PUBLIC UTILITIES FORTNIGHTLY
Impact the Debate

JUNE 15, 2020

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Impact the Debate

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Cover drawing by PUF artist Dennis Auth of a crystal ball of the industry's future from this point in time in the twenty-first century.

Transformation Amid Virus Crisis

Accelerating Into The Straight, and Then …

BY STEVE MITNICK, EDITOR-IN-CHIEF

As in a racing car accelerating out of a corner, the electric power industry was rapidly picking up speed for the straightaway. One utility committed to an aggressive decarbonization target. Then another. Then, in quick succession, a couple of others. Then, well, everyone else seemingly did too. The industry had hit top speed entering the straight.

And just at that precise moment, when it seemed clear how the race would result, out of the blue there's a massive pileup. After the crushing and crunching of metal subsides, there comes a strange quiet. Drivers and fans alike are stunned by the sudden disruption of what's inevitable. And they start searching for what's next.

That's where we are right now, in the electric power industry. We settled at last with steely determination, steering from the corner into the straight. Just ahead, the length of the course which we call the industry transformation – decarbonization, electrification, digitization. But the abrupt accident and the ensuing wreckage really does unsettle the race.

What's next? It's too soon to fully reckon, as the dust of the coronavirus crisis is stubbornly still in the air. Soothsayers and fools know the industry's future exactly but the rest of us cannot.

It's human nature however to begin speculating what's next. And, for our society's cornerstone – by that I do mean the electric power industry – divining the future and securing it with the necessary infrastructure, protocols and processes is not a choice but a mandate.

Once the crisis moves from headlines to history, shall the industry return to the old normal or depart to a new normal? Shall we get right back into our car seats and resume the race, putting the pileup behind us as if it never happened? Or shall we factor in that we face new roadblocks that will slow us down? Though there might be new ways to maneuver around in the roadway that – if we take them – will actually speed us up.

There is one thing we can count on and know for sure of what is to come.

For our society's cornerstone – the electric power industry – divining the future and securing it with the necessary infrastructure, protocols and processes is not a choice but a mandate.

The pages of Public Utilities Fortnightly are bound to be filled with arguments this way and that about how the coronavirus crisis proves utilities and utility regulation should steer to the left or should steer to the right on a broad range of issues.

There will surely be arguments that economic and financial hardships on the public and its utilities necessarily constrain the pace and very nature of the industry transformation. And, there'll be arguments that the crisis convinces us that a reshuffling of priorities is called for, with more focus on the immediate needs for resilience and less on the frills of the future. And, on the other hand, there'll be arguments that the lessons learned make it imperative

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that we redouble transformation initiatives to better prepare for crises to come including from climate change.

A number of utilities may come out of this crisis hard-hit financially. The regulatory proceedings that address these impacts may very well become contentious considering the weakened financial health of many utility customers. Undoubtedly, some parties will propose a scaling back of any utility initiatives that have a longer-term and more abstract purpose such as elements of industry transformation.

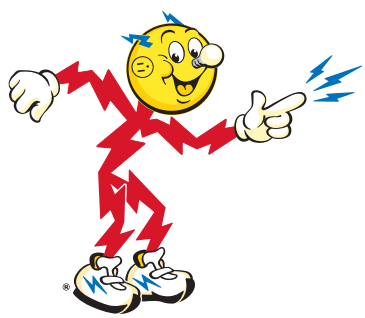
Many utilities, together with their regulators, may feel the need to reinforce their capabilities to withstand the full range of resilience challenges to the continuity of electric service – biological, extreme weather, cyberattacks, wildfires, etc. – by raising investment in infrastructure and the workforce. As for investments in other areas, their priority and the resources devoted to them might be ratcheted down.

In contrast, many utilities may believe that remote and automatic technologies – that are natural components of industry transformation – are essential for greater cost efficiency, enhanced resilience and improved environmental performance. The argument will be that we must continue to follow the road to industry transformation notwithstanding the virus pileup and its residual effects over the next few years.

The coronavirus crisis reminds all of us that nature is an indomitable force. Though mankind has grown in its mastery of the environment in many ways, we're humbled time after time when nature strikes a blow. All we can do is plan and prepare for the black, gray, and white swans. The electric power industry by necessity does this as well as any sector of the economy.

All we can do is plan and prepare for the black, gray, and white swans. The electric power industry by necessity does this as well as any sector of the economy.

And that is why the electric power industry was accelerating the transformation, up until the unfortunate term "social distancing" became all too familiar. And that is why, I suppose, the industry will endeavor to rev up the engine – once it is safe to diminish our distancing – and find its top speed again, to decarbonize, to electrify, and to digitize for a more secure future in the public interest. PUF



Change Agents

on the State and Future of Power

Jennifer Wischnowsky, director – digital strategy and transformation, Ameren,
Ram Sastry, vice president – innovation and technology, American Electric Power,
Chris Gould, head of corporate strategy, chief innovation and sustainability officer, Exelon,
Roger Kranenburg, vice president – energy strategy and policy, Eversource Energy,
Keith Dennis, VP of consumer member engagement,
National Rural Electric Cooperative Association.

They are dynamos. They are indeed generators, continuously converting their unique insights about the industry's present and future into innovative energy at their companies. These change agents are well known to their companies' executive leaders who savor their contributions to overall corporate strategy and operational execution. Jen Wischnowsky at Ameren. Ram Sastry at AEP. Chris Gould at Exelon. Roger Kranenburg at Eversource. And, Keith Dennis at the association of cooperative utilities, NRECA. As they stimulate change at their companies, for the benefit of the customers of those companies, they're changing the industry too. Who better to opine about where the industry is heading?

PUF's Steve Mitnick: What is your take on the current state of the electric power industry?

Chris Gould: Prior to the current atmosphere, there was a lot of momentum building around recognizing that the electric sector was the path through which we would be able to decarbonize the environment.

There was somewhat of a coalescing beginning to happen between all things technology policy, and customers were starting to converge around that vision. We were starting to think through ways that we can get there.

Of course, that's all been understandingly delayed with what's going on now. But for the industry, electrification and the opportunities that it provides are beneficial to customers. How technology and regulatory compacts need to evolve to be able to enable that vision was a positive movement.

Keith Dennis: We're inextricably linked to quality of life and we are there for folks to help them meet their daily needs. In some ways, the less that people think about us, the better job we are doing. We're such an important part of what is going on in the country, and that makes our role essential to our communities.

Current trends are making this more apparent. We're increasingly aligning with consumer values that are outside of what people have normally expected. It's not only keeping the lights on, which is incredibly important to quality of life and daily life, but we're aligning more with increased environmental performance, for example.

We are also aligning with changes in consumers' lifestyles. This includes fun with electric vehicles and technologies, convenience with smart homes and connectivity to devices, putting the power in people's hands to save money through remotely turning off things in your house and better controlling them.

The value that the electric industry is providing to consumers continues to increase. At the same time, the cost of electricity in real terms has not gone up much. Folks are getting more value and it's not only great for their bottom line, it's important for their quality of life. We are doing well, and the state is strong for the industry.

Jen Wischnowsky: While power has been an essential service for a long time, this is the most exciting time for the power and utilities industry. As an industry, we are undergoing a digital transformation that allows us to meet and exceed customer expectations.

Technology is integral to everything we do today and the explosion of smart devices and data lays the foundation for the integrated grid of the future that will enable two-way power flow, cleaner generation, and safer and more efficient use of resources and ways of doing business.

There'll be structural changes in the way we work and the way we engage with each other.

– Chris Gould

Safety and security are and have been core values for Ameren – the coronavirus crisis and continued cybersecurity risks highlight the importance of our companies in operating the grid safely and securely.

The other aspect of why it's such a great time to work in this industry is the opportunity to continue to improve the environmental, social, and governance impacts on our communities.

Our companies are stewards of their communities, and I love working for a company in which the coworkers genuinely care about our customers, our community, and each other. At Ameren, we have a strong focus on diversity, equity, and inclusion – which has a positive impact on all three c's – customers, community, and co-workers.

Roger Kranenburg: The electric power industry, and this is globally, is well-positioned for future opportunity. To Chris's point, much of society's aspiration to decarbonize benefits the electric industry. A lot of the energy load shifts toward the electric industry, as you make that transition and transformation.

For the overall picture, the electric industry future looked good and continues to look good. There was a call with the head of the IEA, the International Energy Agency in Paris, and it was interesting. They usually focus on petroleum and much of the discussion was on petroleum. In closing the call, he was forthcoming on how important the electricity sector is as we evolve the global energy space.

Safety and security are and have been core values for Ameren – the coronavirus crisis and continued cybersecurity risks highlight the importance of our companies in operating the grid safely and securely.

– Jen Wischnowsky

That plays out in specific ways with issues we talk about such as electrification, not only of heat but importantly of transportation. Play that forward, and post-COVID, it's obvious: The world pre-COVID is different from the world post-COVID.

How it's different will evolve over time. Even in that different world, the future state and where the electric power industry's position is in society is an important part. It will depend on changes to our pre-COVID views and some of the questions that are raised. Is the nonstop urbanization trend pre-COVID a sure thing, so to speak, and does that maintain post-COVID? I'm quite happy to be in the suburbs and I'm an urban guy.

There is speeding up of a lot of trends like virtualization. More people are comfortable with virtual now than before, and you've seen the big emissions drop.

Electricity has always been critical to society. Post-COVID, for society, there's more of a realization, or an emphasis, or a focus on how critical electricity is to our lives. It's essential for hospitals curing patients, and people being able to work from home. You compare this pandemic to that of the Spanish Flu of 1918, and society has a lot more tools available.

Yes, there's a significant part of society that's badly hurt. But compared to the tools we had at our disposal in 1918 we are in a much better position. Electricity is ubiquitous. Telecom's ubiquitous, and big parts of the economy and society are going forward.

Ram Sastry: I have to reiterate what the others have said. I've been amazed and now scratch my head. Why did we need to do all these in-person meetings at that huge cost if the virtual format works so well? It's going to cause a lot of introspection.

A pandemic was a low probability but had a huge impact as we're seeing, and we'll debate this in time to come. These types of events where they're low probability but large impact change the nature of how we operate.

Climate change and sustainability are also like that except they don't happen as quickly, but they will have a large impact. For our customers, and the industry, the technology and policy have gotten to a point where we can get to a more decarbonized, electrified economy in transportation, heating in buildings, and chemical processes. That will continue. I don't know if some parts of it will accelerate as a result of this current pandemic. Some parts will decelerate, but nothing will stop.

I had an old boss that used to say, never let a crisis go to waste. Some of what Chris, Roger, and others have said is, we are going to do more remotely. We're going to use more software to automate. We're going to use things where we needed an operator to look, touch, and operate, but that can now be done remotely. We've got a more flexible system that'll allow the growth of the grid to be grid 2.0.

PUF: Chris, your utility is large. A lot of the great cities of the country are served by Exelon utilities. How is that being affected?

Chris Gould: It was a common theme even before all of this. Electrification was going to put increasing demands for reliability and resilience on the grid, if you're depending on it for so much more of what society needs. That was already the trend.

Of course, to be specific, we had storms that just came through the East Coast last week, in particular, to the D.C. area, where we rolled trucks from the other utilities and made sure we were as responsive as possible in this environment, because we know the bar has been raised significantly from a customer need perspective.

The load is shifting in dramatic ways from C&I to residential. We know people need their power for all of the things they used to need, but they need it even more now, communications being one of the absolute keys in terms of being able to continue working virtually. It doesn't happen unless we're able to provide reliable power.

PUF: Keith you uniquely are at NRECA, and you have members across the country. A lot of them are not urban. They're rural. How is their situation being affected?

Keith Dennis: It's completely uncertain where we're going to be in the future. It's important to know that we don't know. I suspect that we are going to see a lot of changes.

We'll see changes in energy use patterns. We'll see businesses that don't come back up. We'll see a lot of folks who are unemployed and having trouble paying their bills.

We're going to see a lot of concern and support from co-ops, with our members, figuring out how to collectively handle and recover from what is a completely historic challenge.

Areas will be hit differently. Some might be impacted a lot less than others. We don't know yet. It's interesting for us because a lot of our co-ops are residential. We have a lot of folks who will be at home potentially during this COVID event, and we'll see changes in energy use.

Electricity's something you don't necessarily think about unless you have to, and one of the times you think about it is if you're having trouble paying the bill. That could create an interesting dynamic around consumer engagement.

We also serve a lot of commercial and industrial locations where businesses aren't up and running. There could be all sorts of impacts as a result. But most important, we're going to see a level of consumer engagement throughout the recovery that is going to make a difference to the rural economy.

At the end of the day, we're going to have all sorts of opportunities to help folks with the same types of services that we always have – energy efficiency, electrification, managing bills, and trying to make sure that the community is strong. We may go back to our roots on that within our communities and rural areas.

PUF: Roger, Eversource is serving much of Connecticut and Massachusetts, some of the hardest hit areas thus far. How is that going to shake up the industry?

Roger Kranenburg: We've got a diverse territory. We've got Boston that's the big urban center, then it goes to the north country of New Hampshire.

I have admired how the overall industry has responded and adapted in this crisis. I would make the argument that the utility industry was one of the best prepared because there's a culture of incident response. It was like, okay, pull the pandemic plan off the shelf. Execute.

There were some hiccups, but it also accelerated some of the things that were taking a little longer. People are now comfortable with leveraging Teams and Skype, and we accelerated a trend to virtualize our call centers. It was amazing how quickly that accelerated.

There is speeding up of a lot of trends like virtualization. More people are comfortable with virtual now than before, and you've seen the big emissions drop.

– Roger Kranenburg

Overall, hats off to the industry for responding so well, and it's been recognized by customers and policymakers. Wow, these guys had it together. They had the plans laying there, sitting there, waiting, ready to go, and they executed on them very well.

We've gotten a lot of good attention. We've got to leverage that and keep it up. One of the stories I would like to share is there's someone from the equipment side of the industry I've known. She sent me an email and was like, hey, the electricity's out, and I've got three girls at home trying to remotely work. Can you give me an idea when it'll come back on? It was a funny moment. I drove over and dropped off some cellphone batteries for her. Electricity is critical, especially now, because everyone's home. They're going to virtual schools and also using telecom.

Another story is when my family freaked out because of the storms that Chris was mentioning. We had a big windstorm. My lights went on and off several times over a few minutes and then the internet went down. The entire family ran into my office, saying, fix it!

A pandemic was low probability but had a huge impact, and we'll debate this in time to come. These types of events where they're low probability but large impact change the nature of how we operate.

– Ram Sastry

In China, when the pandemic went through, a lot of their load went down. A lot of their commercial, industrial levels dropped. With the exception of communications and data centers, which jumped twenty-six to twenty-eight percent.

If you look at where the focus is going to be because of COVID-19, it's amazing how many times people talk about RNA and DNA now on the news. There's going to be a lot of focus on biosciences and data centers.

In addition to the foundations of our industry of reliability, resiliency will be a focus. The electricity has to be there. Power quality is also going to be more at the forefront, typically an urban issue, but it's also heavily a rural issue.

I remember, up in New Hampshire, chatting with some folks. There are some smaller industries there, and electricity prices are high. But the small business community is emphasizing to me how devastating low power quality would be in their operations.

PUF: Ram, American Electric Power has a broad vision of the country. You're in about thirteen States. Is there diversity in how AEP's affected and how you think our industry is affected?

