PUBLIC UTILITIES FORTNIGHTLY®

The Sustainable Resilient Affordable Debates

JANUARY 2024

Jeanne Jones, Brian Savoy
Dan Cregg, Duane Highley
Jim Robb, Julie Fedorchak
Mark Lauby, Sanda Tuzlic

Dots Connected at NARUC Annual

PUBLIC UTILITIES FORTNIGHTLY®
The Sustainable Resilient Affordable Debates

January 2024 • *Volume 162, No. 1*

Front cover: At NARUC's Annual Meeting, from left, EPRI VP Corporate Affairs Katie Jereza, Minnesota Public Service Commission Chair Katie Sieben, EEI EVP and General Counsel Emily Fisher, Michigan Public Service Commission's Commissioner Katherine Peretick.

What's in Store in Twenty-Four?

Confronting the Various Scylla and Charybdis of the New Year

BY STEVE MITNICK, EXECUTIVE EDITOR

What's in store in twenty-four? We know that interest rates will remain higher than any time since the earliest years of the twenty-first century. Though they are likely to moderate. We know that electricity demand will keep surging at rates not seen since the earliest years of the nineteen-seventies. And they are not likely to moderate.

We know that national elections will be held in this year's eleventh month. Depending upon how the vote goes, by year-end we may know the policy trends that have been in place will persist. Or by year-end we may know quite the opposite. That we'll be reversing course with respect to the pace and nature of the energy transition.

As U.S. Secretary of Defense Donald Rumsfeld famously said:

"There are known knowns. There are things we know that we know. There are known unknowns. That is to say, there are things that we know we don't know. But there are also unknown unknowns. These are things we don't know we don't know."

Supply chains for a broad range of critical equipment and materials will continue to be all too tenuous. There will be no let up as well, as to a panoply of problems that threaten the resilience of our energy systems, from cyberattacks to wildfires to weather extremes, seemingly ever more vicious, no thanks to climate change.

As we contemplate how we, in the fashion of Odysseus, shall confront the various Scylla and Charybdis of the new year, it is good to remember the strengths of our ship at sea. The utilities industry has and is investing intensively in energy system resilience, with

(Cont. on page 49)

Steve Mitnick has authored four books on the economics, history, and people of the utilities industries. While in the consulting practice leadership of McKinsey & Co. and Marsh & McLennan, he advised utility leaders. He led a transmission development company and was a New York Governor's chief energy advisor. Mitnick was an expert witness appearing before utility regulatory commissions of six states, D.C., FERC, and in Canada, and taught microeconomics, macroeconomics, and statistics at Georgetown University

PUBLIC UTILITIES FORTNIGHTLY®

The Sustainable Resilient Affordable Debates

 Public Utilities Fortnightly® (ISSN 1078-5892) is published monthly with additional issues published in February, June, and November by **Lines Up, Inc.** Executive and editorial offices at 3033 Wilson Blvd., Suite 700, Arlington, VA 22201. Tel: 703.842.3762, Email: info@fortnightly.com

POSTMASTER: Send address changes to Public Utilities Fortnightly, 3033 Wilson Blvd., Suite 700, Arlington, VA 22201. Periodicals postage paid at Arlington, VA and additional mailing offices.

SUBSCRIPTIONS: $500 per year, except for employees of organizations with ten or more employees, whose organization must have a PUF organization-wide membership. Copies not delivered due to subscriber's failure to send change of address six weeks in advance cannot be replaced. Replacement copies must be claimed within 30 days of cover date for free replacement.

CHANGE OF ADDRESS: Notices should provide old mailing label as well as new address including Zip or Postal Code to: Lines Up, Inc., 3033 Wilson Blvd., Suite 700, Arlington, VA 22201 or call 703.842.3762. Please allow 4 to 6 weeks for changes.

www.fortnightly.com

Reprints: Call 703.842.3762.

Anterix® ACTIVE
ECOSYSTEM

JOIN 100+ TECHNOLOGY INNOVATORS

who are enabling utilities to achieve their grid modernization goals via 900 MHz private LTE networks

Members enjoy technical assistance, collaborative tools and marketing support to develop products and services for 900 MHz private LTE networks enabling utilities and the critical infrastructure sector.

Anterix®

SCAN ME

anterix.com/anterix-active-ecosystem

NARUC Annual: Last Dots Connected

Innovative/Disruptive Technology and Regulation Taken on at La Quinta with excerpts of presentations by newly-elected NARUC President and North Dakota Commissioner Julie Fedorchak, NERC CEO Jim Robb, PJM Interconnection CEO Manu Asthana, MISO CEO John Bear, Michigan Commissioner Katherine Peretick, Minnesota Chair Katie Sieben, EEI Executive VP Clean Energy Emily Fisher, EPRI VP Corporate Affairs Katie Jereza, newly-elected NARUC Second Vice President and Washington Commissioner Ann Rendahl, ESIG Director of System Planning James Okullo, Tri-State Generation and Transmission VP of Planning & Analytics Lisa Tiffin, and PUC of Texas Senior Market Economist Werner Roth

NARUC held its Annual Meeting and Education Conference November 12 - 15 in La Quinta, California, closing out three years of the theme, "Connecting the Dots, Innovative/Disruptive Technology and Regulation." That theme began under the tenure of former NARUC President Paul Kjellander of Idaho and continued under the reigns of Virginia's Judith Jagdmann and Connecticut's Michael Caron.

At this Annual Meeting and Education Conference in La Quinta, the excitement was palpable, as NARUC President Michael Caron passed the torch on to North Dakota Commissioner Julie Fedorchak, who as NARUC's new President will make history with the first all-female leadership of the Association, with Georgia's Tricia Pridemore as First Vice President and Washington's Ann Rendahl as Second Vice President.

Of course, much more went on, as newly-elected NARUC President Fedorchak introduced a new theme for NARUC, "Focused on the Future: State Regulators Leading the Way." More on that can be found in the December 2023 issue of Public Utilities Fortnightly. Here are excerpts from three panels that took place at the Annual Conference.

Operational Challenges in Our Bulk Power System

Newly Elected NARUC President and N.D. Commissioner Julie Fedorchak
NERC CEO Jim Robb
PJM Interconnection CEO Manu Asthana
MISO CEO John Bear

Commissioner Julie Fedorchak: Let's start talking about what the operational differences are between the new versus traditional generators on the system. What are the challenges that are being created?

John Bear: Think about the challenges of the portfolio today versus the portfolio of tomorrow. In the past, we'd figure out the most economical way to commit resources to meet load moving around. If that load moved around and the run changed, we had some other resources we can bring on to make sure everything was done reliably and efficiently.

We now have a very different portfolio. We've got a significant amount of weather-dependent resources, which are inexpensive on a marginal-cost basis. Then we take the other resources that we can turn on, can control, and balance.

The key is there're a lot of different attributes we need to think about as we look at what's on the system. Do we have enough? Do we have enough assets we can control, we can turn on, and make sure they run when the weather is not as we would like it to be, whether sun or rain.

We've gone so fast that we're not on our rule sets. We also need to rethink; how do we think about the risk with that portfolio that we operate? Because one day in ten yesterday, means something very different from one day in ten today.

Manu Asthana: If I boil it down, the difference is uncertainty. The big difference is the new resources are not predictable in the same way as the old resources. As we're going through the transition, the old resources are becoming less predictable also because there's a lot of pressure to not build gas infrastructure and gas is the marginal fuel in our markets for a lot of the year.

We're approaching this intersection where we know we have to decarbonize the system, but we are at risk of not doing so in an orderly fashion. It's something we can and will manage. There are signposts that suggest we are at risk of not having an orderly transition and that's what all three of us are struggling with and advocate for.

Jim Robb: I think about the challenges associated with inverter-based resources, wind and solar, and batteries eventually. Take batteries. You've got the variability issue because the sun doesn't shine at night. We plan around that.

We've got the uncertainty issue, how to deal in real time with whether or not an asset shows up.

That's an issue operators are working to figure out and underscores the importance of having balancing resources like natural gas available until we have something else.

The third issue we're highly focused on, is the way these resources integrate onto

Current Operational Challenges in Our Bulk Power System, from left, PJM Interconnection CEO Manu Asthana, MISO CEO John Bear, NERC CEO Jim Robb, and moderator and NARUC President-elect Julie Fedorchak.

the grid and the difference between an inverter-based resource and a traditional resource where you make power by making something spin that has a magnet on it. When you do that, you get reactive power and inertia. You need to maintain frequency set and voltage with the kinds of controls we have.

With inverter-based resources, you do that through power electronics. What we've learned repeatedly is that if you don't tell the inverters how to behave under even a modest grid disturbance, they will panic and trip offline because their default will be to protect the panel.

Some of our reports on spectacular failures, largely in west Texas, take the Odessa Texas event August of 2022, where a modest disturbance on the grid caused seventeen megawatts of inverter-based resources to panic and trip off.

That resulted in a frequency dip and about eight hundred megawatts of conventional generation tripped off. For something that would've cleared itself and been a complete nothing from the operator's perspective, we ended up losing two and a half gigawatts of power, that's two and a half nuclear units.

ERCOT was close to having to start to shed load. That's why you hear us talking about wanting to make sure we get standards in place for inverters that will allow them to ride through those simple events, make sure they are modeled correctly so system operators will know how to behave under different circumstances.

The way in which these inverters integrate onto the grid needs to be codified through our standards and is going to need to be codified through all the interconnection agreements that FERC puts out and you all implement.

Those operational integration issues are as important and maybe even more so than the variability and uncertainty issues. Because those could be planned around, these others are just going to continue to be a problem that needs to be fixed.

Commissioner Julie Fedorchak: What's the timeline getting those new standards in place?

Jim Robb: Further away than they should be. We uncovered these issues in the Blue Cut Fire in California, in 2016, put in place a guideline, it got endorsed, and embedded in an IEEE standard. It was embraced by the neighborhood community, but we still have inverters that don't have the capability to ride through these issues.

We have drafting teams working on the requirements now. They're probably our top priority set of standards. I anticipate we'll have them in place in the first half of 2024, probably an implementation period after that.

FERC has them embedded in their proforma interconnection agreements published last year. Texas is working on a series of standards around integration into the ERCOT system.

I encourage all states, particularly those with large amounts or high aspirations for interconnecting, particularly solar onto your grid, to do what you can to embed these requirements in your grids.

Commissioner Julie Fedorchak: In a hierarchy of solutions, talk about how much this will help. What else are the most important solutions that grid

operators can work on to help reduce uncertainty?

Manu Asthana: There are three buckets. The first bucket are the resources needed to perform, and they need to show up, be available, perform when needed. In general, today we have enough resources, at least in PJM.

The second bucket is to make sure we have enough resources over time, an adequate supply of resources and enough of the right characteristics in those resources.

The third bucket is what we call essential resources. Frequency support, voltage support inertia, and not panicking and causing cascading issues.

In the first few buckets, having better performance. Winter storm Elliott saw some of the highest levels of generation outages in at least a decade. We're spending a lot of time working with our generators and on market rules and testing requirements to make sure we support their ability to perform.

In that second bucket, making sure we have enough. That's where I'm concerned because we're seeing massive levels of retirement of generation, which potentially could be accelerated by the EPA rule. We're seeing a slow pace of entry of new generation. Some of that is interconnection issues.

We're seeing significant load growth through electrification, but we have to serve the load. That's one of my biggest concerns is we will let these resources we use today retire, and not have replacement resources in time.

John Bear: The biggest concern is we have resources delayed that we want to bring on the system, mostly wind, solar, and some batteries. We've got fifty gigawatts in MISO that we want to execute, that're two- to three-year delayed to come on the system. There are supply chain challenges, there're economics with interest rates, inflation, costs, pushing that back, and we need that energy.

At the same time, we have thermal resources retiring, and combine that with

Talk about the gas-electric harmonization challenges. We're going to start a task force. We'll be asking for RTOs to be involved, hopefully NERC will support our efforts with tactical assistance.
– Julie Fedorchak

Inverter resources, they're good at following the grid, but as we get to the point where they're 40, 50, 60% of the generation mix, they have to create the grid. This is the concept of a grid-forming inverter. The path toward a carbon-free grid is having grid-forming technology through power electronics.
– Jim Robb

significant economic development opportunities across the MISO footprint. When we first started talking about it internally, we calmed ourselves by saying, "If no one's there to build the energy to supply the load, it won't show up."

That's not true. It is showing up. We're seeing a thousand-, two thousand-, three thousand-megawatt loads. These are big opportunities with lots of jobs, but if we can't get anything built, that's a challenge because other technologies we're betting

We have thermal resources retiring and combine that with significant economic development across the MISO footprint. When we first started talking about it internally, we calmed ourselves by saying, "If no one's there to build the energy to supply the load, it won't show up." That's not true. It is showing up.
– John Bear

on aren't where they ought to be.

Jim Robb: You hit a couple of nerves. This demand growth issue is a big deal, whether it's the data centers being put in to support artificial intelligence and basic use of the internet, or electric transportation. Tremendously large loads need to be planned for, both from a bulk power system perspective, but also where the charging infrastructure gets put in are big deals.

We need to keep our eye on the fuel infrastructure behind the sector that is going to change quite a bit, particularly as we add on more wind and solar. Solar is going to require a lot of gas and storage.

We learned that in southern California when Aliso Canyon was out of service, how important local storage assets are to maintain pressure in the distribution system because the power plants will suck the gas out faster than the pipelines will pack it in when they have to deal with that afternoon solar ramp.

We're going to need more infrastructure and particularly gas storage. If we continue to just build out the electric sector but we're not paying attention to the fuel infrastructure behind it, we're going to run into issues.

Commissioner Julie Fedorchak: Talk about the roles of state Commissioners, we can't do it all, but we have a vital role to play. What do you think Commissions should be doing more of, thinking more about or engaging in?

John Bear: We have a valuable partnership with the Organization of MISO States. We work closely with our state Commissioners on these issues, but it's understanding from a resource adequacy standpoint with a new rule set, what does that look like and how do we ensure we have resource capacity in place?

We can make sure that things are reliable, but sometimes being reliable means not everybody's getting power delivered. That's a different view than people outside this room would have on what reliability means.

We've got to work together to understand new rule sets, whether it's how you think about how much an asset is worth, whether it's wind, solar, battery, an existing coal, gas or nuclear plant. Then how do I fit all that together to make sure it all adds up?

Manu Asthana: We cannot do it without our state partners. PJM spent a lot of time with OPSI, our state organization. We're focused on a range of issues, from market design to how do we set the right price signals? How do we correct the credit or calculate the capacity value of different resources, and how far ahead do we run our auctions?

In terms of resource adequacy, we have a mix. We have states that have run integrated resource planning and we come in afterward and check that their result meets our reliability criteria.

But we have states that have delegated that resource adequacy to us through auctions and we partner with all those states in making sure that the rules we have serve the mix of states.

Jim Robb: I celebrate the collaboration and relationships NERC and NARUC have forged over the last several years. We all realize that when the line is blurring from a physics perspective and the distinction between what's bulk power and what's distribution is in the eye of the beholder, the more we work together the better.

Commissioner Julie Fedorchak: There are opportunities like new technologies, partnerships, and investments by the federal government to help us solve these challenges. It feels like one of the things we need more of is patience. Talk about your thoughts on the pace concerns and how we might help this go more smoothly.

John Bear: One of the areas I'd like us to be less patient with is our stakeholder process because our industry has made great progress, but we've always gone from a safe place to a better place. I argue today we're not in a safe place. We are going to go to a better place.

We need to be careful not to take too

much time as we analyze these issues through these stakeholder processes, and we need to move multiple issues at a time.

In terms of the patient side, we have a lot of technologies that are promising, whether it's hydrogen, long-duration storage, small modular reactors. But they're not here today, and while we develop new technology, let's be patient about retiring everything before it's time.

Manu Asthana: This is going to be a messy transition. That's because the new technologies aren't quite ready yet.

We need to be more cautious about pushing the existing generation off because I don't know how these two will intersect. Regulation and legislation that are pushing existing generation off our grid at a date certain, are burning our boats. It's doing it in a way that is creating unacceptable risk. I hope I'm wrong.

Jim Robb: We've got to figure out how to keep the traditional generation on the system as long as we can. We can continue to add wind and solar and all sorts of other new technologies onto the grid.

One of the areas we're starting to pay attention to now is around inverter resources, as they're very good at following the grid, but as we get to the point where they're forty, fifty, sixty percent of the generation mix, they have to create the grid.

This is the concept of a grid-forming inverter. That's where we need to advance our understanding because the path toward a carbon-free grid is having grid-forming technology through power electronics.

It's a solvable problem, but until we've come up with a solution, we've got to make sure we're not short-changing the gas system. That's the fuel now that keeps the lights on.

Commissioner Julie Fedorchak: Let's talk about the gas-electric harmonization challenges that exist. We're going to start a task force. We'll be asking for RTOs to be involved, hopefully NERC will support our efforts with tactical assistance. What are you seeing in terms of the challenges, what are the solutions?

This is going to be a messy transition. New technologies aren't quite ready yet. Regulation and legislation that are pushing existing generation off our grid at a date certain, are burning our boats. It's creating unacceptable risk. I hope I'm wrong.
– Manu Asthana

Manu Asthana: Some of the lessons we learned from Elliott, a third of that generation loss was because of fuel. Two-thirds were other mechanical, so it's the gas-electric issue and most of that third was gas.

To set it in context. The core issue is that morning, the Marcellus Shale lost about a quarter of its production. The Utica Shale lost over half of its production.

That's not a gas-power coordination issue. That's an issue of winterization of the gas production gathering and processing systems.

That's a drill-down from the big numbers to how much was gas and then how much of that was loss of production? That's the single issue, although we shouldn't focus on just the single issue.

John Bear: My request is to expand the scope of what we're talking about because there's got to be a missing money issue if we can't affect things at the wellhead, which is where we've got to go. We can have coordination of all the pipelines, but if the gas isn't there, gas isn't there. We saw that in Uri and experienced it in Elliott.

Jim Robb: There's no doubt that the relationship between the natural gas and power business has changed fundamentally over the last fifteen to twenty years, largely because of the introduction of combined-cycle technology that got gas to be a core fuel for spending on kilowatt hours, not just for balancing through combustion turbines.

But as we pull out coal and nuclear, it's now the largest fuel for the electric sector and the electric sector is the largest consumer of natural gas. The other issue is operationally these systems are entirely integrated. They're not governed that way.

But as we learned in Uri, if you start having rolling outages, you can quickly cut your throat by shutting off gas compressor stations and messing around with processing plants. The clarity around the relationship between these two sectors has become clear.

What was terrifying in the Elliott analysis

was how close Con Ed came to having to rotate when they wouldn't be rotated to actually shutting off gas delivery services to New York City, which would've impacted many of the boroughs in Long Island.

It said in the report that it would take months to restore that system. That would be an economic calamity far greater than the 2003 blackout. It is surprising that's not getting more press.

It had roots in the fact that the pipelines were losing pressure. A lot of that was due to the loss of production in the Marcellus and Utica Shales. It's an integrated issue around the natural gas system, which is not a single system.

It's now so fundamental to our ability to serve electric load that it needs to be thought of as part of the electric system. The call for a Gas Reliability Organization has never been stronger. ❍

Tomorrow's Tech: Integrated Resource Planning

Michigan Commissioner Katherine Peretick
Minnesota Chair Katie Sieben
EEI Executive VP Clean Energy Emily Fisher
EPRI VP Corporate Affairs Katie Jereza

Commissioner Katherine Peretick: Chair Katie Sieben of the Minnesota Public Service Commission is going to tell us about the new ten-megawatt iron air battery that her Commission just approved and how she thought about the integrated resource planning process for it.

Emily Fisher, executive vice president of clean energy at EEI will talk about factors for success during this time of change. Katie Jereza, vice president of corporate affairs at EPRI will talk about system planning challenges and new modeling approaches that are becoming available.

Chair Katie Sieben: I am a former politician and not an engineer unlike Commissioner Peretick. I will give a broad overview of our integrated resource planning in Minnesota. I know not all states do this.

In 2019, Xcel Energy filed their integrated resource plan. They're the largest investor-owned utility in Minnesota, and the Commission approved in 2022 their IRP plan, which for those of you who don't do IRP planning, it's a roadmap, it's a touchstone.

It's the most important part of comprehensive electricity planning that we do as state regulators. It gives the public, the utility, and the Commission an idea of where the utility is headed in the next fifteen years. It's important to point out that we look for the lowest cost in terms of size, type, and timing to arrive at solutions for the utility that will serve the reliability

Integrating Tomorrow's Tech: A Critical Look at Integrated Resource Planning, from left, EPRI VP of Corporate Affairs Katie Jereza, Minnesota Chair Katie Sieben, EEI Executive VP Clean Energy Emily Fisher, and moderator and Michigan Commissioner Katherine Peretick.

needs for the state and for their customers in the upcoming years.

When Xcel first filed their IRP, the proposal included a large, seven hundred-megawatt gas plant, and through an iterative process that took a couple years, Xcel showed tremendous leadership in evolving and listening to stakeholders. The IRP that the Commission approved in February 2022, moved away from a large gas plant and instead had plans to build new renewable resources.

That is central to Xcel's plan for their IRP and for how the long-duration energy storage project came to be. We approved the IRP, and it's extending the life of the nuclear facilities for Xcel, and investing in several thousand megawatts of wind, solar, and storage. It includes this transmission line that goes to southwestern Minnesota that connects to the retiring coal facility.

We did not include in the IRP because it wasn't there at the time – the long-duration energy storage pilot – but a year after the IIJA and the IRA passed, the Commission approved the pilot and Xcel is now moving forward with the ten-megawatt iron-air battery with Form Energy.

Overall, the Department of Energy has invested in the battery project fifty million. There was a twenty million Breakthrough Energy Catalyst award to help lower the overall price of the battery. Again, it's a pilot, it was consistent with the IRP, which is important.

It uses iron technology or iron in a reverse rusting type of process. It's about a tenth of the price of a lithium-ion battery. Minnesota has a diverse economy with iron ore in the northern part of the state, and we're hoping that future iterations of the battery will include iron from Minnesota.

Commissioner Katherine Peretick: Katie, would you like to give some thoughts about planning?

Katie Jereza: How can we help industry and the government deliver new innovation that advances how we make, move, and use energy? It's all about critical organization. For the last ten or so years it's been grid modernization and decarbonization.

For projects that use these newer technologies that might have longer-term benefits with shorter-term costs or that build their value from preventing high-cost catastrophes from occurring like wildfires or increasing global temperatures, how can those costs be properly assessed?
– Katherine Peretick

Well, today, resilience is coming much more to the forefront. We're going faster. We're looking at maybe quadrupling electricity in order to electrify industry transport and building some more. That's changing. At EPRI years ago, I used to talk about the integrated electricity system.

Now we're going way bigger into an integrated energy network that includes long-duration energy storage, hydrogen carbon-capture storage, which isn't quite new, but it is new again, because now it's important for the future.

These planning processes are going to depend on timing, trajectory, and technology, and the transition journeys that we're all going to go on are going to differ from start to finish depending on the infrastructure, geography, and also demand. Because as I mentioned, that's going to grow much more.

Planning is going to change because it's more complex. We're going much faster, and we have to. Because we're going to be more reliant on electricity, resilience is going to be more valued.

Emily Fisher: My title is executive vice president for clean energy. That is not a thing that I was thinking about five years ago. My members are committed to getting as clean as they can, as fast as they can, while keeping affordability and reliability front and center. That's easy to say, but it's hard to do.

We looked out across the technology landscape and a lot of members see pathways to seventy, eighty, maybe even ninety percent clean depending on the resources they have available to them. But we knew to get all the way to that big goal and to be affordable and reliable, we were going to need to invest in new technologies.

We call them 24/7 zero-emitting technologies because when you message test, dispatchable, no normal person knows what you're talking about.

But we have a role in the development of these technologies that is very different

We're opening new dockets on the IRA and the IIJA, engaging with federal partners, stakeholders, environmental groups, and others looking to drive home the benefits to Minnesota utilities. That is why the Form Energy project is so exciting because Xcel had an approved IRP. It's buying down the cost of new technology.
– Katie Sieben

than the role we have played as electric companies in the past. That usually we wait for someone to make something and then give it to us.

Then after we've all become comfortable with it, usually we prefer that someone else becomes comfortable with it first, then we'll use it. I don't think we have the ability to do that. I have two reasons why we need to think about this and not hope that someone will figure it out for us and why the work we've done is so important.

An automaker that will remain nameless, about six years ago came to us and said, "Hey, we're going to do a lot more electric vehicle charging and we've decided the number one thing that we need to do first is start pricing electricity as a transportation fuel."

I don't know what they meant by that, but what they were telling us is the first time a new technology from their perspective interacted with our regulatory regime, they thought it should go away, that they were like, "Well, this is an impediment to making progress. We have to change it."

I'm a huge, ardent fan of the regulated utility model. It's necessary for us to do this work. So, we have to find a way to incorporate these technologies and maybe evolve the regulatory regime, but I don't think we should put the baby out on the back burner.

