

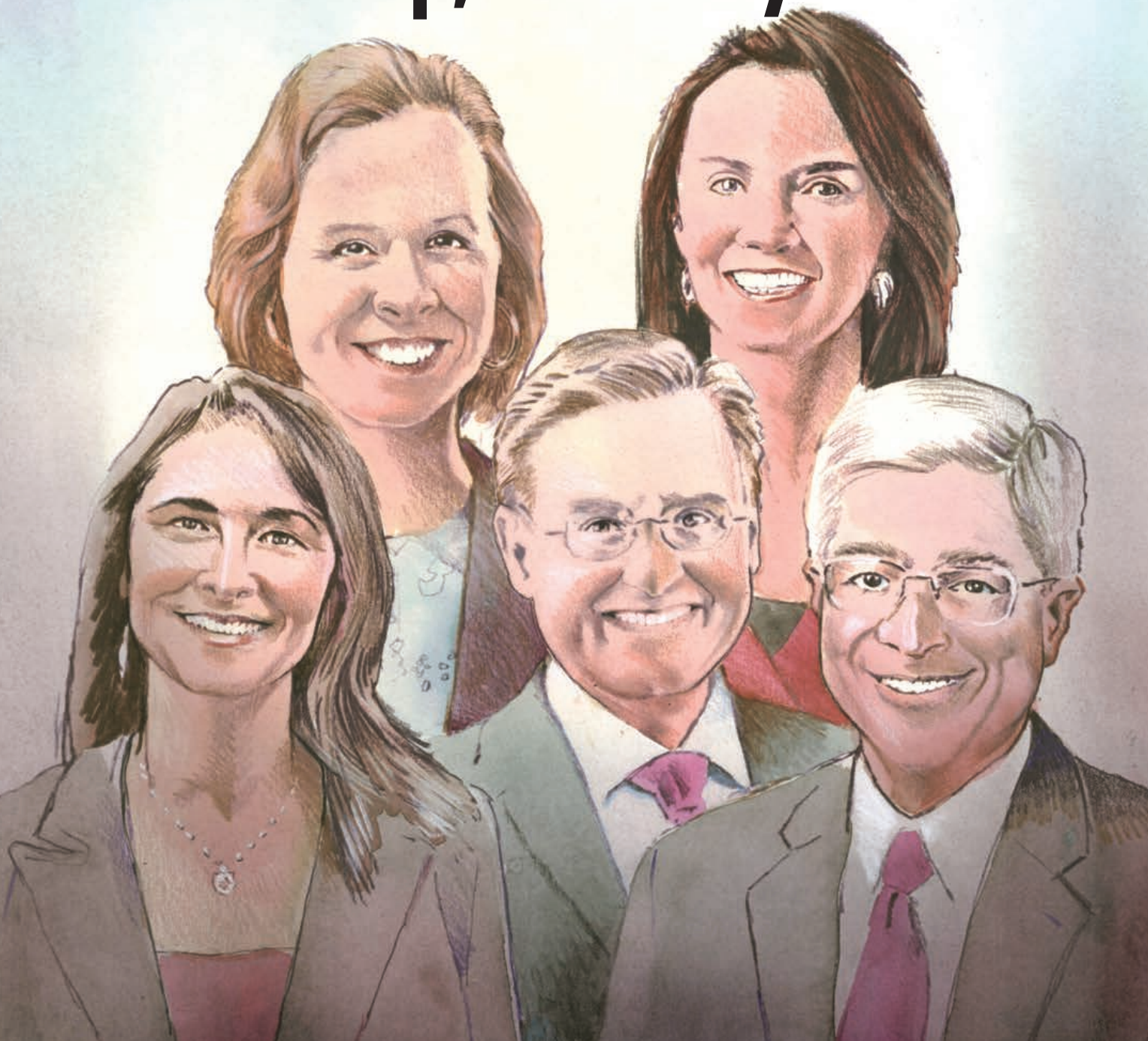
PUBLIC UTILITIES FORTNIGHTLY

Impact the Debate

NOVEMBER 9, 2020

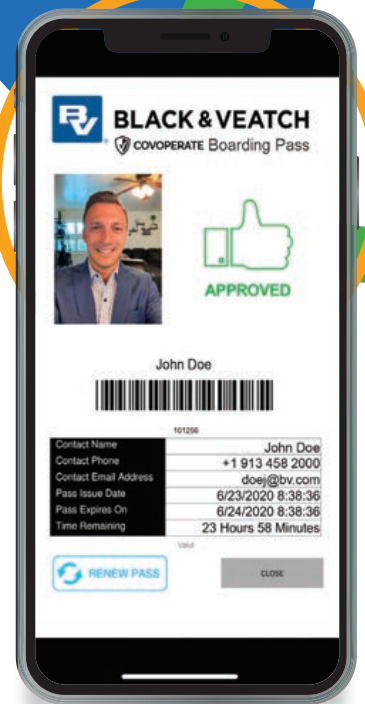
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Front cover drawing by PUF artist Dennis Auth of five senior utility leaders featured in this issue, from left to right, Jacqueline Trapp, Edison International's Chief Human Resources Officer, Debra Smith, Seattle City Light's CEO, Marty Lyons, Ameren Missouri's President, Kim Greene, Southern Company Gas' CEO, Pedro Pizarro, Edison International's CEO.

EPRI's Electrification Summit, From Cyberspace

Head Spinning, Wistful, Hopeful

BY LORI BURKHART

The Electric Power Research Institute amazes me. I've been fortunate to get a behind the scenes look at some of their research facilities, hard hat included, that few are privy too, but were chronicled in these pages of PUF. So, our readers were fortunate too. Because EPRI does incredible work in the public interest benefitting all member utilities and customers.

I also was fortunate to travel with the PUF team to Long Beach, California for EPRI's Electrification 2018 and what an incredible conference that was. That was also recorded in PUF.

I must admit that while the end of October brought another fabulous event, EPRI's Electrification Virtual Summit, chock full of the latest intelligence and greatest speakers, also related in these pages in this issue, while it could make your head spin, it left me feeling wistful.

That's because amidst the pandemic, I miss seeing these incredibly intelligent people in person. Don't you? Anyone out there suffering from Zoom fatigue? Miss seeing everyone up close and personal?

There is hope. EPRI anticipates holding the Electrification 2021 International Conference and Exposition at the Charlotte Convention Center May 3-6, 2021. That would be a normal, in-person event, lest you all have forgotten what that is. I can't wait.