Ram Sastry: Many of my comments are common to what's already been said, but we serve customers in Ohio and Texas that are part of the shale oil industry. For the first time ever, that I can remember, we have negative oil prices for delivery. That load is being impacted dramatically.

Load is down now, for obvious reasons. As conditions get better, the social distancing rules will be in place for quite some time, and a lot of us will change the way we work, socialize, interact, and commute. We're going to do more remotely now that we've seen it works well. That has a long-term impact on industrial activity, and commercial activity, a bump up a little on residential activity.

I will echo what the others have said, that when you have in this uncertain time, customers and entire states locked down and told to shelter in place, having reliable power, and even if you have lost your job, not being worried about it being cut off, would give lots of our customers great comfort. When we do have minor weather events, we do the restoration safely, efficiently, and effectively.

People have seen that, and we've got good reviews, and good customer feedback on that aspect, and we'll continue that. A lot of work internally that we thought we needed to do in person, we've found we can do it remotely using virtual remote tools. If we can do it, many other companies and organizations have discovered it too.

The world, going forward, will be different, and in some ways much better, and in some ways, we have lost something we're not going to get back. But it's forward progress as we go through this. Technology is continually rising up to the task to help solve many of the problems.

I've been amazed at how the data and telecom infrastructure that sits on top of the electric infrastructure, has held during this complete switch around of where and how people work.

PUF: Jen, is the industry and regulation of it going well or not and in what ways?

Jen Wischnowsky: We have seen positive changes in our regulatory frameworks that allow us to prudently invest in improving the reliability of the grid, build renewable generation resources, increase energy efficiency, and promote economic development and efficient electrification in our region. These more modern regulatory frameworks that reduce regulatory lag and allow us to fairly recover our investments are important for our customers and shareholders – our reliance on energy continues to increase and access to capital is important for us to build the grid of the future.

PUF: Where will the industry be in five years?

Chris Gould: Just building on what everybody has said here, I already laid out the need for power quality and for higher levels of

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We're going to see a lot of concern and support from co-ops, with our members, figuring out how to collectively handle and recover from what is a completely historic challenge.

– Keith Dennis

reliability. You have to believe there are going to be more virtual meetings. Some level of the heightened expectations that we are observing now will continue into the future.

We'll be past it, but there'll be structural changes in the way we work and the way we engage with each other, that will put more opportunity and more challenge on the electric sector to be affordable and clean, and yet provide higher levels of reliability and resilience that'll be needed for society.

We will continue to see the same renewables, growth, DER, customer enablement, and transition of these other sectors into electricity. The stakes get higher when you add in the need for the grid in terms of communications, the new face of work, and personal engagement.

PUF: We're counting on you Chris and Exelon, if only because you power five of the Major League Baseball teams and we expect full stadiums, well-powered by then.

Chris Gould: That's right. We're up for it. There's a culture of incident response. But we'll be there, and it further emphasizes the direction we're going. It doesn't change the fundamental course.

Keith Dennis: We're going to continue to, for lack of a better term, gain on market share or an invisible creeping market share into different areas of folks' lives. I don't mean we're going to have a bigger presence in everybody's mind, but we're going to have a bigger footprint with the different types of electric technologies we are powering.

Every year, folks are getting more electric things, whether it's electric scooters, toys, cars, or space heating.

There are rebates and pushes in different states for increasing electric technology adoption. It's an interesting phenomenon because these are efficient products that are being adopted. It

doesn't necessarily mean there's going to be a lot more load. But it means that electricity use will spread out into areas where we've never been.

For example, we will be seeing some presence in transportation with school buses, transit buses, and fleets – and it's going to keep growing.

We've seen some strong, persistent trends in the industry over the past two decades. We've seen battery prices come down, and we've seen increases in connected products. With that, we have seen all sorts of new electric devices coming online. At the same time, we've seen twenty-nine percent emissions reduction per kilowatt hours since 2005.

I suspect that in the coming years those trends are going to continue. Whether or not they do, there's enough momentum to pull us into new areas that we haven't traditionally been in within the past decades.

Jen Wischnowsky: There has been an important shift in recent years to become more customer-centric and that will continue, enabled by the digital transformation happening in the industry.

At Ameren, our strategy hasn't changed, and our customers remain at the center of everything we do. We will continue to execute our strategy to meet and exceed customers' fundamental expectations around reliability and affordability, while providing a distinctive customer experience focused on convenience, choice, and corporate social responsibility.

Underlying those concepts, you hear a focus on making our operations more efficient, investing in self-healing technologies on the grid, using data to improve reliability, and communicate real-time with our customers in their channel of choice, all while improving our impact on the environment.

Another significant change is happening in our workforce as longer tenured coworkers are retiring and more Millennials and even Gen Z coworkers are joining our teams. Our changing workforce has different expectations and we need to continue to evolve our benefits and policies.

Technology will help us here too – allowing our coworkers to work anywhere, anytime, from any device will help lay the foundation for more flexible work arrangements. As a working mom, I'm excited about our opportunity to continue to improve our work environments in ways that will promote more diversity, equity, and inclusion for our coworkers.

Roger Kranenburg: There'll be slightly different tweaks here and there in electric vehicles and wind from what I would have viewed it to be a few months ago, but it's overall a great story and a great picture. We're proud of that.

One of the batteries we're building now and we're still on track, amazingly so, is to commission a thirty-eight-megawatt hour battery for Provincetown, at a tip of the Cape. That is for resiliency. It powers the entire town for a short amount of time until we can fix the lines. It goes into that reliability, power quality, and resiliency for electricity.

Some of what will be different is they'll be more focus on reliability, resiliency, power quality, and support for our grid mod type investments, including things that we were looking to do for our control rooms in making them more robust. We'll get a lot of public policy support for those.

Some of the questions could be the change in the focus of policymakers, who have a lot on their plates right now. I've been impressed at how well policy has continued to move forward, including at the town level. I've been impressed at how government has gone forward and continued to do their work.

Policymakers have a significant amount of debt that's being piled on. My best guess is at least four to five trillion at the U.S. level alone. However, as my former colleague would say, we're still the best-looking horse at the glue factory.

Allowing coworkers to work anywhere, anytime, from any device will help lay the foundation for flexible work arrangements.

– Jen Wischnowsky

We have to be cognizant of the policymakers' world. They'll be more focused on public health and some of that could play into our industry, but it shifts their focus and attention. I believe that the clean energy movement will continue.

For some of the positives, I was on another call, I can't remember what city it was, but the person on the call was like, oh, things are good. You know, it's quiet and we can see the hills. We've never been able to see the hills in this city.

One of the positives that may arise is society may come to the realization that, we kind of like this clean air, this clean environment, and we want it.

We think of greenhouse gases, but the benefits of electric vehicles and other clean investment is also conventional air quality. Society may say, we like that. With the virtualization of a lot of things, some of the benefits are environmental when we get on the other side of this.

The other positive is when you get these big shocks to systems, the systems change direction, and it can create opportunities, for example yes, we want to focus on continuing and maybe even accelerating this clean transition transformation of the broader energy space, and that benefits electricity.

Ram Sastry: I will use a risk lens. I use the term risk because people take it as a negative connotation, but it's also an opportunity. If you look at the landscape today and what's going to accelerate our move to a cleaner, more sustainable supply

(Cont. on page 44)

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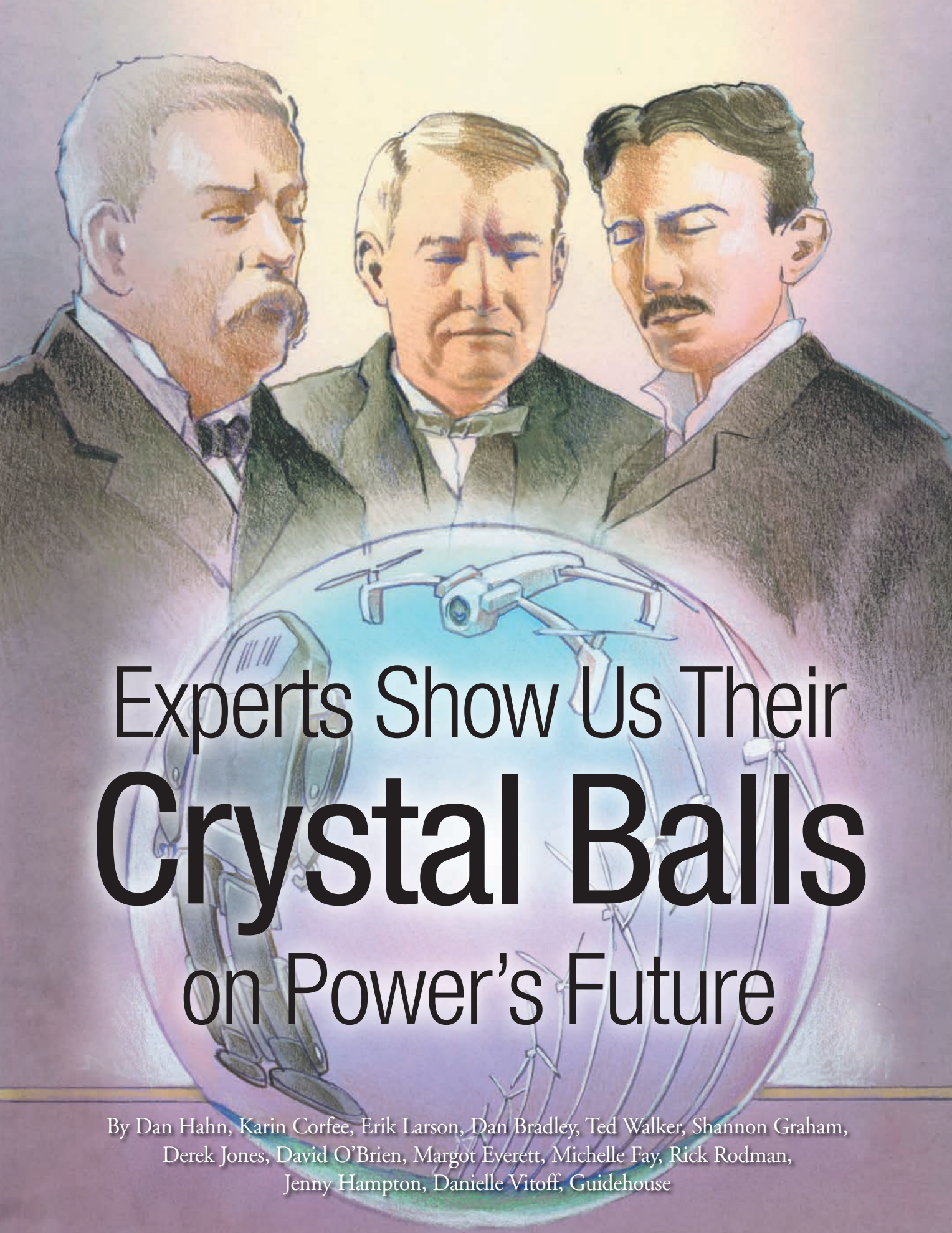


Experts Show Us Their Crystal Balls on Power's Future

By Dan Hahn, Karin Corfee, Erik Larson, Dan Bradley, Ted Walker, Shannon Graham, Derek Jones, David O'Brien, Margot Everett, Michelle Fay, Rick Rodman, Jenny Hampton, Danielle Vitoff, Guidehouse

You have a short elevator ride alone with the CEO of a major utility. What would you want to tell him or her?

Dan Hahn

It's hard to see beyond the current COVID-19 crisis, but our industry has successfully navigated different crises before. As this will be the new reality, and as we return to a new normal, utilities must look to the future.

My advice to utility executives is simple. Be flexible and ready to adapt, focus on your customers, transform your business, and invest now in new Energy Cloud platforms. These emerging platforms unlock new customer value and have the potential to scale faster and yield greater profit margins than the traditional asset-based and supply models.

As these Energy Cloud platforms scale, utilities must embrace a new role – platform orchestrator. We have witnessed significant transformation unfold in the energy sector in the past decade. Today's energy system is cleaner, more distributed, increasingly mobile, and more intelligent.

But we are only at the beginning. Utilities have to further adapt and make different investment decisions as the customers, cities, and communities they serve rely on a partner that can evolve as their energy needs continue to change.

To transform their business, utility leaders need to define a broader customer and sustainability (adaptation) mission and develop a strategic roadmap that guides them as they build the energy system of the future.

This will require making difficult decisions on which strategic initiatives, investments, and divestitures to pursue while facing a higher-risk, more complex, and competitive operating environment.

Innovative new products and services that better meet customer needs and expectations will force the utility to lead. This change requires consistent internal adoption and external engagement with the ever-growing number of stakeholders and partners in their new ecosystem.

Be flexible and ready to adapt, focus on your customers, transform your business, and invest now in new Energy Cloud platforms.

Utilities have to define the role they want to play in this new Energy Cloud reality: developer, operator, service provider, solutions provider, or orchestrator of emerging platforms such as Building-to-Grid, Integrated DER, and Transportation-to-Grid.

The utility as we know it will soon cease to exist, replaced by a full-service provider that orchestrates an ever more complex energy system that is not only safe, reliable, and affordable, but also resilient, clean, distributed, and mobile. Such an energy system can instantaneously adapt to its ever-changing environment. ❍

Dan Hahn leads Guidehouse's Energy Providers practice within the company's Energy, Sustainability, and Infrastructure segment. As a partner, he oversees a global team of industry and key account professionals that collaborate with utilities and energy companies, providing a broad set of strategy and transformation solutions as they navigate the energy transition. He brings 25 years of experience helping clients transform across multiple industry sectors in the areas of operations, digital, strategy, and technology.

What major changes have we seen over the last year to the key opportunities and threats utilities are facing? What can utilities do to be better prepared for these changes?

Karin Corfee

As we begin the recovery from a pandemic with a devasting impact on the health of our citizens, our public health system, and our economy, we are reminded that we are all connected. We are pulling together to help flatten the curve while also doing everything we can to support those in need and revitalize our economy.

But the world will never be the same as more of these gray rhino (or highly probable, high impact, yet neglected) events will occur going forward. This year, resiliency and adaptation have become even higher priorities for utilities to address.

Although slower moving, the climate crisis is still the world's largest existential threat. Without addressing the risks today, it could have a much more acute and sustained impact on our lives and economies.

Net zero is the new trend. More and more countries, states, cities, and corporations are pledging to achieve net zero carbon emissions by mid-century or before. As of late 2019, more than fifteen states had set targets calling for at least a seventy-five percent reduction in greenhouse gas emissions by mid-century.

Additionally, more states are enacting legislation, regulations, or executive orders that set aggressive renewable and greenhouse gas emissions reduction targets. In addition, ambitious targets at the local level are also on the rise. For example, Houston, Texas, the center of our oil industry, has pledged to be carbon neutral by 2050.

Utilities are embracing their key role in decarbonization.

Karin Corfee is a partner in Guidehouse's global Energy, Sustainability, and Infrastructure segment with key expertise in strategic planning, renewable energy, distributed generation, and energy efficiency. Over her 30-year career, she helped develop policies to facilitate increased deployment and optimization of energy efficiency and distributed energy resources. Strategic planning engagements include the California Energy Efficiency Strategic Plan, CAISO Five-Year Strategic Plan and the New Jersey Renewable Energy Plan. Karin recently focused on examining new business models, including financing initiatives, third-party ownership structures, and community solar.

Over 65% of all customer accounts in the U.S. are served by a utility with a carbon or emission reduction goal.

Today, over sixty-five percent of all customer accounts in the U.S. are served by a utility with a carbon or emission reduction goal. They are incorporating these goals in stronger commitments as part of their overall Environmental, Social, and Governance (ESG) responsibilities.

