

The Power Industry, Presently and Projected

Risk Mitigation Takes Center Stage

By Guidehouse's
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Resilience and hardening of power grid infrastructure are far and away the most pressing issues American utilities are dealing with in 2024. Even as the energy transition accelerates – bolstered by decarbonization policies aimed at climate change impacts, technological advances, and improved economics for green generation and grid integration – utilities are grappling with an increase in storm-related outages and aging infrastructure.

In the most recent survey conducted by Guidehouse and Public Utilities Fortnightly, the majority of respondents (sixty-one percent) agreed that “increasing flexibility to improve energy system resilience” is the highest priority outcome for utility investments today.

This represents an important focusing of industry investment beyond electrification, clean energy, distributed energy, and grid modernization and increasingly toward solutions that mitigate risk. As utilities seek to accelerate flexibility and hardening initiatives, familiar challenges, such as creating new interconnections for large-scale renewable integration and an increasingly competitive, distributed, and diverse operating environment persist. Power utilities in the U.S are weathering an unnerving period of disruption – one that promises to endure for decades.

While the power industry operating environment may be more complex, many of the technologies emerging today offer exciting opportunities for utilities to reliably deliver power to end-users while meeting evolving customer demands. AI-based solutions are enabling predictive maintenance programs, which can minimize outages and improve worker efficiency and safety.

Hydrogen-based solutions introduce an element of fungibility between electrons and molecules while addressing the intermittency and geographic limitations of clean and distributed power. Investors are flocking back to the cleantech sector writ large, following a notable boom/bust period that took place more than a decade ago. Finally, electrification of fleets and building stock nationwide will ensure that demand for electrons will continue to rise. Indeed, thanks to burgeoning AI and data centers, load on the U.S. grid has already begun to climb following years of decline.

Managing all this change will require utilities to remain nimble and accelerate innovation, but the number of effective tools in utility toolboxes is growing. At the same time, familiar utility challenges such as restrictive regulatory environment,

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embedded organizational silos, and infrastructure cost will continue to create challenges.

Utilities Embracing Resilience

In the latest example of worsening climate change impacts, the U.S. National Oceanic and Atmospheric Association (NOAA) announced in May that it predicts an eighty-five percent chance of above-normal hurricane activity in the Atlantic basin in 2024, with seventeen to twenty-five total named storms expected, including four to seven major hurricanes. In the Midwest, this year’s tornado season is already on pace to match 2011 – the worst year in recorded history.

In fact, climate-related disasters have nearly doubled over the past twenty years compared with the prior twenty years, according to a study released by the U.N. in 2020. Worldwide, the number of major floods more than doubled, the number of severe storms rose forty percent, and major increases in droughts, wildfires, and heatwaves were all noted.

Major weather events are having a measurable impact on service reliability for utilities. According to data released by the U.S. Energy Information Administration in January 2024, U.S. electricity customers have experienced an average of five to

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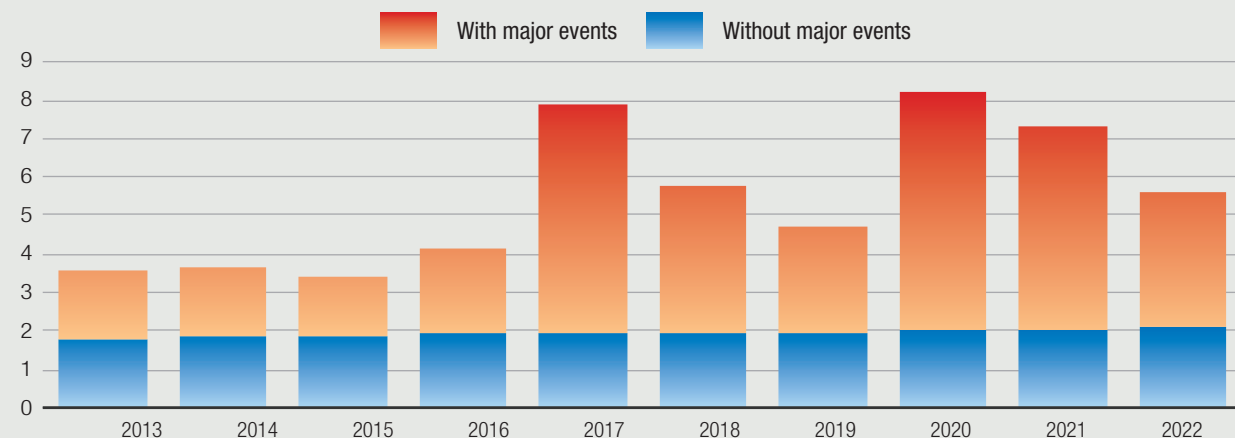
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Fig. 1**AVERAGE ANNUAL TOTAL OF ELECTRIC POWER INTERRUPTIONS (2013-2022)**

Number of hours per customer



Source: U.S. Energy Information Administration, Annual Electric Power Industry Report



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– *Richelle Elberg*

eight hours of power interruptions since 2017, up from four or less from 2013-2016.