The anecdote that makes me think about this thesis statement, how do we do this together, is I spend a lot of time talking to technology developers and they're brilliant and smart and creative in ways that I never will be.

They tend to go into a room, make technology, bring it to us, and say, "Here, it solves your problems." A lot of the members of our company say, "Oh, that isn't exactly the problem I had. I have this other problem." So, we need to be more part of their process.

What I love about what you're doing is that Xcel and Form have committed to this idea that they are going to co-create some of the solutions that this battery can provide so that the electric company can be responsive in real time about what kinds of services they need from this technology.

That's my goal, is how do we figure this out together? I want the answers to these questions.

Commissioner Katherine Peretick: One of those big challenges when we're planning for new technologies is we don't have many years of operating data to input into the models to fully understand exactly what we're going to be getting.

Katie, how do you account for the increased risk of that lack of knowledge and how do you value expected benefits? Then if that information changes along the way, how are we supposed to pivot?

Katie Jereza: It'll be iterative. We'll take a good shot at it by doing modeling. There are models out there. We work with the National Labs; modelers check with each other to try to validate them. But modeling is essential.

For example, EPRI partners with NOAA to get the climate data because global climate data is great, but does that help the utility when you're trying to figure out if that pole is going to go down in the next storm?

We need to get down to the infrastructure level. Partnerships are key to getting the data, working with the workforce groups, labor, and CWD to get that data on workforce. What do we need?

Data is important. Then it's doing that iterative process. Let's look at the modeling and at the power flow. Economic modelers love to say, "Oh, it's going to be this cost to do this." Then another group says, "What're the reliability implications?"

So, that is a complicated calculation. EPRI has attempted to look at, I talked about integrated resource planning. We're scientific, so we came up with a new acronym of, Integrated Strategic System Planning.

The strategic is to indicate the long-term and the system because it's really a system assistance working today. So, think in a systematic way, but also think about physics and economics.

Chair Katie Sieben: It's important that we not under-emphasize the moment we're

in. The moment I feel like we're in right now in this energy transition is we have an incredible opportunity because of the IIJA and the IRA.

Whether it's a big utility or a small one, a municipal or a cooperative, maximizing the benefits of the IRA to make the clean energy transition more affordable is where utility Commissioners should spend a lot of time.

Because whether you agree with the federal policy or not, it doesn't matter if you can go out and procure projects that your Commission is going to need, infrastructure projects, tax credits, things that are going to lead to a more reliable system and more affordable rates.

That's where I'm trying to push our utilities that have been a hundred percent behind this, and responsive. We're opening new dockets on the IRA and the IIJA, engaging with federal partners, stakeholders, environmental groups, and others looking to drive home the benefits to Minnesota utilities.

That is why the Form Energy project is so exciting because Xcel had an approved IRP. Yes, it included batteries, but they went out on their own accord, applied for this funding, announced it to the Commission, "Oh, we have this pilot."

It's buying down the cost of new technology. As regulators, we always want everything as cheap as possible, so it doesn't cost as much in rates.

It's a tremendous example of the utility having an integrated resource plan that sets the roadmap and then the Commission adapting and saying, "Okay, it's not exactly what was filed, but we like it, we see the attributes, and we want to encourage you to bring it forward."

Another great example of maximizing the benefits of these federal investments is funding that has gone to the JTIQ project, states working in collaboration with one another to say, "How do we buy down the costs of transmission that we know we're going to need in the future so that it benefits all of us?"

Could you expand the planning process to also include the distribution system? Maybe that sounds terrifying, but one of the benefits of at least broadening the aperture of the lens through which we're thinking about planning is that a lot of these emerging technologies do more than one thing.
– Emily Fisher

Commissioner Katherine Peretick: Chair Sieben, as Commissioners, balancing those costs you're talking about has to be at the forefront of our minds for any decisions that we make.

For projects that use these newer technologies that might have longer-term benefits with shorter-term costs or that build their value from preventing high-cost catastrophes from occurring like wildfires or increasing global temperatures or things like that, how can those costs be properly assessed? Emily, do you want to start on that?

Emily Fisher: You mentioned wildfires, and that's a critical topic. It's also about technology. It's about reducing risks, that there could be substantial wildfires that result in devastating losses that can have devastating consequences for an electric company and their financial health and ability to invest in a clean energy transition.

For a lot of weird reasons, we won't get into, we have decided that electric companies are the defacto insurers of last resort of wildfires. That's probably something we have to fix, but that's a different panel.

But in the interim, there are ways to reduce risk and they involve technology investment. It can be hard for Commissions to grapple with the scale of that investment given all the other capital expenditures that people see coming just on the idea that you are stopping something bad from happening. It's hard to quantify that.

Commissions need to tell us what would make them comfortable with those decisions. We are spending a lot of time, for example, on risk modeling in a way that we haven't on issues related to wildfire and other adaptation challenges related to extreme weather events. Can we help you understand the scale of the potential challenge?

Does that make it easier for you to approve an expenditure when the main benefit is stopping something terrible from happening – proving a negative – it's difficult, but we have to engage in that conversation where it can't be so narrowly focused because not making those investments is potentially catastrophic.

Back to my cybersecurity days, when I think about planning and trying to protect against something you don't want to have happen, we had a saying, "build it in, don't bolt it on." The more we can plan and design for issues, that can help with affordability.
– Katie Jereza

We have to reframe the conversation but tell us what information would make you feel better about approving these investments. What do you need from a risk perspective, but also from a cost perspective?

Katie Jereza: Back to my cybersecurity days, when I think about planning and trying to protect against something you don't want to have happen, we had a saying, "build it in, don't bolt it on."

Because even if you're trying to prevent something from happening, if you build it in today, but find out later that maybe you need a patch or fix, it could be three times or more expensive to fix it later. The more we can plan and design for issues, that can help with affordability.

Commissioner Katherine Peretick: How do you think current utility and Commission planning processes need to change to fully and fairly value all energy resources and provide a robust analysis of the benefits of these new technologies?

For example, should integrated resource planning be somehow further integrated with distribution system planning and how do we plan for the changing energy usage patterns?

Chair Katie Sieben: It's important to recognize, and everybody who's a regulator in the room understands this, that there's more pressure on utility Commissions to listen to outside stakeholders who may not be familiar with IRPs or IDPs, or even how the Commission works.

It's a challenge for Commissioners to balance the need to explain to the public what our IRP process is doing and bring them along, so they have some buy-in into that future plan.

To go back to Xcel's most recent IRP, but their plan evolved. That was not necessarily because the Commission was saying, "We don't like this big gas plant. Instead, you should build a big transmission line to the coal plant. It was because of the stakeholders and the participatory process that the Commission sort of demanded in early steps that Xcel went and continued to work.

Thanks to the leadership of Xcel, they went to work with stakeholders and got more buy in. Part of the IRP that we saw this last time is getting more complex. The load forecasting is more difficult, and the Commission is doing more on integrated distribution planning.

That folds into the IRP, but the way I think about it is the IRP is the pivotal roadmap for where the utility is going in the next fifteen years. Then there're MISO and overall transmission planning at the regional market level that are making even IRPs much more complicated.

It's important you have Commissions that are engaged at MISO, OMS, and other regional markets that can help say, "This is how transmission planning is so important for us in Minnesota to meet our clean energy goals that the state legislature is mandating too." Folding all these complexities of IDP regional transmission planning into our decision making in the integrated resource plans.

Emily Fisher: There's an R in there that stands for resource. Then you talk about, could you expand the planning process to also include the distribution system? Maybe that sounds terrifying, but one of the benefits of at least broadening the aperture of the lens through which we're thinking about planning is that a lot of these emerging technologies do more than one thing.

We're used to thinking of, this thing provides energy and capacity, and this thing provides another set of services, and storage in particular can provide some of those services sometimes simultaneously.

At least being willing to acknowledge that the services that could be provided have multiple benefits would allow you to think differently about costs, because you're getting more than one benefit out of the process. Maybe you're not fully integrating your distribution system planning as that might be a lot to do at one time, but at least recognizing that even though you're in an IRP process, you're also providing other benefits for the future. ❍

Multi-Metric Resource Adequacy Framework

Washington Commissioner Ann Rendahl
NERC CEO Jim Robb
ESIG Director of System Planning James Okullo
Tri-State Generation and Transmission VP of Planning & Analytics Lisa Tiffin
PUC of Texas Senior Market Economist Werner Roth

Commissioner Ann Rendahl: Reliability risks are shifting with extreme climate events and the transmission grid. As a result, resource adequacy, modeling, and reliability assessment frameworks are evolving to better capture the changing nature of the electric system.

Relevant to this topic, yesterday NERC released a new report, "Resource Adequacy for State Utility Regulators, Current Practices, and Emerging Reforms." Utilities, reliability entities, researchers, and regulators are focused on exploring advanced resource adequacy frameworks that leverage multiple metrics to evaluate the ability of power systems to minimize various outage events while balancing costs.

The panelists are going to discuss the motivation behind a multi-metric analysis and explore how regulators can benefit from these approaches, as well as gain a better understanding of the potential reliability impacts of our regulatory decisions.

Jim Robb: The slides I share here set the table for the need to think through this multi-metric resource adequacy framework. Over the last ten years, we've seen a four-percent decrease in capacity available on peak, and a three-percent increase in load over that same decade.

This was a decade without a tremendous amount of policy initiative around electrification. So, if you extrapolate this going forward, you can see we are moving in the wrong direction from a resource adequacy perspective.

The composition of the resources we have today has changed significantly. Substantially less inventory fuel with the reduction in the

Measuring What Matters: How Regulators Can Leverage Multi-Metric Resource Adequacy Framework, from left, ESIG Director of System Planning James Okullo, Tri-State Generation and Transmission VP of Planning & Analytics Lisa Tiffin, PUC of Texas Senior Market Economist Werner Roth, NERC CEO Jim Robb, and moderator and newly elected NARUC Second Vice President Ann Rendahl.

Entities charged with resource adequacy, meaning you, need to think through, first, what reliability criteria should we be designing for? The one day in ten is probably not the metric. Think about unserved energy in the context of how long would an unserved energy event last, how big would it be, and how frequently would it occur?
– Jim Robb

coal fleet, increases in gas and wind, and a spectacular increase in solar.

As a result of this changing, both capacity mix as well as the tightening of the overall supply-demand balance – that's what's driving these changes that you're seeing in our reliability maps, showing more and more areas in the country, that risk shortfalls.

One of the big challenges is we all still carry around in our head reserve margin as the measure for resource adequacy. Hopefully I'm going to make a few points that'll lead you to believe that maybe that's not the way we should think.

Look at three markets. Start with Texas. Anticipated reserve margin, that's iron already in the ground, plus capacity that with a very high degree of assurance will come on. Other resources could show up. The target reserve margin is based on the one-in-ten-year forecast or the one-in-ten-year requirement and the nature of the utility system in place.

If you look at Texas, you say, "This is great. We've got more than adequate capacity and it's growing over time." But if you take a probabilistic view of, what does that mean in terms of energy available to serve customers, you get a different view. In 2024, we anticipate about seven hundred fifty megawatt hours of unserved energy in Texas.

That's driven by the change in the capacity mix, and even though there're tons of capacity, there may not be tons of energy available. If you look at the loss of load hours, which is the frequency of duration of events, about two tenths of a percent of not being served.

By 2026, when we see reserve margins growing, we see almost a doubling of expected unserved energy and a fifty percent increase in loss of load hours. So, there's something going on beyond just capacity changes.

California, similar story. We're seeing tightening reserve margins over time, but adequate through the next five years.

In 2024, we're anticipating thirty-seven thousand megawatt hours of unserved energy growing to half a million by 2026. Look at the load hours with unserved energy going from 0.7 hours to almost ten hours. Even though again, there's adequacy from a reserve margin perspective, the ability to serve customers with energy is declining.

At PJM, substantial reserve margins over time, and if you look at this on an expected energy, unserved energy, or loss-of-load hours, they look good during this period. The issue is the higher risk of retirement. If they end up losing the capacity they anticipate over the next ten years, they would be in a similar soup as the other areas I talked about.

MISO shows why the probabilistic stuff doesn't necessarily capture everything either. Our winter reliability assessment, very adequate reserve margins for this winter and next winter. But those adequate reserve margins can turn into an energy shortfall.

You've got a hundred fifty gigawatts of capacity, more or less in the MISO footprint. We would expect under normal conditions we'd lose about twenty-eight gigawatts of capacity due to planned maintenance of facilities over time, and then the typical forced outage rate for failures around the system.

But if you throw in the potential for a wind event, either too much wind where they have to feather the turbines or not enough wind, you could see another twenty-five megawatts of capacity coming out easily. MISO would be unable to serve a high winter load.

This is why we keep making the points around these extreme conditions are challenging the system. In the case of MISO, the performance of wind is a very big deal.

Policymakers and entities charged with resource adequacy, meaning you, need to think through, first, what reliability criteria should we be designing for? The one day in ten is probably not the metric, which was born out of an economy that was metal bending.

We need to shift to think about unserved energy and in the context of how long would an unserved energy event last, how big would it be, and how frequently would it occur?

Werner Roth: I was invited to give the perspective of our work on implementing a bulk metric reliability framework. Standard disclaimer as a Staff member, I'm speaking on my behalf, not representing a position of the PUC of Texas or Commissioners.

ERCOT does not have a reliability standard. We do have the reserve margin as referenced in the NERC report, 13.75 percent that ties to the one-in-ten LOLE, but that number has not been updated in some time. So, not any relevant measurement.

After winter storm Uri, the Texas legislature directed the Texas Commission to establish a reliability standard for ERCOT. Texas Commission Staff opened a project to pursue this.

One of the first things we did was circulate questions for market participants and the general public. In a rare demonstration of unity among filing parties, there was consensus that any single reliability metric, including the industry standard of one-in-ten LOLE would not be sufficient.

There was support for moving forward with a volumetric approach to finding a reliability standard for ERCOT. As part of this discussion between ERCOT market participants and the Texas Commission, we came up with a three-part framework where we would focus on three different metrics to establish a reliability standard.

First is frequency, and how often load-shed events from generation inadequacy occur. Not more than once in X number of years. This aligns with the current LOLE standard, the one in ten or some other frequency level of magnitude.

The maximum amount of load shed during an event is more than X megawatts or X percent of load. Trying to say how extreme an event is during that maximum load shed during that event and the duration, how long the load shed event would last and not more than X number of hours.

We're in the early stages, but we've run the standard for a one-in-ten LOLE. We would add enough generation to make sure we can get onto that and that would produce a series of events that have a range of magnitude and duration, even with one in ten, still some extreme outlying events that would have extreme magnitude, long duration.

Utilities, reliability entities, researchers, and regulators are focused on exploring advanced resource adequacy frameworks that leverage multiple metrics to evaluate the ability of power systems to minimize various outage events while balancing costs. Panelists are going to discuss the motivation behind a multi-metric analysis.
– Ann Rendahl

How are we contemplating capturing these in a reliability standard? The first idea we've come up with is something we would call, exceeds probabilities. Essentially, how likely are you with an event to go over a certain threshold?

So, with the one percent exceeds probability at approximately a duration of thirteen hours magnitude of about thirteen thousand megawatts, this is saying that any event that has a greater duration than that, has about a one-in-a-hundred chance of occurring.

This isn't the only way you would be able to do this. You can say, "If we have ten percent of our peak load being shed, what is the percentage probability that we're going to be in excess of that?" We've done those calculations as well, and same on the duration side.

ERCOT will be providing us with the updates as the analysis is performed and the ultimate decision will be made on what the reliability standard for the ERCOT market will be next year.

Lisa Tiffin: We are regulated by the State of Colorado for resource planning. When we do our resource planning under Colorado regulation, we do it system wide.

Our resource planning process, we work through a two-phase process. At the heart of this process are our reliability metrics, always have been, but even more so now with the changing resource mix. We are retiring coal, bringing on renewables, and semi-dispatchable resources in this decade, and that is a huge change for G&T Cooperatives.

We have two levels of reliability metrics. We have reliability metrics looking at normal operations. That's a planning reserve margin, loss-of-load hours, and expected unserved energy.

We had a study recently on our system to update our planning reserve margin. We're moving from a fifteen percent to a

The most difficult aspect has been that for magnitude or duration there isn't an established level of what is acceptable. Winter storm Uri is an example. One of the ways we're addressing that is updating calculations for value of loss of load. Those will be considered as we update our reliability standards.
– Werner Roth

twenty-two percent PRM as a transition. We will likely hit thirty percent before we're all through, before it starts to come back under control.

That's going to require full RTO organized markets and other changes, resource adequacy programs in our footprint. We're too complex. Our members are bearing the brunt of keeping the lights on.

On loss-of-load hours, we do one-day-in-ten years. And expected uncertain energy, that's just an annual limit. What we started prior to our last phase-two process with our members is, every scenario in addition to having normal dispatch has an extreme weather event sensitivity.

And the scenarios where that can ultimately end up being our preferred plan. We stress a week in the summer and a week in the winter. We stress load, thermal, intermittent, semi-dispatchable, transmission, pricing. Then we have a set of metrics that those weeks have to meet.

It was member driven, but we received guidance from the PUC in Colorado around our reliability metrics. We're looking at frequency. We've looked both at how many hours you would allow in any given event and how many hours you would allow in a year.

We're starting to look at duration, limited sequential loss-of-load hours. We look at the magnitude, what's the percent of load in any hour that we're willing to have unserved, and we put a percent threshold of load on that.

The last one is market leans. It's important as a cooperative and G&T that we're there for our neighbors and we appreciate it when our neighbors help us. Our members are willing to pay to make sure we're showing up with capacity.

We're looking for standardized methodologies. We answer to a lot of reliability entities. We'd like to see some uniformity across the footprint that we serve.

James Okullo: Resource adequacy is so vital that if we get it wrong, bad things happen. EPRI surveyed the U.S., Europe, Australia, South Africa.

One thing in common. Loss-of-load expectation (LOLE) is king, one in ten reigns supreme in most places. There are exceptions where people are using loss-of-load hours (LOLH), common in Europe. South Africa is using a bit of expected unserved energy (EUE) and something around capacity factor. Australia is using EUE.

There's a bit of a problem because LOLE doesn't give the full picture of what is going on. Look at two events. The California experience and Uri. On the surface, if we look at LOLE, those events are not very different. It's two days versus four days.

The California event was two successive days, two separate events. The Texas event was one event. If we stopped there, that doesn't look as bad as the California event.

When you look at LOLH, now we're starting to see a difference of six hours in California. Texas was seventy-one consecutive hours; the California event was spread out.

Now when you look at the EUE, we see the real difference in the events. Twenty-seven hundred-megawatt hours for the California event, that's a big number. That was quite disruptive. But the Texas event was almost a million-megawatt hours of unserved energy with dire consequences.

The max shortfalls, a thousand megawatts in California and twenty thousand megawatts in Texas.

If we were to use a standard metric of LOLE, looking at these two events, they're not very different. But looking at the duration of the events, at the amount of energy, it lends itself to adopting multiple views on resource adequacy to understand what is going on and setting criteria more appropriate for the kinds of events we're going to be seeing.

Last, the idea that metrics are arbitrary. One day in ten is an arbitrary metric and I think of it as a line in the sand. If you fall below, you're in one set of the equation for a reliable system. If you're above, you've crossed, and that isn't quite accurate.

How do we ground that in reality? One way is to add economics. It costs something to get to a certain level of reliability. How much are we willing to pay?

We need to adopt metrics that give visibility into the financial costs. On the flip side, what is the cost of not meeting those reliability standards?

It is vital that we look at several metrics to capture the risk from the system because of all the changes we're seeing. Look at those outlier events, the extreme events and tail events, and let's add some economic component, some cost component to the decisions we're making around reliability.

Commissioner Ann Rendahl: Utility engineers and reliability experts have been evaluating these resource adequacy issues for a number of years, looking at this trend. But in your work on these models and methods, are utility engineers and experts receptive to this change?

Jim Robb: There's a broad consensus that we need more sophisticated tools and modeling. We're all struggling with the assumptions that need to be made to go into them. What weather conditions should we be planning for? How do we handle common mode failures?

That's the one big change as a result of the resource mix change. We used to worry about random events on the grid and we still have random failures, but now you've got cloud cover, solar droughts, wind droughts, those kinds of dimensions.

One of the vexations is to think through, what are the right inputs to put into the models? The models are relatively well-developed. We haven't used them the way they need to be used going forward. But getting the inputs right is a challenging topic and then gaining agreement around what those look like.

Werner Roth: There is a general acknowledgement that there needs to be a change away from the standard we've used historically. How that gets done, there's always going to be pushback around changing how we've historically done things for the last century, as far as resource planning.

On the MISO side, working on that resource advocacy construct, whenever significant changes happen, say going from annual construct to a four-season construct, there was pushback from certain stakeholders. They adapted to the changes once it was implemented. I feel like this would be the same way.

We have a task force at ESIG focusing on this topic. There is consensus that we need to change, looking at EUE as a foundation of this multi-metric framework. The two challenges are, we're talking about metrics, how to measure. It's entirely different to think about criteria; how do we set criteria given those metrics?
– James Okullo

James Okullo: We have a task force at ESIG focusing on this topic. There is consensus that we need to change, looking at EUE as a foundation of this multi-metric framework.

The two challenges are, we're talking about metrics, how to measure. It's entirely different to think about criteria; how do we set criteria given those metrics?

That links to the other piece. A lot is going to be determined by folks in this room. It's going to be the regulators who determine what we are okay with. On the engineering side the models have changed, they have progressed, we have consensus. How do you translate that into action is a big question.

Commissioner Ann Rendahl: NERC just presented at FERC's annual reliability technical summit. Did you discuss the need for multi-metric resource adequacy frameworks and what was FERC's reception?

Jim Robb: I didn't frame it in the context of the multi-metric resource adequacy framework, but we've been very focused on, FERC is focused on, and the chairman pushed me quite a bit on this notion around an energy sufficiency standard in our planning standards. We have a drafting team working on energy availability, energy sufficiency, and the operating timeframe. A day ahead and then over the course of the next year.

We're going to launch a second team to look at the planning criteria to rethink the planning standards around that. That was more complicated because that's where you got to start thinking through all the weather examples. It intersects with the extreme weather planning that we've been directed to do. We're working on it.

Around establishing criteria as distinct from the metric, we're going to try to host a technical conference in the first half of 2024 and bring all of the planning coordinators, RCs together, and not just in the U.S.

Commissioner Ann Rendahl: Werner,

We would like to see NERC driving the reliability standards around this issue. Direction from NERC at the reliability standard level would be very helpful, especially for a system like Tri-State where we are so diverse. Anytime we can have consistency, we know it helps our economics and reliability.
– Lisa Tiffin

what's been the hardest issue to resolve as you've been moving toward a multi-metric framework? What can other states or regions learn from Texas' experience?

Werner Roth: The most difficult aspect has been that for magnitude or duration there isn't an established level of what is acceptable. Using winter storm Uri as an example, that's not an acceptable level of magnitude or duration for an event.

How often is a twelve-hour duration event acceptable? Everybody wants to have reliability with the lights on all the time and to pay as little as possible. It comes down to a balance of reliability versus affordability.

One of the ways we're addressing that is we're updating our calculations for the value of loss load. We have something to compare load shed on cost with and the cost of new entry. We have contracts out right now to conduct new studies for both of those. We should have results in 2024 and those will be considered as we update our reliability standard. As far as recommendations for other state regulators are concerned, this can't be ignored.

Commissioner Ann Rendahl: With system planners throughout the country, thinking about introducing an array of advanced resource adequacy frameworks, how do you expect different approaches in neighboring systems to be coordinated and aligned?

Lisa Tiffin: We would like to see NERC driving the reliability standards around this issue. Direction from NERC at the reliability standard level would be very helpful, especially for a system like Tri-State where we are so diverse. Anytime we can have consistency, we know it helps our economics and reliability.

Jim Robb: This is a hard question, and one that we struggle with because although we can attack some of this issue through our reliability standards, there's a fairly clear line where our authority stops. We can't create the scenario where that orders somebody to build.

So, one of the things that is important is that we create the framework for the utilities to be able to have an objective conversation with whatever body it is that would approve resource initiatives. That they're well-informed as to what the trade-offs are in terms of the risks that we run, if certain assets aren't brought to the table.

From a standards perspective, we can attack some of this problem, but it's not going to be fully satisfying because these decisions are better made locally. The regional differences are important to respect and honor.

The criteria that people will put in place will differ around the country based on the resilience of the population. A two-hour load-loss event in New York City is very different than a two-hour load-loss event in rural Kansas.

Through our technical committees we will be developing more forums for people to share best practices. Out of that may come a more uniform model for doing these kinds of assessments, but it's tricky for a host of reasons. PUF

In 2022, for the 27 million households in the middle quintile, with respect to income before taxes, their income averaged $65,659. The middle quintile is halfway between the lowest quintile, the nation's households with the lowest income, and the highest quintile, the nation's households with the highest income. After taxes, middle quintile income averaged somewhat less than income before taxes, at $63,676. Middle quintile expenditures on average on all goods and services, however, was a little less, at $61,950. And their expenditures on electricity specifically, that is, residential electric bills, averaged $1,664. On a monthly basis, that's an average of $139. This according to the U.S. Department of Labor, Bureau of Labor Statistics, from its Consumer Expenditure Survey.