While EPRI leads the way, lots is going on in the industry in the march toward cleaner air. PUF brings you top leaders in this issue on how they are taking their utilities on the decarbonization path.

Ameren recently committed to achieve net zero carbon emissions by

the year 2050. It was included in Ameren Missouri's fifteen year integrated resource plan filed at the Missouri Public Service Commission.

PUF talked with Marty Lyons, Ameren Missouri's president to find out more, as utilities in the Midwest are somewhat known for relying on coal-fired generation for the affordability and reliability of their electric service. You don't want to miss this fascinating discussion.

PUF had a conversation with Southern Company Gas CEO, Kim Greene, on her perspectives and tangible actions the company is taking to meet decarbonization and customers' decarbonization goals. The dialogue is useful as you think about how you are helping your customers meet similar goals in the future. PUF's editor-in-chief Steve Mitnick engaged with Dan Hahn from Guidehouse for this colloquy.



EPRI anticipates holding the Electrification 2021 International Conference and Exposition at the Charlotte Convention Center May 3-6, 2021.

We take a fascinating look at what is going on in Seattle with Debra Smith, GM and CEO of Seattle City Light, who gives an unflinchingly honest view of what it is like to be a leader in uneasy times. Smith has much to say about integrity in the workplace, social reckoning, and urban recovery. Truly a talk not to be missed.

The United States Energy Association had much going on recently. Still reeling from the loss of executive director Barry Worthington, the Association had to find a way to move on. Although not an easy time, PUF brings you a look back and ahead with acting executive director Sheila Hollis. Fortunately for USEA, she brings a wealth of knowledge and a steady hand to guide the way forward.

Lori Burkhardt is the Managing Editor of Public Utilities Fortnightly.



