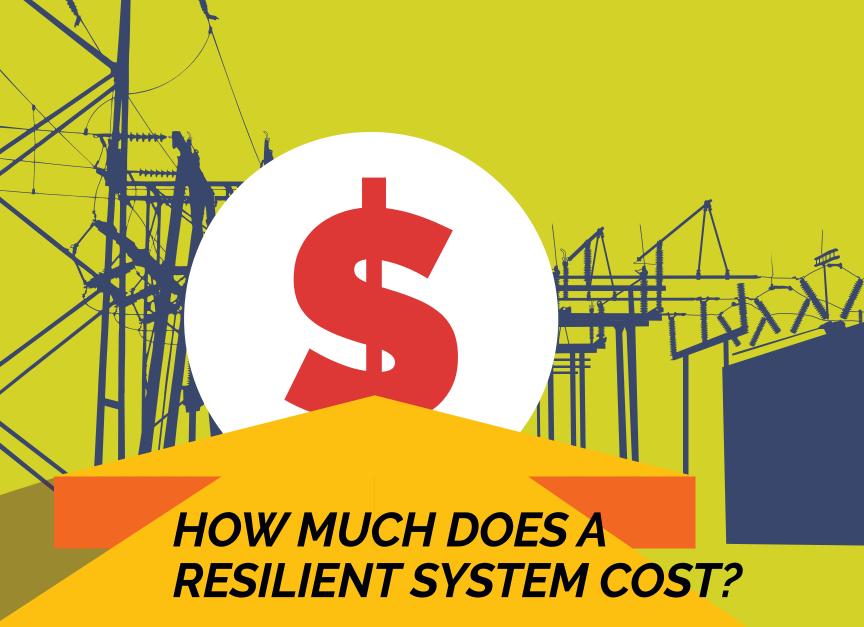
A separate team is taking a broader review and analysis of the degrees of risk presented by various bulk electric system facilities that meet the low-impact criteria and report on whether those criteria should be modified. The group consists of NERC staff, FERC staff and industry representatives. The team includes public power representatives from the Florida Municipal Power Agency and Chelan Public Utility District in Washington. The aim was to assemble a team of cybersecurity and compliance experts that represent a cross section of the industry to fairly represent the potential threat and risk posed by a coordinated cyberattack on low-impact BES cyber systems.

What's next

It is likely that NERC will submit recommendations for any modifications before the end of the year. In June, NERC sent registered entities a letter about these likely changes, in some cases rescinding the low-impact status. Utilities facing changes have until October 2023 to get into compliance. Utilities on the edge of moving to a different risk category are likely to see the biggest changes from these decisions, but any changes will be pertinent for all utilities, regardless of size or registration status.

The policy outcomes that arise from this regulatory attention will need to balance the government interest in protecting the nation against a coordinated cyberattack and industry concerns about regulatory burden and resources. Interconnectivity of systems and the need for adequate security is a growing concern for all utilities, and those who don't see changes in their compliance levels are likely to learn and deploy some new best practices that will emerge from the review.





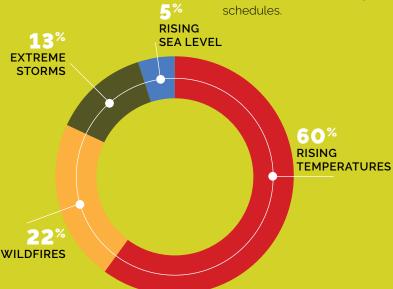
he cost of resilience can be difficult to pinpoint. Utility resilience investments often include figures for system hardening or building assets, such as storage or microgrids. However, resilience can overlap with other initiatives, including emergency planning and digitization. In these cases, it would be difficult to decouple what costs are related to resilience versus other strategic goals.

Investing in resilience can include a number of items before, during, or after a major event:

BEFORE	DURING	AFTER
Helps minimize potential impacts	Allows greater flexibility and adaptability	Supports quick restoration
Includes: system hardening, microgrids and cybersecurity controls	Includes: workforce and supply chain contingencies, access to diverse generating mix, dynamic control systems and demand response	Includes: mutual aid contracts, exercise of response plans, maintaining stock of key supplies and access to resources

INVESTMENT GAP

Larger investor-owned utilities have issued reports tallying resilience expenditures in billions of dollars. An ICF report estimated that investor-owned utilities need to spend \$500 billion to make their systems more resilient to climate hazards. It says improvements are needed to mitigate risks from:



The Proceedings of the National Academy of Science estimated about \$180 billion in new capacity will be needed by the end of the century to offset decreased efficiency and increased peak demand during heat waves.