GET SMART

Smart Grid Toolkit

GET SMART.™ SMARTGRID.

The marketing tools you need to engage customers and advance your grid modernization program.

RESEARCH BASED – The Toolkit is the product of interviews with public and private utility program managers within IOUs, municipalities and rural co-ops across different regions, and it incorporates the most recent and reputable Smart Grid utility marketing research studies focused on consumer knowledge, perceptions and concerns.

CONSUMER FOCUSED – It speaks to residential and small commercial consumers in plain language, and is designed to connect with all demographic profiles.

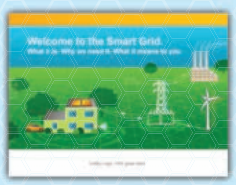
CREATIVELY DRIVEN – It addresses your customers as people first and customers second, to capture their attention and encourage further exploration of the benefits of smart grid technologies.

READY TO GO – The Toolkit's templated marketing components are ready to go to work. We'll simply add your logo, brand colors and contact info and it's ready for print reproduction and digital widespread dissemination.

For more information or to purchase your Toolkit, call 413-453-9121 or email Sales@SmartGridToolkit.com

Templated Marketing Tools

FACT SHEETS



POWERPOINT

POSTERS

PAMPHLET/BILL STUFFER

DIRECT MAILERS

VISIT SMARTGRIDTOOLKIT.COM FOR DETAILS

A COMPLETE CAMPAIGN FOR A LOW, ONE-TIME FEE

CFO Roundtable

Conversations with
PSEG CFO Dan Cregg;
Duke Energy CFO Brian Savoy;
Exelon CFO Jeanne Jones

It has become an annual tradition. At Edison Electric Institute's Financial Conference, the Public Utilities Fortnightly team talked with Chief Financial Officers at major utility companies. This year, the PUF team discussed important issues with the CFOs of Exelon and Duke Energy. And a few days later, also talked with the CFO of PSEG.

The theme this year was quite appropriately investing in resilience. The PUF team asked questions like, why does your utility prioritize resilience in its investments, what are the expected benefits for the utility customer, and what are examples of major resilience investments that are planned?

The topic of customer affordability naturally came up since ensuring electric utility service is affordable is, for the CFOs, an absolutely critical consideration. In these pages you will find these fascinating conversations.

PSEG CFO Dan Cregg

PUF's Steve Mitnick: Why does PSEG prioritize resilience in its investments?

Dan Cregg: That's a simple answer. If I think about our investments and what we're trying to do for our customers, we provide an essential service that they use every day. Making sure that it is there for them, as expected, that's first and foremost.

In addition, we're fortunate that the State of New Jersey does express that as a critical element of their energy policy, so we're making sure that we continue to be as resilient as we can within our system and that we sustain that resilience. Those are critical elements to everything we do, both on the gas and electric side.

The other aspect we may have that's a bit different from others is one of the most vital resources in New Jersey in the energy space, and that is our nuclear units. Those units are dispatchable, carbon-free generators that produce close to forty percent of the energy that New Jersey uses. That's a critical part of our energy infrastructure beyond our pipes and wires.

PUF: What are the expected tangible benefits of investing in resilience for the PSEG customer?

Dan Cregg: First and foremost, it's service reliability. At the end of the day, we have to be there for folks. It also involves minimizing the number and duration of outages.

It's now the twentieth anniversary of the blackout of 2003. You'll recall that a fair bit of the northeast part of the country went out.

That blackout ended within our service territory and we're proud to have identified what needed to be done to stop that at the time. In addition, we were able to follow on with investments to minimize the likelihood of anything like that ever happening again.

Another example, in 2020, we had a storm named Ida. That storm was all about the volume of water and the flooding. We highlight to folks that after the work we've done to make our system more resilient, when Ida hit, one of our substations had fifty-six inches of water, but that substation did not lose power the entire time.

One of the most vital resources in New Jersey in the energy space, and that is our nuclear units. Those units are dispatchable, carbon-free generators that produce close to forty percent of the energy that New Jersey uses.

By raising our substations, which is one of the things we did on the back end of Superstorm Sandy in our Energy Strong program, customers saw a tangible benefit from investments in resilience that are still seen today on a regular basis.

PUF: What are examples of major resilience investments that are planned, that you are planning, and want to do?

Dan Cregg: The first thing that comes to mind is what I just talked about, the Energy Strong infrastructure programs. A lot of those substations were critical elements to our plan to ensure that we have the resilience of the system that we rely on today, as well as going forward.

When we updated the design of those systems, we incorporated new data from FEMA's higher flood maps, which contributed to the resiliency success we did have during Ida.

On the gas side of the business, we have our GSMP, gas system modernization program, which we've been doing that program for a number of years and continues on. It has got another decade or two to run before we finalize all that work. That's replacing cast iron mains with plastic pipe.

A significant flood event such as Ida could have caused water intrusion into those pipes, and a solution to that is a shutdown of the system and having to go door-by-door to get that gas flowing again. That GSMP program, in addition to reducing methane from the pipes, also takes care of that water intrusion and won't let that happen.

After the work we've done to make our system more resilient, when Ida hit, one of our substations had 56 inches of water, but did not lose power. By raising our substations, which we did on the back end of Superstorm Sandy in our Energy Strong program, customers saw a tangible benefit.

The last mile of our system is another critical part of our system, and it's going to gain importance as we go forward, as people begin to electrify their homes and use more electric vehicles. Beyond just the age of that infrastructure, it was not built for what we're going to see as the energy transition advances. That'll be critical as we step into the future.

PUF: You mentioned the higher built substations, talk a bit more about that.

Dan Cregg: They are in locations more prone to some of the water issues because given the time when the system was built, these stations tended to be sited along the lower lying areas near railways and rivers. That's where some of the equipment came in when these stations were built.

Even in our more urban areas, some of the challenges become, how do you find the best location and to try to work with the community to make sure these substations can be in the right places from the standpoint of land acquisition and how we do what we do. We're very proud of the community partnerships created at several of our urban station locations that have advanced system modernization and resilience.

We are currently in the midst of moving to automated metering. Our AMI rollout is about halfway completed. The information we'll be able to glean, the ability to turn people on/off without a truck roll and manage all that on a much more efficient basis is going to be critical going forward, as well.

PUF: Utilities around the country have focused on reliability, resilience, and affordability too. What's your perspective on that balance and on what affordability means at PSEG?

Dan Cregg: It's a critical question because everybody expects reliability, but the reality of the situation is that people have bills to pay, and they need to manage that as part of their overall budget.

That's how we look at it, as well. We tend to look at what our bills are as a share of the wallet, both of our average customer and those customers who have a bit more challenge paying their

bills. We look at it from both of those perspectives and we stack up extremely well.

We may not have the lowest bill in the country, but as I often say, New Jersey doesn't have the lowest price for a gallon of milk, for real estate taxes, for a host of things. We're in a higher price area.

But when you put it against the standpoint of the overall wallet share of our customers, we deliver tremendous reliability for value. If you take a look at both the JD Power Electric and Gas Awards, we hold them both right now, so there's satisfaction with not only the service, but also the cost.

One of the other things on this front is that while New Jersey doesn't necessarily have the greatest overall resources from the standpoint of what you need to explore renewables, as a state, we have focused on energy efficiency.

We have old housing stock. We have old commercial buildings that are not as efficient as they could or should be.

Oftentimes, if it's a hospital administrator, their first act is not necessarily to think about their incremental capital dollar going to energy efficiency, when it can go to buying an X-ray machine or an MRI. Also, multi-tenant locations are not the first thought from the standpoint of how energy efficiency will get done.

Our energy efficiency programs are significant. We've just filed on December 1st, our most recent energy efficiency program. It aggregates to over three billion dollars over the next triennium period.

The way we think about it, it will help affordability because it will help the bill go down by having usage go down, so it'll help our customers. It clearly will help the environment from a climate perspective. It will create significant jobs within the State of New Jersey. It will help the shareholders given that there's a return on the investment.

Our energy efficiency program will help affordability, help the environment, create significant jobs within the State, and help shareholders given there's a return on investment.

With a sizable energy efficiency program of that magnitude, it's also important for us to have decoupling. Our bills are decoupled from the volume that we sell, and that helps to ensure the utility is aligned with maximizing the energy efficiency adoption.

I would also point out that universal access is a critical component of the energy efficiency program that we've all put forth to align with the policy of the state. It's a great program. We've been involved in it for a number of years, and our most recent filing, we'll continue to step up the magnitude and get incremental results there.

PUF: Energy efficiency investment goes right to affordability at the LMI, Low- and Middle-Income customer group.

Dan Cregg: It's critically important there, and we're thrilled to be able to partner with the state in these programs.

Duke Energy CFO Brian Savoy

PUF's Steve Mitnick: Why is investing in resilience so important for Duke Energy?

Brian Savoy: A strong, resilient power grid is fundamental to serving our customers with excellence. We look at all climate risks associated with our system but focus on wind, flooding, and heat, which are primary factors that impact our jurisdictions.

Through advanced data and analytics, we can pinpoint areas of our grid to focus our strengthening and resiliency work. These can include areas that have had an increased number of outages, areas that are prone to flooding – or might be years from now – because of climate impacts over time, and areas that might have increased technological needs from distributed generation and electrification.

We take all this data and focus our investments on those areas that have the highest customer impact, and we call it the green circuit. That's our approach. We look at the entire circuit and if we're going to upgrade a circuit, we look at every element of it.

Do we need to upgrade it for distributed generation that will have two-way power flows? Do we need to upgrade it for increased electrification needs in a specific area? And foundationally, we look at grid improvement work such as replacing poles, installing steel and concrete poles, and performing targeted undergrounding of lines in areas where data tells us it makes sense to do so.

Those fundamentals are so important to resiliency. Case in point, Hurricane Idalia, this year, didn't hit our most highly populated areas in Florida and South Carolina, but we did have three hundred thousand outages.

We would've had a lot more had we not done these resiliency investments. We restored ninety-five percent of those outages in thirty-six hours. So, the ability to quickly restore power is also a benefit of resiliency investments because we didn't have to replace many poles like we did in 2017 with Hurricane Irma.

PUF: Duke Energy is large, with scale, and a diversity of service areas. Also, some of the most growing, economically vibrant parts of the country, and does that roll into the calculus?

Brian Savoy: It absolutely does. Growth is an element of our investment opportunity. We've got to support growth, in addition to the changing generation flows that we're seeing.

In short, for a century, we planned the system inside out,

An interesting investment we've made on a sizable part of our grid in Florida, and about half of it in the Carolinas, is called smart, self-healing technology. It functions similar to a GPS system or Waze on your phone, rerouting power to avoid the areas of congestion and getting customers the quickest route to get the lights back on.

central station generation, running wires for customers. Now it's a full-on outside-in model, where you start with the customer.

The customer may have generation resources to offer or may have different needs altogether, but it's important to meet them where they are first and go from there.

It's a full paradigm shift. But it does make us smarter, and it allows us to focus our investments on where they have the greatest impact for our customers.

PUF: Benefits to customers, considering restoration efforts; talk more about that and how it affects affordability.

Brian Savoy: Absolutely. It's multifold, but first and foremost, it's limiting the number of outages customers experience and when they do happen, shortening the duration. As customers increasingly adopt new technologies and have more energy needs, it's becoming more important to be able to reliably serve that increased demand.

Customers expect to have access to power 24/7 to fuel whatever they need fueled, that's the job. When we do have an outage, it's limiting the duration of the outage. So, fewer outages, measured in frequency, that's SAIFI.

Then duration is SAIDI, reducing the duration when you do have an outage. An interesting investment we've made on a sizable part of our grid in Florida, and about half of it in the Carolinas, is called smart, self-healing technology. It functions similar to a GPS system or Waze on your phone, rerouting power to avoid the areas of congestion and getting customers the quickest route to get the lights back on – sometimes they may not even notice an interruption.

In Hurricane Idalia, smart, self-healing technology helped customers avoided outages – saving seven million minutes of customer interruption. Self-healing technology is in operation every day, especially as we perform maintenance on our circuits – helping reroute power to limit the number of outages to the fewest customers possible.

While self-healing technology is not yet fully implemented and may not make sense for every circuit, we're targeting investments in areas that we've had the most significant outages or where we know there is an opportunity to improve grid reliability and customer experience.

PUF: How does innovation fit into that equation with affordability and resilience?

Brian Savoy: The innovation elements are not only the hardware on the grid, but it's how you plan the grid. ISOP is an innovative tool we use to advance our integrated systems and operations. It evaluates our generation, transmission, and distribution and asks, "Where's the next best dollar to spend?"

Our regulators and customers expect us to invest funds efficiently and wisely. So, ISOP has informed our grid investment plans in the Carolinas of late and is being utilized in Florida as we move to the next round of our multiyear rate plan, informing our investment strategy.

It's the plannings team led by Harry Sideris [EVP of Customer Experience, Solutions Services], and the strategy team under me, to advance this ISOP effort. It brings a level of collaboration across the enterprise that we've never experienced.

PUF: What investments are coming in resilience? Give examples of investments coming in the next one, two, three, four years bringing new customer benefits.

Brian Savoy: Across our system, we have a couple of key investment opportunities within transmission. In the Carolinas, wood transmission poles will become extinct. That's in the next few years. It's happening. Our transmission team is absolutely focused on this.

The other area of focus is upgrading the transmission system to easily connect to renewables.

Both in the Carolinas and in the Midwest, we are actively resuming expansion of natural gas to support new generation needs, and it is job one.

PUF: Also important is the role resilient natural gas resources are playing for electricity. Can you touch on that?

Brian Savoy: Natural gas supply is going to be critical to the net-zero journey. Both in the Carolinas and in the Midwest, we are actively resuming expansion of natural gas to support new generation needs, and it is job one.

We hope to see new natural gas plants coming very soon to the Carolinas. We've already filed pre-CPCNs for a couple, and there's a few more in our IRPs. In Indiana, we have the need as well to support this growing customer base, because reshoring of manufacturing is driving needs for customers exponentially.

Exelon CFO Jeanne Jones

PUF's Steve Mitnick: Why is resilience and investing in resilience so important to Exelon and the Exelon utilities?

Jeanne Jones: There are three reasons. It's always been important. But what's new today is more demand on the grid. Second, it's a changing generation stack from large baseload – whether nuclear, gas, coal – to more distributed energy, solar, wind, hydrogen.

The third is the weather. There are a lot of stats around the number of significant storms, which cost over a billion dollars. That's defined as a major storm. This number has tripled in the last several years.

It's because of those three, starting with incremental demand, as more people are working from home and businesses are relying on resiliency. They think, "I don't want to be out, but if I'm going to be out, get me back online as fast as possible." It's electrification, cars, the full transportation sector.

As more demand comes on by data centers, our customers are relying on the grid more and more. With the changing generation sources, the grid must be ready to accommodate that. It went from one baseload generation pushing power out, to now hundreds of sources pushing power back and forth, curtailing or pulling it in.

Also, extreme weather events. While it's always been important to our customers, those are new trends, so we have to up our game on how reliable and resilient the grid is.

PUF: When investing in resilience it's important to say what a set of projects or a whole proposal is going to do. What are the customer benefits? How does Exelon think about that?

Jeanne Jones: We always start with what our customers want. Our customers want a resilient, clean, affordable grid. All our investment plans are designed to meet the goals in our various jurisdictions.

Let's say in Illinois for example, there is a target of a million electric vehicles on the road by 2030. It's a progressive goal. Also, a hundred percent clean energy by 2045. Our investment plans always start with that, where our customers and our jurisdictions want to go.

Then, how do we get there? We lay that out in all our jurisdictions. We have forward-looking plans.

Whether it's a future test year or a multiyear plan, we lay out the next three to four years of, okay, these are the places you want to go. These are the investments we need to make, and here are the benefits you'll see as we reach emission-reduction, electrification, and reliability goals.

Some of our jurisdictions are asking us to reduce peak load demand. We make sure those investments are aligned with what our stakeholders and customers are asking, and that we show them a path to doing that over the next three to four years.

Before we spend a dollar, we have upfront alignment through our rate reviews that this is where we're going to invest for the next three to four years. The benefits are there, which are meeting goals of cleaner air, a more resilient and reliable grid, and different sources of generation, which provide a more diversified generation mix.

There is also the increase in volatile weather from climate change. We had a storm in August 2020, when I was at ComEd, with a derecho and ten tornadoes touching down in our service territory. It was a massive storm.

We had over seven hundred and fifty thousand customers out. But through the investments we had made over the last decade, including smart meters, electronically controlled switching devices, being able to move customers over to different feeders, hardening of the grid, changing wood poles to steel, all of that, we were able to get about sixty percent of customers back up in twenty-four hours.

We back tested it and found, prior to these investments, if a storm of that magnitude had hit our customers, we would've had another seven hundred and fifty thousand customers out, and it would've taken an additional seven days to get them back online. Our engineers are constantly doing that type of testing, so we know the investments are working.

It's important to share that information with our customers, the commissions, and others, that this is how these investments help our customers. Being out less than twenty-four hours versus being out seven days for a business or a family, is meaningful.

PUF: I talked with Derek HasBrouck at PA Consulting. He said the best national performance in improving reliability was Commonwealth Edison.

Jeanne Jones: We were excited to achieve that. It was neat because our COO, Terry Donnelly is retiring. To get that award was wonderful. I worked with him at ComEd, and we have a great successor, but Terry worked hard to achieve that.

PUF: How does affordability roll in on that question of responding to what customers want, and delivering benefits?

Jeanne Jones: Because of Calvin Butler's [Exelon CEO] focus and because of our culture, our current rates are below the national average, and twenty-three percent below the average of the top twenty cities in the country.

We've done a good job, but while we're starting from a good place, we have to keep moving forward. How do we do that?

It's a portfolio approach. We have to control our costs, and our size and scale is helpful. It's everything from mutual assistance and being able to deploy our trucks across jurisdictions quickly.

It's the same processes, same procedures to economies of scale. When we find something innovative, we can rapidly deploy it and get the same synergies. Investing in technology, controlling our O&M costs is paramount.

That means something to the commissions too, being able to show that we're being as efficient with every dollar that we're entrusted with. Also, Exelon is a leader in finding other ways to fund this energy transformation.

There are the infrastructure investment jobs. We applied for seven hundred million in grants, and we've already received a hundred eighty million dollars targeted at grid resilience, access to broadband, leveraging our fiber that we put in for underserved communities.

Help can come in different ways, through federal grants and other funding. We work hard, and our customer services teams connect our customers with state and local assistance. Over the last two years, through our programs, we've connected customers to a billion dollars of assistance.

We always start with what our customers want. Our customers want a resilient, clean, affordable grid. All our investment plans are designed to meet the goals in our various jurisdictions.

Last, is energy efficiency. We invest to help our consumers reduce their energy consumption and bring down peak load. We invest about nine hundred million per year across the platform in those programs. Because we're decoupled from volume in seventy-five percent of our jurisdictions, it's good for customers and for us.

The effect of that is our customers have saved about a hundred forty million megawatt hours over the last ten years. It's been significant. All that together is what I mean by portfolio approach. We can't take our eye off the ball on any of those.

The result of that is that, again, rates are twenty-three percent below. Our electric bills as a percent of the median income are below the national average. We watch all those metrics. Exelon is a company that measures and benchmarks everything and tries to make sure we're at the top.

PUF: Exelon's emphasized innovation, including cost. The scale plays into innovation too.

Jeanne Jones: It does because you can have the different innovative groups. We have innovation groups at each of the utilities. Sunny Elebua [Exelon Chief Strategy and Sustainability Officer] leads the broad strategy of that. But when someone identifies the best practice, we then deploy it across all four operating companies.

BGE started this drone program, for example, leveraging

drones to do vegetation management in hard-to-access areas. They found out what the drone could do compared to a human crew.

There were significant savings, not only in the hours, but also in supplies, the materials used for vegetation management. They reap the benefits immediately. The size and scale are helpful.

PUF: What can customers, investors, and other stakeholders look to coming down the line as major investments in resilience?

Jeanne Jones: It ties back to the first question, which is, transmission is going to be critical for those three key trends I mentioned. There's more demand coming on the grid with the data centers, we're changing the generation stack, and there's more volatile weather.

A couple of examples of recent transmission projects for Exelon; Brandon Shores was a coal plant in the Maryland service territory that is retiring. PJM looked at the reliability needs and mandated about an eight hundred million investment to the Exelon companies.

That's to help get other power into the service territory to replace coal. Again, it's the changing generation stack. In addition to that, in the Dominion area, there are about seventy-five hundred megawatts of data centers coming up.

PJM also looked at that and had a competitive bidding process. Exelon, through that process, there's an initial view that we would have about eight hundred fifty million of additional transmission out there.

Our electric bills as a percent of the median income are below the national average. We watch all those metrics. Exelon is a company that measures and benchmarks everything and tries to make sure we're at the top.

Whether it's the changing generation stack or more demand on the grid, transmission is going to be a key solution. Because of where we are, Exelon is poised to be a big part of that.

PUF: Is it rewarding and fun to be the chief financial officer of Exelon? I think it's our biggest utility.

Jeanne Jones: It is by customer count. We are the largest. Because of everything we've talked about, this industry is going through such an incredible change, it's exciting to be a part of that.

But what drives me is the way that Exelon shows up in our communities. I have three young kids and I'm in finance, I could work anywhere. But I'm working at a company, which has as its purpose, powering a cleaner and brighter future for our customers in our community, and it's the same community that my kids are growing up in. That's cool.

It's cleaning the air, building a more resilient grid, implementing all the workforce development programs. That to me, in addition to the industry being exciting, is what I find exciting about Exelon. PUF

Gas – Electric Systems Evolve Beyond Interdependency

The Interconnected Bulk Energy System

By NERC CEO Jim Robb
and Chief Engineer Mark Lauby

As we continue to retire other forms of generation, such as coal and nuclear, natural gas has become the dominant fuel for electric power generation in the United States with power generation now the largest end use for natural gas. Initially, the experience of operating the gas - electric system was seen as interdependent.

However, recent experiences have illustrated that these two systems have become interconnected, rather than just interdependent. A new reliability paradigm, the Interconnected Bulk Energy System, emerges with this evolution, reflecting the increased interrelationship between the gas and electricity sectors that has been growing steadily since the 1980s and has accelerated during the energy transition.

Recent events impacting the delivery of natural gas and electricity to consumers during cold weather conditions further emphasize the fundamental shift in the relationship between the two sectors. The table highlights the critical role and interdependency of natural gas and electric power generation and provides a comparison of recent events and their effects on both the natural gas system and bulk electric system generation, all of which resulted in the need for load shed. See Figure 1.

The frequency and subsequent impact of extreme winter weather has increased during the last decade on both the gas and electric systems. Indeed, as FERC Commissioner Allison Clements observed during a preview of the Winter Storm Elliott report findings at the September FERC open meeting, "… We've had five major winter events in the last eleven years… that is essentially a coin flip."

During Storm Elliott in 2022, gas pressures on Con Edison's gas system were so low, the utility was in danger of losing pressure on all, or large portions, of its local distribution system. Had the cold weather persisted, Con Ed would have been forced to reduce service to large portions of its natural gas customer base, resulting in millions of customers in New York City and nearby areas not being able to heat their homes.

It would have taken months to safely repressurize the system and restore service to customers. It also would have impacted New York City more significantly than during the 2003 Northeast Blackout, which lasted a little over a day. Ultimately, this was avoided by Con Ed's use of liquid natural gas coupled with the cold snap breaking and temperatures rising.

Likewise, during Winter Storm Uri in 2021, there was significant correlation between interactions between ERCOT's load shedding program and the interruption of service to critical natural gas facilities. This action created a self-perpetuating "loop of doom" that further exacerbated the loss of power generation facilities due to fuel issues.

These examples illustrate clearly that the relationship between natural gas and electricity goes beyond traditional interdependency characteristics. Rather, they have become an Interconnected Bulk Energy System, where the reliable operations of either system are impacted by events that emanate from the other system. It is time to recognize these systems as being interconnected and ensure that the risks from events originating from either system are managed.

These two systems have become interconnected, rather than just interdependent. A new reliability paradigm, the Interconnected Bulk Energy System, emerges with this evolution, reflecting the increased interrelationship between the gas and electricity sectors.

Managing Risks with Interconnected Systems

Interconnected electric bulk power systems provide significant benefits, such as supporting a robust resource mix with agreed-upon contingency reserves, providing essential reliability services like frequency response, and ramping capability – substantial advantages that would be costly for a single participant to replicate.

Interregional transmission links large portions of North America, enabling the sharing of these benefits broadly, and facilitates the optimization of resource mix, diversity, and essential reliability services. But there are risks.

While the interconnected system can enhance reliability, it can also increase vulnerability due to its interconnected nature. Events such as the 1965 and 2003 blackouts bring these vulnerabilities into sharp focus as detailed in Julie Cohn's book, titled "The Grid: Biography of an America Technology."