See Figure 1.

The need for improved grid resilience is clear – but the path forward may be less so. Given the forty- to fifty-year useful life of many grid assets, grid operators can no longer rely on historical averages to predict disruptive weather events in a five, ten, or fifteen-year plan – they need to look out thirty or more years and recalibrate assumptions around likely impacts. Here too, powerful new generative AI applications have the potential to ease the burden.

Utilities in several harder-hit states of late (such as, California, Florida, Texas, New York) have begun making major grid resilience investments – with and without state-level mandates – and they are paying off. Florida Power & Light reported zero transmission structure failures during Hurricane Ian in 2022, a remarkable accomplishment for being exposed to one hundred fifty-five-mph winds. Southern California Edison has reduced the major fire risk from its equipment by eighty-five percent since 2018.

Looking ahead, no region in the U.S. is immune to the potentially devastating impacts of climate-related threats. Beyond the risks associated with fires across the West, tornados in the Midwest, and hurricanes along the Eastern Seaboard and Gulf, the Southwest is seeing longer, hotter summers marked by drought and flash flooding. In the Northeast, heat waves can stress systems, ice storms can bring down power lines, and flooding can damage underground equipment.

In short, investing for more reliable, resilient power grids, using the most advanced tools and techniques available, must now be considered standard operating procedure for power companies anywhere in the country – and utilities are rising to the challenge.

According to the Edison Electric Institute, U.S. utilities invested more than thirty billion dollars in adaptation, hardening,

and resilience initiatives in 2023, up from twenty-five billion in 2021. The fact that the Institute only began breaking out this category of investment in 2020 highlights resiliency's recent emergence as a topic of critical concern within the power industry.

But it will take more than utility capital investments to meet the full breadth of the problem. A multi-faceted approach will be needed; one that involves partnerships and collaboration with regulatory bodies, state and local governments, technology solution providers, private investors, and customers.

Utility industry leaders are encouraged to take the lead in coordinating efforts. Furthermore, the various elements needed for a comprehensive resilience program will almost certainly differ from utility to utility.

Increasingly, technologies like microgrids and virtual power plants, behind-the-meter battery storage, and sophisticated OT solutions like advanced distribution management systems and distributed energy resources management systems will move beyond nice-to-have to table stakes for true grid resilience. Importantly, greater coordination and standardization by state and federal regulatory bodies will also become more critical.

T&D Interconnection Relies on Regulatory Intervention

Decarbonization and integration of renewables into the U.S.' generation stock has been a focus for more than a decade, but the scale of those efforts has grown to such a degree that interconnection challenges for new projects now represent a debilitating bottleneck.

In April 2024, a study by Lawrence Berkeley National Laboratory found that in 2023 more than twelve hundred fifty interconnection requests were pulled – around ten percent of projects in the queue – due to interconnection delays. The study also found that just nineteen percent of interconnection projects submitted between 2000 and 2018 had been completed through 2023. Unfortunately, this is not a problem that utilities can solve on their own – state and federal government involvement will be required.

The federal government is moving quickly to address the backlog. In May 2024, the Biden administration, in partnership with twenty-one states, launched the Federal-State Modern Grid Deployment Initiative to accelerate progress in resolving shared grid challenges and opportunities. One of the partnership's key goals will be to improve state and federal cooperation for both interregional and intraregional transmission planning efforts, including via Regional Transmission Organizations and Independent Service Operators.

Also in May, the Federal Energy Regulatory Commission released Order 1920 requiring each of the transmission planning regions in the United States to undergo long-term transmission planning – something most regions across the country had not been doing. The rulemaking contains important reforms to local transmission oversight and interregional coordination.



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But while the Order standardizes long-term study requirements, it only requires that the studies take place. For the planning to translate into beneficial grid projects, states and stakeholders will need to continue to participate in planning processes and push for actual project selection and construction.

FERC Order 1920 came on the heels of FERC 2023, issued in July 2023. FERC Order 2023 aims to streamline the generator interconnection process by addressing queue backlogs, improving certainty, establishing clear treatment for proven alternative transmission technologies, and allowing cluster studies for faster, more efficient proposal review.

Finally, in October 2023, the Department of Energy announced three and a half billion dollars in grants to expand capacity for wind and solar, harden power lines, integrate electric vehicles and battery storage, and build out microgrids.

Fifty-eight projects in forty-four states will be eligible for



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the funding, and when matched by funds from state and local governments and utility and industry partners, will represent more than eight billion dollars in investment – the largest ever one-time investment in the U.S. power grid.

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Despite the government's clear focus on the interconnection challenge, however, more will need to be done to further streamline the process. As utility C&I customers pursue net-zero goals and seek solutions that can have immediate impact, utilities will need to plan for an increase in grid defections. In the interim, utilities and state regulators can work to accelerate deployment of technologies that maximize what the existing grid can accommodate.