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But there is more happening with USEA, which held its Advanced Energy Technology Forum, and the PUF team listened in to bring readers meaningful moments. We found them with EPRI's president, Arshad Mansoor and ENGIE's Michael Webber.

And there is more of EPRI from Charlotte, partnered with DOE, as U.S. Energy Secretary Dan Brouillette announced a sixty-five million dollar DOE funding opportunity for technologies that allows energy-efficient buildings to interact with each other and the electric grid, to reduce emissions and improve grid flexibility. It was a beautiful day, as everyone, masked and socially distanced, took part in the ceremony. We have photos.

PUF readers know we love our Public Utility Commissions. So, we were quite pleased to say yes, when our neighbor to the north, the Alberta Utilities Commission, asked us for a


Because of innovation, and because of new technologies, there is a need for rethinking the workforce. The Alberta Utilities Commission talks about the issues with an evolving workforce to

Seek out the questions asked by the Alberta Utilities Commission in the sidebar called AUC Asks! Their contact information is listed so please respond and start a dialogue.

favor. The AUC asked PUF for help engaging all of you, our readers, to help understand what the employee of tomorrow will look like and what changing times mean for the employee of today.

In these pages we ask for your help.

keep up with the changes they are seeing as utilities become more innovative.

Seek out the questions asked by the Alberta Utilities Commission in the sidebar called AUC Asks! Their contact information is listed so please respond and start a dialogue. 

Lori Burkhardt



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EPRI's Electrification Virtual Summit

Conversation with EPRI's Director for Research and Development,
Neva Espinoza

Plentiful Plenaries

Monday: A Progress Report

Tuesday: Decarbonizing Heavy Industries

Wednesday: Electric Mobility

Thursday: Building a More Resilient System

Friday: Community Electrification



he Electric Power Research Institute, EPRI as it is fondly known in the industry, held its Electrification Virtual Summit at the end of October. The PUF team was there, holding on to memories of the amazing Electrification 2018 held in Long Beach, with actual people in attendance. It was all good, this virtual Summit, as it built on what was started in California.

Here, PUF brings you a taste of the Electrification Virtual Summit, with excerpts from plenary sessions held each day. But first PUF talks to a rising star at EPRI, Neva Espinoza, who knows so much about electrification and decarbonization that we are sure you will be seeing more of her in these pages.

The PUF team was ready to attend the cancelled Electrification 2020 in Charlotte this past April, which was quite disappointing. But the PUF team is heartened to hear EPRI will indeed be holding its Electrification 2021 International Conference and Exposition at the Charlotte Convention Center on May 3-6, 2021. Mark your calendars.

Neva Espinoza

EPRI's Director for Research and Development

PUF's Steve Mitnick: You are one of the leaders of the Electrification Virtual Conference and you headed one of the key sessions. Why was that such an important session?

Neva Espinoza: The session I led during the Electrification Conference is called Going the Last Mile: Decarbonizing Our Heavy Industry. What we've seen, and what we continue to see, is so much success and a lot of investment in the electrification of transportation, and electrification of buildings, both commercial and residential.

Looking at the overall decarbonization picture, at deep decarbonization economy-wide, which means greater than eighty percent decarbonization across the economy, about three percent of end-use applications are not necessarily suited for what we're calling direct electrification.

Those are things like shipping, heavy industry, petrochemical, and even our gas turbine fleets. Our gas turbine fleet provides a huge amount of power to our grid today. Natural gas is a huge contributor.

How do you decarbonize those parts of the economy that tend to be carbon intense and aren't necessarily as easily – not that electrification is easy, because it's not – but not as well-suited for that electrification pathway? How do you address that across the economy?

PUF: How do we address that?

Neva Espinoza: EPRI has launched a collaborative R&D project called the Low-Carbon Resources Initiative, or the LCRI. We partnered with GTI, the Gas Technology Institute, in that effort.

When you think about the traditional electric sector, you've got a generation fleet and we are lowering the carbon intensity of that generation fleet year over year, with thirty percent reduction

When you think about the whole shipping industry burning clean fuels, what's the infrastructure that's needed on land in order to enable that?

of carbon intensity from 2005 to 2020 across the U.S. fleet. We see reasonable forecasts of getting to fifty percent less carbon by 2030.