Assessing ESG performance will help utilities hedge their risks and tap into new business opportunities. Utilities will need to respond holistically around investments, strategic plans, business and regulatory models, products and services, and operations and people to capitalize on these opportunities.

Executing a clear and ambitious ESG strategy demonstrates adaptation, resilience, preparedness, and leadership, which will be rewarded by customers, employees, shareholders, and investors.

We must embrace change and adapt. In the words of investor and financial commentator Jim Rogers, "Those who cannot adjust to change will be swept aside by it. Those who recognize change and react accordingly will benefit." ❍

Are utilities well-equipped for next generation Energy Cloud business models? What is your view on the industry's readiness? What can utilities do now to be ready?

Erik Larson

Next generation Energy Cloud business models are quickly gaining traction. Increasingly, customers seek choice, control, convenience, and cost-effective solutions that embrace a more sustainable, decarbonized future.

Although policy and regulatory reform is an important driver of transformation, customer demand and technology innovation are relentless instigators of disruption.

Few utilities are at the forefront of disruption. Only one in four major utilities in the U.S. have made meaningful progress in developing future-oriented business models, according to Guidehouse analysis.

Only one in four major utilities in the U.S. have made meaningful progress in developing future-oriented business models.

Only one in ten have done so proactively with little outside pressure from regulators, customers, or competition. The utility industry is behind on the business model innovation curve.

That is precisely why our industry has become a ripe target for disruption from a diverse set of emerging non-utility competitors taking aim with equally giant ambitions.

Utility executives need to adopt an agile, dual-track approach to innovation. In the short-term, they must play defense by optimizing the current business model (commodity sales) and play offense by aggressively pursuing new business models.

There is opportunity in scaling new and improved customer journeys, new platforms to enable Vehicle-to-Grid and Building-to-Grid applications that decarbonize and digitize whole new systems, and new ways to drive energy efficiency, resiliency, and sustainability more effectively with less investment.

Utilities should tactically invest in disruptive platforms, partner with customers and innovative companies to codevelop better solutions, push for regulatory structures to maximize customer value, and encourage a startup culture of agility and innovation that makes transformation and reinvention the norm. ❍

Erik Larson is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment with more than 13 years of management consulting and advisory experience. He has advised some of the world's largest energy companies and utilities, midsized generation and distribution companies, and energy startups. He provides valuable support to both regulated and unregulated business segments across the energy value chain, with a focus on market assessment, utility business models, investment due diligence, mergers and integration, regulatory and growth strategy, and operations improvement.

How will utilities' relationships with their customers change over the next decade? How can utilities get ahead of this?

Dan Bradley

Leading utilities are investing today in the technologies and systems required to become world class at integrating renewables and distributed energy resources (DER), enabling grid interactive buildings, driving transportation electrification infrastructure, and transforming the customer relationship model from reactive to proactive.

Dan Bradley is a partner in Guidehouse's global Energy, Sustainability, and Infrastructure segment known for innovative approaches that help clients position themselves for growth as the industry rapidly transforms. Dan works across the utility, investor, and manufacturing sectors. His most notable recent work centers on his role as director-in-charge of REV Connect, where he is helping the State of New York advance its Reforming the Energy Vision goals through a first-of-its-kind program that facilitates partnerships between innovative companies and utilities. Dan has authored dozens of articles on the emerging energy markets and technologies and has spoken at numerous industry events. In 2019, he was recognized by Consulting Magazine as one of the Top 25 Consultants.

This new model embraces the prosumer, decarbonization objectives, platform orchestration, and a mission to provide value to all customers. Let's call this new model the Prosaver Utility.

Prosaver utilities will be defined by two characteristics: A proactive customer relationship building trust at each customer touch point coupled with a mission to deliver value to customers with savings of cost and carbon;

Proactive customer relationships – Prosaver utilities may be measured more by the volume and quality of outbound messaging to customers at a time and channel of the customer's preference than by the volume of inbound calls.

This new model embraces the prosumer, decarbonization objectives, platform orchestration, and a mission to provide value to all customers.

Proactive and personalized multi-channel communication will anticipate and proactively address customer issues around outages and billing or move out with the goal of each interaction to build trust in the relationship through the delivery of value.

Platforms to save customers carbon and cost – Prosaver utilities will proactively determine the value to be shared by resources on the grid at a determined location and point in time.

This value can be quantified, financed, and offered to the customer through platforms that reward performance when needed to address cost savings or carbon reduction. The platforms used to integrate and share value will be vehicles for new products and services to meet the proactive needs of customers.

Through these differentiated services, the Prosaver Utility model has the potential to be more effective in scaling the customer base and share of customer's energy spend than legacy models.

The result? Retained and satisfied customers who appreciate control over the channel of their choice, the value shared by the integration of their energy resources, and the overall reduction of carbon from the system. ❍

We all hear of "as a service" offerings across many other industries. What does this mean for utilities? What does energy as a service look like?

Ted Walker

At its core, energy as a service (EaaS) is about selling tangible value and outcomes versus selling something intangible like kilowatt-hours or kilowatts. Traditionally, the utility business model focuses on selling (including generating and delivering) a commodity input fuel (electricity).

The EaaS business model is a shift away from selling the input commodity to expanding the value chain and bundling the commodity input with the end use application or outcome a customer seeks to achieve. This will result in a more comprehensive and differentiated product and service bundle to customers.

To truly customize an EaaS solution to a customer, a few simple questions can be used that focus on outcomes:

What degree of reliability/resiliency (how many 9s of reliability?) do you need for a certain application? This will trigger things like distributed generation/storage and financing;

How much autonomy and control do you want? This would trigger how much control the utility would have on peak demand response triggers;

How decarbonized do you want your generation source to be? This would unlock the development of a truly optimized solution that might include a combination of reduced carbon grid-based generation, more energy efficiency investments, electrification, and demand flexibility;

What is your budget? This would trigger bundling of financial instruments and guaranteed customer savings options.

Energy as a service (EaaS) is about selling tangible value and outcomes versus selling something intangible like kilowatts.

Fast-forward a decade where we live in a fully Internet of Things-enabled world where each load consuming device will have the capability to precisely measure and control its energy usage. In this world, would a utility still only be selling commodity kilowatt-hours?

The bottom line is that EaaS solutions allow utilities to better meet the intrinsic needs of their customers – cost reductions, improved supply quality, higher sustainability, improved use of technology, and simplified operations – while better aligning its revenue streams with underlying cost drivers. ❍

Ted Walker is a partner in Guidehouse's global Energy, Sustainability, and Infrastructure segment. He has over 20 years' experience working with and for premier energy companies delivering strategic and transformative results to his clients. Ted is focused on innovation and growth opportunities and the changing role of the utility in the evolving energy ecosystem. He is an involved leader who is comfortable at every level of an engagement from the operations floor to the C-Suite. He has authored and contributed to several thought leadership pieces analyzing various aspects of the utilities industry.

How are European energy companies positioning themselves in a quickly decarbonizing market? What lessons can be learned from them for U.S. utilities?

Shannon Graham

Europe's vision is to become a climate-neutral continent by 2050. Its energy companies are leading the shift from intensive carbon-based generation to aggressive renewable energy development, propelled by long-term energy policy and broad shareholder buy-in.

Advancing from early stage activities, industry players are now competing to stay ahead of the curve by developing low carbon customer solutions and transforming energy infrastructure to meet net zero targets.

On the customer side, beyond renewables, integrated offerings around e-mobility, distributed energy, building energy management, and other low carbon solutions are scaling up. Large commercial and industrial customers are championing the decarbonization of sectors, which requires intelligent planning and sizable investment in innovative solutions that can effectively integrate renewables, clean gas (including hydrogen), and carbon capture and storage.

On the energy system and infrastructure side, the focus is on innovation, resiliency, and integrated network design to accommodate large-scale renewable energy and the transition to renewable gas.

For example, energy companies in Northern Europe are using reliable offshore wind in the North Sea to decarbonize the energy system through production of green hydrogen and innovative integration of gas and electricity networks, and to decarbonize heavy industries in the south part of Germany.

The lesson learned for U.S. utilities? Start preparing now through no-regrets actions, including the following:

Pathways – Define a low carbon trajectory toward 2050 or earlier;

Scale – Enhance design and be ready to scale – customers will demand it; and

Partnerships – Work with best-in-class partners to tackle the complexity of the challenges ahead. ❍

Europe's vision is to become a climate-neutral continent by 2050.

Shannon Graham is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment with more than 20 years of energy industry experience. She worked in more than 20 countries and with dozens of clients to deploy new utility business models, utility organizations, and government programs. She focuses on transformational aspects of the electricity industry, including the integration of distributed resources into the electric grid and into utility business models – especially as it pertains to utility diversification.

Approximately one-third of energy use in the U.S. is for transportation. How can utilities tap into this market in a significant way?

Derek Jones

The emerging Transportation-to-Grid (T2G) platform describes the opportunities created by the intersection of an expanding e-mobility infrastructure (which includes electrification of transportation from passenger vehicles to transit systems to port operations) and the electricity grid.

Take the example of power flows to plug-in EVs (PEVs). Guidehouse Insights expects 127 million PEVs in use globally by 2030. Power flows to these PEVs represent more than 422 TWh of load annually. This energy content equates to roughly 248 million barrels of oil or enough energy to power more than thirty-eight million homes for one year.

The shift to fueling vehicle powertrains with electricity offers utilities, and other market players opportunities for value stacking. Utilities as platform orchestrators can stack value by delivering electricity to PEVs and by also building out their networks to optimize PEV charging capabilities.

Maximizing the value of unidirectional charging (V1G) and bidirectional charging (V2G) through load orchestration provides still more value stacking opportunities.

Successful stacking strategies will rely on the utility's honest assessment of its internal capabilities and a willingness to partner in areas of weakness, forging compelling market offerings within the T2G platform. ❍

Derek Jones is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment with more than 15 years of experience in the transportation and energy sectors. His multi-disciplinary experience includes a deep knowledge of transportation and distributed energy resource market ecosystems, US regulatory and policy environments, and program design and implementation. Derek manages market assessment, adoption forecasting, load research, business case, regulatory strategy, and process evaluation analysis.

The shift to fueling vehicle powertrains with electricity offers utilities, and other market players opportunities for value stacking.

What are the major regulatory changes you see in the next decade? What is needed from regulators to optimize outcomes for all stakeholders?

David O'Brien

Over the next decade, the regulatory system will need to adapt, and utilities will increasingly act as orchestrators as opposed to classic asset builders. They must innovate in the way they operate and in the solutions they offer customers.

The traditional cost of service, rate case docket style environment will not suffice. We need to focus on how we reward utilities for being orchestrators and how they are provided flexibility to be adaptive to the changing needs of customers. Less hearing room, more customer outcomes.

Solutions will be found in a modern form of performance-based regulation (PBR 2.0). Financial incentives will alter the asset builder business model, as return on utility investment can be merit-driven based on excellence, advancing policy goals, and meeting customer expectations. The regulatory process will be centered around measuring and rewarding outcomes as opposed to litigating inputs.

Solutions will be found in a modern form of performance-based regulation (PBR 2.0).

David O'Brien is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment where he helps clients navigate the energy industry's transformation. With a focus on strategy and operations, he helps clients develop sustainable business models and establish regulatory frameworks to optimize physical and financial aspects of the changing distribution grid. David has nearly 30 years of experience covering energy policy, regulatory and grid planning, economic development, and business strategy.

PBR 2.0 will also entail streamlined and nimble regulatory decision-making to shorten the time to market for new technologies and solutions in concert with customer and societal expectations.

As we saw in the transformation of the telecom industry, a diversity of players will be part of servicing customers. The energy vertical will become more and more of a contested market space.

Regulatory intercept, degree of oversight, and decision-making timeframes will need to narrow. A culture of innovation will need to emerge and flourish, and innovation is a 360-degree effort. ❍

What are the major changes to how utilities should approach rate design over the next decade to deal with challenging industry dynamics?

Margot Everett

Similar to competitive businesses, pricing and rate design will become a significant tool for achieving the regulated utility's strategic objectives, whether it is to mitigate competitive pressures or to advance business strategy.

Within the decade, traditional rate structures will be replaced with customer-centric pricing. Emerging rate design will continue to reflect costs and rely more heavily on product differentiation and customer segmentation.

Drivers for pricing innovation encompass three principle factors, addressing customer preferences, enabling technologies, and evolving the customer experience. An example of a new rate option is subscription pricing, which allows a customer to choose to pay a monthly or annual charge and consume up to a prescribed level or gain access to discounted rates, much like phone plans.

This provides customers with control and predictability around their monthly bills and a payment structure that is familiar and customer friendly.

With greater amounts of zero marginal cost electricity and lower cost demand reduction technology, a new era in rate design can better align rate structures with cost structures, all while meeting evolving customer expectations and preferences.

To prepare, utilities and regulators must work together to find suitable pricing solutions and embrace advanced customer data-driven approaches to developing creative and cost-reflective options. ❍

Margot Everett is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment. She is an industry leader in developing modern utility pricing solutions, helping clients transform their pricing structures to improve transparency, promote new technologies, and maintain cost-based economic principles. She has nearly 35 years of experience in energy policy and market issues, analytics, and strategy, with expertise in electric and gas rate design, cost allocation, load forecasting and research, and market, credit, and enterprise risk management.

Within the decade, traditional rate structures will be replaced with customer-centric pricing.

What will the utility of the future look like in 2030? How will it be different from today's utility?

Michelle Fay

The utility of the future still provides its traditional, core services, but has also embraced new customer needs, changing policies and regulations, higher penetration of clean and distributed energy resources (DER), and new disruptive competitors.

The utility of the future will improve resiliency and adapt to, and prepare for, more crises, while simultaneously addressing its aging infrastructure and workforce.

Michelle Fay is a partner in Guidehouse's global Energy, Sustainability, and Infrastructure segment supporting clients as they implement transformational programs. She brings more than 20 years of experience planning and delivering complex and innovative programs for utilities. Michelle's expertise includes program and project management, organizational change management, account management, process and performance improvement, grid modernization, energy efficiency, and analytics. She is an experienced leader specializing in emerging technologies and is respected for her integrity, leadership, team building, strategic planning, and laser-focused execution.

The industry is at the inception of a massive digital transformation, and utilities will become more dependent on technology and data to drive value, manage the grid, and enable decision making.

Utilities will need to manage higher penetrations of DER and millions of smart devices that need to operate seamlessly with the grid. The management of this complex grid, which Guidehouse calls the Neural Grid, will require the use of advanced technology to forecast load, facilitate third party interconnections, and securely manage these new sources of flexible load options without impacting reliability.

While this complex system of digitally connected devices is complex to manage, it also generates volumes of valuable data that can be used to drive valuable insights. Future utilities will use robotic process automation to automate highly repetitive processes.

The industry is at the inception of a massive digital transformation, and utilities will become more dependent on technology and data.

They will use digital technology and visualizations to improve situational awareness for events or outages and engage customers in new ways. They will leverage data and insights to identify opportunities to develop innovative customer-focused products and services and enable decision making, potentially filling the gaps in the aging workforce.

As utilities are required to operate more horizontally and integrated, they should change their operating model to enforce collaboration of previously siloed departments. A dramatic increase in DER, for example, requires a cross-functional team and cross-functional strategic planning and delivery operating model.