COST IS UTILITY-SPECIFIC

Utilities considering how much to invest in resilience should start by conducting a risk analysis of hazards the system might face. Then, conduct a cost-benefit analysis of how much potential disruptions and solutions could cost. Utilities should then prioritize assets based on risk, impact, and maintenance and upgrade schedules

- The Department of Energy's State Energy Program funds states and territories, with one of its goals being to bolster and implement energy security, resiliency and emergency preparedness plans.
- The Department of Housing and Urban Development's Community Development Block Grant program provides funding to cities and states for disaster recovery — such as for power system improvements in Puerto Rico and the U.S. Virgin Islands

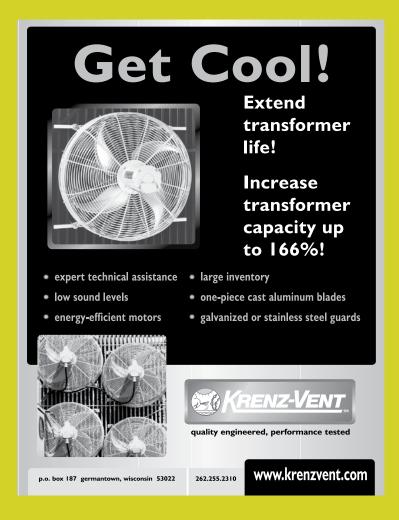
 and mitigation, including for energy efficiency and renewable energy projects.

Increased resilience is part of the focus of infrastructure discussions in Congress.
The Bipartisan Infrastructure
Framework released in June 2021 includes \$47 billion for resilience, "to prepare more of our infrastructure for the impacts of climate change, cyber attacks, and extreme weather events." It also designates \$73 billion for power infrastructure, specifically calling for "resilient transmission lines."

FUNDING FOR RESILIENCE

Current sources of federal funding for energy resilience include:

The Federal Emergency
 Management Agency has
 various hazard mitigation
 and preparedness grants
 for communities and non profit entities. FEMA's Build ing Resilient Infrastructure
 Communities program
 began in 2020, with more
 than \$91 million approved
 for utility projects.



PLAN

Define expectations

- Identify potential risks, clear activation
 triggers, and notification protocol
- Identify organizational capabilities and needs
- Define roles & responsibilities including response leadership

 Develop communications plans for public and other stakeholder notification

ORGANIZE

Identify the skillsets, equipment, technology, and other resources needed to execute plans

- Secure equipment and technology necessary for response
- Maintain contacts for and relationships with other entities involved in response
- Line up contracts for potential vendors/service providers (e.g., debris, accounting, logistics)
- Enter mutual aid agreements
- Ensure availability of extra supplies





ELEMENTS OF PREPAREDNESS

The severity of an event isn't the only factor that determines how long restoration will be – how robust a utility's preparedness program is also can translate to how smooth the process goes.

The All-Hazards Guidebook details how utilities can build a culture of preparedness through planning, organizing, training and exercising, and evaluating their programs.

EVALUATE

Continually improve

- Develop and review after-action reports, including after exercises, to identify areas for improvement or potential gaps
- Make improvements to address gaps, risks, and changing stakeholder expectations
- Benchmark your utility's response

TRAIN AND EXERCISE

Build and test response capabilities

- Provide awareness and education on potential threats and hazards to the utility
- Train all individuals involved in response on their roles and functions
- Test capabilities, equipment, and processes to find gaps in plans, skills, or resources





ABLE PUBLIC ER PROVIDER?

Get recognized for your commitment to developing a reliable, safe system and workforce.

APPLY BY SEPTEMBER 30

PublicPower.org/RP3



DISCOVER WHA POSSIBLE AN WHAT'S AHEA

Funding from our Demonstration of Energy & Efficiency Developments - aka DEED program allows utilities and students to test technologies, ideas, and careers in public power.

APPLY FOR SCHOLARSHIPS BY OCTOBER 15

PREPARE FOR THE NEXT GRANT CYCLE **NOVEMBER 1 TO FEBRUARY 15**

PublicPower.org/DEED



In-Person Meetings Are Back

Reconnect with your public power peers and experience unparalleled professional development.

Business & Financial Conference

Denver, Colorado

September 19 - 22 2021 Updates on accounting & finance, customer accounting & services, HR, IT, pricing & market analysis, and risk management

Legal & Regulatory Conference

Savannah, Georgia

October 17 - 20

2021

How federal legislative and regulatory changes are affecting public power

Customer Connections Conference

Scottsdale Arizona

October 24 - 27

2021

The latest in public communications, customer service, energy innovation, and key accounts

Learn more and register at www.PublicPower.org
/Academy