You have a generation fleet that is lowering carbon over time, and you are providing electricity to an integrated grid. On that grid, you have a variety of flexible resources. Flexible resources come from numerous places.

You also have pumped-storage hydro. We've built out batteries. We have other alternate energy storage capabilities. Then we have things like demand response. All of these add flexibility to the grid. Then we take that grid in an integrated way and we electrify different parts of the economy.

When you think about the forty percent of the economy that is carbon intense, how do you connect those parts of the economy to the electric grid as well? We're proposing something that many people call power-to-gas. The idea is you're using electricity to create molecules, and, if you use clean electricity then you get clean molecules. Then you take those molecules as fuel and use that fuel in those other pieces of the economy.

PUF: Forty percent of the economy is more difficult to electrify. One of the speakers was with Maersk. How does Maersk fit in?

Neva Espinoza: Maersk is a company whose business is shipping across vast oceans. They use carbon as a fuel to do that. Maersk has set a goal to be carbon neutral by 2050.



We can store energy beyond space and time. Natural gas is a fuel, but also an energy storage mechanism. How can we use other fuels in more integrated systems?

It's going to take technology change to do it. Maersk is looking at alternative fuels, low-carbon fuel, in order to power its shipping fleets.

Bo Cerup-Simonson is running the Maersk Mc-Kinney Møller Center for Zero Carbon Shipping, a new innovation hub in Copenhagen. They're in the process of setting that up, which is all about hydrogen innovation and what that looks like for their business model.

There are core challenges for the shipping industry, more on land than at sea, meaning technologies are available and/or in development that will enable them to burn clean fuels.

But when you think about the whole shipping industry burning clean fuels, what's the infrastructure that's needed on land in order to enable that? How are those fuels going to be created?

There aren't clean fuels sitting there waiting to be used. If there were, we'd be using them. You essentially have to make clean fuel. How do you do that? There are a number of ways, but those land challenges are something that Maersk is looking

at and trying to address as part of this overall plan.

PUF: At the LCRI kickoff, Paul Browning from Mitsubishi was one of the stars. Why is he such a leader in this clean molecule endeavor?

Neva Espinoza: Mitsubishi Power was the first OEM anchor sponsor of the LCRI, and there are various reasons, but mainly his vision for the future. You could listen to him for hours. But he is looking at how he can enable gas-driven fleets to move to low-carbon fuels in the future economy.

There are many technologies in development. You've probably seen several announcements come out recently, with Mitsubishi partnering with multiple stakeholders.

The most recent announcement was the partnership between Mitsubishi Power and Entergy, looking at how can we not just blend fuels in gas turbines to reduce overall emissions and carbon dioxide, but completely shift to maybe one hundred percent clean fuel in these machines.

Beyond that, Mitsubishi is looking at storage capabilities. One of these benefits when you think of a more integrated energy network is flexible resources that are on the U.S. grid today.

If we are going to be integrating energy systems – electricity and molecules – you may have the capability to add a significant amount of flexibility in terms of long-term storage on those energy systems. Things like hydrogen, ammonia, synthetic fuels, et cetera, are essentially energy. They hold the energy in them.

We can store energy beyond space and time. It's similar to what natural gas is right now. Natural gas is a fuel, but it's also an energy storage mechanism. How can we use other fuels as well in more integrated systems to do that?

PUF: That's a powerful thought because we think of the need to store energy and use it, maybe the same day or weeks later, and we are always thinking of batteries or pumped hydro, not necessarily a fuel.

Neva Espinoza: It's an exciting idea. You see a lot of investment in places like Europe, around that, because depending on the climate and the region you're in, there are different ways you may be looking at low-carbon goals.

For some climates and regions of the world, direct electrification of heating is without a doubt the best approach. In other places, like in the U.K., for example, that may not be the case – it is a winter peaking system – with space heating accounting for forty percent of energy consumption and representing twenty percent of their GHG emissions.