After the 1965 Blackout and despite initial reservations, industry recognized the continued benefits of an interconnected system. A more collaborative, criteria-based approach

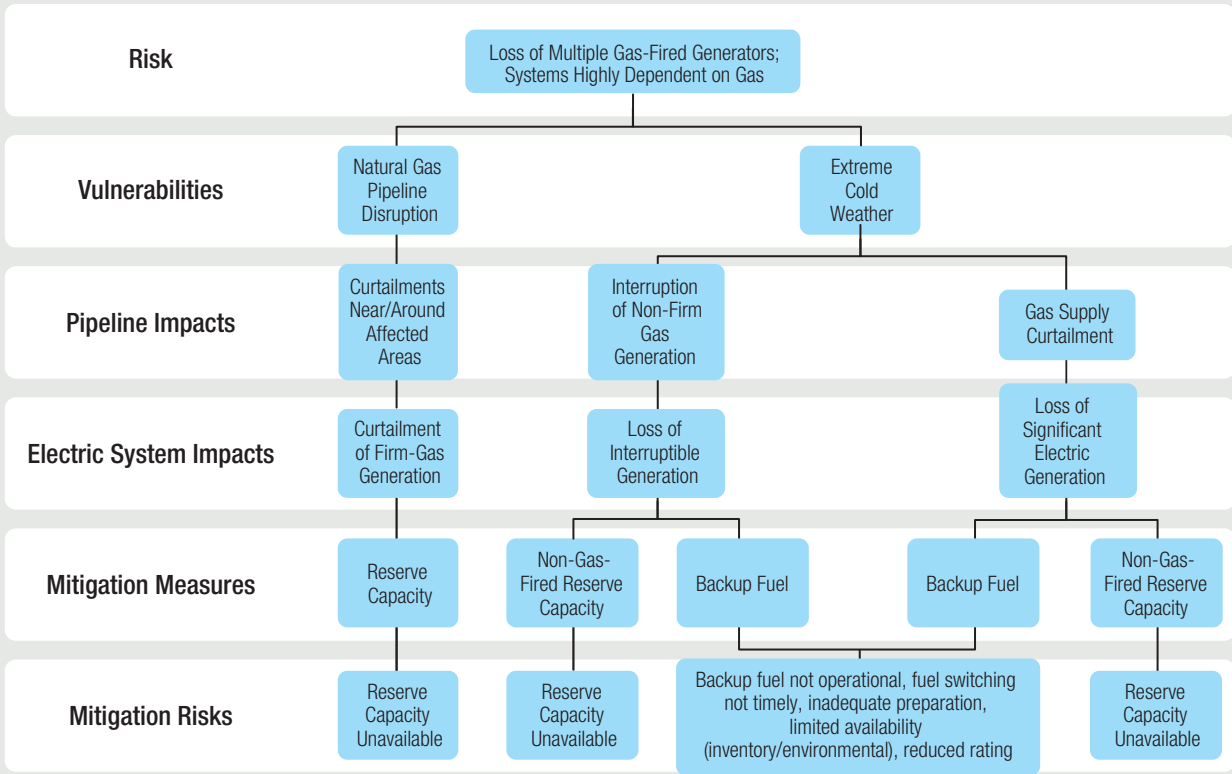
James Robb is NERC President and CEO. **Mark Lauby** is NERC Senior Vice President and Chief Engineer.

Fig. 1 **Similarities to Past Extreme Cold Weather Events**

	2011 Event	2014 Event	2018 Event	2021 Event
Significant levels of incremental unplanned electric generating unit losses with top causes found to be mechanical/electrical, freezing, and fuel issues.	x	x	x	x
Significant natural gas production decreases occurred, with some areas of the country more severely affected.	x		x	
Short-range forecasts of peak electricity demands were less than actual demands for some BAs in event area.	x		x	x
Significant natural gas LDC outages or near miss	x			

Source: FERC, NERC and Regional Entity Staff Report Winter Storm Elliott: Inquiry into Bulk-Power System Operations During December 2022

Fig. 2 **Risk Assessments of Impacts and Mitigation**



Source: 2013 Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power Phase II: A Vulnerability and Scenario Assessment for the North American Bulk Power System

was needed to ensure that the risks associated with being part of an interconnection of the North American grid, such as instability, uncontrolled separation, or cascading failures, were well managed.

Consequently, industry established the National Electric Reliability Council and several Regional Reliability Organizations to address risks to the reliable operation of the electric bulk power system. As part of this process, industry participants wrote and agreed upon the planning and operating criteria to ensure overall reliable operation.

In 2005, with the advent of electric markets and following the 2003 Blackout, the United States Congress modified the Federal Energy Power Act, with Section 215 mandating the creation of an Electric Reliability Organization (ERO) that would report to the Federal Energy Regulatory Commission. This organization (now called the North American Electric Reliability

Creating Industry-Driven Reliability Standards

Reliability Standards that are written by and agreed upon by industry experts define the expectations of organizations to support reliable operations as part of their day-to-day activities.

When new and existing equipment is integrated into the interconnected systems, there are expectations that the equipment will perform in a way that contributes to the reliable operation of the interconnected system and the equipment will not be allowed to connect unless they do so. These expectations are enshrined in Reliability Standards. If the equipment later does not comply with the Reliability Standards, the entity pays a penalty and must commit to addressing the shortfall.

Industry's participation in development and voting on the Reliability Standards for use in the resulting compliance and enforcement program is vital to the success of this model. This approach ensures that all participants support the reliable operation of the interconnected system. Improvements to these Reliability Standards can continue as new technologies are incorporated into the interconnection, and performance is measured.

This has been the hallmark of the reliable operation of the electric bulk power interconnected system in North America.

Corporation or NERC) works with industry to develop necessary Reliability Standards, enforce the Standards, and perform periodic reliability assessments.

The Interconnected Bulk Energy System

In recent years, the resource mix has evolved, and now large amounts of electrically produced energy are being fueled by just-in-time delivery of natural gas. These dispatchable resources, which have replaced many coal-fired power plants, are increasingly critical to the reliable operation of the bulk power system as we add more variable energy producing resources, such as wind and solar, to the grid.

Consequently, disruption in natural gas supply impacts the reliable operation of the electric bulk power system in more dramatic ways today than in the past. That dynamic will only increase as other fossil-fire and nuclear dispatchable resources retire and variable generation expands.

Further, the natural gas energy system has become dependent on a reliable delivery of electrical power to support winterization efforts for wellheads and processing facilities, along with compressor stations and natural gas system control.

Disruption of electric supply results in reduced production and supply of natural gas, and thereby the reliable operation of the natural gas system – as evidenced during Winter Storm Uri. This newly Interconnected Bulk Energy System provides great benefits for the consumer, enabling the grid transformation that is underway by supporting the integration of large amounts of energy-constrained renewable energy resources, while providing the dispatchable resources needed to offset the uncertainty from the variability of their output.

NERC is calling for formalized coordination and collaboration between both industries, including development of a Reliability Standard-setting and enforcement organization.

– Jim Robb

The cochairs, in the forward of their July 2023 Gas Electric Harmonization Forum Report, make a strong case that the time is now for creation of a Natural Gas Reliability Organization (GRO) to perform a similar role for the gas sector (wellhead through burner tip) that NERC performs for the electricity sector.

– Mark Lauby

Until long-duration energy storage or forms of dispatchable clean energy production, such as small modular nuclear reactors, are available at scale, this use of natural gas supports reliability, resilience, and affordable electricity, and improves the environmental footprint compared to the use of coal or fuel oil for dispatchable generation.

Electric generation also increases consumer efficiency/control for residential, commercial, and industrial applications and provides a backbone for natural gas system visibility and control.

But there are risks.

Impacts on the reliability of both systems have become more evident as the gas and electric grids increasingly integrate, creating an Interconnected Bulk Energy System. Winter Storms Elliott and Uri are recent examples, with other events resulting in very tight operations for both systems. And this will only increase in the coming years as this diagram of Risk Assessments of Impacts and Mitigation shows.

See Figure 2.

This, coupled with the increasingly volatile cyber and physical security risk landscape, elevates the importance of understanding how each system will support the overall reliable operation of the Interconnected Bulk Energy System.

The new interconnected operating paradigm raises many questions about how electric system operators are hardening their equipment and facilities (both physical and cyber) to assure that electricity is not disrupted to critical loads that support the reliable operation of both the electric and natural gas systems.

North America Requires Reliability Standards for the Interconnected Bulk Energy System

The emerging Interconnected Bulk Energy System requires a new suite of specific Reliability Standards to ensure reliable operation of the interconnected systems.

Leadership from both the natural gas and electric power industries is vital to set the path forward for the reliable operation of this newly interconnected energy system. Clear expectations about how the gas and electric sectors support reliability must be developed collaboratively, including the investments needed, cost-recovery mechanisms, and how challenges to reliability are addressed.

Over the past two years, the North American Energy Standards Board convened representatives from the natural gas and electric sectors under the leadership of three energy experts – former Department of Energy Assistant Secretary Sue Tierney, former Public Utility Commission of Texas Chair and former FERC Chair Pat Wood, and former PUCT Commissioner and Chair Bob Gee.

While the forum advanced more than twenty pragmatic recommendations for improving coordination between these two systems, only a handful were ultimately agreed upon by natural gas and electric industry representatives. Given the critical nature of the issue, this is a disappointing outcome.

The cochairs, in the forward of their Gas Electric Harmonization Forum Report, make a strong case that the time is now for the creation of a Natural Gas Reliability Organization (GRO) to

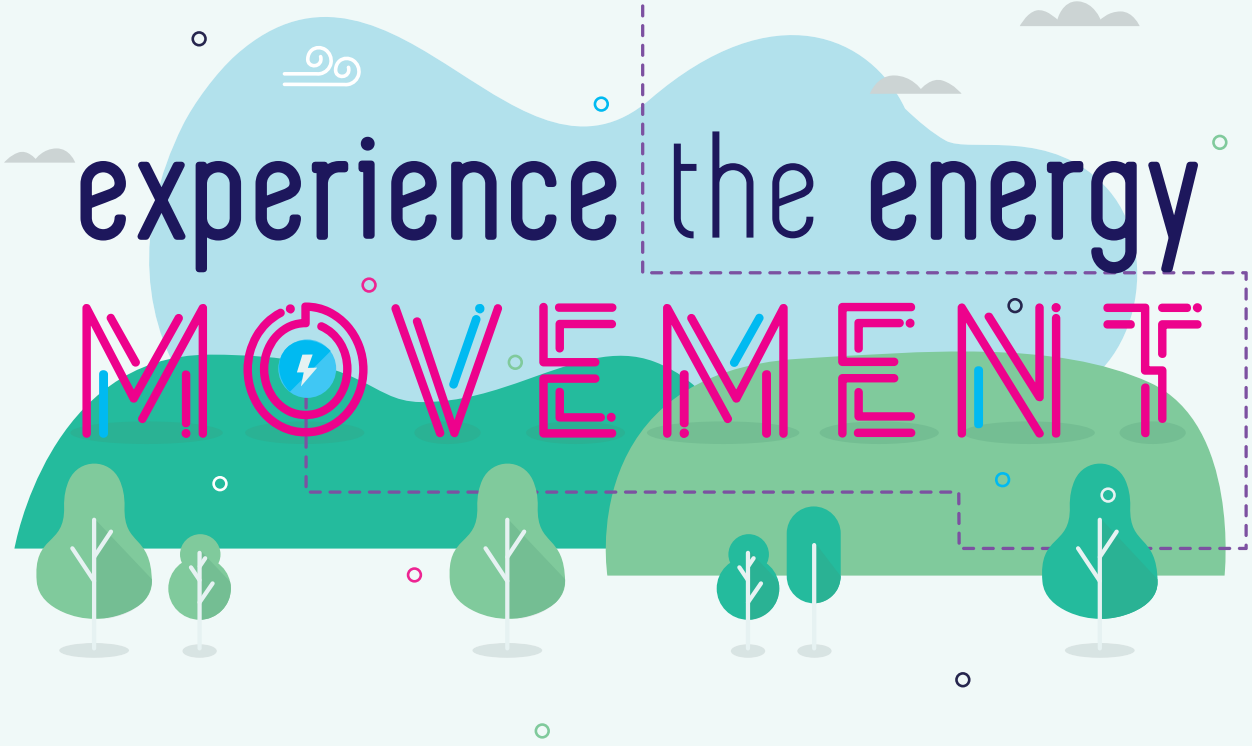
(Cont. on page 53)

DISTRIBUTECH® INTERNATIONAL

EDUCATION: FEBRUARY 26-29, 2024
EXHIBITION: FEBRUARY 27-29, 2024
Orange County Convention Center
Orlando, Florida, USA

#DISTRIBUTECH24 // DISTRIBUTECH.COM

experience the energy MOVEMENT



In partnership with:

PUBLIC UTILITIES FORTNIGHTLY
The Sustainable Resilient Affordable Solution

What to expect at DISTRIBUTECH International® 2024:

- Explore cutting-edge technologies
- Gain insights from industry experts
- Network with industry leaders
- Be part of the energy revolution

Learn more at distributech.com ○ Save 20% off registration with code DTPART26

ORGANIZED BY: CLARION ENERGY

OFFICIAL MEDIA: POWER GRID INTERNATIONAL

HOST UTILITY: DUKE ENERGY®

Powering the People

From the Institute for Electric Innovation's Powering the People annual conference, excerpts of remarks by D.C. Commission Chair Emile Thompson, DTE Energy's Jonathan Hirte, Oracle's Matt O'Keefe (Head of Opower), Fortis CEO Dave Hutchens, Southern Company's Lee Evans, Uplight's Neil Veilleux, Bidgely's Maria Kretzing, IBM's Caroline Roche, AES Corporation Chief Utility Innovation Officer Raiford Smith

More than a dozen thought leaders and decision makers took the stage at the Edison Foundation's Institute for Electric Innovation's 13th annual Powering the People event on November 28 in Washington D.C. These experts shared insights and perspectives on critical topics including Advancing Energy Affordability; Potential and Perils of AI; Customers as a Resource: Demand Flexibility, VPPs, and Future Grid Potential.

Opening remarks on energy affordability were given by D.C. Public Service Commission Chair Emile Thompson. Moderators included Fortis CEO Dave Hutchens, Institute for Electric Innovation Executive Director Adam Cooper, and NorthWestern Energy CEO (retired) Bob Rowe. Closing remarks were given by Edison Electric Institute CEO Tom Kuhn.

This 13th annual Celebration of Innovation is excerpted here from remarks by some of the speakers at the event. Enjoy these comments on the role of data analytics, automation, and personalization tools to better engage customers; the role of customers; and the promise of Artificial Intelligence.

Emile Thompson

D.C. Public Service Commission Chair

Emile Thompson: In the District, we have the most ambitious clean energy commitments. We state that by 2032, all electricity that's being used will be generated from renewable sources, and that by 2045, we will have carbon neutrality. In addition, we say that by 2041, fifteen percent of electricity that we consume within D.C. will be generated within our boundaries.

Now, we often say this, but D.C. is unique. D.C. does not have any thermal generation. It's a completely dense urban environment, with an aging building stock. So, when we start talking about these goals, affordability is front of mind to achieving each of these, and they raise very important questions, such as how we procure that energy efficiently and affordably.

How will you build enough solar in a dense urban environment to power fifteen percent of the load? Then how do you achieve carbon neutrality with an aging building stock where you need to power heating, stoves, water heaters, and other appliances?

But looking forward, we know we can't rely solely on utility discount programs to ensure affordability for our ratepayers. We have to look at ways to ensure that the energy that's being procured is being done in an inexpensive manner, as well as that we are reducing overall usage.
– Emile Thompson

Traditionally, when we looked at affordability from the utility point of view, there was the idea of the utility discount programs. If a person earned a certain amount of money and was below a certain threshold, they could get a credit on their bill, and D.C. was no different.

In fact, in the mid-1980s, we instituted our first utility discount programs that stated that if you made seventy-five percent or less of the area median income, you were entitled to a credit on your bill that was roughly equal to the distribution charge on your bill.

That was a big benefit because our bills,

the distribution portion is about half the bill. So, a select group of customers were getting a fifty percent discount on their bills.

But then COVID happened, and we realized we needed to do more. One of the more startling statistics that came out of COVID stated that fifty-nine percent of homes in America were one check away from homelessness.

One of the things we first did, was we raised that threshold to eighty-five percent, therefore, allowing more people to engage and participate in our utility discount programs. Another thing that we realized was because people were making these tough decisions during that time, sometimes people had allowed their energy bills to go unpaid, so they had these large arrearages.

We talked to both utilities and had them file plans around arrearage management programs, so that customers could pay down these large balances without the threat of disconnection.

Another thing that we looked at with our local EDC is the idea of discounts for houses of worship and nonprofits. The idea being that these are pillars of the community. They often are providing assistance to those who need it most. If we can help those institutions, they can help more people.

That program is certainly in its nascent stages. Essentially, it provides a credit of seven megawatts of demand on the bill, and we'll see how that takes shape.

But looking forward, we know we can't rely solely on utility discount programs to ensure affordability for our ratepayers. We have to look at ways to ensure that the energy that's being procured is being done in an inexpensive manner, as well as that we are reducing overall usage.

I believe the Energy Equity Project states that the gold standard is six percent of an individual's yearly salary should be spent on energy and utility bills. That's something to keep in mind. So first, procurement of energy.

Earlier, I talked about how we have this goal that fifteen percent of our energy must be generated within D.C. One of the things we've worked hard on is our community solar program.

That program allows people who are otherwise unable to have solar on their roofs, whether it's they don't own their home or it's too expensive to subscribe to a community facility, to not only let them reap the benefits of a decarbonized environment but also to have lower electricity bills. That's one way to ensure affordability, making sure people are paying less overall.

Another way is through energy efficiency. We all know that the cheapest kilowatt-hour is the one that's not used. What we have asked our utilities to do is invest and propose energy efficiency plans, thereby giving consumers the ability to use less energy and reap those benefits.

Another thing that we have asked our utilities to do is go after the federal funding that's been made available recently. Whether it's through the IRA, the IIJA, the Build Back Better, or one of those many acronym plans.

But the idea there is of course, that through these programs and initiatives, utilities will be able to save money on R&D costs, those costs will then be saved, and will be passed on to ratepayers to ensure that they're not bearing the full brunt of this clean energy transition.

As we continue to move forward, affordability will always be at the forefront, and as we plan over the next few years, that will determine what these costs look like. Another thing that we've done in D.C. is we've asked our utilities to not only submit five-year plans, but also thirty-year plans on how they'll achieve the District's clean energy goals.

The idea being that a careful review of these plans, ensuring that they're moving in the right direction, will lead them to be good stewards of ratepayer money, but also ensure that they're meeting the goals that we have. ❍

Jonathan Hirte

DTE Energy Director of Federal Affairs

Jonathan Hirte: We are an electric provider in southeast Michigan that includes metro Detroit. We also do gas delivery throughout the state, including some rural counties in northern Michigan.

When you look at our customer base, about thirty percent of our customers are at two hundred percent of FPL or below. So, we have a large universe of customers that at some point may need energy assistance to help them meet that energy burden and maintain bill affordability.

Digging into sort of the deeper findings. I know some of these were mentioned both by Matt and by Ted. Our kind of cohort, we were one that had five cohorts instead of three. But that middle cohort, one pattern that really emerged was the extent to which consumption of energy was a key driver of arrearages.

That may seem sort of intuitive, but for these folks, they historically were in the oldest homes in our service territory. They often had severe issues with the building envelope, whether that was broken windows, or a hole in the roof.

There was a higher incident of folks who were renting and so didn't have a lot of incentive or ability to make energy efficiency investments. Then, these are customers who based on their limited income, didn't have a lot of funds they could put toward energy efficiency investments.

That was a key signifier when we looked at the data. A related and important piece that we picked out was age and income are

not that strong of predictors of arrears. I know that Ted mentioned that, but looking at the federal poverty level is a good indicator because that enables us to get a better sense of what that family's disposable income is and how they're going to be able to sustainably manage their bills.

Just thinking about how we've pivoted out of this partnership with eSource and the conversations we have with our utility peers. One is, and I think Matt mentioned this, we want more data. We need more data.

One way we can go about that is working to continue to beef up our analytical capabilities, have a more robust internal process where we can, once we have that information, leverage it, and use it to do outreach more efficiently to the customers, particularly the ones that would benefit the most from EWR investments.

Related to that, what does that collection process look like? We as a company have always had teams dedicated to assisting low-income customers with energy assistance.

But we're sort of pivoting our model and taking maybe a broader approach to say, where can we have a dedicated low-income team that is not just helping when someone has a problem with bills but is there when they are onboarding and having a conversation when they're setting up their service to get a better sense of what the profile is of that user.

What is the number of individuals in the household? What is the age of the home? What are some of those other data points that can be useful so that we can then model out and give a better sense of if these customers are going to come into a situation where they would run into a challenge with continual arrearages?

We're pivoting our model and taking a broader approach to say, where can we have a dedicated low-income team that is not just helping when someone has a problem with bills but is there when they are onboarding and when they're setting up their service to get a better sense of what the profile is of that user.

– Jonathan Hirte

Our North Star in this, and again a lot of this is resource constrained, but it's the individualized approach in working one-on-one with customers. Being able to build out an energy advocate team where they could develop an individualized relationship over time with the customer, have one-on-one conversations, be able to deliver information about EWR, information about demand-side management, program opportunities, other resources in the community that can help them stay on top of their energy consumption, and ultimately avoid building up that backlog of build. ❍

Matt O'Keefe

Oracle Utilities' Head of Opower

Matt O'Keefe: What are the tools and resources being used? Those tools that we've designed alongside our customers are to reach a couple of the key issues that our customers, the utilities, are dealing with.

I want to highlight the top three that they have told us about. In interviews with over a hundred of our customers – the utilities – told us the top three were complicated cross-organization enrollment procedures, customer identification, and program awareness. Program awareness is by far the number one.

This is really interesting to me because folks feel confident in the existing programming they already have. So, whereas we all want to come with the next generation of programs, they're undersubscribed and not always meeting the right people; it's helping to solve that problem.

Then, in talking in focus groups and

in one-on-one conversations with folks that are low- and moderate-income, we're trying to figure out how to square that circle and bridge that gap.

How many more things can I say about, yes, bridge the gap. You know what the biggest problems they're facing are, and to build on what Ted said, I'll double click on some details of the hundred-plus we talked to, eighty-six percent are worried about affording the utility bills.

This is low- and moderate-income. Sixty-four percent have received a shutoff notice in the last year. Two-thirds have received a shutoff notice in the last year and fifty-six percent have paid their utility bill past their due date more than three times in the last year.

We were shocked by these numbers. We thought it would be in the teens for a lot of these. But the next stat is the one that is why we go to work every day and why we are continuing to build our business around this, which is that when asked how to solve the problem, the number one answer people gave was talk to their friends and family.

That's interesting. Number two was going to Google and a distant third, fewer than one out of three people said, "Talk to your utility about this problem you're facing." That's deeply disappointing.

They're viewing them as the problem in their lives because they have to write them a check and whatnot. So, what are we doing with our clients to solve that problem? A ton, and I want to highlight just a broader approach. So, it's to do with finding them, reaching them, and then enrolling them.

The finding part, as Ted articulated, is difficult, but to steal his phrase of this audience of one, this becomes a problem because when do you stop layering more and more data? What data is the most important?

So, we figured out working with our customers, how it's different for each of our clients, but what data to layer? There're particular layers of energy usage data that are more insightful than you would imagine to actually determinate whether or not people are on their way toward a shutoff or on their way toward going into arrears. Layered with, of course, all the available census and demographic data, as well as third-party data that can be acquired.

We're normalizing it by letting folks know how many people in their area, territory, zip code, are participating in programs. We're letting them know it's normal in their neighborhood, giving them exact data, so folks understand it's not only those folks who are that check away from poverty, but a lot are going in and out of these programs over time.

– Matt O'Keefe

But another big factor is how do you get more data from the individuals themselves? So, our biggest customers, more than a million people, have taken the audit.

We can take that information from those folks and layer that on, as well as the duplicating analytics. We're then layering that over the maps and down to the household level, so folks can understand where there are households with high energy burdens.

Chair Thompson said earlier that six percent is the data point that we're aiming to keep people below each month. So, we are identifying people who are using more than six percent of their monthly income toward their energy use.

Then particularly highlighting those households worth more than ten percent of their income among energy use, which are the severely burdened folks. So, once we find those folks, you can imagine that data is really powerful, but what do you do with it?

Because again, only one-third of people or fewer are looking to the utilities. We're proactively reaching out to customers. The most important part here is these moderate folks. As you asked Bob, the moderate-income folks have never thought

about engaging with Community Action Agency or stopping by that booth at the fair, opening up that envelope.

They don't think it's for them. So, we're normalizing it by letting folks know how many people in their area, in their territory, in their zip code are participating in programs.

We're letting them know it's normal in their neighborhood, giving exact data to that household so folks understand it's not only those folks who are just that check away from poverty, but a lot are going in and out of these programs over time. So, that normalization is key. Alerting people well in advance of when bills are due and then also using new, unique channels.