Finally, utilities will need to embrace and adopt new technologies as increasing complexity makes it impossible to rely on a handful of individuals who know the system. As an aging workforce faces retirement, institutional knowledge will dissipate, requiring greater use of analytics and automation. ❍

How has risk management changed for utilities? What can utilities learn from other industries?

Rick Rodman

For the past century, utilities have effectively managed risks like asset performance and life cycle replacement by relying on sound engineering practices and efficient business processes.

However, utilities' risk management practices will need to change to address new evolving and emerging risks that increasingly threaten their strategy, business model, and operations. These include greater competition, emerging technologies, changing customer needs, and an increasing probability of significant risk events related to climate change, pandemics, and physical and cybersecurity.

This new utility risk management framework addresses categories of risks holistically.

Historically, utilities have managed traditional asset and regulatory risks well with controls-based processes managed by each business line. Increasingly, utilities are facing evolving risks related to technology, customer needs, and security, which need to be managed across business lines. Emerging risks related to business model and climate change are putting direct pressures on the utility's strategic objectives and must be addressed from the top.

Utilities must adopt a new risk management approach that marries the familiar, controls-based practices for risks that jeopardize day-to-day operations with new and evolving enterprise risk management methods that focus on addressing medium- and long-term risks to strategic objectives.

This new utility risk management framework addresses categories of risks holistically, which creates synergies to risk management by using common mitigations and focusing on whether the risks – collectively or individually – should be mitigated, transferred (such as through insurance), divested (sell the assets or the part of the business that houses the risk), or accepted and monitored. ❍

Rick Rodman is a partner in Guidehouse's global Energy, Sustainability, and Infrastructure segment working in the areas of strategic planning, trend assessments, business case studies, operational effectiveness, and business process re-engineering. He manages the development and implementation of large-scale programs at several federal civilian agencies. He has received numerous recognition awards from his clients for leadership, performance, and contribution to excellence. He served as one of the partners who helped win the 2014 Malcolm Baldrige National Quality Award for performance excellence through innovation, improvement, and visionary leadership.

How can utilities use design thinking to develop game-changing innovations? What lessons can be learned from other industries?

Jenny Hampton

Utilities face more complexity than ever before and are under constant pressure to evolve their business models to better address shifting customer needs.

Utility decarbonization efforts, for example, require an unprecedented level of integration between people and technology focused on deploying thousands of game-changing innovations that incorporate people's needs, behaviors, and their actual day-to-day experiences.

While design thinking and innovation labs have sprung up in many utilities, we have yet to see a sizable shift in focus from more traditional business models.

Innovative ideas don't just magically appear. At Guidehouse, we know innovation happens through an iterative process of listening to, observing, and empathizing with people.

We use a five-phase design thinking process to help utilities move from effectively scoping a problem, to learning from people, generating ideas, testing and iterating on solutions, and planning for full-scale implementation.

Design thinking focuses on people and their needs and uses critical thinking and creativity to help utilities solve problems, gain a competitive advantage, and deliver exceptional customer experiences.

The computer mouse was created using design thinking. Airbnb was taken from a failing start up to a billion-dollar business using design thinking. To be competitive in a rapidly accelerating industry transformation, utilities need to deploy and optimize creativity so they can better address shifting customer demands and capitalize on a rapidly changing competitive landscape. ❍

Jenny Hampton is a director in Guidehouse's global Energy, Sustainability, and Infrastructure segment with more than 10 years of experience implementing and evaluating energy efficiency and renewable energy programs in the residential, commercial, and industrial sectors. She led the evaluations of dozens of behavior change programs, conducted customer engagement and market segmentation research, managed primary data collection and analysis efforts, developed campaign creative and media plans, and coordinated program partnerships between local communities and utilities.

While design thinking and innovation labs have sprung up in many utilities, we have yet to see a sizable shift in focus from traditional business models.

What role can utilities take in their customers' quest to decarbonize? How have we seen utilities shifting more decarbonization choices to their clients?

Danielle Vitoff

Most utilities already support their customers' decarbonization journey through energy efficiency programs and renewable electricity sales. However, they will need to deliver more advanced solutions in order to keep pace with customers accelerating their decarbonization targets and the implementation of new energy solutions.

Utilities can help their customers meet these goals by developing comprehensive solutions that support their customers' sustainability journeys. Embracing the role of decarbonization solutions provider requires shifting more choice and control to customers. Several integrated solutions can help utilities meet accelerating demand for decarbonization services. For example:

Electrification – Electrification of many systems is required to meet decarbonization targets, including heating and transportation. Utilities can offer key support to their customers in making this transition, including offering incentives and education to ensure the right decisions are made and that electric solutions are used most efficiently;

Collaborative resource planning – Utilities invite customers into their resource planning process and ensure better alignment around goals and expectations, including anticipating and planning for additional renewable demand;

Optimization and digitization – Advanced metering infrastructure, smart meters, and smart equipment offer powerful tools for utilities to interact with their customers, support cost optimization, improve grid reliability, accelerate decarbonization initiatives, and optimize grid operation;

Onsite renewable generation and storage – Most customers that have set decarbonization goals expect onsite renewable generation and storage to play a key role. Utilities can support these initiatives through program design, incentives, and supporting regulatory changes that enable customers to realize maximum value from their installations; and

Renewable fuels – With all energy ultimately becoming renewable, a smart combination of hydrogen and biomethane with electricity would be part of a cost-optimal route to full decarbonization for cities (buildings), manufacturing, and transportation.

Ultimately, the market demand for decarbonization services is growing quickly. Utilities can choose to work with their customers and help them achieve their aims or risk ceding market share to new market entrants who are already competing to provide these solutions. PUF

Embracing the role of decarbonization solutions provider requires shifting more choice and control to customers.

Danielle Vitoff is an associate director in Guidehouse's global Energy, Sustainability, and Infrastructure segment. She supports companies, cities, and utilities in developing low-carbon strategies, including greenhouse gas footprinting, target development, risk and opportunity assessments, and implementation support. She is a LEED Advanced Professional and a TRUE Advisor.

Our Panel of Veteran Leaders on Electric Trends

Paula Glover, CEO, American Association of Blacks in Energy,
Pat Wood, former chair of the Federal Energy Regulatory Commission and Public Utility Commission of Texas,
Miles Keogh, executive director, National Association of Clean Air Agencies (and former director of the NARUC Research Lab),
Ron Melton of the Pacific Northwest National Laboratory,
Jeff Morris of Schneider Electric (former Washington State Representative),
moderated by retired Kansas State Representative Tom Sloan.

Most of the panel interviews appearing in Public Utilities Fortnightly involve persons with similar professional positions, for example: CEOs and Commissioners. For this panel, we selected persons experienced in various aspects of the energy industry; persons with disparate positions and professional interests.

We have two association executives, Paula Glover and Miles Keogh; two policymakers, Pat Wood and Jeff Morris; and a leader at a DOE National Laboratory, Ron Melton. All have long histories in the energy sector and national perspectives.

Our objectives in developing this panel were two-fold: In response to broad, probing questions, to elicit potentially competing perspectives on what the future of the electric industry may be, and For those responses to stimulate readers to develop their own perspectives and initiate similar discussions within their own organizations.

We will not know what the "right" answer to any of the questions will be for several years, but without stimulating thoughtful discussions, this publication is failing in its responsibilities to be a thought leader by bringing alternative ideas to your attention.

Paula Glover

CEO, American Association of Blacks in Energy

PUF's Tom Sloan: In the next five to ten years, what technological advancement will most impact the electric industry? Why? How?

Paula Glover: The likely result is a combination of technological advancements, some having more impact than others depending on region. For example, distributed storage advancement could play a large role in places where the sun shines often, as coupled with solar and rooftop solar.

Carbon capture is another technological advancement to consider. If carbon capture experiences growth and the technology moves forward at a progressive pace, this could significantly impact infrastructure investment decisions.

Advancements in nuclear generation will also impact the industry, and if done successfully will fill the need for zero-carbon baseload.

Utility scale storage capacity, as distinguished from distributed storage mentioned above is the obvious game changer.

PUF: During the pandemic, many people worked from home. Will this be a trend in the industry? If, yes, what are its implications?

Paula Glover: Certainly, companies will reevaluate the new normal, but any decision on the workplace of the future will likely be driven by what achieves best outcomes for employees, customers, and the company. That said, current events have allowed companies to understand how they can incorporate flexible schedules and telework to fulfill human resource needs.

PUF: What will determine the future of renewable energy – Economics? Public opinion? Regulatory environment? Technological advances? Transmission development? Other?

What's not mentioned is politics and election outcomes this coming November. That said, the march to renewables is unlikely to experience a rollback.

Paula Glover: All the above. What's not mentioned is politics and election outcomes this coming November.

That said, the march to renewables is unlikely to experience a rollback, but federal leadership can dictate growth incentives,

and to some degree the speed of the march. However, federal incentives notwithstanding, state policy will play a large role in moving renewables forward.

PUF: Will the pandemic's impact lead to more distributed generation and/or better utility-customer and customer-customer interactions? If yes, how?

Paula Glover: As mentioned above, we may see some growth in distributed storage, in that the pandemic has exposed a number of uncertainties during times of crises. That said, the amount of growth, and efficacy of distributed storage will be determined by technology.

As to customer interactions, it's correct that a possible outcome is better customer relations. As you know, IOUs were among the first to voluntarily suspend disconnections as the crisis began, something likely appreciated by all customers.

PUF: The current federal Administration has relaxed regulatory and environmental rules regarding fossil fuel emissions. Will electric utilities change their strategic and operational plans in response? Please explain.

Paula Glover: Likely not. As a general rule, most electric companies have already begun reducing carbon emissions, based on actions of the previous administration, and in response to state actions. Related needed infrastructure investments are already baked-in, with additional investments well in the planning and implementation stages, in anticipation of where markets are going. ❍

Pat Wood

Former chair of the Federal Energy Regulatory Commission and Public Utility Commission of Texas

PUF: In the next five to ten years, what technological advancement will most impact the electric industry? Why? How?

Pat Wood: Power Storage. As a regulator keen on driving the move to competitive markets, storage was the missing silver bullet from my electric power artillery, a bullet we did have during the successful natural gas restructuring.

Without the ability to time-shift power supply, the power grid is only a real-time network – and the product moves a lot faster than natural gas flowing through a pipeline. Now, with cost-effective batteries, and future non-battery storage technologies, we have the ability to rationalize both supply and demand across all parts of the power grid.

The ability to store power levels the playing field for low-cost variable supply and demand resources to compete against historic generation resources, lowering prices. It also reduces, if not eliminates, most types of market power abuse.

PUF: During the pandemic, many people worked from home. Will this be a trend in the industry? If, yes, what are its implications?

Pat Wood: Although I am concerned about medically-vulnerable people and for the many that have lost their jobs, the work from home experience has been a more positive one for me. Our work team has been highly productive and engaged, and the elimination of commutes has bought back a lot of time for all of us.

In some situations, there is no substitute for face-to-face interaction and physical presence, but to the extent it can be reduced without impact on productivity, work from home will likely

The trend toward a more decentralized, decarbonized, and democratized power system was well underway before the pandemic, and I expect that trend to continue, likely accelerate.

become much more pervasive across our part of the economy.

The pandemic has significantly accelerated the use of digital customer interfaces in commercial businesses. As we have seen these past few weeks, the shift in power demand from commercial to residential load has changed consumption somewhat, but I don't see that as anything remarkable.

PUF: What will determine the future of renewable energy – Economics? Public opinion? Regulatory environment? Technological advances? Transmission development? Other?

Pat Wood: Based on my experience to date, I expect that economics will drive the evolution of the renewable power industry. Dramatic drops in costs for wind and solar power have moved those resources to the lowest rungs on the cost ladder, so it is likely that will drive their broader adoption.

That success story will inform public opinion, particularly in retail competition states where customers, like me, can choose to buy power directly from renewable providers – and not pay the price premium seen in regulated markets. To fully capture the wealth of the lowest-cost resources, namely wind in central North America, more interstate transmission projects would be needed.

PUF: Will the pandemic's impact lead to more distributed generation and/or better utility-customer and customer-customer interactions? If yes, how?

Pat Wood: The trend toward a more decentralized, decarbonized, and democratized power system was well underway before the pandemic, and I expect that trend to continue, likely accelerate.

PUF: The current federal Administration has relaxed regulatory and environmental rules regarding fossil fuel emissions. Will electric utilities change their strategic and operational plans in response? Please explain.

Pat Wood: Both regulated and competitive generation owners have to plan investments and operations over multiple years, so while rule relaxation may allow short-term relief, it is not likely to be available in the longer term. Therefore, any business decisions should reflect longer term trends, and cleaner air is such a trend.

One of the benefits of the pandemic shutdown has been the return of clear skies in most cities across the country and world. Seeing such a future today will unquestionably broaden popular support for emissions reductions. Although most of the pandemic reductions come from the transportation sector, the spillover sentiment is likely to spill over to the power sector. ❍

Miles Keogh

Executive director, National Association of Clean Air Agencies (and former director of the NARUC Research Lab)

PUF: In the next five to ten years, what technological advancement will most impact the electric industry? Why? How?

Miles Keogh: The most important revolution that's transformed the economy at large has yet to fully disrupt the power sector: data, information, and intelligence. The public still flips a switch without thinking much about what's happening back there, and that affects what they buy, what they do, and how they vote.

As commercial and industrial clients see systems better, and as the public has better information that helps them understand the link between flipping a switch and the pollution in the air they breathe, they'll buy differently, vote differently, and demand differently.

PUF: During the pandemic, many people worked from home. Will this be a trend in the industry? If, yes, what are its implications?

Miles Keogh: Telework in the office arena will expand, and it'll change the kinds of things we want at home – home office space, for example – and at work – more dedicated conference rooms, fewer coworking spaces, more bullpens for weekly meetings, and fewer cubicle farms. Telework will change, but not eliminate, office work. In blue collar work – still the majority of the economy – it's not going to be a big change.

PUF: What will determine the future of renewable energy – Economics? Public opinion? Regulatory environment? Technological advances? Transmission development? Other?

Miles Keogh: It'll be national-level regulation and legislation, adopted for long enough to create incumbency by those resources. I still have yet to see a voluntarily-adopted RPS.

The only way to drive clean energy is to require its adoption. Sometimes the way to have a good idea is to stop having a bad idea. There are still vast subsidies for fossil fuels. The only way they'll stop is for legislative and regulatory incentives to be actively eliminated.

PUF: Will the pandemic's impact lead to more distributed generation and/or better utility-customer and customer-customer interactions? If yes, how?

Miles Keogh: I'm genuinely not sure what the pandemic will do to the power sector. It'll strengthen those companies with balance sheets deep enough to weather the downturn, and captive rate base makes those companies nigh indestructible, by design.

Smaller companies counting on disruption are going to have a problem in a declining load and economically devastated environment. Conversely, the link between PM emissions and virus mortality is a serious wildcard, and if it gains traction in the marketplace of ideas, may cause political and regulatory leaders to ask some fundamental and potentially transformational questions about the best way to provide power to people. But my bet is that economic devastation probably presses a long, hard pause on any discussion of, say, a Green New Deal.

PUF: The current federal Administration has relaxed regulatory and environmental rules regarding fossil fuel emissions. Will electric utilities change their strategic and operational plans in response? Please explain.

Miles Keogh: Power companies would be crazy to think the march toward protecting people and the planet is transient. A re-elected Trump administration with expanded deregulatory ambitions will only harden and broaden the state and local revolt against the dismantling of public health protections, so even there the power sector will face regulatory and legal requirements to reduce and eliminate fossil fuels.