If you were going to directly electrify all of that, you would almost have to essentially double your capacity of electricity, which would require a lot of new infrastructure. You have to weigh the pros and cons. Things like low-carbon resources, or a hybrid solution, potentially add an alternate solution to address those types of challenges.

PUF: Mitsubishi's Paul Browning was saying at the LCRI

session, the Intermountain Power Project in the Pacific Northwest is going forward. You mentioned a project with Entergy.

Neva Espinoza: Exactly. Mitsubishi is out there doing things. Mitsubishi is putting metal on the ground, and understanding technology cost, performance, best practices, lessons learned, overcoming technical challenges and barriers.

That's one of the reasons that Mitsubishi Power has joined LCRI because they understand the value of this collective knowledge and the value of getting these types of demonstration moving forward.

On top of the technical challenges and hurdles that are real and that we have to address, there are also the perception hurdles that we need to address. Can you do this safely? Can you do this reliably? Can you do this affordably? Some of the best ways to address those types of hurdles are to go and do it and do it safely, affordably, and reliably, and then improve it over time.

PUF: From the Department of Energy, Michael Berube, talked on sustainable transportation. Talk about that.

Neva Espinoza: He's from the Department of Energy, from

Chemical energy storage is part of that conversation. There's a lot of work looking at hydrogen and beyond in the DOE.

Chemical energy storage is part of that conversation. There's a lot of work looking at hydrogen and beyond in the DOE. Part of that has existed for a long time. It's fuel cell work, but that's even expanding as time goes on beyond fuel cells.

Michael gave perspective on how the Department of Energy sees the role for low-carbon resources and what we may expect to see out of the government in the coming months and years in the space. **PUF**

EERE. The Department of Energy has been putting a lot of focus as of late around low-carbon resources, and several RFIs have come out. There has been a large concentrated effort collaboratively across the different offices of the Department of Energy around the energy storage brand challenge.

A Progress Report

2020 is a year of necessary progress in almost inconceivably difficult times. In spite of unforeseen challenges, the electricity system continues to evolve, and customers have ever-increasing choices to adopt clean energy technologies.

To open the conference, moderator Arshad Mansoor, EPRI president, led a panel with Pedro Pizarro CEO, Edison International, and Debra Smith CEO, Seattle City Light, looking ahead at what electrification will bring.

EPRI's Arshad Mansoor: I'm going to ask you, what do you see? Not just the progress report in this challenging year, but what has been the progress since we met in Long Beach?

While we are going through this pandemic, we are still working on electrification. We are still working on the things that are important for us, for our communities and for our society.

What we have is two of the industry leaders of energy companies. They're leading the charge in their communities for a clean energy transition and we'll hear from them on their progress.

Edison International's Pedro Pizarro: We see three quarters of passenger vehicles needing to be electric by 2045. The glide slope that we calculated is in line with the executive order that our governor issued a few weeks ago, calling for all new passenger vehicles sold to be zero fuel. A lot of that will be electric by 2035.

We calculated from an affordability perspective, the total energy bill for the average customer will be one third lower in real terms in 2045 than it is today. The electric bill may be higher



While we are going through this pandemic, we are still working on electrification.

— Arshad Mansoor

because they're using more electricity, but they'll be using less gasoline, maybe none. They'll be using less natural gas.

We see the California economy needing a significant investment, something like one hundred seventy-five billion dollars for clean energy resources and seventy-five billion dollars to bolster the grid in order to be able to move that power around

with a sixty percent load increase across the economy in order to repower the economy.

I mentioned the governor's executive order in the electric vehicle space. We've seen significant traction already where our Public Utilities Commission has provided support for over eight hundred million dollars in programs just for our utility.

The most recent of these is a four hundred and thirty million dollar approval for our charge ready program that will help deploy thirty-eight thousand chargers across southern California over the next four or five years. That can't be something that's helping us. This needs to help every community. Bringing along all communities, including the disadvantaged in low-income communities is critical.

Out of that four hundred-plus million dollars, over two-hundred million is targeted toward multiple unit dwellings and low income and disadvantaged communities because that transition needs to be equitable for all.