Videos have been incredibly impactful for explaining the complexities of enrolling in programs, who qualifies for them, and why you should give it a shot and at different times of the year. The last part I'll highlight briefly is the enrollment process.

The movement toward centralized hubs. One-stop shops and savings hubs are so important. I'm glad to see so many of our customers are investing in this now with us.

It is important that once that customer gives information about their income, or once they share a little bit more about what they need, it is saved for them, and that profile is built so they know what programs they qualify for. There're a lot of folks who qualify for everything but tons who qualify for just one or two programs, and most of them are not even inside of the LMI team.

So, we've got to look far beyond what the buckets of funding are and not do what we do when we're doing our worst work, which is just follow those budgets. Combine those across the board, so that enrollment with savings hubs, focusing on easy-to-use interfaces, and taking that data once it's given to the utility and using it to involve as many problems as possible is quite key. ❍

Dave Hutchens

Fortis CEO

Dave Hutchens: You have them spread across your system, distributed energy resources. So, you have a very different batch of resources' data points.

When we were planning loads and resources thirty years ago, we had twenty discrete generators that served the Tucson Electric Power area. Now there're probably over twenty thousand different generators that you have across the entire system. It is a bit more complicated from the resource side of things.

Now, add in, on the demand side, really high peaky demand, things that we have to be able to respond to. Electric vehicles, a big impact on your distribution system, transmission system, the entire generation transmission and distribution chain has to be able to support those peaky types of loads.

So, this is where we're sitting here today, is having a conversation about, well, with that change in resources and that change in demand, how can we manage to squeeze as much out of those resources as we possibly can to make this as efficient as possible?

It's not about flattening the load; it's about shaping the load to match your resources. This is weird, so it's not resources following load, necessarily, there's still a lot of that going on, but this is also a conversation about load following resources. That's how this has changed.
– Dave Hutchens

It's not about flattening the load; it's about shaping the load to match your resources. This is weird, so it's not resources following load, necessarily, there's still a lot of that going on, but this is also a conversation about load following resources.

That's how this has changed. In that three decades of time is a completely different conversation. The whole point of this conversation and why we're at where we are today and where we'll go further in the future is all about the clean energy transition.

So, this is a very critical component to get right in this conversation, to maintain affordability and reliability with those two, with a very different system to manage. ❍

Lee Evans

Southern Company Director Load Flexibility and Economics

Lee Evans: Yes, there's a lot there. The resource planners and the operators. The easiest way to get load flexibility to count is to know that the response is there and it's going to show up. People have described this as a leap of faith at first. I think that's too simplistic.

I don't think it's a leap of faith. I think it's just more detailed planning and analysis that needs to accompany it. One of the things that Southern Company has started doing with our very large programs is modeling them like a resource now, through our reserve margin models. Those resources have energy profiles, have response rates, and we run those through just like we would a supply-side resource.

Based on that, we're putting demand-side resources on a more equal playing field. That's an evolution that we've not done with such advanced modeling before. It used to be a more simplistic measurement and planning around these because for decades we rarely needed them.

We always recognized them on the resource plan. We have a very reliable system and we only called on these programs once every ten years or so for an hour or two.

The polar vortex in 2014 and the recent events on Christmas Eve in the southeast opened up a lot of people's eyes and really caused a lot of focus on something that we were already working on, but accelerated to make sure that we can rely on these resources because we are going to be putting a lot more of them in the resource plan. The only thing worse than not relying on them is relying on them and them not showing up. ❍

We're putting demand-side resources on a more equal playing field. That's an evolution that we've not done with such advanced modeling before.
– Lee Evans

Neil Veilleux

Uplight Senior Director Market Development

Neil Veilleux: To capitalize on that opportunity, three things need to come together. That's technology, markets, and policy, and then customer engagement, a good customer experience. On that technology side, we arguably have everything we need.

Digitization of the grid has been happening for a number of years. We've got smart meters, smart thermostats, and smart DVRs. We certainly need better, smoother access to data from those smart devices, but the pieces are in place and there're a lot of smart innovators at Uplight and elsewhere that are working to solve those problems.

On markets and policy, which is what I hold near and dear to my heart, there's a lot of work to be done. There're just problems all over the market as we're trying to figure out how to structure programs or policies to make demand flexibility work in the residential sector.

I think we can do it. I think there's a lot of great progress that's being made,

Customers as a Resource, from left, Fortis CEO Dave Hutchens, Uplight Senior Director Market Development Neil Veilleux, Sparkfund AVP Growth Brendan Reed, U.S. Energy Department Senior Advisor Virtual Power Plant David Nemtzow, Southern Company Director Load Flexibility and Economics Lee Evans.

and a lot of that liftoff report that David mentioned earlier has got a lot of great suggestions, but I think there's a lot more to be done there and we can and should talk about that more later.

Then on that frictionless customer experience, we know how to do this. This is the bread and butter of what Uplight does with our utility partners, really think through what is a frictionless customer experience, how do we make it easy for customers to participate in demand flexibility programs?

It comes down to a few things. Great customer education. So, whether that's outbound email marketing or whether it's home and group reports or videos that help them understand complex topics, I think that the tool set is pretty wide and deep on customer education.

It's a simplified buying journey, which we often do through e-commerce platforms, again, with our utilities, high utility marketplaces. It's also meeting the customer where they're at.

On markets and policy, which is what I hold near and dear to my heart, there's a lot of work to be done. There're just problems all over the market as we're trying to figure out how to structure programs or policies to make demand flexibility work in the residential sector.
– Neil Veilleux

Not every customer wants to go to an e-commerce platform to buy a special thermostat, but they might at Home Depot, or they might go to Amazon and there're APIs now that enable us to apply utility rebates and pre-enrollment for demand solutions at those stores. That's an exciting development.

Then helping the customer take the right next step. So, maybe they come to the utility to explore buying a heat pump. Absolutely, let's help them do that, especially as IRA dollars rain down on us. But let's also point them toward a smart thermostat or better weatherization and help them take that right next step at the right time for them to recreate that frictionless experience. ❍

Maria Kretzing
Bidgely GM Electric Vehicles

Maria Kretzing: I like to say that sometimes we say, "Oh, AI is the hot topic right now." Actually, utilities have been adopting AI even before digital came about. It's been years in the making.

However, this new trend or this excitement around AI is really good. To your point, you have to start with a small win before your utility will trust larger things with AI, but utilities aren't going to be able to deliver clean energy in a scalable, cost-effective, reliable way without AI.

Look at some of the commitments, they're incredibly aggressive. The only way to meet it is to bring in AI. I'm glad you brought up EVs. Electric vehicles are a huge concern. It is the primary conversation I'm having with utilities.

There're a couple of different elements to electric vehicles that utilities want to address with AI. The most basic one is, hey, who has an EV in my territory?

That's where we use detection analytics, and disaggregation to say, you may have a million-household utility and forty thousand have electric vehicles, here they are. There're levels deeper that you need to go in terms of that intelligence.

There're a few problems you need to solve, which includes how do you engage that customer? How do you plan for your grid in the future? How do you identify customers likely to adopt? Forecast who's going to adopt.

That's where AI can help at a much deeper level and actually solve real problems. I know we want to focus on the opportunities, but one peril I see is people have these enormous lists of AI could do literally anything, that is dangerous, and you need to focus on what are my biggest problems? Isolate that to three to five problems and solve those with AI.

You have to start with a small win before your utility will trust larger things with AI, but utilities aren't going to be able to deliver clean energy in a scalable, cost-effective, reliable way without AI.
– Maria Kretzing

I've talked to some utilities, and they put a list of a hundred things in front of me and that's going to deter you from solving the real problem. So, I'll end with this, which is just one way.

We've used these EV analytics to help the utility, Hydro One, in Toronto, Canada. They use our EV analytics, specifically, they use our hourly estimation of all appliances but for EV.

The problem was that their distribution planning team was basically going to estimate the whole load of an EV going on coincident peak. That's just a bad recipe for over-investment.

So, we used the AI to determine, hey, what factor of an EV should we plan for being coincident with the peak? We got that down to about 0.25 and, you're right, avoided some over-investment. ❍

In 2022, for 27 million households in the lowest quintile, with respect to income before taxes, income averaged $14,191. After taxes, income averaged more, $16,337. Their expenditures on average on all goods and services was substantially greater, at $32,612. Expenditures on electricity specifically, residential electric bills, averaged $1,205. On a monthly basis, that's an average of $100. This according to U.S. Department of Labor, Bureau of Labor Statistics, Consumer Expenditure Survey.

Caroline Roche

IBM VP and Senior Partner

Caroline Roche: Utilities historically are quite relevant to some of these other industries that are also facing the clean energy transition. Talking about AI is not new, and IBM has been working from a technology perspective on AI for over thirty-five years, maybe longer.

One of the first instances of that was in 1997, when we had a machine beat a chess player. You are familiar, I imagine, with when Watson beat Jeopardy. So, we have been using AI for some time, and I think one of the things that's the most interesting as I talk about this with my clients and my teams is AI is everywhere.

But most people don't understand that there's a big difference between AI and Generative AI. Generative AI is not equal to AI, necessarily. I've been kind of laughing at the fact that with the advent of OpenAI, there has been a lot more interest in good old AI, as I like to call it, of the traditional predictive forecasting.

Generative AI is a very interesting opportunity for all companies, and one of the things IBM has focused on is enterprise grade AI. I'll give you a story. One of my retail clothing retailers deployed a chatbot this summer with predictive recommendations around outfits using OpenAI, and they saw some challenges with performance and good outfit recommendations.

They didn't have good outfit recommendations with Generative AI. That comes back to some of the challenges around the data that you're using to train the models.

I'll give another story on, is anyone a US Open Tennis fan in the room? IBM does the whole technology, and my team does the whole technology around the US Open, and this year we used good old AI to predict the winners, so hooray for us on that.

Then, also Generative AI to do live captioning of the tennis matches. That was a very interesting challenge because live captioning is a risky business if you're using generative AI because you can't control what the model is saying.

Most people don't understand that there's a big difference between AI and Generative AI. Generative AI is not equal to AI, necessarily. I've been kind of laughing at the fact that with the advent of OpenAI, there has been a lot more interest in good old AI, as I like to call it, of the traditional predictive forecasting.
– Caroline Roche

A lot of work went into what data we were using to train the AI in the live voice over the telecast. Then, expanding that to other languages because tennis has a lot of countries with different languages and people who want to be watching a telecast that may not be in their native language.

A lot of work went into how do you train the data that's going into these models? How do you make it relevant not only to sports, but to tennis, but to Arthur Ashe Stadium, and how do you make it contextual?

So, it was governing the data going into the models, governing the experience of the captioning, but then also making sure we were looking at bias. Things like sometimes men's tennis matches have more crowd noise than women's.

One of the things that we use to drive our video forecasting is crowd noise and engagement. How do you not have bias toward men's matches when you're displaying that on the website?

That is all very interesting as it kind of comes back to utilities, because utilities have tended to be a little risk averse. Unlike the US Open, which wanted to use Generative AI in the webcast, utilities are not jumping into the deep end of using Generative AI to be talking to their customers yet.

Potential and Perils of AI, from left, Institute for Electric Innovation Executive Director Adam Cooper, SAS Institute Principal Industry Consultant Sacha Fontaine, IBM VP and Senior Partner Caroline Roche, Bidgely GM Electric Vehicles Maria Kretzing, AES Corp. Chief Utility Innovation Officer Raiford Smith.

As we've been talking to utilities, a lot of the focus has been on augmenting human engagement. One of the areas where we've gotten the most traction is augmenting engagement with more back-office workers who tend to be more permanent, longer-term employees because those employees are more trusted. Looking at workflows like HR, marketing, IT, help desk and operations and things where humans can engage with the AI and make sure that it's trusted.

That comes back to the quick wins and feeling good about how your employees are engaging with it before you unleash the beast on your customers. But the final thing is when digital transformation was the topic du jour, I felt like there often would be lots of random acts of digital going on in organizations.

Now, I feel like there are lots of random acts of AI going on in organizations, but really one of the things that's the most promising about AI is going from a, let's just put a little AI in this process, to really rethinking processes with AI and automation underpinning the process.

There's a lot of promise and excitement around using AI as an AI-driven process versus a chatbot here or there. That's one of the things I have a lot of excitement and hope about as we move toward a broader AI adoption in utilities. ❍


Institute for Electric Innovation Executive Director Adam Cooper.


EEI CEO Tom Kuhn (retired Dec. 31, 2023).

Raiford Smith

AES Corp. Chief Utility Innovation Officer

Raiford Smith: It's more of a master of cheerleading, because so much of what happens in the utility is based on that momentum. In terms of what we're using AI for, what we're using it for is it really touches all of our business, from better understanding our customers.

Ted mentioned it earlier, he said, "I like to think of it as a customer or a segment of one." I always said, "How many segments do we need? Well, first, start by counting, how many customers do we have? That's how many segments we start with."

But we have areas that are going on there to better understand the consumer. From that understanding of the consumer, that helps us better understand the impacts to the grid. If you can predict where those new opportunities are coming from, then you can start to understand how to better plan, design, and ultimately, run your grid.

The power grid is the secondary. The third is understanding all of that also drives us in terms of generation. How do we think about using our assets more efficiently and effectively, of course, but even better, how do we get to that sustainable goal faster?

I was in a bunch of debates internally, and we were having an argument over whether we wanted to be clean or cleaner. Clean won, by the way, that's good.

But the idea here is that you can't go and make a wholesale change of all that infrastructure, without actually figuring out how to run your business more effectively and efficiently. In all of those areas, we're using AI to help us drive that transformation and help us better inform where we're going. PUF

The idea is that you can't go and make a wholesale change of all that infrastructure, without figuring out how to run your business more effectively and efficiently. In all those areas, we're using AI to help us drive that transformation and help us better inform where we're going.

– Raiford Smith

What's in Store in Twenty-Four?

(Cont. from p. 4)

courageous support by regulatory and political leaders. The ship's crew, the public service-minded people of the industry and its regulators, is increasingly inventive as they put into place new equipment and new processes to head off the increasing threats.

In twenty-twenty four, the Public Utilities Fortnightly team will again host the Edison Congress in April and Fortnightly Top Innovators in October, shining a light on the great engineering and operations leaders of the industry in the spring event and the great innovators of the industry in the fall event. When you see all these dedicated and creative folks in the same room, you cannot doubt that the best and brightest are on the beat to keep our lights shining.

Rumsfeld did warn that there are unknown unknowns, things we don't know we don't know. So, let us all prepare to encounter whatever comes next, in the new year. And as we do, you can count on one thing for sure. Public Utilities Fortnightly will be there to chronicle how the utilities industry and its regulators steer the ship through the Strait of Messina. PUF

Tri-State's Future Per Its CEO

Conversation with Tri State G&T CEO
Duane Highley

Tri-State Generation and Transmission Association is a western giant, a cooperative power supplier made up of forty-five members, including forty-two electric distribution cooperatives and public power districts serving over a million electric consumers. Its CEO has referred to Tri-State as being "oddly named" since it operates in four states, across the panhandle of Nebraska, as well as in Colorado, Wyoming, and New Mexico.

Tri-State is not-for profit and is known for a being a leader in its huge swath of the western area in which it operates, being among the first cooperatives in the nation to adopt an Environmental Management System, which enables environmental compliance, enhances strategic planning, and promotes environmental stewardship. That is while determining the optimal mix of more than thirty generation resources to serve members, while having two rate decreases in the last three years.

That is about to change, although not by much. There is a lot going on and to explain the latest at Tri-State, Public Utilities Fortnightly went right to the top, to CEO Duane Highley. Listen in.

PUF's Steve Mitnick: Your company is tackling the energy transition. Talk about that.

Duane Highley: Yes. We've got a responsible energy plan that we issued in 2019, back when nobody believed we were going to do it, and we're making it happen. We're going to have fifty percent of the energy our members use renewable in 2025.

We had the kickoff for our latest major solar project recently. It's two hundred megawatts of a total of five hundred ninety-five megawatts of new solar online in 2024-2025. On top of that we will have another six hundred-plus megawatts of wind.

By the end of this decade, we'll be eighty-nine percent decarbonized for our Colorado consumers from a 2005 baseline. Across all four states we will be seventy percent clean energy consumed by the end of the decade.

PUF: That eighty-nine percent is for the Colorado consumer?

Duane Highley: For Colorado, we have to meet a baseline reduction from 2005 in terms of tons of carbon, just total tons have to be reduced by eighty percent. But our actual reduction per kilowatt-hour delivered is forecast to be eighty-nine percent.

It's almost a ninety percent reduction in carbon content. We're moving at light speed for a utility. Usually we utilities move slowly, but this is a rapid energy transition driven by a lot of wind, solar, and retirement of coal.

PUF: You have the advantage that you're in a great part of the country for renewable resources. But there're a lot of challenges too.

Duane Highley: Yes. First, we're blessed in terms of geography. We have great wind and solar resources. That's the American west, with our footprint in Colorado, Wyoming, New Mexico and western Nebraska.

But it's increasingly difficult to develop because even with those resources, people are saying they don't necessarily want them in their backyard. Even if they do, is the transmission grid able to accept that much?

In a lot of places, we're already tapped out, and the western grid especially is severely constrained. With a seven-to-fifteen-year development horizon for new transmission lines, we're forced to plug these renewables into places where the grid will accept them today, which may not always be in the most optimal locations.

By the end of this decade, we'll be 89% decarbonized for our Colorado consumers from a 2005 baseline. Across all four states we will be 70% clean energy consumed by the end of the decade.

But it means we're prioritizing those locations on the grid where we can accept the power, we're developing transmission, and moving as quickly to an RTO as we can. That's another element of our plan.

PUF: You said that there's pushback from property owners or other parties against new renewables. Can you say more?

Duane Highley: Well, in some areas, they're already calling for moratoriums on wind development. You've seen that in states in the eastern grid, and there's been some of that occurring in the western grid now.

None of them have stuck permanently, but a county or an area will say, "We want to put a moratorium on wind development," and let the local people get their voices in. It's getting harder.

We have a geothermal proposal that's being explored in central Colorado and some in the community are coming out against it. You wouldn't think geothermal would be a problem, but it's always the "not my backyard" or "not in my second backyard." It's going to get harder as we continue to try and exploit the renewable resource and get more of it on the grid.

PUF: You said an RTO in the west would be a help.

Duane Highley: We're bullish on an RTO. You see what SPP has been able to do on the eastern grid with wind integration, seventy, eighty percent wind integration.

MISO, SPP, Cal ISO, they're north to south markets, that's why they have duck curves. By moving renewables east and west, that problem would not exist. By enhancing DC converters, the duck curve problem can be eliminated. We're excited about getting SPP to expand west.

We knew going into this with how many renewables we were going to have to add at Tri-State and at our neighboring utilities that we would need an RTO in order to balance that out over a wide geographic region that was bigger than any of us.

Tri-State's in five different balancing areas. It's a big footprint.

We want to see SPP integrate across the east-west grid divide and then be able to enhance the DC converters so we can move that power. What's important about renewables is to move them across time zones, not just north to south.

If you look at RTOs in this country, MISO, SPP, Cal ISO, they're north to south markets, that's why they have duck curves. By moving renewables east and west, that problem would not exist.

By enhancing the DC converters, the duck curve problem can be eliminated. Renewable power could move across time zones to where they have greater value, and that's why we're extremely excited about getting SPP to expand west.

PUF: You're member owned, and sensitive to members. You have members in many states, which can have different views about the energy transition. How do you handle that?

Duane Highley: This is what's great about Tri-State being a member-owned organization. We have forty-two-member system utilities that we serve, and all are nonprofit, either cooperatives or public power districts.

They each elect a board member from their board of directors to sit on the Tri-State board, and I face them every month, along with my senior staff. Every month in our board room, we face members from the end of the line who care about reliability and affordability.

If we can make reliability and affordability work while making the energy transition, they're supportive. So even Wyoming members that aren't necessarily as excited about green energy can get on board with affordability.

We work in the cooperative business model and focus on cost because we're member-owned and not-for-profit, and I face the members every month. That keeps me honest on costs, and I'm not going to spend their money in a bad way.

If we can show our members that wind power, using federal subsidies and now the New ERA funding, is the lowest cost of any resource, that's saving them money, and even if they're not big on the wind, they're big on saving money.

The other aspect is reliability, and that's always job one. We've been able to prove through enhanced reliability metrics we've adopted, and we think the rest of the industry should follow what we call Level Two reliability metrics. We can prove that we're going to keep the lights on even if the wind and solar aren't there, and that's the key.

PUF: Talk about Level Two reliability, as that's a different kind of metric.

Duane Highley: Traditionally, we use a planning reserve margin that was based on modeling a of loss of load probability of one day in ten years. Everybody uses an LOLP, LOLE-type analysis. But that's limited because you also have to assume a lower capacity credit for the renewables.

Even if you reduce their capacity contribution, say wind isn't credited as a hundred-megawatt wind farm, but is credited at forty megawatts or less, that still doesn't capture the true reliability

impact. Because what happens in a Storm Uri, or a Storm Elliott is that we'll experience wind droughts across multiple states simultaneously.

In Level Two, we build a resource plan that considers one of the worst possible weeks in the winter and one of the worst possible weeks in the summer. We model those highly stressed weeks, because you can have wind droughts, and then in winter, our load peaks in the morning and the evening when there's also no sun.

In Level Two, we significantly reduce renewable contributions, and we don't count on capacity or normal levels of energy imports from our neighbors, which is almost everybody else's modeling practice. They say, "I'm going to assume I can get two hundred megawatts from my neighbors." Well, when it's one of these big storm events, the neighbors aren't there either.

We're all having the same problems, so we don't count on imports, and we have to demonstrate to our regulators, the Colorado PUC in this case for the resource plan, that we can keep the lights on without significant contribution from renewable capacity, without capacity imports. That means we have to have some resources that will run for a week at a time at our command. That's natural gas.

By using this methodology, a gas plant is prudent for us. Because we don't need it much, but when we need it, we really need it.

PUF: Are you optimistic about the future and where Tri-State is going in the next year, to three years?

Duane Highley: Yes. I think the future is so bright, you're going to need sunglasses. It's just an amazing number of renewables that we can integrate and prove are reliable and affordable.

Also, we haven't had a rate increase since 2017. In the last three years we've had two rate decreases. What other utility's done that? We will finally have an increase next year. We finally need one, but it's going to be only 1.4 percent higher than our rates were in 2017.

We have to demonstrate to our regulators, the Colorado PUC for the resource plan, that we can keep the lights on without significant contribution from renewable capacity, without capacity imports. That means resources that will run for a week at a time at our command. That's natural gas.

Can you say that about your cable bill, your cell phone, any other utility you can think of? It's because of our members and our not-for-profit focus. We're taking advantage of the New ERA money, we've got a Letter of Interest provided to USDA, so stay tuned for that.

You're going to see a big announcement in December as we file a resource plan based on that potential funding. It's got broad stakeholder support and is going to allow us to bring on more renewables faster at a lower cost for our members with a stronger balance sheet, less debt. It's all positive, and I'm excited about all this. PUF

Gas – Electric Systems Evolve

(Cont. from p. 36)

perform a similar role for the gas sector (wellhead through burner tip) that NERC performs for the electricity sector.

Acting FERC Chair Willie Phillips supports the report's conclusions and continues to amplify that case. Further, the Winter Storm Elliott Report also identified this need as part of its recommendations.

While FERC and/or NERC could possibly play a role in establishing a GRO, it is critical that an entity with some authority is mandated to assure natural gas system reliability. This is especially vital due to the fundamental role of gas in an Interconnected Bulk Energy System upon which North Americans are becoming increasingly dependent.

The GRO would be mandated to coordinate with the ERO and develop the needed Reliability Standards that would ensure this Interconnected Bulk Energy System is reliable and affordable for the benefit of customers.

Going forward, the interconnected nature of the natural gas and electric system will expand. NERC is calling for formalized coordination and collaboration between both industries, including the development of a Reliability Standard-setting and enforcement organization that encompasses the Interconnected Bulk Energy System and the deep need for coordination between both industries to ensure their reliable operation. PUF

The nation's 134 million households can be broken up into nine Census divisions. The lowest residential electric bills on average are in the East North Central division encompassing the states of Indiana, Illinois, Michigan, Ohio, and Wisconsin. Those bills averaged $1,422 in 2022, or $118.50 per month. This is according to the Bureau of Labor Statistics, Consumer Expenditure Survey.

How Fleet Electrification is Going

Conversation with Accenture's
Sanda Tuzlic

Accenture recently released a global report and survey, "Lead the Charge: Fleet Electrification Accelerated," of senior decision makers in fleet management that shows most of the transportation sector remains in the early stages of fleet electrification. The report highlights key issues for the utilities industry, including that only thirty-four percent of respondents were highly confident in the capacity of their current local electricity distribution network to provide the number of connections and amount of power needed for charging EVs.