An electoral blue wave will result in a first hundred days of roll-forwards that will whiplash those companies who counted on stopping the clock in 2016. And either way, power companies don't prefer pollution – these are their communities, and as the regulatory environment and the framework of market incentives get further out of step with what we know about public health and climate damage, the moral burden will grow heavier on the shoulders of people in the power sector who serve and live in those communities.

The only way to drive clean energy is to require its adoption. Sometimes the way to have a good idea is to stop having a bad idea.

At some point operational and strategic directions will need to align away from what obviously hurts communities and the planet, and the longer companies are reluctant to do that, the more painful the eventual change will be. And there's money to be made in putting pollution aside. Smart companies will grow toward doing right by doing good now. ❍

Ron Melton

of Pacific Northwest National Laboratory

PUF: In the next five to ten years, what technological advancement will most impact the electric industry? Why? How?

Ron Melton: Local and community generation combined with inexpensive storage will change the very nature of the electric power system. When we reach a point that we can think of storage as ubiquitous – as much as we like, wherever we like it – the way we control and coordinate the balance of the electric power system changes dramatically with the distribution system now the dominant element, and automated distributed control and coordination technologies widely deployed enabling what will amount to programmable net load shapes feeder by feeder.

This in turn dramatically changes the role of the bulk power system, the bulk power system market structures, and overall bulk power system operations to be truly supply following with significant supply being distributed.

PUF: During the pandemic, many people worked from home. Will this be a trend in the industry? If, yes, what are its implications?

Ron Melton: Given our experience with telework, yes there will be an impact. For utilities, not clear.

Many business functions can be done via telework. Operations are another matter. Over the long term there is also a social dimension that can't be ignored. People are by their nature social creatures. This social dimension will drive the long term viability of telework.

Implications for the industry of telework broadly are changing load patterns between commercial and residential. Possibly different temporal load shapes for loads that were driven by standard workdays. The workday may become elongated in time when averaged over lots of people.

PUF: What will determine the future of renewable energy – Economics? Public opinion? Regulatory environment? Technological advances? Transmission development? Other?

Ron Melton: My guess is economics will be the long term determinant followed by decarbonization related to climate change mitigation, which could be economic too, but is on a long time frame that we typically refuse to deal with.

PUF: Will the pandemic's impact lead to more distributed generation and/or better utility-customer and customer-customer interactions? If yes, how?

Ron Melton: I have trouble seeing a linkage between the pandemic and these elements of the electric power industry. If there were wide scale reliability problems that were traced to personnel shortages due to the pandemic that might be another DER growth driver. But I haven't seen anything to date that suggests that will happen.

When we reach a point that we can think of storage as ubiquitous – as much as we like, wherever we like it – the way we control and coordinate the balance of the electric power system changes dramatically with the distribution system now the dominant element.

PUF: The current federal Administration has relaxed regulatory and environmental rules regarding fossil fuel emissions. Will electric utilities change their strategic and operational plans in response? Please explain.

Ron Melton: Some may, but those taking a more strategic view should not for at least two reasons. First, their customers in most of the country still expect a more environmentally friendly approach and also like the economics of falling costs of PV and storage. That combination will be important to many utilities.

Second, the current relaxation is not likely to continue. If the administration changes in this year's election, then there isn't time to adjust. Even if the current administration lasts another four years, the risk of taking a different track now and having to reinvest in response to more stringent environmental controls in five years seems to be a bad trade off.

Utilities will largely stay the course. Another factor, of course, is state level RPS factors that also have to be considered and pull away from taking advantage of the relaxed environmental rules. ❍

Jeff Morris

of Schneider Electric (former Washington State Representative)

PUF: In the next five to ten years, what technological advancement will most impact the electric industry? Why? How?

Jeff Morris: Machine learning. As machine learning advances so will the advent of the bottom up electric grid.

The ability to use the data of patterns in buildings, to use the ambient air and water as a storage medium to work in unison with the grid, predict mobile electric demand, like electric vehicles, coming and going from behind the meter, communicate with the distribution system operator uptake rates based on customer values.

The most efficient electrical and economic transaction is where supply and demand meet at the closest proximity, and machine learning will enable that. Either cost or other values like a decarbonization by customers can be planned and predicted versus the organic, reactive, and expensive way we plan our electric grid today.

(Cont. on page 46)

PUF Annual Pulse of Power Survey

How You Answered Eight Questions

By Mackinnon Lawrence and Jessie Mehrhoff,
Guidehouse

In its fifth consecutive year, Guidehouse, formerly Navigant, and Public Utilities Fortnightly's annual pulse of the industry survey captured the power sector's view on disruptive forces shaping the future of energy. Responses from utilities, regulatory commissions, manufacturers, and service providers indicate a continued, strong understanding that the utility industry is in the midst of significant transformation. As the industry evolves toward a more distributed, clean, mobile, and intelligent energy future, the survey shows that business model evolution, distributed energy resources integration, and climate change are top of mind for all industry stakeholders as both existing and new challenges accelerate unprecedented change.

Note that this survey took place right before the COVID-19 crisis hit us, and the impacts of this crisis were not surveyed.

Clean Power, DER Continue to Disrupt Utility Business Model

Survey respondents acknowledge that the growth of both clean energy and DER are having a demonstrable impact on the utility business model, and will for the foreseeable future. Aligning with last year's response, nearly two-thirds or 62 percent, of respondents in 2020 stated that rapidly increasing renewables and DER are the most disruptive force to the utility business model.

This response is consistent with observed trends across the industry. Record generation from wind and near-record generation from solar in 2019 led to clean energy resources supplying more electricity in the U.S. than coal for the first time ever according to the Energy Information Administration.

Meanwhile, new global DER capacity deployments continue to outpace new centralized generation capacity. According to analysis by Guidehouse Insights, annual net new DER installed capacity – including fast-growing segments like distributed renewables, electric vehicle charging, and demand side management – is expected to grow to more than a hundred and ninety-five gigawatts in 2020 and to more than five hundred gigawatts by 2030.

As digitization of the power grid continues, new advanced software and hardware that allow for greater control and interoperability are enabling the proliferation of DER. For example, utilities and other grid operators and energy providers are using DER management systems to accomplish various goals such as resource adequacy, economic optimization, and grid services depending on the type of energy provider and the regulatory and market environments in which they operate.

DER management systems and advanced distribution management system related-investment in North America is expected to reach one billion dollars by the middle of the decade. Optimization of energy resources including grid services like voltage management, peak reduction, and load shaping will become even more critical as DER deployments continue to increase.

Utilities Embracing More than Clean Energy in Face of Climate Change

As expected, a vast majority of utilities recognize that climate change is a disruptive force already threatening current business models, 71 percent. The percentage of respondents acknowledging that climate change is posing a tangible threat increased by two percentage points over last year's survey, 69 percent. We expect that this will continue to increase going forward as destructive weather events will occur more frequently and utilities are taking a lead role in the decarbonization of our economies.

Optimization of energy resources including grid services like voltage management, peak reduction, and load shaping will become even more critical as DER deployments continue to increase.

As part of their overall Environmental, Social, and Governance goals, a growing number of utilities have set aggressive carbon emission reduction targets. Some have targeted net zero between 2040 and 2050.

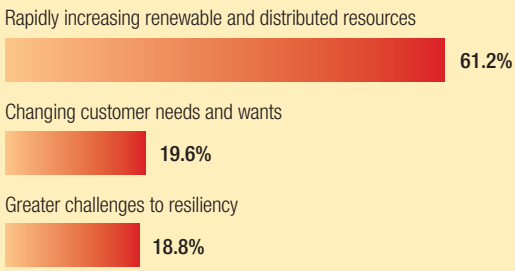
A majority of survey respondents, 66 percent, favored an all-of-the-above strategy for utilities to proactively respond to climate change threats, including converting generation fleets to renewables and storage, embracing sustainability initiatives across utility operations, and integrating resiliency throughout the network. Factors driving increased prioritization across the industry include changing consumer demand and institutional investors looking to mitigate climate change risk across their portfolios.

Expanding state and local policies and regulations are also pushing the industry to embrace clean energy and efficiency. Despite the lack of clear financial value placed on resiliency initiatives today, the energy industry recognizes the need to embed both resiliency and sustainability into their long-term strategic and financial goals. Adaptation is the new industry norm.

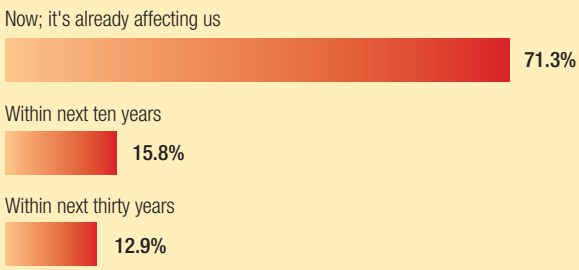
Solar plus storage – either behind the meter or at utility scale – is an increasingly important solution in the utility arsenal to avoid carbon-intensive generation and improve resiliency. By 2021, annual installed distributed solar photovoltaic capacity in North America

Disruptions

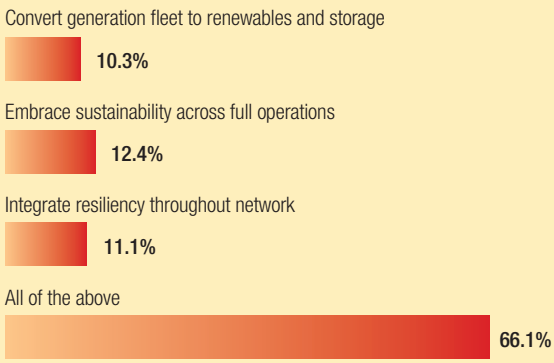
Q1. Which is most disruptive to the utility business model?



Q2. When will climate change pose a tangible threat to utilities?



Q8. What should utilities do today – most importantly – to address climate change risks?



is expected to exceed ten gigawatts, and annual installed distributed battery storage power capacity is expected to near one gigawatt.

Distributed renewables are interconnecting to the grid at a rate high enough to create new customer-sited power plants in some utility jurisdictions. However, renewable generation plus storage alone will not suffice in designing the resilient utility of the future.

Connected Devices Create More Resilient Intelligent Grid

While grid modernization initiatives remain a high priority for most utilities and a critical evolutionary step to improve grid resiliency, survey respondents were less likely to suggest digitization and artificial intelligence, 14 percent, to support sustained growth. Less surprisingly, utilities will strategically focus on electrification, 54 percent, and product and service diversification, 32 percent, pursuing new revenue opportunities to offset continued decline in overall demand.

With electrification a key focus for utility stakeholders, the intersection of transportation and the grid will continue to be a driver of innovation and partnership for the industry. Analysis from Guidehouse Insights shows that by the end of 2020, approximately two million plug-in electric vehicles are expected to make up the North American fleet. The majority of these vehicles will be individually owned and connected through nearly two million charge ports throughout North America.

The interconnection of plug electric vehicle-charging infrastructure will grow alongside residential and commercial building electrification. In North America, fully electrified homes are estimated to increase more than ten-fold from an installed base of over fifty-four thousand in 2020 to seven hundred and forty-four thousand by 2029.

Commercial electric heat pump shipments, a key component of electrified buildings in North America, are expected to near twenty thousand shipments in 2020 and grow to sixty-five thousand over the same period.

Product and service diversification and business model evolution go hand in hand. With connected DER enabling a new class of prosumers, survey respondents recognize the importance of embracing network orchestration roles like enabling transactive energy and facilitating third-party participants, 47 percent. This is compared to last year, when only 28 percent of respondents in our survey felt that utilities should serve as a transactive energy orchestrator. A DER asset developer or owner role for utilities was favored by only one-fifth of survey respondents, which indicates that utilities will rely on others for that while they focus on the network or platform orchestration role.

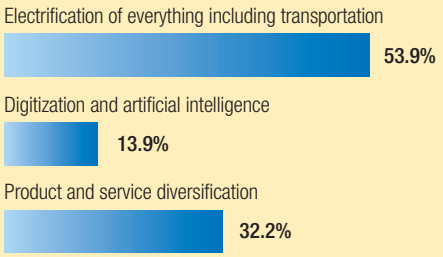
Multipronged Approach Will Create Utilities of the Future

Utilities face a myriad of potential new competitors that are competing for the fast-growing new energy assets, products, and services market. Two-thirds of survey respondents identify technology and telecommunications companies as posing the largest threat, 66 percent, which is consistent with our 2019 survey. Somewhat surprisingly, only one-fifth of survey respondents saw oil and gas, 20 percent, and electric and gas companies from outside the U.S., 14 percent, as threats.

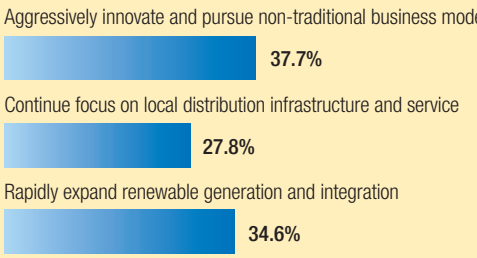
Meanwhile, these actors are actively acquiring customers away from U.S. utilities and are leading the way globally by investing in and developing capabilities around next-generation Energy Cloud platforms. The rapidly evolving energy as a service market, projected to reach two hundred and seventy-eight billion dollars in revenue globally by 2028, represents one highly contested

Business Strategies

Q3. Which should utilities most embrace for sustained growth?

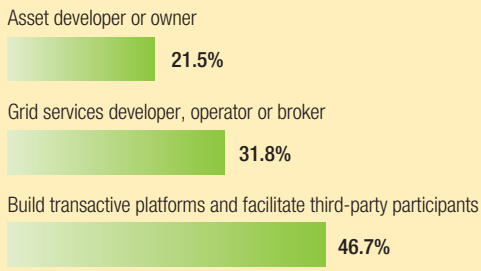


Q4. Which overall strategy should utilities pursue?

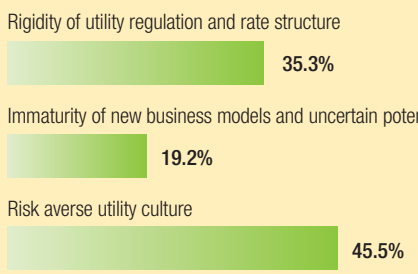


Regulations and Competitors

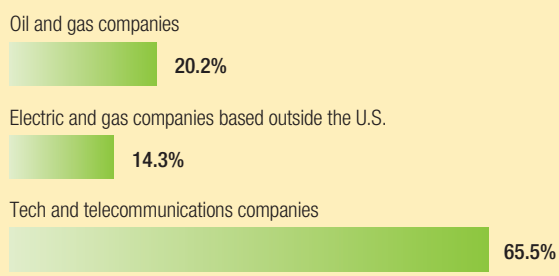
Q5. What is the most attractive new business model in distributed resources?



Q6. What primarily prevents utilities from investing in new business models?



Q7. Which potential competitors pose the biggest threat to utilities?



Factors driving increased prioritization across the industry include changing consumer demand and institutional investors looking to mitigate climate change risk across their portfolios.

market opportunity today. As customers continue to demand leading-edge technologies, services, and rapid issue response and resolution, utilities will need to foster strategic partnerships or better develop their capabilities to compete.