Seattle City Light's Debra Smith: Long before I joined City Light, they had an aggressive goal at the time. The city had a goal of putting in twenty City Light owned charging stations. We've been somewhat slow in doing that. I sometimes think that's a good thing.

The private sector, certainly Volkswagen and others have done a great job of coming in and seeding from a private funding perspective, the growth of that infrastructure, at least in the City



At City Light, we are focusing electrification on public transportation.

– Debra Smith

of Seattle. We have not made it easy for them.

We have struggled to make it easy for the private sector to come in and invest money in our community.

An example is, we got through city council, a change that got rid of what has become archaic, the one site, one service rule that made it challenging for folks to come put in a privately owned infrastructure at a strip mall or at a Target, which is what folks want.

What we've done is by slowing, we have the opportunity then to use public funding to fill in the gaps. How do we ensure that adequate infrastructure is there for folks who need it or who are in underserved areas?

That to me is the role of the public sector. That's where, as a public utility, I have the opportunity to come along and use my funds appropriately.

At City Light, we are focusing electrification on public transportation. We're working with the primary provider, Metro, on buses. They are committed. Even with COVID, they are as committed to transforming their fleet into an all-electric fleet.

We've been working to partner in building their first electric base. They came to us and said, can you help us? You know more about this than we do. We saw that as a great opportunity to move out of our traditional space and offer help and consulting services.

We're working with Washington State Ferries. We're working with the port, the cruise ship industry, which has taken a huge hit with COVID. This provides an opportunity for us to do some of the electrification where at the port side, many of these big ships have been doing it themselves. ○



A \$430 million approval for our charge ready program will help deploy 38,000 chargers across southern California. Bringing along low-income communities is critical.

– Pedro Pizarro

Decarbonizing Heavy Industries

As we decarbonize, changes will be needed. Many of our industries, including steel, cement, fertilizer, and air and sea travel, will need additional options for electricity, including hydrogen, ammonia, synthetic fuels and other low-carbon resources.

Moderated by Neva Espinoza, EPRI's director of research and development, the panel included Bo Cerup-Simonsen, executive technical advisor, fleet management & technology, Maersk, Paul Browning, CEO, Mitsubishi Power Americas, and Michael Berube, acting deputy assistant secretary, sustainable transportation, energy efficiency and renewable energy, DOE.

EPRI's Neva Espinoza: We believe there's a fourth pathway to enable deep decarbonization, something we're calling low carbon resources. When we talk about low carbon resources, we're talking about hydrogen, ammonia, synthetic fuels, and we're talking in biofuels and how they become part of our transformation of our energy system going forward, looking at how can we integrate those new resources.

When you look at what's happening in power generation and the opportunity we have for electrification going forward to enable this decarbonization, what do you see as those core sectors that are going to be in fact impacted, and how far do you actually think electrification can go?

Mitsubishi's Paul Browning: There's a broad realization that to continue to install more renewable power, they're going to need long duration storage as part of their overall storage solution. They're going to need short duration, and that's going to be using lithium-ion battery technology. If pumped hydro is available, they're going to use that, but everybody is coming to a recognition that long duration storage is going to require a technology, and hydrogen right now is the lowest cost way to store renewable power for long periods of time.

We have already announced projects, our customers have announced projects. One in particular is the Intermountain Power Project in Delta, Utah. We've been given full notice to proceed.

The customer, Intermountain Power Project, has selected us to provide the gas turbine power. We've guaranteed these gas turbines are going to be able to use thirty percent hydrogen at commercial operation in 2025 and eventually a one hundred percent hydrogen and then, where is the hydrogen coming from?

We're developing a project underneath the Intermountain Power Project using an existing salt dome to store hydrogen for long periods of time, and we're developing along with that project electrolysis capabilities, probably over two hundred megawatts of electrolysis that's going to be able to use renewable power to convert water into hydrogen and oxygen. We're going to store the



The first salt carbon is going to be capable of storing 150 GWh of renewable electricity. That's more renewable electricity storage capability than we have in the entire U.S. now.

– Paul Browning

hydrogen underground, and it's going to be used when needed to provide dispatchable renewable power in the Intermountain Power Project.