The report further finds that only thirty-two percent have high confidence about connecting new chargers to the grid within a reasonable lead time, with the same number highly confident about the ability to make use of employees' home-charging infrastructure. Because EV fleet management and charging infrastructure tools are highly digitized and require specific digital capabilities, only forty-nine percent of respondents said their workforce has the right skills. One in ten have not even investigated where their skills gaps are.

There is much more detail found in the report, including recommendations for fleet owners and operators to move fleet electrification to center stage. Public Utilities Fortnightly wanted to know more and brings you here a conversation with one of the sponsors of the study, Accenture's Sanda Tuzlic, to dig deeper into the future of EV fleet electrification.

PUF's Steve Mitnick: What are the most important takeaways for the industry from this report about where we are and are going on electric vehicle fleet electrification?

Sanda Tuzlic: The most important finding is that the majority of organizations are still in the early stages of fleet electrification and have either not yet started the process of electrification or are less than a quarter of the way through.

Fleet electrification is not expected to be achieved until after 2030, and our research revealed less than a quarter of fleet operators expected to achieve this before that date, so the pressure to decarbonize is truly on.

Thirty percent of executives shared they have no electric vehicles in their fleet. And about half of the executives say, "Electric vehicles make up a maximum of a quarter of our fleet." So, we really are at the beginning of this fleet electrification journey.

Why is this? It's in the early stages and as with all early adopters there is much uncertainty, especially around the business case, which is slowing down electrification.

A wide range of challenges are impeding progress. Capital investment and infrastructure requirements are currently the most significant challenges; however, a range of challenges across strategy, finance, infrastructure, culture, operations, and digital technology are impeding progress.

PUF: You mentioned companies' business cases include the availability of the infrastructure.

Sanda Tuzlic: Exactly, but what was striking is the low level of confidence in the infrastructure availability. That is because fleet electrification is new, this is a big shift, there's a lot that comes into play, to be considered.

Suddenly, there is a need to start thinking about infrastructure for charging. How do I set it up?

Thirty-two percent of respondents in our survey shared difficulties in installing necessary infrastructure as a challenge.

The most important finding is the majority of organizations are still in the early stages of fleet electrification and have either not yet started the process of electrification or are less than a quarter of the way through.

You need to start interacting with new players. Your grid company has to make sure your connections can be upgraded. Will my grid operator be able to meet the timelines I have set out in my fleet electrification transition roadmap to be connected in a timely matter? We are seeing in more advanced markets the challenges grid operators are having in meeting connection timelines.

You need to start thinking about, how can employees charge the EV? New infrastructure is creating new challenges, including lack of knowledge and capabilities by operators. That reflects in a low level of confidence in dealing with this infrastructure challenge.

Also, there is the impact on operational processes, as well as the IT infrastructure in place to manage a mixed fleet, building off the lack of confidence in the ability to meet electrification needs when it comes to infrastructure. All are big challenges, which the survey revealed.

PUF: Describe how thorough and how broad this survey was, including your analysis.

Sanda Tuzlic: We surveyed four hundred fifty senior decision makers involved in fleet management in key markets across the globe to get a pulse on organizational readiness.

The study was based on the experiences we've had so far

One striking finding is that fleet managers are often neglected in this decision-making process because it starts typically as regulatory driven. 60% of organizations in our survey and 68% in Asia-Pacific say electrification is being driven as a sustainability measure and not integrated into their business strategy.

working with fleet operators and helping them on this transformation journey.

We structured the survey around five universal challenges. The questions we asked, and the structure of the report were inspired by these five universal challenges: strategy and business case, infrastructure, culture, data, and IT.

We wanted to understand what is holding fleet operators back, what are the key barriers to adoption? And then be pragmatic in our recommendations on how to either start this journey or accelerate their current fleet electrification.

It helped us think about the different elements required to accelerate fleet electrification for our clients. Because this is going beyond swapping one ICE vehicle for an electric one; you need to think holistically. It needs to start from the top down and you need to involve different stakeholders early on in that process.

One striking finding that I saw from the survey is that fleet managers are often neglected in this decision-making process because it starts typically as regulatory driven. Sixty percent of organizations in our survey and sixty-eight percent in Asia-Pacific say that their electrification is being driven as a sustainability measure and not integrated into their business strategy.

The CFO is often involved, but it's the fleet managers who are the ones that will be impacted. Interestingly, resistance is coming mostly from fleet managers, drivers, and the front-end staff.

It's not enough to only look at fleet electrification as what's the TCO, the total cost of ownership, the infrastructure needs, and vehicle requirements. The entire organization needs to come along on this journey.

The facility manager needs to be involved in connections, upgrades, and building management system integrations. The energy management component becomes a completely new aspect for these fleet operators to think about.

PUF: Why did Accenture take on this this survey, analysis, and report?

Sanda Tuzlic: We wanted to understand what are the key challenges that fleet operators are facing? So, we can design solutions

together with our clients, to help fleet operators transition, arriving at solutions that address these pain points.

PUF: How did you get involved in this study? What do you do with Accenture?

Sanda Tuzlic: Personally, I am interested and vested in EVs. My electric vehicle already had forty thousand kilometers. I do have some hands-on experience in driving electric vehicles across Europe.

Professionally, I'm leading our Net Zero Road Transportation practice across all industries, so not only for utilities, because the convergence means different market participants and industries need to participate in this new value chain that is being created around electric vehicle charging and electric mobility.

For my role, I was the sponsor of the study. I wanted to assess, get the voice of the customer, make sure that whatever we are designing in terms of offerings from an Accenture perspective, and solutions we're designing with our clients, that they are addressing the real customer problem and removing frictions for fleets to accelerate.

Our ambition is to be the scaling partner of the industry. Accenture is good at big, complex programs. This is one of them, but it's now still in the early stages. The big wave is still to come, we are getting ready, and making sure we are ready to serve it once it hits us like a tsunami.

PUF: What should everyone do with this report?

Sanda Tuzlic: I touched upon it earlier in terms of collaboration and partnering up. It's having that true partnership between utilities and actors in the ecosystem. That is fleet operators, charge point operators, anybody involved in helping transition those fleets.

Early engagement and planning, especially by utilities, will be important for meeting those desired timelines. Make a link with policy, similar to what we're seeing in renewables.

Also, for new connections and interconnections for getting this infrastructure connected to the grid, we are seeing some challenges, not only in the U.S., but across the markets where electrification is well underway, interconnection queues and timelines are growing concerns.

This requires close collaboration among the industry, the fleet operators, and the ecosystem supporting them to electrify, and the regulators as well, to find appropriate solutions to accelerate this journey.

In the UK, the regulator just released new rules to speed up electricity grid connections for viable projects. It stepped away from that existing first-come, first-serve based system and made sure that speculative developers are forced out of the queue.

It's an example of how policy regulators are addressing that key concern in the industry around queuing and how to make it more appropriate to follow on the requirements coming from the demand of the industry for electrification.

Grid operators are overwhelmed with the amount of investment that needs to be made to support electrification. They're working closely and listening to each other on what is needed to remove the bottlenecks, and that is important because there are no silver bullets.

In the UK, the regulator just released new rules to speed up electricity grid connections for viable projects. It stepped away from that existing first-come, first-serve based system and made sure speculative developers are forced out of the queue.

The local challenges will require local solutions. That includes close collaboration because the regulators don't know it all. It's new for everybody.

They're also having a capability gap in dealing with this transition. Think about regulations around buildings, parking and public places, the role of the cities and how they drive urban design. It all affects charging hubs and where to position them, how to accommodate for low-emission zones, and not putting burdens on lower-income levels.

Financing will be crucial. The role of government is a great example of how that has compelled many fleets in the U.S. to accelerate the journey. Coming up with solutions can elevate the burden of this high CapEx cost that fleet certification represents, and thinking about how to create more innovative financial products that can help in turning that CapEx into OpEx.

Not only on the vehicle side, but on the charging infrastructure side is also where collaborating with the broader ecosystem like the financial institutions can be an enabler to accelerate this fleet transition. PUF

The nation's 134 million households can be broken into nine Census divisions. The highest residential electric bills on average are in the East South Central division encompassing the states of Alabama, Kentucky, Mississippi, and Tennessee. Those bills averaged $1,916 in 2022, or $160 per month. Just behind are average residential electric bills in the West South Central division of the states of Arkansas, Louisiana, Oklahoma, and Texas. Those bills averaged $1,910 in 2022, or $159 per month. The Census divisions with the lowest average residential electric bills? East North Central, Middle Atlantic, Pacific, West North Central.

Large Public Power Council on Grid Reliability

From the Large Public Power Council's "Power Shift" meeting on Washington D.C.'s Capitol Hill, excerpts of remarks by U.S. Senator Kevin Cramer (R-ND); Omaha Public Power District CEO Javier Fernandez; LPPC Chair and Long Island Power Authority CEO Tom Falcone; United States Energy Association CEO Mark Menezes

The Large Public Power Council, LPPC, hosted an event in early December on grid reliability, "Power Shift: Meeting America's Power Needs." It examined the latest energy policy developments from Washington, D.C., and discussed how our nation can achieve a decarbonized future, while also ensuring families and businesses continue to benefit from reliable and affordable power.

Welcoming remarks were given by LPPC CEO John Di Stasio. U.S. Senator Kevin Cramer (R-ND), a former North Dakota PSC Commissioner, spoke on grid reliability and more.

This was followed by a panel featuring LPPC Chair and LIPA CEO Tom Falcone, Omaha Public Power District CEO Javier Fernandez, U.S. Rep. Sean Casten (D-IL) Energy Advisor Nikki Roy, and former Deputy Secretary of Energy and United States Energy Association CEO Mark Menezes. Enjoy these excerpted remarks.

U.S. Senator Kevin Cramer (R-ND)

Kevin Cramer: Baker Electric, the co-op, is where my dad started his career as a sophomore, I think in high school, climbing poles and learning how electricity is distributed and how the lights stay on. As a mean-spirited, right-wing capitalist – big ogre – he used to regulate investor-owned utilities.

When I was this regulator trying to figure out locational marginal pricing, I went to my colleague, Tony Clark, one day. About two weeks into it, I said, Tony, I don't even know what I'm doing. I'm drowning in this. Because it was like RTO week when I got there, and we were trying to set up MISO and I wondered, "I don't even understand the engineering, much less the economics of this. Please help me."

He laughed and said, "Do you believe in baptism by immersion?" I said, "I actually do as a Lutheran, it's not intuitive, but I do." He said, "Well, that's what this is." Tony's dad was an Episcopal priest. So how he used this illustration, how he had the wisdom to use it, I don't know. But I said, "I don't know if I have time, even with immersion, I can't keep up." He said, "It will come, it will click and come to you."

But not taking that chance, I called one of our smaller utilities and said, "Can you send me an engineer and an economist, and a white sheet of paper?" So, we spent an hour in my office and the engineer drew the lines, and the economists put the prices, and then it clicked.

But whether you're an investor-owned utility or public power company, a municipality, or a co-op, whatever the case might be, you have to answer to someone eventually, as I used to say to the investor-owned utilities, who always complained to me because the co-ops had such a tremendous advantage because they didn't have to come to the regulator for permission.

I said, "Try my mother-in-law. I'd much rather come to a utility regulator with evidence in hand than to my mother-in-law, who has a tremendous stake in the game." So, I set the table with that discussion.

John, by the way, your introduction was so great because you made the relevant points about balance and resource adequacy and the transition that we're in and how to again, balance all of those things and more importantly said, have a discussion.

It's too late to turn back all of the retiring older-generation facilities that we had, but we should stop. We should reject this urgency that seems to demand a lot of incentives to build out a whole bunch of generation that won't keep the lights on 24 hours a day, 7 days a week.

– Kevin Cramer

I like discussions more than I like lectures, and you least of all need to be lectured by me. But I'll maybe just say a little bit along the lines of this transition, how I see it going, and the role I try to play with both my technical background and some common sense from my mother-in-law, and then just my daddy who climbed the dang pole and kept the lights on.

Coming from a cold weather place that generates a lot of electricity, we produce a lot of coal, we produce a lot of wind. We export more than we consume. So other people's cultures and getting back to the RTO of the regions, the interstate component of all this, all of that's very important to me.

The preservation of federalism, as well as good policy, good stewardship of our environment and our resources. It won't surprise you that I get concerned when we're navigating the monkey bars and we're tempted to let go of the one we're hanging onto before we grab the next one.

I feel like that's where we are. So, the role I try to play is slow down, don't get the cart before the horse. Don't get the transmission line before the generation or lower demand. I feel like right now we're in this moment where all the incentives are centered around one part, but they don't connect to the other part.

They need your wisdom. They need your planning skills. We need to be in this together at a pace that sets us up for success, rather than feeling good about ourselves. So that's very general.

I'm not going to, but I could list all of the crazy regulations. Not only am I on the EPW committee, I'm on the banking committee. Now, before you study me too closely, Sonny Bono was on judiciary. He really was.

But all these regulations relate to a utopia that somebody has created in their mind. I'm also on the Armed Services Committee, and I see some of the policies, and I talked to enough international leaders. Just last night I spoke to the International Development Union Center, leaders from around the world that get together to talk policies.

I spent a lot of time talking to generals about how we protect certain things and how we use certain resources, certain ways. I talk to a lot of European energy ministers, prime ministers, foreign ministers who want what we have. They want what we have. They want our natural gas to generate cleaner electricity and to heat their homes and run their factories, for example.

But I think more than anything, what they need is our leadership, and they need our counsel. They need our innovation. This is why, as much as I loved former President Trump and would love to serve with him again, he and I argued, and I lost, of course.

I never know anybody that won an argument with him, but at least not internally, that we needed to remain in the Paris Accord. Why? Because the world needs us.

And because when we sit at a table, we're at the head of the table and we can help navigate this for the world, this transition in responsible ways. Okay, I lost that argument. But now I look at our federal government and I look up and down the federal agencies and see almost a shell game going on. We're transporting or exporting. Climate guilt is more important than actually dealing with the climate itself.

So, the discussion you're going to have, the discussion many of us are having has to be realistic and be balanced and balance adequacy with environmental stewardship and with the resources that we've been given and blessed with. Then together we can do that…

It's too late to turn back all of the retiring older-generation facilities that we had, but we should stop. One of the senses of urgency that we should reject is this urgency that somehow seems to demand a lot of incentives to build out a whole bunch of generation that won't

(Cont. on page 62)

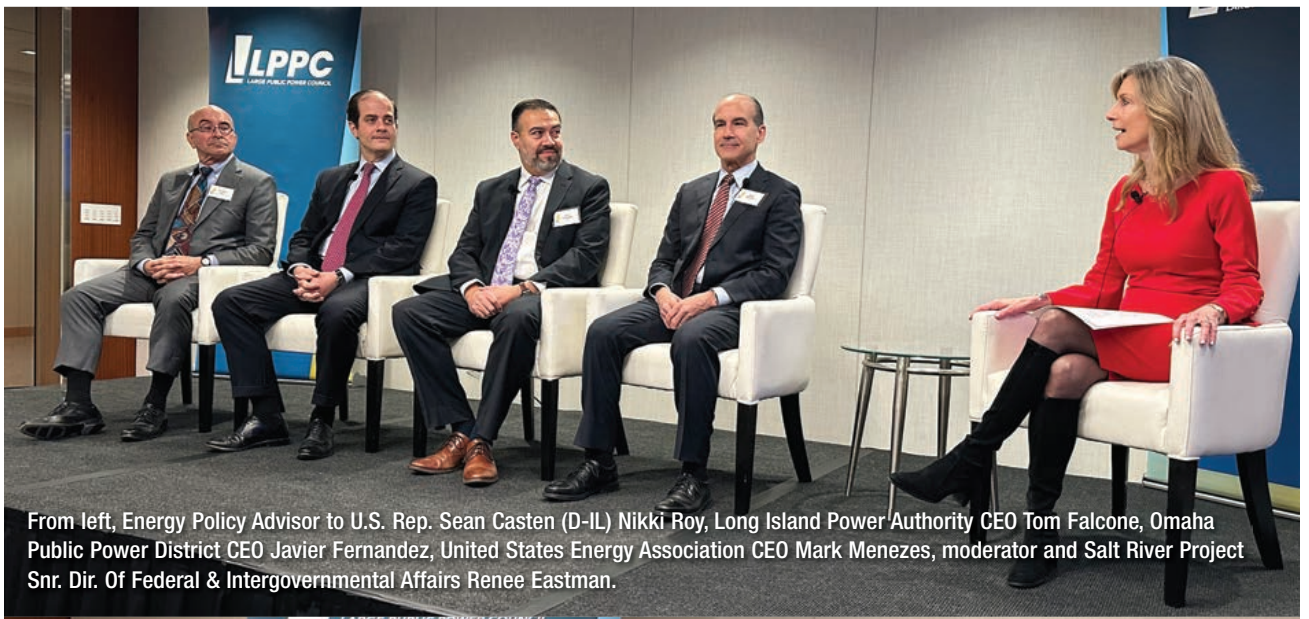
United States Energy Association CEO Mark Menezes

Mark Menezes: You have obligations to provide affordable, reliable, clean, and resilient power. Those are your obligations. You don't have a choice. In our world, you're forced to make – and you heard this from Senator Kramer – binary choices.

One hundred percent renewables are not fossil, non-fossil. You won't get very far in policy discussions when you're forced into those binary discussions.

I find it very helpful to begin conversations with policymakers to say, "We can't choose one or the other because we have an obligation for all four of those." ❍

One hundred percent renewables are not fossil, non-fossil. You won't get very far in policy discussions when you're forced into those binary discussions.
– Mark Menezes



From left, Energy Policy Advisor to U.S. Rep. Sean Casten (D-IL) Nikki Roy, Long Island Power Authority CEO Tom Falcone, Omaha Public Power District CEO Javier Fernandez, United States Energy Association CEO Mark Menezes, moderator and Salt River Project Snr. Dir. Of Federal & Intergovernmental Affairs Renee Eastman.

From left, Energy Policy Advisor to U.S. Rep. Sean Casten (D-IL) Nikki Roy, Long Island Power Authority CEO Tom Falcone, Omaha Public Power District CEO Javier Fernandez.

Large Public Power Council President John DiStasio.

Salt River Project Snr. Dir. Of Federal & Intergovernmental Affairs Renee Eastman.

keep the lights on twenty-four hours a day, seven days a week.

We have to be honest with people about intermittent sources of electricity, and that's what I mean by, the balance. For some reason, we've incentivized the closing of plants. We've let go before we grab the next bar. There is a sense of urgency about it. I loved your illustration, and I lived it. I live in Bismarck, North Dakota with a power plant that they just blew up about a few months ago.

I shot video of the whole thing right across the Missouri River from me, and we had blackouts because of what was going on in Texas, because that side of North Dakota's SPP. The rest of it's MISO.

That is very hard for people from a major energy-producing state to understand. We've got to be a lot more careful that direction, but what I worry about in your illustration is that our attention span as a culture is so short that it's going to take more than a rolling blackout before somebody goes, "Maybe, we shouldn't have retired that plant so soon," but we all know better.

I would just appeal to your courage as managers, as board members, as investors, to do what I feel like I have to do sometimes. Around here, I talked about the art of the possible, Bismarck's political definition. The same is true out there.

We have capital. We have literal capital and political capital, and how we accumulate it, and how we spend it, matters. How we talk about issues matters. I think we've got to resist the knee-jerk reaction to do this thing over here, not thinking about the consequences over there.

What I'm talking about is retiring big sources of baseload power while we wait for the development of permanent wind or whatever the case may be. I've sited lots of wind farms in my life.

I've sited lots of transmission lines, and I've sited lots of pipelines. They're all really important, and we need to do a better job of that balance and discussion, but I hear your call. We need permitting reform really fast so we can build things really fast. ❍

Omaha Public Power District CEO Javier Fernandez

Javier Fernandez: We experienced a sixteen percent increase in our peak winter load. This past August, we broke our summer peak load by ten percent in one year, and it's going to continue to happen year after year, after year. This is when people need our services the most. When it's minus thirty degrees in the winter, people are using more and more electricity to heat their homes. And it's happening in the heat of the summer.

We're talking about permitting reform. Permitting reform, not only for long-distance, high-voltage transmission lines, but permitting reform at the state and the local levels.

We, too, are doubling the size of our generation portfolio. We have to. We are well on our way. We're going to deliver at least seven hundred megawatts of new generation next year.

We would have been there with an additional thousand megawatts, had it not been for local permitting issues. This is where locating new solar farms and new wind farms is becoming a gigantic issue. Rural counties don't want that type of infrastructure in their territory, and trying to come to the table, and present

One acre of corn used for ethanol production, versus one acre of solar panels for electricity. You pack 34 times more energy with solar production than with planting corn. You yield 34 times more energy, that uses zero water, zero fertilizer, zero pesticides. But it's hard to get that message across.

– Javier Fernandez

these scary new technologies in a way that it's really not that much. I'll give you one example.

Nebraska is known for raising corn. Forty percent of the corn grown in Nebraska is already used to harvest energy, in the form of ethanol. Four and a half million acres of corn production in Nebraska is used to harvest energy already. Now, we're looking at ten thousand acres, a fraction. One quarter of one percent of that land that would be used for solar production. But it's different. It's solar panels. It's not corn plants.

When you look at the efficiency, acre per acre. One acre of corn used for ethanol production, versus one acre of solar panels used for electricity. You pack thirty-four times more energy with solar production than with planting corn. So, you have a crop that yields thirty-four times more energy, that uses zero water, zero fertilizer, zero pesticides, it doesn't compete for water for other users. But it's really hard to get that message across.

Those are the conversations we're having with our neighboring rural communities, to make sure that we have a good conversation, and we all come to the table and solve this issue too. ❍

Long Island Power Authority CEO Tom Falcone

Tom Falcone: This is a wind farm in federal waters, and it'll be operational by January. But that has been an eight-year saga. On the positive side, you can make your way through, and get this stuff built.

On the concerning side, with the speed at which we want to do these things, eight years, when the construction period is about eighteen months. All the rest is in getting coalesced around, this is a project we want to do.

On the hopeful side, to your point on engagement, we built the first one in East Hampton. There is no path by which you could land an offshore wind project and bring it to a substation that does not pass by at least one billionaire's house. You've looked at all of them.

The opposition was quite large. But if you can build it in East Hampton, you can build it anywhere. It took a coalition of the local community to say that this was important, and to get it done.

That said, there are also other offshore wind projects that have been proposed on Long Island. Some have run into opposition they have not been able to surmount, at least yet. I think part of that was community engagement upfront was not that good…

I have a couple of quick thoughts. First, we share the same strategy, which is we're going to get to a zero or near zero carbon grid, but the electric grid only is thirteen percent of New York State's carbon emissions. Sixty percent is heating and transportation.

If you really care about carbon, if you want to get to a low-carbon grid, you have to take that clean electric grid and use it to power transportation and heating. We are pursuing electrification. We're pursuing heat pumps, which are very economic on Long Island.

So, people are going to get more and more of their needs from electricity but for people to feel comfortable with that, two things have to happen. One, the price has to be reasonable. So, we have to maintain affordability of electricity but number two, it has to be reliable.

People have to feel like, I can trust the electric grid, including in big storms. Long Island is a long island for anybody not familiar with it, and occasionally a

(Cont. on page 69)

It's not just infrastructure that needs to be reliable. The biggest thing in those moments is your ability to communicate with customers and that's the resiliency of your IT systems. When the power does go out, what people want to know is when's it coming back, and they want information that's accurate and timely.

– Tom Falcone

How Can We Ensure Energy Transition is Just?

Procedural Justice at State Commissions

By New York University's School Of Law's
Elizabeth Stein and Burçin Ünel

For over a century, state utility regulators across the country have worked hard to ensure that the entities they oversee deliver safe and adequate service at just and reasonable rates. That century saw the emergence of the interconnected energy system we rely on today, as well as a series of transformations in society, transportation, and technology, and multiple evolutions of utility governance.

Today, the climate crisis and resulting energy transition are upending settled beliefs about a range of energy-related practices and values – such as the benefits and costs of various energy sources, relationships between supply and demand, interactions among different infrastructure systems and fuels, and time horizons of interest for planning and analysis.

Utility regulators now face the challenge of ensuring that the energy utilities they oversee do their parts to effect the energy transition, while continuing to provide safe and adequate service at just and reasonable rates. Moreover, they need to accomplish all this while assuring fairer outcomes for communities that have in the past been persistently and disproportionately harmed by energy infrastructure decisions.

Fairness is not a novel consideration for state utility regulators. One of their core responsibilities has always been to protect the general public – or at least, utility customers – from being disserved by monopolies providing vital services. A complex web of overlapping institutional practices has grown up to help regulators make sure residential customers, including low-income customers, have access to decent utility service at prices they can afford.

But ensuring safety and fairness for communities that may be disserved by energy infrastructure has not always been prioritized. With the new wave of energy utility infrastructure investment now underway, commissions urgently need to make sure that this time the voices of disadvantaged communities are heard.

To ensure tomorrow's energy system is fairer to communities than yesterday's, state commissions will need to start by recognizing what was missing in their decision processes, and what could be done differently. Ongoing research by the Institute for Policy Integrity at New York University School of Law sheds light on the wide range of what procedures are currently in place in nine states.