With the energy transformation in full swing, respondents were mostly split over which strategy utilities should pursue. The relative efficacy of aggressive innovation, the pursuit of non-traditional business models, the rapid expansion of renewable generation and integration, and a continued focus on local distribution infrastructure and services will depend on utility-specific factors like policy and regulatory priorities, customer demographics and preferences, and of course the local generation mix and price of electricity. All are important strategic considerations going forward, and will continue to play a key role in a multipronged strategy for most utility stakeholders.

While previous years' surveys consistently pointed to the regulatory environment as a primary inhibitor preventing utilities from investing in new business models, this year's survey showed the utilities' own risk-averse culture, 46 percent, as the biggest hurdle.

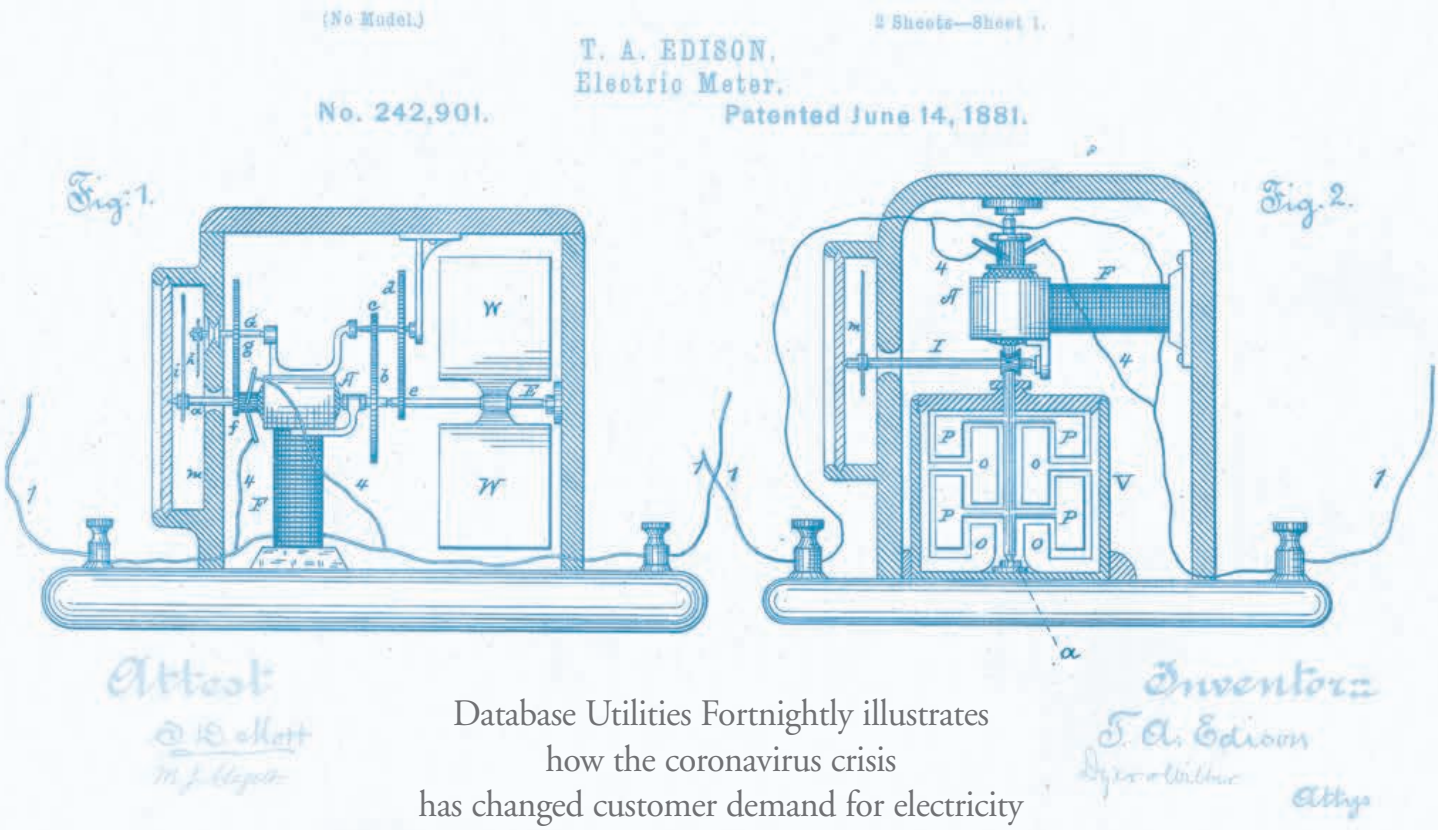
Although the immaturity of new business models is a slight concern, 19 percent, sentiment across the industry is still focused on more structural barriers to innovation like restrictive regulations and utility operating culture. This finding suggests an opportunity for regulators and utilities to partner to co-create a more ambitious future vision for the industry.

In closing, we see the energy transformation accelerating. These survey results confirm that utilities are challenged in several parts of their business.

But we see utilities embracing the change and taking a leadership role in many areas. We are just at the beginning. But the opportunity to create new customer and shareholder value is there.

And it's up to utilities to find pathways to unlock this value, while providing safe, reliable, and affordable energy to the communities and customers they serve. Not an easy task, but utilities seem to be better prepared for it then even a year ago. PUF

Flattening the Curve, that is, the Load Duration Curve



Database Utilities Fortnightly illustrates how the coronavirus crisis has changed customer demand for electricity

We did this for thirty-seven different control areas and utility service territories. What is it that we did?

For each one of them, the Public Utilities Fortnightly team plotted their load duration curves during the four fortnights, that is, the eight weeks, from the first of April – when social distancing generally became the practice nationally – through the twenty-sixth of May. So, each of these load duration curves was based on thirteen hundred and forty-four hourly megawatt-hour values of customer demand for electricity.

And then, we compared these load duration curves to their curves during the same four fortnight period last year, in 2019 (the first of April through the twenty-sixth of May of last year). Comparing the 2020 load duration curves to the 2019 load duration curves allowed us to check out the changes brought on by the coronavirus crisis and its consequences for customer demand.

The results were truly remarkable. In the most affected parts of the country, the load duration curves have significantly flattened, reflecting the present situation in which so many people are staying at home rather than spending weekdays nine-to-five at work places.

The following pages give you a taste of the results. There you'll find the load duration curves for the first of April through May twenty-sixth of 2019 and 2020 for eight selected utility service territories. These are among the service territories in which the load duration curve has been most impacted by the coronavirus crisis.

As illustrated below, the load duration curves of Baltimore Gas and Electric, Con Edison's New York City area, Dominion Virginia Power, Duke Energy's Progress East area, PECO Energy, Pennsylvania Power and Light, Public Service Electric and Gas, and Santee Cooper have significantly flattened this year from last year. This flattening can be captured in the commonly-used statistic in electricity end-use analysis called the load factor.

The load factor is simply the average of all the hourly megawatt-hour values of customer demand during the period studied, divided by the highest (or peak) value of customer demand during the period. Thus, a load duration curve with a low load factor suggests customer demand is relatively variable and peaked. Conversely, a load duration curve with a high load factor suggests customer demand is relatively consistent and not particularly peaked. Such a pattern of customer demand is typically more economical for a utility to serve.

For example, the load factor of Baltimore Gas and Electric went from 60 percent during the four fortnight period in 2019 to 71.4 percent during the same period in 2020. Similarly, the load factor of Dominion Virginia Power went from 62.4 percent during the four fortnight period in 2019 to 74.1 percent during the same period in 2020.

The load duration curves have significantly flattened, reflecting that so many people are staying at home rather than spending weekdays 9-to-5 at work places.

At these two and the other six selected utility service territories, as implied by the increased load factors, the load duration curves for the period this year are clearly flatter than last year. In these parts of the country and in many of the most-affected areas by the coronavirus crisis, the change in commercial and industrial customer demand is quite prominently represented by the load duration curve and the load factor statistic.