Hydrogen Hubs Offer a Path Forward

In addition to resilience and interconnection challenges, one of the buzziest topics in the power industry in recent years has been the potential for hydrogen to accelerate decarbonization of the American economy. Here too, the federal government has been proactive in catalyzing investment, with support for hydrogen initiatives included in both the Inflation Reduction Act and the Bipartisan Infrastructure Law.

The Department of Energy's Hydrogen Shot initiative, launched in 2021, set a goal of reducing the cost of clean hydrogen by eighty percent, to \$1/kg, in one decade. Meeting that goal could unleash ten million metric tons of clean hydrogen production potential – and utilities are well positioned to play a key role.

For example, utilities can use hydrogen to replace natural gas in gas turbine power plants to meet their emission reduction

goals. Some gas turbines on the market today can handle blends of up to fifty to sixty percent hydrogen by volume – but the cost of clean hydrogen relative to natural gas remains high.

Even at the aspirational price of \$1 per kg for green hydrogen, natural gas would need to be around \$7.50/MMBtu for hydrogen to be competitive. Presently, natural gas is selling near historic lows, at under \$2/MMBtu. Tax credits alone are unlikely to address this gap.

Still, participating in hydrogen hub projects gives utilities a chance to work with state and local partners, as well as with companies across the value chain, to develop markets for hydrogen that will ultimately drive down costs. Utilities should begin engaging with customers now in order to understand their long-term needs and should integrate hydrogen planning in order to understand how they can unlock value and community benefits at the intersection of electrons and molecules.

Stay Nimble and Expect the Unexpected

After a century of relatively stable, predictable operations, utilities today are seeing their industry undergo massive change. The

Regional Meetings

(Cont. from p. 25)

to network, meet Staff from other states and other regions, and share concerns. It builds up that same network of support that we as Commissioners are so fortunate to have through our regional conferences in NARUC.

PUF: The average tenure of a Commissioner is three-and-a-half years, so much turnover. How important is it for you to reach out to new Commissioners in your role as MARC President?

Commissioner Sarah Freeman: It's very important and I look forward to doing so. MARC is a tight-knit conference and I feel we do a great job of welcoming new members into the MARC family. I fully intend to continue that tradition.

It's always bittersweet to see friends and colleagues leave their Commissions, but it's wonderful to welcome new faces in as well and introduce them to all the programming offered by MARC and other regions in NARUC. And just say, "The world's your oyster."

PUF: MARC in 2025 will be in Indianapolis. It's your job to promote the State of Indiana. How do you ensure that everybody thinks of it as a showplace?

need for improved resilience in the face of ever more challenging weather and climate-related events is obvious. In recent years, state and federal agencies have stepped up, implementing a plethora of bills, orders, and regulatory policies designed to smooth the path toward a cleaner, more reliable energy system.

But not every state is as proactive as the next – in some cases utilities may need to become the driving force for a local energy transition. At the federal level, a change in administration could result in a substantial shift in priorities.

It seems the only constant for utilities in 2024 is change. But much of that change is encouraging. While sophisticated AI and burgeoning data center power demand have both their pros and cons, in general, technology promises to help utility managers solve their thornier challenges in coming years.

Investors in this latest wave of cleantech interest appear willing to stick it out for the long run, embracing innovations with the potential for true paradigm shifts. Only through cooperation among investors, solutions providers, regulators, utility managers, and developers can the full promise of the energy transition unfold. **PUF**

Commissioner Sarah Freeman: We've gotten off to a great start with the highlight reel video that we shared at the luncheon here in Minneapolis, put together by talented members of our Staff. Other Staff have been running a hospitality table to introduce everybody to everything that Indianapolis and Indiana have to offer.

We'll continue that outreach over the next year. We've got a lot of exciting things in store. We've already booked some venues in town that we want to highlight, as well as booking one of my favorite bands in town. We will be hashing out the details over the next year as we work to set up panels and design educational content that will be of interest and helpful to everybody, and identifying speakers, as well.

Before that though, I want to highlight another meeting that MARC hosts every year. It's a Commissioners-only educational summit we hold in January of each year.

In January of 2025, we'll be hosting that educational meeting in Oklahoma City because our MARC colleague and good friend Bob Anthony will be ending his term with the Oklahoma Corporation Commission as the longest-serving Commissioner in the country. We want to be in Oklahoma City to give Bob a well-earned send-off from his MARC friends and family. **PUF**

The Producer Price Index for this May was reported showing that average prices paid by power plant owners for natural gas was down 1.9 percent from a year earlier. The trend of falling gas prices is increasingly being reflected in electric rates across customer classes.

A photograph of a wind farm at sunrise. The sky is a mix of orange, yellow, and blue. The wind turbines are white and stand on a grassy hillside. A layer of mist or fog is visible in the valley between the hills.

Lighting the Way for Our Clients to Lead the Way