State-level regulators across the country do not currently have a shared understanding of what they would need to do differently to ensure that disadvantaged communities have a meaningful opportunity to be heard in decision-making processes and help shape better outcomes.

Utility Regulators and the Public Interest

Without competition and customer choice to keep monopoly utilities in line, regulatory oversight prevents these large, powerful companies from delivering low-quality service or outlandish prices. Oversight also has been essential for delivering equitable outcomes society has prioritized – that is, getting decent, affordable service in place even for customers in far-flung locations that might be costly to serve, as in the case of rural electrification.

As utility service has been increasingly recognized as a public safety necessity, ensuring it stays affordable for all has become a priority. In many states, additional government entities have been created to help make sure utility service remains in reach for low- and moderate-income customers.

These consumer advocates perform an important service of counterbalancing the utility drive to perhaps spend more than necessary – as well as counterbalancing more powerful customers, who are more capable than typical individuals of representing their own interests in regulatory fora.

But electric and gas utilities aren't just large monopoly companies that provide essential services and must be prevented from charging unreasonable prices for those services. They are also energy companies and infrastructure companies. Energy infrastructure is a tremendously essential force in American life.

For more than a century, energy infrastructure has fueled the American economy, but it has also done significant harm, including air and water pollution and land/community impacts. Importantly, that harm has not been spread evenly – it has often

Burçin Ünel is the Executive Director of the Institute for Policy Integrity at New York University School of Law. Burçin is an expert in utility regulation and environmental and energy policy, and she has authored over one hundred papers, policy briefs, public comments, and reports on numerous energy and environmental policy issues.

Elizabeth Stein is the State Policy Director at the Institute for Policy Integrity at New York University School of Law. Elizabeth's work focuses on utility regulation and environmental and energy policy. Before joining Policy Integrity, Elizabeth was Lead Counsel, Energy Transition, at Environmental Defense Fund.

As utility service has been increasingly recognized as a public safety necessity, ensuring it stays affordable for all has become a priority.

– Elizabeth Stein

been concentrated in particular communities, especially low-income and minority communities that are poorer.

At the same time, some disadvantaged communities also experience worse-than-typical utility services, in terms of reliability – a phenomenon that some advocates attribute to aging equipment and underinvestment by utility companies.

Some utility regulators have experience considering community interests other than affordability, such as employment impacts and pollution mitigation. But these concerns often sit less comfortably within the traditional scope of the utility regulator's role. And unlike protecting the interests of low-income ratepayers, there is no well-established, widely adopted toolkit for utility regulators to protect all these interests.

In short, state-level regulators across the country do not currently have a shared understanding of what they would need to do differently to ensure that disadvantaged communities have a meaningful opportunity to be heard in decision-making processes and help shape better outcomes. The energy transition has intensified the need to develop these capabilities, and quickly.

Achieving rapid reductions in economy-wide pollution will require extensive buildout of some new types of energy infrastructure – while hitting the brakes, or even pulling the plug, on some traditional types. The need for rapid, far-reaching changes in how energy infrastructure is planned and built means utility regulators need this new toolkit as soon as possible.

Institute for Policy Integrity's Research

An increasing body of literature is improving our understanding of inequitable outcomes. This area of fairness focused on outcomes. Distributional equity concerns the manifest unfairness of some communities bearing more than their share of ills, such as bad air quality and related health problems.

Research into distributional equity is making real progress toward quantifying unfairness in the distribution of harms and assessing progress in remediating that unfairness. For procedural equity, however – the fairness and inclusiveness of the procedures that ultimately help shape the outcomes – a body of research exists but is less fully developed.

Against this backdrop, Policy Integrity has been working to develop a baseline understanding of what conventional practices currently may prevent utility regulators from integrating the voices of disadvantaged communities, and what some regulators are already doing to mitigate these barriers.

Based on existing knowledge and research on state regulatory proceedings, including known efforts to improve procedural equity by utility regulators, we postulated that there were six general areas in which lack of procedural equity at utility regulatory

bodies might be possible: financial support, accessibility, meaningful engagement, information resources and support, transparency, and equity prioritization.

For each of these areas, we identified a variety of potentially helpful measures. Then, for a select group of states – California, Georgia, Illinois, Massachusetts, Michigan, New York, Pennsylvania, Texas, and Wyoming – we surveyed the websites of utility regulators, as well as relevant statutory and regulatory provisions that we were able to identify, to assess whether regulatory bodies had adopted such measures.

As a follow-on step, we have been vetting our findings with practitioners and stakeholders for further context.

The nine states we examined show a wide range of geographic sizes, population sizes, energy market structures, mixes of urban and rural development, industrial characteristics, and climate policies. While a survey like this may not yield a complete picture of the situation on the ground for any particular state regulator, the aggregate picture across the various states sheds light on the range of practices that are in place.

The reality is that finding procedural information can be difficult, and community members unfamiliar with regulatory proceedings would likely encounter some of the same challenges we experienced.

With the new wave of energy utility infrastructure investment now underway, commissions urgently need to make sure that this time the voices of disadvantaged communities are heard.

– Burçin Ünel

Every Regulator Has Strengths and Weaknesses

The various regulators had unique portfolios of tools to enhance procedural equity for disadvantaged communities. Although some regulators had a statutory or institutional commitment to enhancing procedural equity, no one regulator had arrived at a definitive formula that other regulators could rely upon to ensure procedural equity for communities would in fact be achieved. But every regulator had at least some promising levers in place for community stakeholders to use.

Existing Institutions and Practices Don't Fill the Gap

Most of the states assessed had public advocates with some statutory responsibility for participating in utility regulatory proceedings on behalf of interests that might otherwise go unrepresented. However, in most states, these entities were strictly consumer advocates; that is, their purpose is to make sure that the interests of individual consumers are represented in proceedings that might otherwise be dominated entirely by utility interests, or by utilities and their largest, most sophisticated customers and perhaps other market participants.

Another seemingly promising tool to enhance procedural equity that may be an ill fit for disadvantaged communities is intervenor compensation. On its face, intervenor compensation

sounds like it could serve as an all-purpose funding stream that could assist prospective participants from disadvantaged communities at various stages in various types of procedures.

In practice, however, intervenor compensation programs appear to be few and far between. They only exist in a few states, and even where they exist, their scope may be very narrow, covering only a limited range of utility regulatory proceedings.

Moreover, in practice, they do little for disadvantaged communities because their basic structure does not meet those communities' needs – typically, they provide funding only retroactively, such that intervenors must advance significant resources up front before potentially being reimbursed months or even years later. For disadvantaged communities, help often needs to come up front or it may be no help at all.

Capable Representation Access May Be Worth More than Money

Many of the tools we looked for involved funding to overcome cost barriers and other access barriers, and lowering barriers to entry where possible. However, much of the difficulty faced by disadvantaged communities in these regulatory fora arises from the technical complexity of the subject matter, and the need to draw on significant subject-matter expertise.

Given the complexity of these fora and the subject matter, the diversity among dockets even at a single commission, and the important role of settlement negotiations, legal resources that can represent communities might be a powerful tool for improving procedural equity.

While some policy decisions are made through rulemaking-type processes that may follow procedures that require significant transparency, many key decisions affecting specific communities are reached by utilities through closed-door negotiations with other sophisticated, well-resourced parties in confidential settlement processes, and subsequently ratified by regulators.

While more can and should be done to make sure the voices of non-intervenor parties with an interest can inform final regulatory decisions even in matters where some kind of settlement is reached, for communities that are likely to be directly affected by proceedings, there may be no substitute for competent representation at the negotiating table in the first place.

For disadvantaged communities to participate meaningfully in complex proceedings involving settlement discussions, a large number of separate barriers would likely need to be overcome. They would need assistance identifying the relevant regulatory dockets; whether or not counsel is strictly required, they would need expert advice about both procedural requirements and the substantive issues; they would likely need funding or other assistance to make it possible for one or more community members to participate at the requisite times and places, which might be quite time-intensive and occur during hours when most community members cannot be present and may even require travel.

Research into distributional equity is making real progress toward quantifying unfairness in the distribution of harms and assessing progress in remediating that unfairness. For procedural equity, however – the fairness and inclusiveness of the procedures that ultimately help shape the outcomes – a body of research exists but is less fully developed.

Money might go a long way to overcoming some of these barriers, others, not so much. With so many different barriers, assistance in connecting affected communities with competent representation – whether through a designated entity like a consumer advocate, by funding third-party representation, by cultivating relevant expertise at academic centers with energy law expertise, or through other channels – may be an especially potent tool to help level the playing field for communities that are at risk of being, or have in the past been, negatively affected by energy system decisions.

The Time is Now

The transition of our energy systems from highly polluting to clean provides a watershed moment to enhance procedural equity. The decisions that are being made now have the potential to alleviate pollution burdens and transform economic opportunities.

But if done wrong, they could inflict new harms on communities that have already been harmed by the energy decisions of past generations. Doing a better job of including affected communities in energy decision making is essential to making sure the transition to the clean energy future is just. PUF

In 2022, for the 27 million households in the highest quintile, with respect to income before taxes, income averaged $244,025. After taxes, income averaged substantially less, $196,794. Expenditures on average on all goods and services, was substantially less, at $140,654. Expenditures on electricity specifically, residential electric bills, averaged $2,185. On a monthly basis, that's an average of $182. This according to the U.S. Department of Labor, Bureau of Labor Statistics, from its Consumer Expenditure Survey.

(Cont. from p. 63)

hurricane or storm or something comes up the East Coast, and once or twice a decade we get whacked and fifty to ninety percent of our customers could lose power.

Now when you get hit by a hurricane, people are going to lose power. That's going to happen. The question is how you make the grid as resilient as possible so that you can restore it as quickly as possible. So, our board has put in a couple of standards. One of them is around everyday reliability, but another one is on resiliency.

Our last big storm was in 2020. We came out the other side of it and said, "Well, what's our strategy, so that if the same exact storm were to hit five years from now, we would reduce the speed of restoration by about twenty percent. We'd pick up the pace by about twenty percent," and that's a realistic target. We put out a strategy.

It's a lot of money. It's billions of dollars of investment. However, it's things that need to be done to assure reliability, which is especially a big priority for Long Island.

One other thing, which perhaps is off topic of this forum, but is good advice for any electric utility, is it's not just the infrastructure that needs to be reliable. The biggest thing that also comes in those moments is your ability to communicate with your customers and give them information and that's the resiliency of your IT systems.

I'm not aware of too many utilities who haven't had trouble because they're very complex and they need to be very robust and be tested very well and it is not easy to do. But in those key moments when the power does go out, what people really want to know is when's it coming back, and they want you to be able to provide information that's accurate and timely. PUF

The panelists as seen from the audience.

The Impact of the Electrification of Everything

A Panel Discussion at GridFWD 2023

Last fall, energy leaders and innovators gathered in the Pacific Northwest at a regional conference called GridFWD to discuss the challenges and opportunities of grid edge disruption and electrification. Held at the Columbia River Gorge at the Skamania Lodge in Stevenson, Washington, three hundred participants shared a wide range of potential solutions on the impact of energy transition on the industry.

The panelists in the excerpted discussion below talked about the need for utilities to embrace change and innovation, and to collaborate with third-party vendors and national labs to develop common architectures and interoperable technologies. They also emphasized the importance of data collection and analysis to optimize the grid and enable more efficient load management.

Moderated by POWER Engineers Chief Digital Officer Nathan Bingham, the panel included National Grid Principal Analyst for Clean Energy Development Gideon Katsh, PXiSE CEO Tim Allen, Avista Utilities Director of Avista Innovation Lab John Gibson, and Landis+Gyr Director of Regulatory Affairs and Industry Relations Marguerite Behringer.

POWER Engineers' Nathan Bingham: There is such a wide range of opinions on what this electrification and energy transition means to our industry. As I've traveled around the country and talked with our utility customers, I've heard some of them react to the electrification of everything with, "It's not that big of a deal and we think we've got it covered." For others it's, "This is going to disrupt everything, and we need three hundred percent more energy by 2045."

I've realized that I hear such wide opinions on what the energy transition will take because the grid is just so complex, and each utility's specific situation is different. So, electrification might take nothing for some feeders and a full rebuild for others.

What do you find most exciting about what's going on in the electric industry today?

Tim Allen: After twenty years in this industry, where not a lot changed, I find the speed of transformation to be the most exciting thing. We've talked a lot at this conference about the increasing amount of generation coming from solar, wind, energy storage resources, and how it's being distributed across distribution systems, not just the transmission system like it has been historically.

I see similarities from other transformations in the telecom industry, entertainment industry, the banking industry, and these have all been made possible by innovative, secure software.

Marguerite Behringer: For me, it's the platform of possibilities that we are delivering today.

The industry is putting a lot more sensors on the grid, and this innovative hardware is opening up an environment to build software solutions, AI, and machine learning on top of granular real-time data. The possibilities feel somewhat endless to solve some of these problems that we've been thinking about for a long time.

I work a lot with utilities as well as federal representatives. As we consider the grid grants that are available today, I tell folks that the smart grid that the U.S. DOE, Congress, and industry is envisioning, "Ain't your mama's smart grid," (I live in Texas).

In addition to the growth of electric vehicles, we are seeing a lot of heat pump adoption and energy storage is coming online even faster than we thought it would. These changes reveal a challenge around what we do next and how we scale it up.

– Gideon Katsh

The American Recovery Reinvestment Act, the ARRA grants back in 2009 deployed the first generation of the smart grid. Today, we have new capabilities to capture new data at the continuous, waveform sub-second level and build use cases on top of that.

The communication technologies now available enable real-time sensing and response, allowing both customers and utilities to be informed simultaneously about what's going on with the grid.

This enables a huge platform to make our systems cleaner, more reliable, and more affordable, which hopefully gets our systems and stakeholders alike talking to each other more.

Gideon Katsh: What makes me most excited right now is the tangible progress we're making. Electric vehicle sales are ticking up for passenger vehicles. We're also seeing increases in larger trucks, buses, and delivery van sales.

In addition to the growth of electric vehicles, we are seeing a lot of heat pump adoption and energy storage is coming online even faster than we thought it would. These changes reveal a challenge around what we do next and how we scale it up.

How do we go from the earliest stage of adoption to much broader adoption and meaningful electrification? It's exciting then to think about what the solutions are and how to apply them.

John Gibson: Over my career, the most exciting thing to me is to see the evolution of the utility's engagement with the customer. I can remember when we referred to customers as ratepayers. Then we moved to a stage where we call customers, industrial, residential, and commercial.

But I think in the future we will meet the customers where they are at. If the consumer is interested in affordable, reliable, safe delivery of energy, we will meet them there. If the consumer or a tribal entity is interested in sovereignty, energy independence, and clean energy, we will meet them there.

If underrepresented communities feel like they need a resiliency shelter to support their community during the times of disaster, we will meet them there. If we have consumers or prosumers who are interested in engaging with the energy ecosystem through energy districts, we will meet them there. Often people will ask me, "What's the future of utility look like?"

What's new is that engagement with our customer. They'll pull us to the future. We won't direct them. They'll pull us.

As a part of that effort, we are partnering with Edo (Ecodistrict operator) on a connected communities project, doing target-based demand response. We're leveraging a lot of the good work that Pacific Northwest National Labs have done in regard to architecture to support distributed controlled technologies out in the field.

So, when I think of what the future of utilities will be, it's for all of you to define. It's the consumer that will pull us in that direction. We just need to be a step ahead to ensure that we can deliver.

POWER Engineers' Nathan Bingham: Despite some recent slowdowns in passenger electric vehicle sales, the major last mile delivery fleet operators are committed to electrifying. With that rapid growth and change coming, what are some technologies or processes or policies that might help growth be accomplished in a realistic and efficient fashion?

I know there's a lot of concern about cost and labor and all these different factors perhaps limiting us from just building to meet this additional load growth. How do we meet this additional load growth that's coming due to electrification, and especially in the nearest case, electric vehicles?

Gideon Katsh: I don't know that we have a specific technology so to speak, but we're having a lot of thoughts on what kind of systems or processes are important. We're asking, "How do we plan and anticipate what we want the future to look like?"

We have very strong decarbonization goals. All vehicles, light duty, heavy duty, will be zero emission in the future. It will be the same thing for heating. All of it will move from gas or oil to electric or some combination of that, plus non-emitting fuels,

There is a wide range of opinions on what this electrification and energy transition means to our industry. As I've talked with our utility customers, some react to the electrification of everything with, "It's not that big of a deal." For others it's, "This is going to disrupt everything."

– Nathan Bingham

which means there's going to be a lot of load growth, a lot of new demand on the grid.

We recently published an analysis on a study feeder in National Grid's U.S. service territory, looking at what happens if the vehicles in one commercial district electrify. The load growth would exceed the capabilities of distribution network in the area, as well as components at the substation and transmission network.

So, how do we not just respond to electrification but accelerate it? It could be grid investments, grid capability enhancing technologies, and customer programs.

We don't know exactly what it will look like, where exactly X

If everything went electric today there may be some challenges, but for better or worse it's not happening overnight. It does have to happen quickly to meet decarbonization goals, so we should act now, think about it, and determine what our strategies and plans are.

– Gideon Katsh

amount of everything will be on our network or what it will be over time, but there are ways we're getting ahead of this. We're starting to think about working with fleets more, working with our customers more, to get a sense about where this will happen.

While planning, there are definitely a lot of choices we can make, thinking about large industrial areas with a lot of trucks that are parked there right now. Can we talk to those people and make those investments keeping in mind what their plans are?

The most common questions I get are, "Can the grid handle this?" and, "Is it going to overwhelm the power grid?" If everything went electric today there may be some challenges, but for better or worse it's not happening overnight.

What's new is that engagement with our customer. They'll pull us to the future. We won't direct them. They'll pull us. As part of that effort, we are partnering with Edo (Ecodistrict operator) on a connected communities project, doing target-based demand response.

– John Gibson

It does have to happen very quickly to meet decarbonization goals, so we should act now, at the outset, to think about it, and determine what our strategies and plans are to help guide us toward the right solution.

John Gibson: Well, as a utility engineer, we're essentially facility engineers. We see the electric infrastructure as a plant, and we optimize its utilization. For example, congested transportation systems require the traffic to slow down or stop. But on the electric grid, if you exceed the capacity, the system burns down. So, we have to build for the largest peak load on the system.

Consequently, the system is underutilized, so optimizing usage is a big goal for the utility. Another concept is to deploy a

Believe it or not, a lot of grid operators and distribution operators know they have problems on their system, but they don't exactly know if that problem was created by electric vehicle chargers, or if it was created by some other loads they don't know about.

– Tim Allen

Regulators also need to incentivize disruption, innovation, and rate recovery of software services. This paradigm can encourage utilities to solve problems creatively. Utilities, especially investor-owned utilities, can be fairly risk averse as a financial institution.

– Marguerite Behringer

variety of resources, or non-wire alternatives, on the grid. But as we look at various point solutions on the grid, it is not often that a non-wire solution competes with a wire solution.

But we also recognize we can't just look at non-wires point solutions. We think of it as a program. If we can get a variety of products and services out to our customers over time that are controllable, we can leverage those assets in a way to help address the utilization of the system. It's not unlike the energy efficiency program, except it's controllable.

You don't target energy efficiency programs at a particular point location because a wired solution is always going to address that. Instead, you administer a program broadly across the system.

So, we've ended up distributing energy resources or demand response in that context. But over time, if it's built to a standard, and has appropriate control framework in place, it can be dispatched to essentially address challenges of improving utilization of the grid.

Tim Allen: The way we operate the grid and the way the markets operate are based on the old grid, old market, central generation model. Now we have generation distributed throughout the transmission and distribution system.

One of the biggest things I see enabling this transition is using creativity, innovation, and collaboration to look at the way the markets operate, and the way utilities are managed, regulated, and operated.

I worked in a utility where distribution and transmission planning were put under the same leader with teams doing their individual jobs with their own focus and plans. Then we would present them together as if we were planning together. But we weren't.

Today, when you think about generation being in both the transmission and distribution system, generation operations typically sit in the transmission organization. It runs on transmission software. Now we have generators in the distribution system.

So, there's a big need for creativity, innovation, and collaboration. As markets develop technologies and solutions, there will be people who see these problems creep up faster than others. We've seen that working with customers around the world using software.

Like Marguerite said, you have to start with visibility and awareness and so you can understand what's causing the problems. Believe it or not, a lot of grid operators and distribution operators know they have problems on their system, but they don't exactly know if that problem was created by electric vehicle chargers, or if it was created by some other loads that they don't know about.

POWER Engineers' Nathan Bingham: Utilities already have so much information and now we're talking about how we need more information. How do they manage all this information?

Marguerite Behringer: When I previously worked with the Department of Energy, I reviewed a hundred or so AMI deployments from the ARRA grants and interviewed dozens of commissioners. Landis+Gyr has been listening to folks in the industry, thinking about how to use data, add AI and machine learning, create applications for the customer as well as the utility and automate as much as we can.

This is all possible through edge computing, which utilizes continuous high-fidelity waveform data in real time to process and react to information in a new way.

As we collect data, we need to create a platform for it. If we can work out the data sharing and the business models, there's immense opportunity, whether that's detecting your bill is too high or detecting electric on the grid or creating a digital twin or looking at your transformer life. All of those things are possible. It's just a matter of prioritizing, delivering, and setting real incentives.

Regulators also need to incentivize disruption, innovation, and rate recovery of software services. This paradigm can encourage utilities to solve problems creatively. Utilities, especially investor-owned utilities, can be fairly risk averse as a financial institution.

John Gibson: We're not going to be able to have central computing systems that pull data from the field to support decision making back at the main office and then send out a response. That intelligence is going to have to be distributed.

Also, as a utility, we often get vendors that come to us about their particular platform. The cost to interoperate with multiple vendors' solutions, whether it be the communication structure, the relays, the backend office technologies, is not sustainable.

A significant percentage of our IT budget is spent maintaining those systems. We're going to have to look at different types of interoperability models. We're going to have to look at different ways of hosting technology out toward the edge of the grid and we're going to have to look at open standards as a mechanism to drive this opportunity. PUF

According to the Consumer Expenditure Survey, the authoritative analysis by the U.S. Bureau of Labor Statistics of how Americans spend their money, in the two years of 2020 and 2021, the hundred and thirty-two million households in the country spent an average of $64,187 per year on all goods and services. Even though their average annual income before taxes was greater, at $85,906, as well as their income after taxes, at $76,863.

The hundred and thirty-two million households had on average 2.5 people each, of which 1.3 earned income, 0.6 were children, and 0.4 were adults sixty-five years old and older. The average household had 1.9 vehicles, and most were homeowners, sixty-five percent in fact.

Forty-two million of those households lived in just four states, California, Texas, Florida, and New York. That's thirty-two percent of all American households, in those four states.

The lowest income quintile in those states amounts to nearly eight and a half million households. They have the lowest income before taxes in California, Texas, Florida, and New York. In California, their income before taxes averaged $15,020. In Texas, their income averaged $10,087. In Florida the average was $11,553, and in New York it was $12,612.

Typically, the average expenditures of lowest income quintile households substantially exceed their average income. Many of these households receive monies from retirement accounts, government, family, and other non-income sources.

The lowest income quintile households in California spent on average $35,374 per year on all goods and services. $1,004 went to pay their residential electric bills, 2.8 percent of the total. The lowest income households in Texas spent on average $29,264 per year on all goods and services; $1,427 went to pay their residential electric bills, 4.9 percent. The lowest income households in Florida spent on average $29,329 per year on all goods and services; $1,412 went to pay their residential electric bills, 4.8 percent. The lowest income households in New York spent on average $28,712 per year on all goods and services; $803 went to pay their residential electric bills, 2.8 percent.

Three Opportunities for Utilities in 2024

Addressing the Energy Trilemma

By EY Americas Power & Utilities
Trey Thornton, Jeff Miller, and Omar Al-Juburi

Despite an ever-evolving energy landscape, three core priorities remain for U.S. utilities: providing reliable, affordable, and sustainable energy. In 2024, utilities are balancing traditional and novel funding approaches to progress these priorities. In fact, utility executives are better positioned than ever before to confidently make the transformational decisions needed to progress the energy transition.

To start, utilities should focus on three key opportunities:

Strengthen the balance sheet to support investment strategies that will create lasting value for stakeholders.

Maximize newly available capital – such as funding through grants and tax credits – to accelerate the energy transition.

Modernize technology to progress the business.

While there is a clear route for success, the operating environment continues to produce hurdles. For example, reliability is threatened by severe weather, aging infrastructure, the risks of cyberattacks in an increasingly geopolitically fraught environment, and even trends in energy transition, such as increasing electrification and deployment of distributed energy resources.

Meanwhile, rising capital costs and continued high inflation threaten the affordability of energy. Simultaneously, though the demand for renewables and electrification continues to grow, infrastructure and technology delays, along with competing priorities, threaten the progress toward sustainability.

These challenges will continue to test the focus of utility leadership, making long-term strategic planning more difficult but more important. Ultimately, the pathway to overcoming these hurdles to enable reliable, affordable, and sustainable energy will require transformation in multiple areas.