Fig. 1 **Baltimore Gas and Electric**

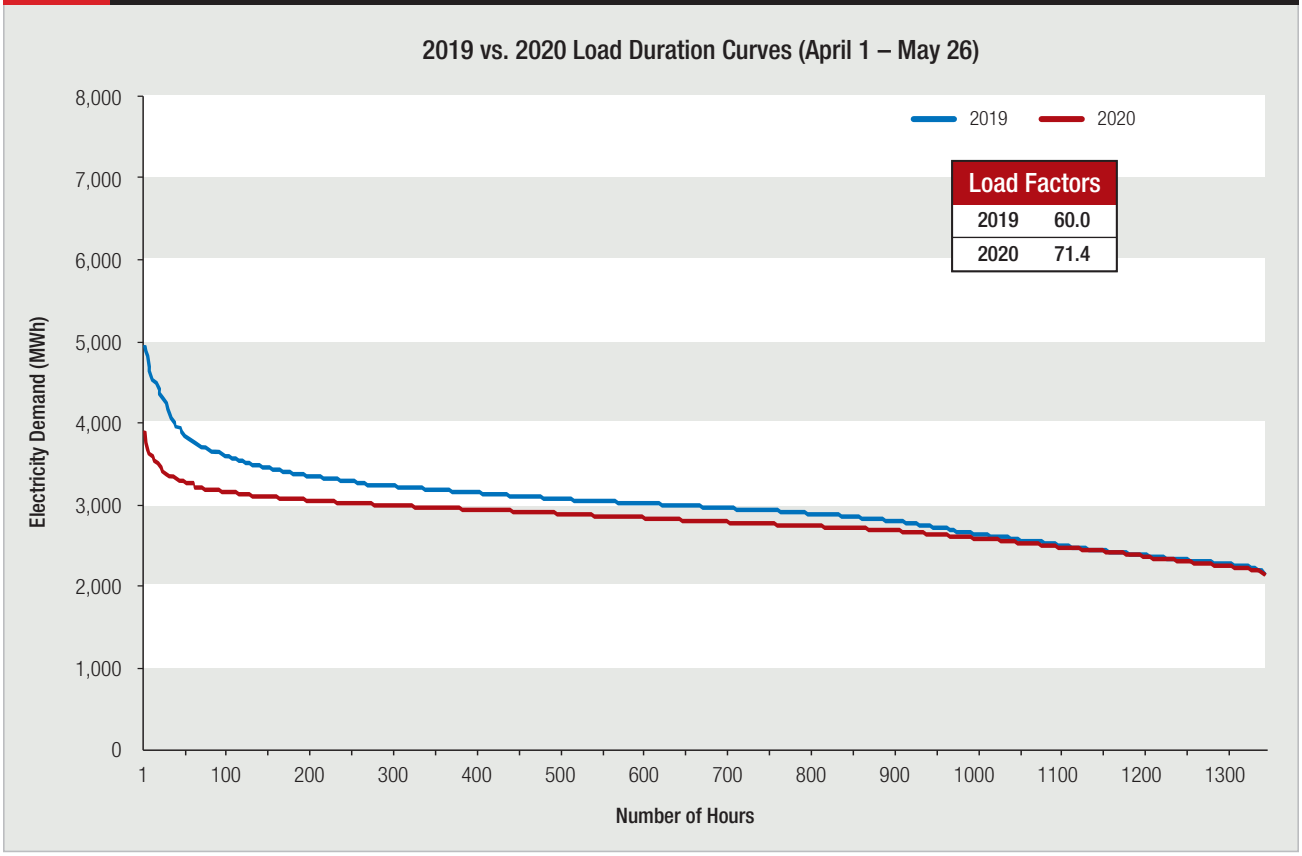


Fig. 2 **Con Edison's New York City area**

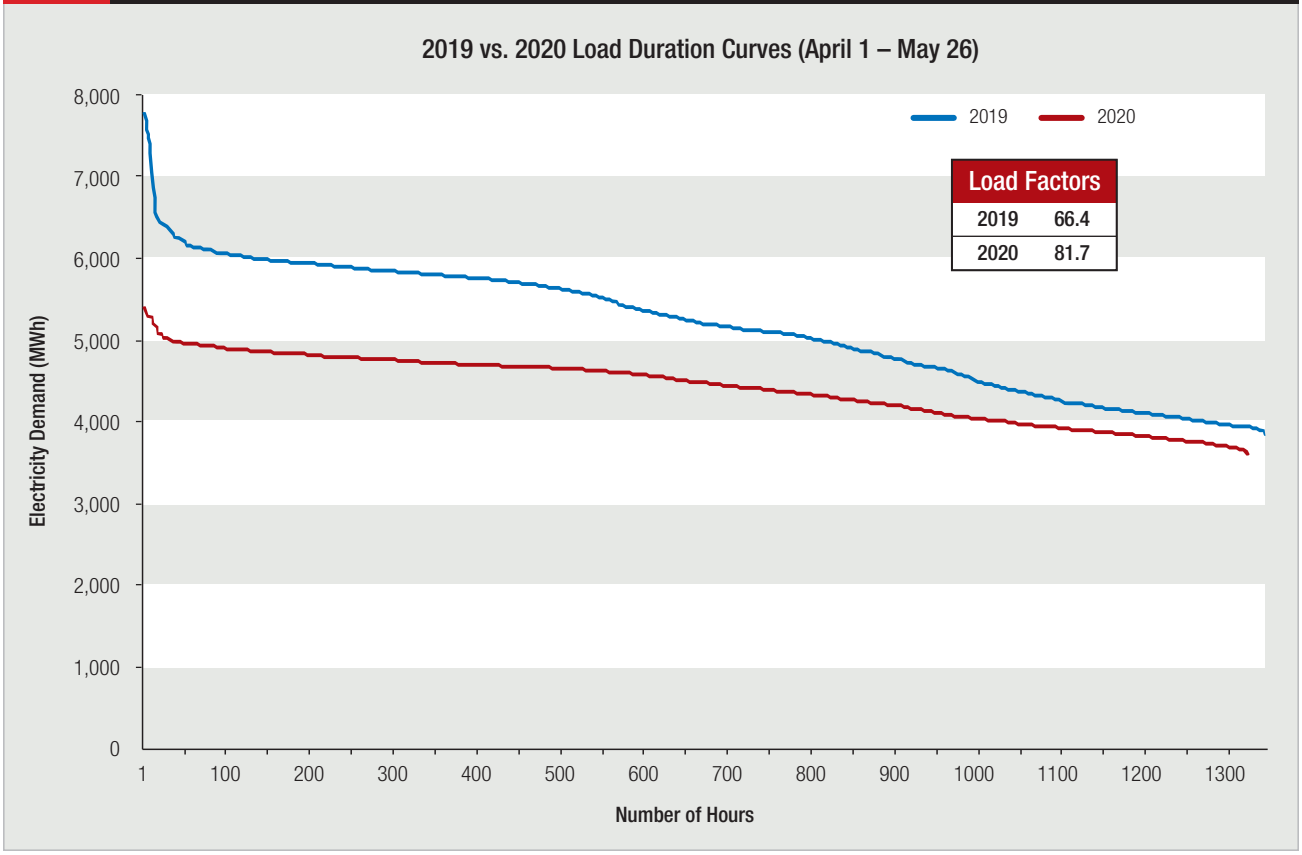


Fig. 3 **Dominion Virginia Power**

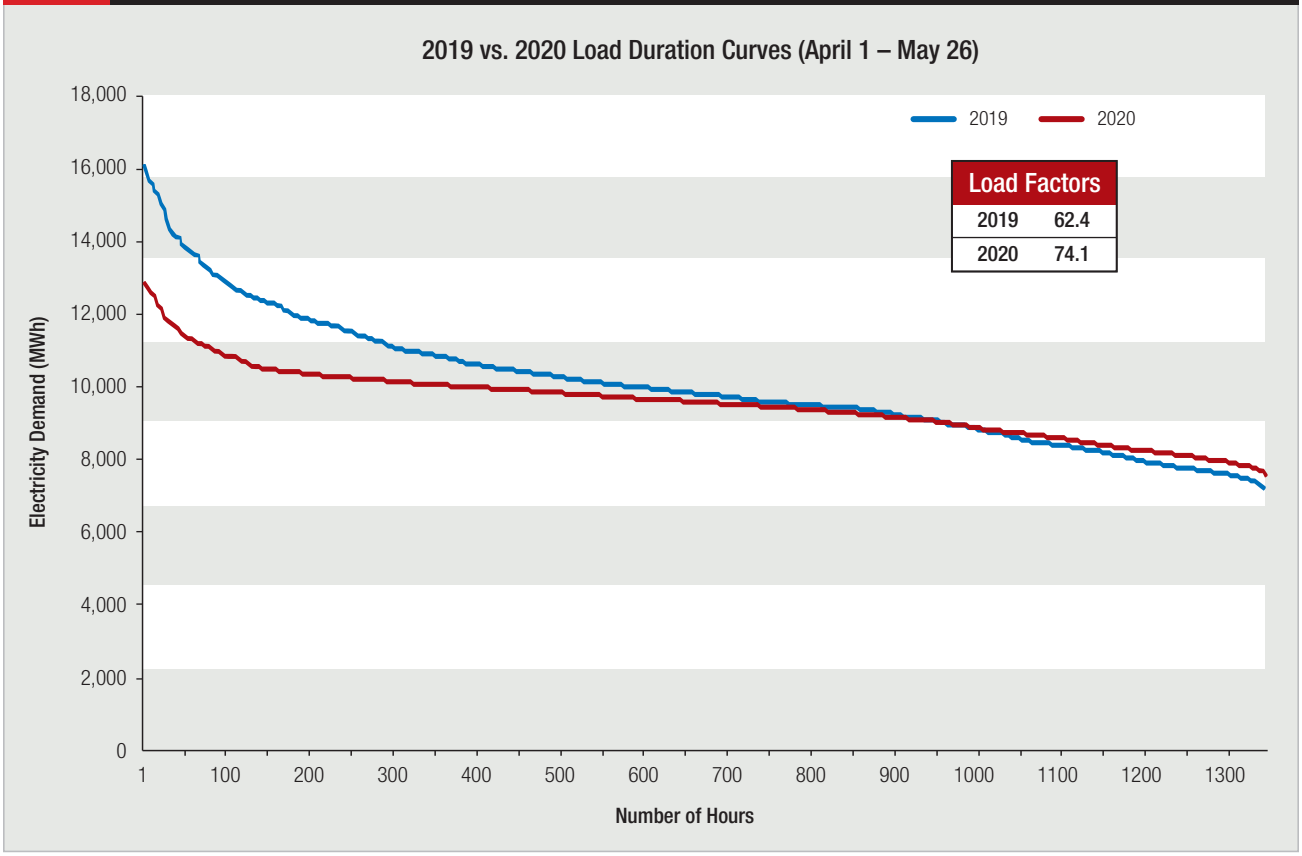


Fig. 4 **Duke Energy's Progress East area**

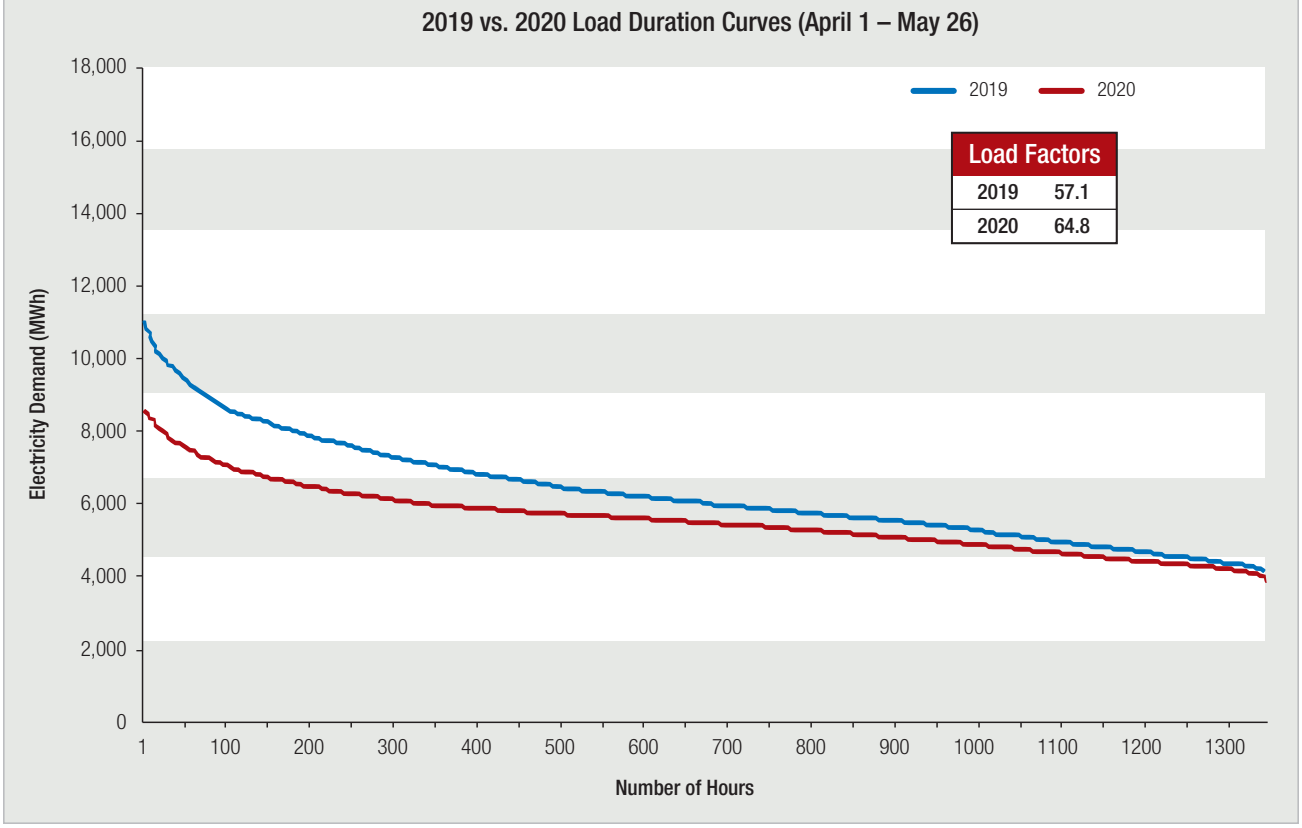


Fig. 5 **PECO Energy**

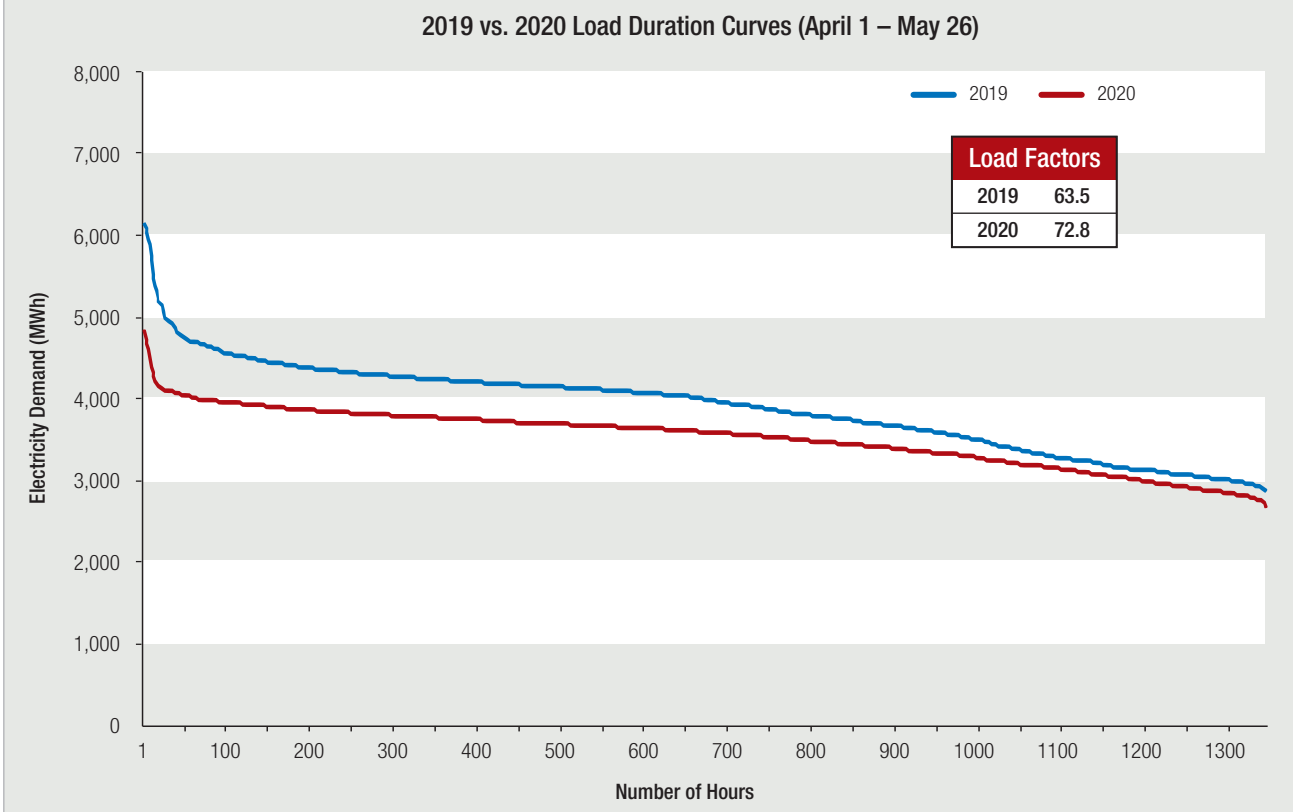


Fig. 6 **Pennsylvania Power and Light**

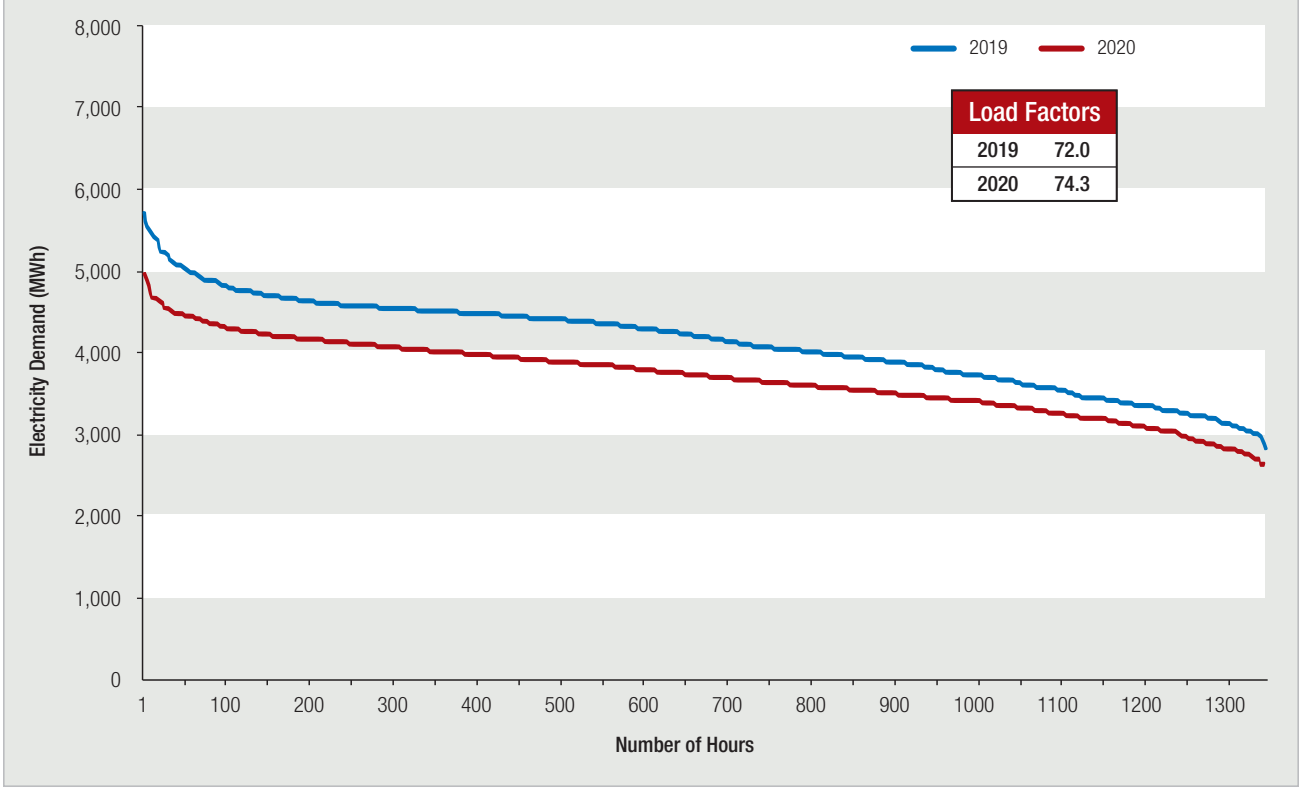


Fig. 7 **Public Service Electric and Gas**

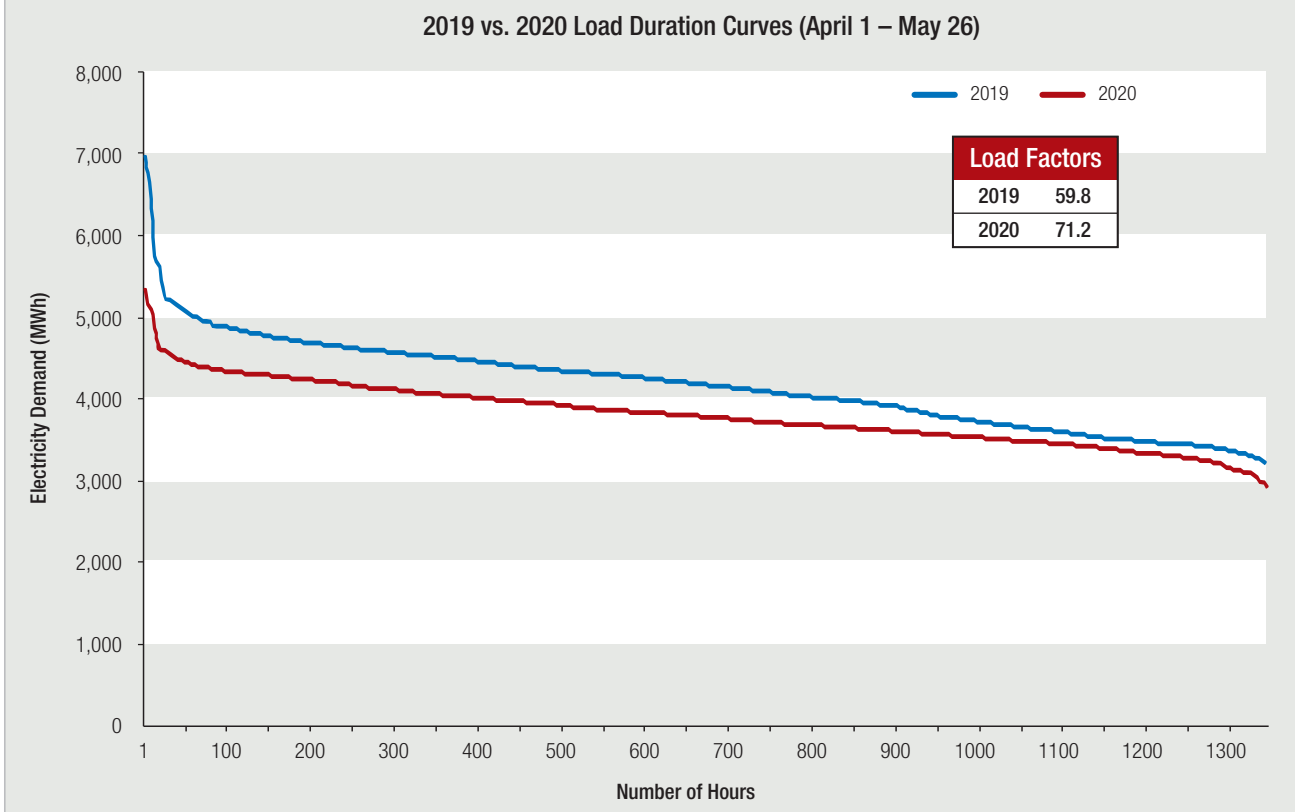
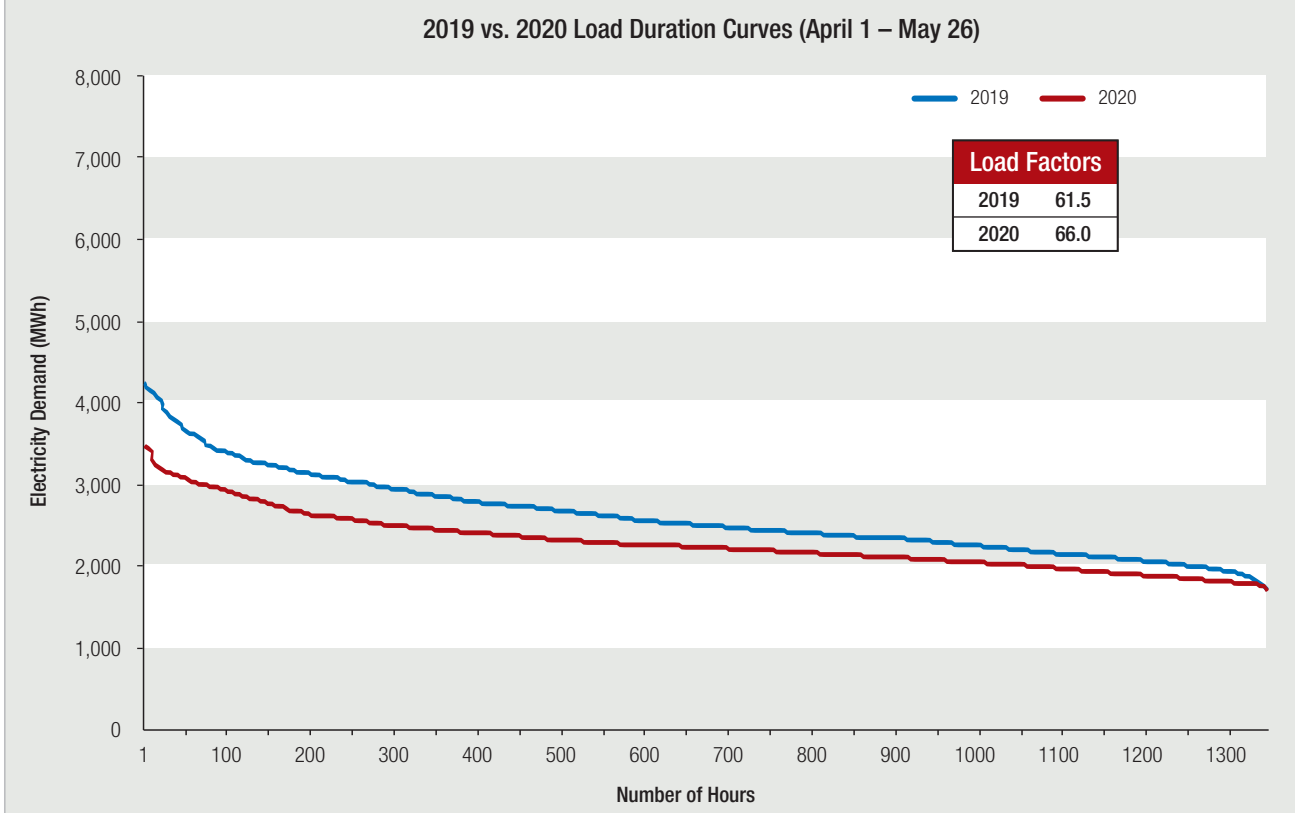


Fig. 8 **Santee Cooper**



(Cont. from p. 12)

environment and the ability to use lots of resources at the load side, it is software, AI, automation, and digital technology.

Those are going to be accelerated in the environment we find ourselves in, where we want to do more electrification for a variety of risk factors, with climate being one of them. It will be the ability to be confident in knowing that will be available when I need it.

With resiliency, everyone is going to look at whether they had plans or not before this. This is a risk shock to most organizations, and some will survive this, but many won't. Many will not come back from it, but those who do will be looking at the plans saying, what do I have to do to be a more resilient organization?

How do I ensure my resiliency, not just for pandemic risks, but other risks? The utility is in an interesting position to help on both those fronts. Electrification and decarbonization are on one side and a resiliency and more risk aware organization are on the other side.

That's providing a lot of, at least electric, infrastructure that allows for a more resilient supply to our customers or to segments of customers that would like it. In 2025, we'd have more of that than we would normally because they're accelerated by these things.

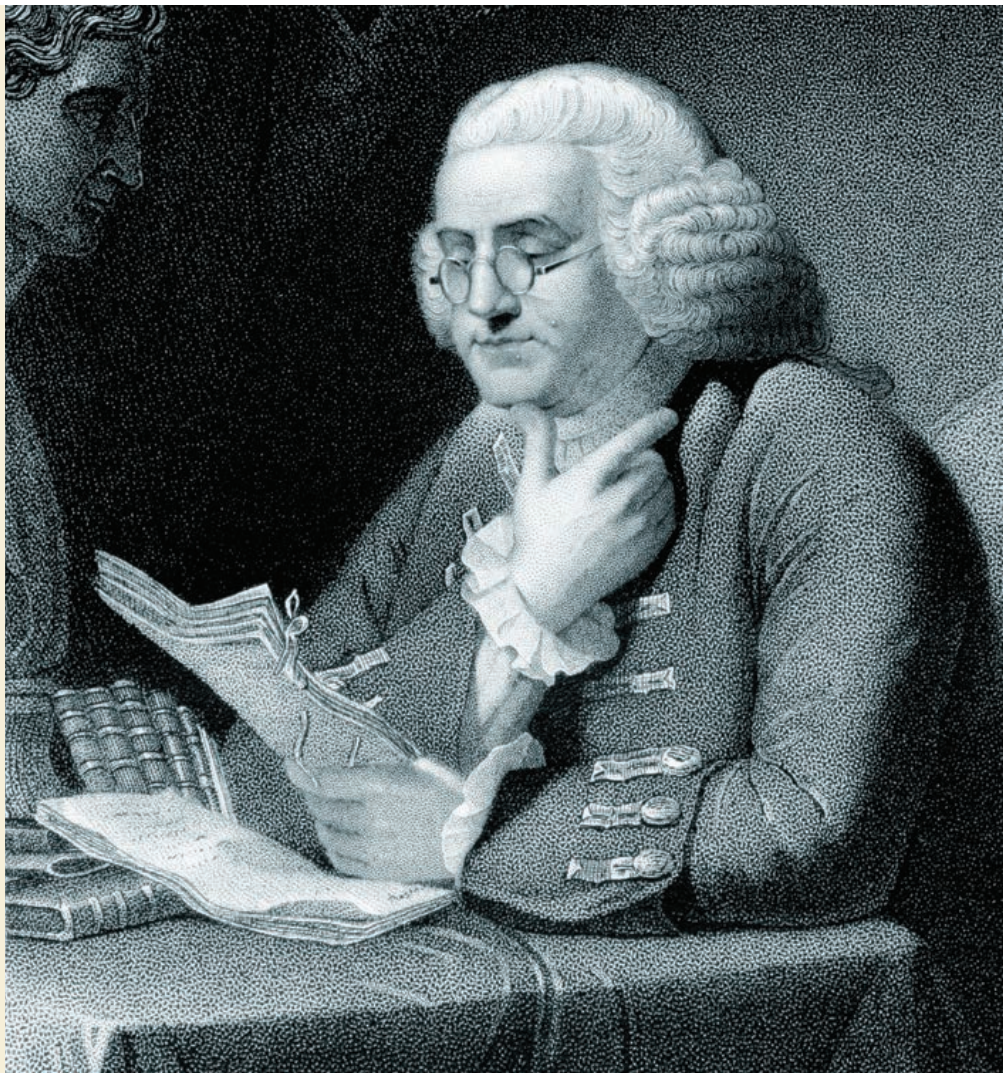
Electricity use will spread out into areas where we've never been.

– Keith Dennis

But the low gasoline prices may slow the rollout of customer EVs. Maybe fleets and transit vehicles will electrify, but maybe other things will go slower because people who were making the calculation based on the price of gas tend to wait.

There may be a deceleration on some things, but over time we'll get back to where we are now, and we'll make progress in other areas related to electrification and resiliency. PUF

This special issue of Public Utilities Fortnightly is being published on the fifteenth of June, which of course is a gigantic day in the utility regulation and policy community. The fifteenth of June is obviously the anniversary of electricity's discovery by Ben Franklin. On this day in 1752, twenty-four years before the Declaration of Independence, Ben literally flew a kite in a Philadelphia storm and captured electricity, charging a Leyden Jar, verifying that lightning and electricity were similar. Do not try that at home by the way, lest you become a lightning rod, literally.



PUBLIC UTILITIES FORTNIGHTLY

Impact the Debate

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Advertising Index

Veteran Leaders on Electric Trends

(Cont. from p. 33)

PUF: During the pandemic, many people worked from home. Will this be a trend in the industry? If, yes, what are its implications?

Jeff Morris: Yes. One of the lessons from the great recession was with automation many businesses did not need the size of work force they previously carried. The profitable but jobless recovery demonstrated that.

The lesson of this non-economic recession will be we didn't need all that building space. The telecommuting work force uses less energy, is less carbon intense, and has less risk to liability.