Managed services, especially in back-office functions like finance, procurement, tax and cyber, can help utilities drive innovation and reshape spending to better manage through the energy transition.

– Trey Thornton

Step 1: Strengthen the Balance Sheet to Support Investment Strategies that Will Create Lasting Value for Stakeholders.

In a challenging economic environment, utilities will continue divesting both non-core assets and even portions of their transmission and distribution portfolios, strengthening the balance sheet for future investments.

As the industry reshapes itself around new business models and strategies, these types of asset shifts can play a major role in helping companies build capital, streamline their operations, reduce overhead, create new partnerships, and sharply refocus their efforts on more value-added areas of the marketplace where they choose to participate.

It's also a time to be creative about operations and maintenance costs. While many utilities have launched broad cost-reduction efforts, one approach increasingly being considered is the adoption of managed services structures, in which support functions are utilized in a flexible, on-demand way. Managed services, especially in back-office functions like finance, procurement, tax and cyber, can help utilities drive innovation and reshape spending to better manage through the energy transition.

As companies streamline, they are investing with a more forward-looking lens, evidenced by several hundred alternative and renewable energy projects announced and at least a hundred seventy thousand new clean energy jobs created in the U.S. since the Inflation Reduction Act of 2022.

Step 2: Maximize Newly Available Capital – Such as Funding Through Grants and Tax Credits – to Accelerate the Energy Transition.

Utilities are consistently in the position of prioritizing capital investments, given the need for resiliency-related infrastructure investments and the implications for customer affordability. However, groundbreaking legislative changes during 2021–22 at both the federal and state levels are unlocking funding and financing for the sector.

For example, the 2021 Infrastructure Investment and Jobs Act and the IRA of 2022 will eventually deliver ninety-seven billion in funding to companies researching, developing, and deploying clean energy projects and technologies.

As 2023 came to an end, the first grants were awarded from the Department of Energy – including three and a half billion

Trey Thornton is EY Americas Power & Utilities Leader. **Jeff Miller** is EY Americas Power & Utilities Strategy Lead. **Omar Al-Juburi** is EY Americas Power & Utilities Technology Consulting Leader.

At the center of utility strategies is an investment in foundational capabilities – both infrastructure and systems – that will underpin the broader industry transformation.

– Trey Thornton

Rather than seeking IIJA grants or IRA tax benefits piecemeal, utilities should first determine which opportunities align with their long-term strategy.

– Jeff Miller

earmarked for fifty-eight projects designed to expand capacity for wind and solar, harden power lines against extreme weather and develop microgrids.

Another seven billion in grants was announced for the creation of hydrogen hubs across the country. The opportunity is far from over; clean energy grants will continue for at least five years, and the tax benefits will likely extend further.

The availability of federally funded capital for these types of groundbreaking investments should give utility executives the confidence and ability to make CapEx decisions today that will deliver significant value for years to come – especially considering that rising interest rates have made many forms of private financing more expensive.

Utilities can turn to other sources of capital, too. The last few years have seen record-setting rate case requests, but state regulators are generally willing to allow utilities to raise revenues for needed and prudent grid investments.

Cost takeout can also help free up cash for investment and can actually lead to transformational outcomes, especially when utilities implement creative models that deliver meaningful benefits to customers around affordability and service levels. And utilities that receive grants and tax subsidies to help with grid buildouts or hardening can redeploy the capital originally planned for those activities into different projects.

Additionally, the strategy driving capital allocations should not be overlooked. Rather than seeking IIJA grants or IRA tax benefits piecemeal, utilities should first determine which opportunities align with their long-term strategy.

The rapid growth and acceptance of AI is an opportunity – and a risk – that every utility should be exploring today.
– Omar Al-Juburi

Step 3: Modernize Technology to Progress the Business.

Newly available funding and financing can be leveraged to improve field and customer operations, optimize the back office, and protect the enterprise holistically, which will in turn optimize utility service.

The IIJA grants announced in late 2023 included millions of dollars for utilities to integrate distributed energy resource management systems and advanced distribution management systems that are needed for grid modernization (such as supporting interconnections of rooftop solar panels and electric vehicles) and will provide data-driven insights needed to forecast, aggregate and dispatch customer-generated electricity.

Those needs aren't the only areas ripe for technological modernization. As utilities receive funds to enable distribution improvements, they should also evaluate how to shift funds previously earmarked for grid modernization toward other priorities across their organizations.

For example, utilities lag their peers in other industries with implementing state-of-the-art enterprise resource planning platforms and customer information systems. For years, product vendors have pushed utilities to upgrade their systems and move to cloud and managed services to increase efficiency, improve resiliency, and provide much-needed security of data and grid reliability. But adoption has been slow, primarily due to cost issues and regulatory resistance.

Those delays in modernization mean that utilities today often find themselves overwhelmed with choices and the sheer magnitude of potential investments. Trying to do too much too soon can have negative impacts on both finances and performance and make developing a workable roadmap trickier.

One major opportunity is the introduction of tools that utilize artificial intelligence (AI) to enhance the operating environment. These emerging tools are particularly relevant for customer-facing technologies that make it easier and more beneficial for consumers to understand, predict and adjust their usage.

The rapid growth and acceptance of AI is an opportunity – and a risk – that every utility should be exploring today. It can help utilities improve their efficiency, accuracy, and ability to process and analyze huge amounts of data seamlessly.

Summary

Utilities can find and implement lasting solutions to address the energy trilemma of reliability, affordability, and sustainability. At the center of utility strategies is an investment in foundational capabilities – both infrastructure and systems – that will underpin the broader industry transformation. These capabilities include managing a complex portfolio of suppliers and partners, leading with digital, adopting renewables and emerging technology at scale, building flexibility into the energy system, and putting customers and employees first. PUF

The nation's 134 million households can be broken up into nine Census divisions. The lowest residential electric bills on average, as a percentage of total expenditures on all goods and services, are in the Pacific division encompassing the states of Alaska, California, Hawaii, Oregon, and Washington. Those bills averaged only 1.8 percent of total household expenditures in 2022.

Tracking Utility Reliability for Nearly Four Decades

Conversation with PA Consulting's
Derek HasBrouck

PA Consulting has recognized outstanding reliability at utilities via its ReliabilityOne® program, which includes awards and community. 2023 marked the twenty-third year the awards were given, and Commonwealth Edison, an Exelon utility, was recognized as this year's most reliable U.S. utility.

Also recognized were six regional utilities across the U.S., based on overall system-wide SAIDI, SAIFI, and CAIDI performance. Winners this year: San Diego Gas & Electric, Public Service Electric and Gas Company, Consolidated Edison Company of New York, Orange and Rockland Utilities, Florida Power & Light Company, and Commonwealth Edison.

An important part is the Community, a unique forum for utility leaders to openly share best practices and methods to overcome challenges allowing for real change in their organizations. Listen in on this conversation with Program Director Derek HasBrouck, as he digs into utility reliability, and why he says the best-practices conference with award winners may be an "unfair advantage."

PUF's Steve Mitnick: Derek, you've been an expert in system reliability for a long time. Talk about that and what you and your team at PA Consulting do in this area.

Derek HasBrouck: We've been helping utilities, regulators, and end users understand system reliability and the actual reliability that individual customers experience for over thirty-five years.

That's taken many forms, from improved maintenance programs to targeted asset modernization, and now a whole lot of grid modernization. Advanced metering infrastructure also plays a key role.

Today, the topic is generally resiliency. How do we ensure reliability on blue-sky days, how do we think about major events, and how to build-in the capability to both mitigate the impact of those events and rapidly restore functionality to society on the backside of those events?

The ReliabilityOne® program has its roots as a platform to recognize utilities that are the best at that, because there is a wide divergence of performance across the industry. We measure that performance, validate it, and certify those measurements. Then we look to use the platform to sing the praises of the utilities that are truly the best in the industry.

PUF: This is a very highly quantitative and rigorous analysis to measure and look at the distribution of performances.

Derek HasBrouck: One hundred percent. There is some publicly available information that we start with. Then we delve into the nuances of how each company has prepared that information, how they measure and quantify it, what they exclude, if anything, and how their processes work, so we can certify that the results we're basing decisions on are accurate and apples-to-apples, as the saying goes.

PUF: There's a divergence among the best performers, the middle of the pack, and maybe those that are lagging a bit. Is that true, that there's a significant difference?

Derek HasBrouck: Well, yes, and there's been a change in performance over time by the whole industry, as well. If we look back at the award program; this is our twenty-third annual awards.

At the turn of the century, a leading utility in most regions of the country would deliver something like two hours of outage, on average, to each customer each year, and that was generally something along the range of one-ish outage event on average per customer. If an individual customer was out once on a sustained basis, for two hours over the course of a year, that was good performance or maybe quite good performance.

> There are companies that are consistent and dedicated to reliability, and it shows. It comes out in the consistency of the improvement in their performance. That is what we've been talking about. You have to keep getting better.

Today, that number is an outage every two years on average for the best performers, and that outage duration annually is about thirty minutes. And, over that time, we've gone from sort of guessing at the raw data behind all those calculations to having actual meter data from AMI, which verifies when the power went off and when it came back on.

The impact of those automated improvements in the measurements is a drag on the reported performance. The paper solutions always yielded slightly better than were true.

Examples are a first responder arrives at a site to a simple fuse blown on an overhead transformer and verifies what the issue is. "Yes, there's a dead squirrel at the bottom of the pole. I'll re-fuse the transformer." He calls that time back in to the dispatcher.

That would invariably get reported as typically either in five-minute or ten-minute chunks. You report round numbers. You don't report 9:44. You report, "That was about 9:45 or 9:40." Now we have electronic measurement of those times, and don't have any fuzz in the tennis ball anymore.

PUF: There was an award you gave this year. Who won this award?

Derek HasBrouck: I need to set the stage. We give regional awards annually, and those award winners have the best numeric

From left, Terence Donnelly, President and COO of ComEd, accepting the National ReliabilityOne Award from Derek HasBrouck.

Maybe that's an unfair advantage. This is a group of the best-performing utilities, talking amongst each other about how they can get even better in terms of reliability and resiliency to serve their customers. Those conversations continually raise the bar.

results in their respective region. We then give a national award that takes that numeric performance into account and includes other qualitative factors that we think are important.

This year's national award winner was ComEd, in Chicago, an Exelon Company, based on 2022 calendar year performance. In some ways, this recognition for ComEd is a recognition of their long-term journey. From the mid-2000s to now, it's a worst-to-first story.

Because ComEd has gone from an average duration of outages that was up in the sixty- or seventy-minute category a decade ago to twenty-six minutes in 2022, based on one set of reporting criteria.

A big improvement. Investments in AMI and grid modernization play roles, along with a lot of hard work by ComEd's workforce. It is exciting to see.

PUF: Do you find over the years, especially in the regions, that some companies consistently are up there, and some win two or three years in a row?

Derek HasBrouck: Absolutely. There are companies that are consistent and dedicated to reliability, and it shows. It comes out in the consistency of the improvement in their performance. That is what we've been talking about. You have to keep getting better.

Let's go with Florida Power and Light. They are the best in the southeast region. And, they have consistently improved their performance annually since 2013. The way they do it is every day throughout each year, they look to raise the bar in terms of reliability, and particularly resiliency.

We also give out special achievement awards, and this year Florida Power and Light got the grid resiliency award for recognition of how the utility hardened and enhanced its grid design. So, when Hurricane Ian came through in 2022, a Category

Four storm with a broad footprint, the utility restored customers effectively in eight days, and had a huge percentage of customers restored within two days.

The utility thinks about the value of resiliency in the context of the GDP of the State of Florida. FPL thinks in terms of "What can we do to get Florida up and running, and how can we make prudent investments to do that?" As a result of that thinking, they have made numerous changes, one example of which is the elimination of wood structures on their transmission system.

Because if the transmission system falls over, that is a weeks' issue. They have a strategy on their distribution feeders that, yes, when boats blow inland, as we saw in Ian, some power lines are going to get damaged, but if the poles remain upright, we can pick the wire back up relatively quickly.

While the whole grid hardening and storm resiliency effort pays off on blue-sky days, they really pay off when events like Ian come through.

PUF: What do people do with it? Is the data and the analysis enough so that companies act? Also, you're a consulting firm, are you informed by this analysis, and does it lead to actions for further improvements?

Derek HasBrouck: The awards ceremony is an evening dinner, but the best part of the event is that we have a day-two best-practices conference where this group of regional winners from around the country sit and talk, moderated by the PA Consulting team, in a structured fashion about what they are doing to further advance.

Maybe that's an unfair advantage. This is a group of the best-performing utilities, talking amongst each other about how they can get even better in terms of reliability and resiliency to serve their customers. Those conversations continually raise the bar.

Here's a concrete example that brings it back to PA Consulting's focus on end-to-end innovation. As a result of one of those conversations four years ago, one of the companies said, "We've got an issue with a type of equipment, connection, and it causes a significant reliability issue. How could we predict in advance before they fail?"

We had conversation with them, and in working with a machine learning startup company, PA Consulting and our partner have developed a solution we call iPredict. It is deployed by several utilities and uses high-fidelity power quality metering data to identify fault precursors to enable us to move the distribution system from a run-to-failure to a replace, just before failure on a planned basis.

That whole area of waveform analysis to improve equipment performance and system performance is frankly what's keeping me engaged, because it is fun, interesting, exciting stuff. PUF

Leading Role for Technical Requirements

(Cont. from p. 86)

committees, is uniquely positioned to frame and facilitate in-depth discussions and capture the stories we need to tell to ensure that the technical needs of utilities are at the forefront of driving change.

By collectively talking about real projects and narrating stories that illustrate the how, utilities can build the confidence to drive home clear, concise messages to effectively engage all of the stakeholders that comprise the transformational who. This engagement includes educating internal audiences such as executive leadership, middle management, and employees in emerging roles such as IT, and data analytics.

It also means strengthening lines of communication with the exploding universe of vendors, tech startups, and individual contributors that are introducing unconventional approaches and potentially disruptive innovations to the industry.

Finally, our storytelling must connect transformational activities to direct customer benefits such as cost savings and service quality. Messages regarding progress and milestone achievements must speak to consumers, policymakers, and regulators who all influence business and regulatory models in a variety of ways.

As we navigate these transformative times, the collaborative efforts of AEIC's member companies and its committees are instrumental to the resilient, innovative, sustainable future of our industry. Honing our skills at the art of storytelling for the new energy economy can be a valuable asset to unlocking transformative change. PUF

Advertising Index

A Look Ahead to 2024

Critical Issues Shaping the Global Energy Industry

BY EEI INTERNATIONAL SENIOR VICE PRESIDENT LAWRENCE JONES

In conversations with leaders of electric companies from around the world, we have discussed critical issues that will shape the industry in 2024. Whether it is the clean energy transition, supply chain innovation, or advanced digitalization, the electric power industry landscape continues to evolve.

Electric companies will continue to focus on ensuring affordability, reliability, and resilience for customers around the world. Working with policymakers and regulators, electric companies will continue to advocate for favorable policies that will enable them to deliver resilient clean energy to customers.

These policies range from supporting grid modernization and clean energy integration to the advancing of digitalization and deployment of grid enhancing technologies.

Navigating Uncertainty, Complexity, and Risks

Industry stakeholders can expect increased complexity and uncertainty on various fronts, including the shifts in the global economy, the effects of an increasing demand for electricity, and geopolitical conflicts affecting supply chains.

These uncertainties can impede or accelerate the transition momentum, depending on the preparedness and flexibility of industry stakeholders. Electric companies plan and prepare year-round for various scenarios, including extreme weather events and cyberattacks. They use digital modeling and participate in emergency response exercises with government and industry partners to make sure they are prepared to respond.

In addition to complexity, the industry must confront emerging risks in different forms. Climate, economic, and extreme weather are all significant risks, and they can occur simultaneously, as we continue to transition to increasingly cleaner energy systems, ensuring energy grid reliability is paramount, as is customer and employee safety.

Advancing Innovation

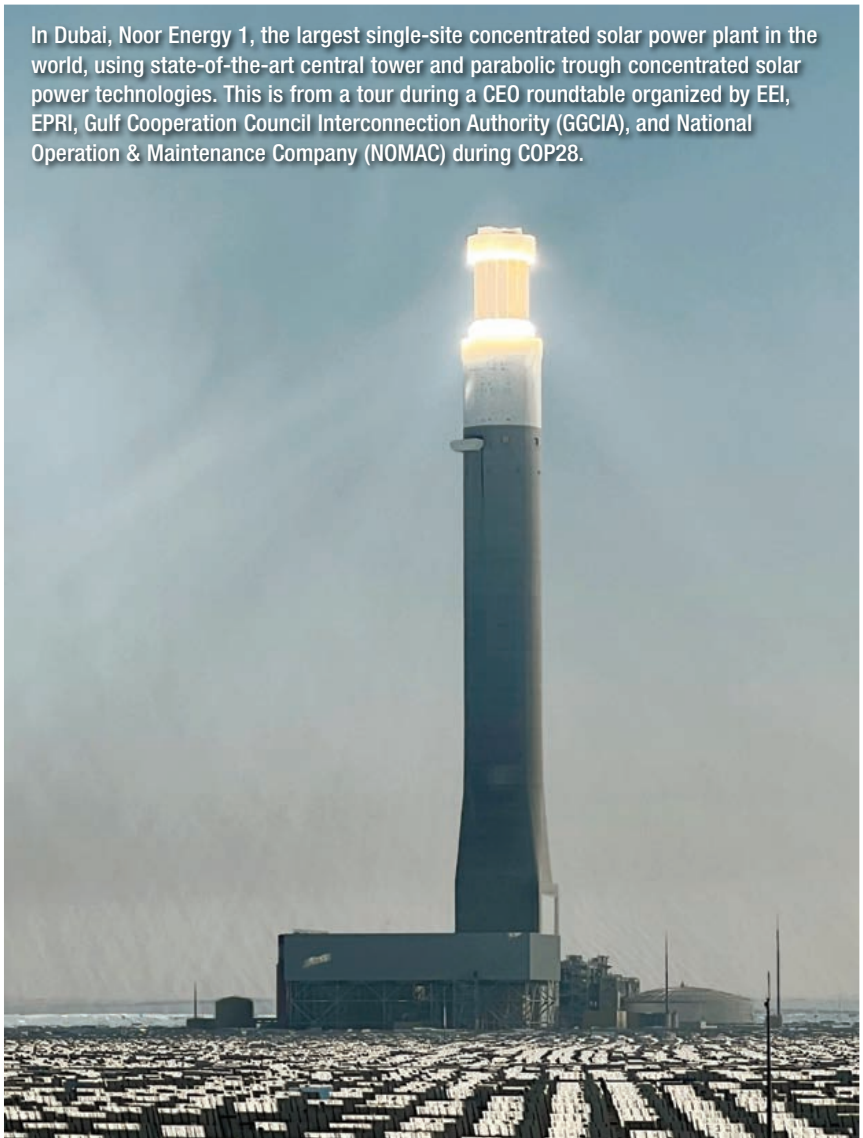
Navigating uncertainty demands innovation as a crucial solution. Electric companies worldwide are addressing global challenges through advanced technologies and innovation. They also use systems thinking to better understand the interdependencies inherent between different critical infrastructures. To enhance resilience, the application of systems thinking becomes imperative in the process of designing more effective solutions.

Global electricity demand continues to grow through increased consumption from the acceleration of urbanization, electric transportation, advanced manufacturing, and data centers. Meeting this growth requires innovation along the entire electricity value chain to ensure resource adequacy and infrastructure readiness. Electric companies are preparing their workforces to manage the rapidly evolving needs of customers.

For all stakeholders, the evolution of AI is an important issue in our industry. Electric companies are gauging and demonstrating the use of AI in smart-grid technologies and in customer-solutions applications. However, while there is a strong desire to harness the projected benefits of AI, the issues of governance, risks, and costs will determine the extent to which AI is deployed by electric companies. Policymakers

Building on the momentum of COP28, we expect 2024 to be a year where businesses and governments continue to lean in on deploying clean energy technologies. In the U.S., we continue to support siting and permitting reform and the buildout of transmission to support the deployment of clean energy.

Lawrence Jones is Senior Vice President of EEI International Programs.



In Dubai, Noor Energy 1, the largest single-site concentrated solar power plant in the world, using state-of-the-art central tower and parabolic trough concentrated solar power technologies. This is from a tour during a CEO roundtable organized by EEI, EPRI, Gulf Cooperation Council Interconnection Authority (GGCIA), and National Operation & Maintenance Company (NOMAC) during COP28.

Participants in the EEI-EPRI-GCCIA CEO Roundtable at COP28 included EEI Chair and Edison International CEO Pedro Pizarro, National Grid UK Chief Engineer David Wright, former U.S. Secretary of Energy Ernie Moniz, and industry leaders from Brazil, Europe, South Africa, the United States, and the GCC Region.

continue to deliberate on regulations of the technology for use across sectors.

Where does AI fit into electric companies' digitalization and energy transition roadmaps? No matter an organization's answer, integrating these new technologies into industrial systems requires a holistic risk-based approach. Mapping out how generative AI can be harnessed can also be part of the solution to imagining the future of work in the electric power industry.

We can expect advances in other technologies such as energy storage, transmission and distribution grid solutions, and countless others. Electric power companies will continue to implement these technologies in different ways, providing solutions to some of our most significant challenges. Augmented reality, for example, can be used to virtually train and run tests to improve workers' safety and reduce operational risks.

Charging Ahead

Building on the momentum of COP28, we expect 2024 to be a year where businesses and governments continue to lean in on deploying clean energy technologies. As more governments and businesses make pledges to accelerate actions on climate, electric companies are proactively making investments and taking action to expand and enhance grid infrastructure and to deploy more clean energy. In the United States, we continue to support siting and permitting reform and the buildout of transmission to support the deployment of clean energy across the country.

Meeting demand growth, managing risks, and advancing innovation are all part of the larger narrative we see around the world; electric companies will continue to work collaboratively with policymakers and regulators to prioritize the investments needed to deliver an affordable and reliable clean energy future to customers.

We're looking forward to EEI's eighth Global Electrification Forum, taking place April 15 to 19, 2024. Expect all the themes mentioned here to be covered and much more. Registration for the GEF will open soon at https://eei.org/international. PUF

Residential electric bills, nationwide, averaged 2.3 percent of total household expenditures in 2022.

A Leading Role for Technical Requirements in Grid Transformation

The Art of Storytelling

BY AEIC VICE PRESIDENT OF TECHNICAL STRATEGY ELIZABETH COOK

It's no secret that the electric utility industry is undergoing transformative change. The grid is evolving at an unprecedented pace, energized by rapid technological advancements and the commitment to transition away from fossil fuel-based power generation to a wide array of cleaner, more sustainable sources of electricity.

Historically, with ever-growing load growth, the industry focused on programs designed to reduce usage. Now, with an increasing emphasis on electrification, we are intentionally increasing demand. This transition has placed electric utilities at a critical confluence.

The industry is still operating under traditional regulatory and business models developed over the past one hundred years to meet the mandate of safe, reliable, affordable power. Now, on top of that, there are rapidly rising expectations to increase efficiency and sustainability while influencing consumer behavior and delivering high customer satisfaction.

Central to navigating this confluence is the understanding that the technical requirements of the electric utility should be the primary driver that enables and fosters change. This means that utilities, as the owners and operators of grid assets, should be embracing and leading the imperative shift toward new ways of thinking, innovation, and entrepreneurship.

This is not a familiar or comfortable role for an industry that, historically, has had a very low tolerance for risk. Utilities are driven by technical necessities, which can often require a slower pace of adoption in order to avoid getting it wrong by moving too fast.

So, how then can utilities assume a leadership role during a period of such rapid change? First, we need to get beyond the well-documented discussions of the what and the why of grid transformation and its benefits. Our focus must shift to how meaningful change will happen and who will lead it.

At the heart of how transformation should proceed lies the pursuit of operational excellence and the alignment of modern technical requirements with evolving regulatory and business models. Utilities must recognize that their technical needs can unlock innovation and rouse the entrepreneurial spirit of operational experts within their organizations to embrace and lead change.

If the utilities that own the current assets and their operational experts who understand how the grid works don't become better educators and storytellers about the technical needs of grid transformation, then they risk future misalignment of business and regulatory models that could negatively impact operations and financial stability.

If the utilities that own the current assets and their operational experts who understand how the grid works don't become better educators and storytellers about the technical needs of grid transformation, then they risk future misalignment of business and regulatory models that could negatively impact operations and financial stability.

This is where AEIC has a pivotal role to play. There is immense power in AEIC's community of member utilities coming together to share experiences, challenges, and successes. We need to define the how of transformation by using operational lessons learned to guide key decision-making along the way.

AEIC, with its roster of expert

(Cont. on page 83)

Elizabeth Cook is AEIC Vice President of Technical Strategy.

NARUC Winter Policy Summit

SAVE THE DATE!

FEBRUARY 25-28, 2024

Westin Washington Hotel • Washington, D.C.

#NARUCWinter24 | naruc.org

Julie Fedorchak, NARUC President