We will also see less pressure to build more and more commute infrastructure, which will reduce transportation taxes and allow more resources on what infrastructure we will need like backhaul fiber, better air handling in human congestion points, and telemedicine.

PUF: What will determine the future of renewable energy – Economics? Public opinion? Regulatory environment? Technological advances? Transmission development? Other?

Jeff Morris: A colleague wrote a blog about the movie, Current Wars, pointing out we are seeing the devolution of Westinghouse to the model envisioned by Edison before our eyes today.

I agree.

Only a handful of utility CEOs are seeing the demise of hardware as a revenue source and the onset of software and transactions as the new business model. The future of renewables is in price, location, and time.

Many customers today are looking at their electric bills and seeing that the cost of electricity is a very small percentage of their electric bills. Why should I pay for electricity that costs me more if I provide it myself?

The grid defection rate in Hawaii, TV shows on the ease of building off the grid, and savvy utilities offering their own disconnected product or rates and pilots based on a sharing economy are showing the future of renewable energy.

The lesson of this non-economic recession will be we didn't need all that building space. The telecommuting work force uses less energy, is less carbon intense, and has less risk to liability.

PUF: Will the pandemic's impact lead to more distributed generation and/or better utility-customer and customer-customer interactions? If yes, how?

Jeff Morris: This is a tipping point. Utilities with their head in the sand start to push more hardware out to substations that serve residential load.

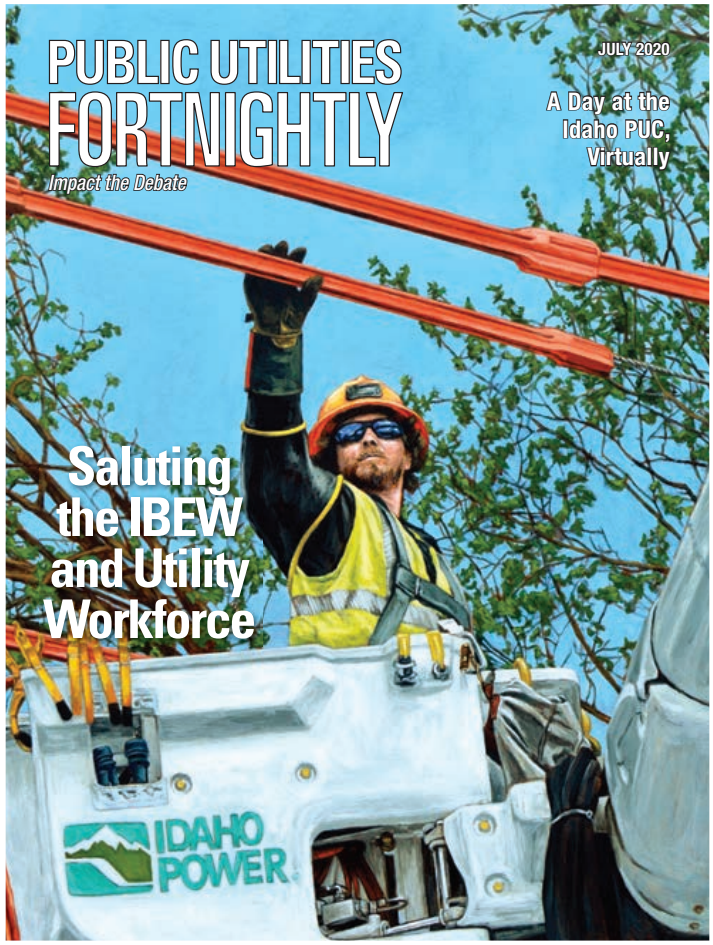
This will result in increased rates and more separation in the cost spread to self-generate, store, and manage my own electrification. Many microgrid owners are seeing the only benefit to connect to the grid is that if they get paid for providing benefits.

Utilities that have digitized their distribution system, in particular their circuits, are seeing a larger value in the relationship between themselves and customers on the circuit level. Less dense utilities are seeing they need to offer their own disconnected DERs or lose customers.

PUF: The current federal Administration has relaxed regulatory and environmental rules regarding fossil fuel emissions. Will electric utilities change their strategic and operational plans in response? Please explain.

Jeff Morris: No. The last administration tightened rules and when they were changed utilities didn't change their plans because customers, not government, were telling them what they wanted. PUF

Four fortnights – eight weeks – since the country adopted social distancing in the main, the electric industry has been decisively impacted. Through the twenty-sixth of May, the period from the first of April has seen a 6.2% decrease in electric sales in the continental U.S., year-over-year. And, during these last eight weeks, coal plants have generated 33.7% less. And, coal plants during the last eight weeks have generated just 15.4% of total grid generation. While zero-emission plants generated 45.1%. And, carbon dioxide emissions are down by 19.2%. So, carbon intensity during the period of the first of April through the twenty-sixth of May is down to 0.69 pounds of emissions per kilowatt-hour, from 0.79% in the same period of 2019.



Coming Next Month in July's Public Utilities Fortnightly

Saluting the IBEW and Utility Workforce

A Day at the Idaho PUC, Virtually

Illustration by Paul Kjellander

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