The important thing about that is, the phase one, the very first salt carbon, is going to be capable of storing one hundred fifty gigawatt hours of renewable electricity. That's more renewable electricity storage capability than we have in the entire installed base in the United States right now.

It's an order of magnitude more than any project that anyone's ever conceived before. That's important because once we have that in place to solve this problem of long duration renewable power storage for the power generation industry, we now have a very abundant and affordable source of green hydrogen that's available for other sectors.

Maersk's Bo Cerup-Simonsen: There are great opportunities in creating projects where you vertically integrate the supply chain, so we have the energy company and utility company partnering up with a shipping company to provide a project allowing decarbonized shipping. We would foresee these kinds of projects will start to appear across the globe, and that will create confidence that decarbonization of shipping is technically possible.

We'll be seeing projects where we use battery for short



I'm confident we're going to see a multitude of projects demonstrating it is possible to decarbonize shipping even if it's a so-called hard to abate sector.

– Bo Cerup-Simonsen

distances. We will use hydrogen, we will use ammonia, we'll use methanol, we'll use biofuels, and we'll use various powering technologies such as turbines, fuel cells, combustion engines, electric motors. I'm confident we're going to see a multitude of projects demonstrating it is possible to decarbonize shipping even if it's a so-called hard to abate sector.

DOE's Michael Berube: Will large scale battery storage be more cost effective? Will large scale hydrogen storage be most cost effective? At massive scale, if you want to do seasonal storage? You're not going to do that with batteries, but the question becomes how often do you need that storage?

The key for hydrogen, we can drop the electrolyzer costs through R&D, but then you need to have the two most important factors, really low cost electrons. If we're in an era where we



For hydrogen to work, you need to have some amount of value stacking. We're doing work tying nuclear power plants with hydrogen production.

– Michael Berube

have large amounts of curtailed renewables and then you have essentially, close to free electrons, nothing's ever free, and really high utilization. You need both of those. You need to be utilizing full time and have low cost electrons.

It's definitely possible. The next step is we do need demonstration projects to prove out that capability, and for hydrogen to work, everything we see is you need to have some amount of value stacking. You need to be able to get playing multiple roles at once.

We're doing work tying nuclear power plants with hydrogen production where there's some benefits to the nuclear power plants. I have waste heat, so it's a little cheaper to produce the hydrogen there and maybe you have it for storage, so you have multiple values stacking on top of each other.

It can provide grid services and frequency regulation. There's some value to those grid services but you're going to need to stack multiple things on top, to get the economics to look good. ○

Electric Mobility

The rubber meets the road in the coming decade. Electrification has arrived in every aspect of transportation, giving customers and fleets unprecedented options. Here, EV pioneers engaged in a vibrant discussion of how we meet ambitious societal goals for the electrification of transportation.

Moderated by EPRI's Mark Duvall, director, electrification and customer solutions, on the panel were Chelsea Sexton, electric

vehicle advisor, Tony Posawatz, CEO, Invictus iCAR LLC, and Ed Kjaer, CEO, CMK Consulting LLC.

EPRI's Mark Duvall: We have a long way to go to achieving close to total transportation electrification by 2050. It won't be easy. What are the critical challenges yet to be addressed by auto manufacturers, electric utilities, EV infrastructure companies, and other organizations?

EV Advisor Chelsea Sexton: The single biggest challenge



The single biggest challenge facing vehicle electrification today is lack of product. By that, I mean, variety, but also geographic distribution.

– Chelsea Sexton

facing vehicle electrification today is lack of product. By that, I mean, variety, but also geographic distribution. It's a little ironic to mention in light of the unveiling of the GMC Hummer and the Volkswagen ID.4, various EVs that are coming.

But the reality is most are only available in California and the carb states in relatively low numbers. The disparity between those dozen states or so, and the rest of the country is still fairly fast. People simply cannot adopt what is not available.



If you're just starting out, residential type charging programs make all the sense to begin with, then workplace, and then making sure there's enough public charging.

– Ed Kjaer



One of the near term challenges is we've never had relationships with auto companies and refueling companies, at least nothing worth noting. We have to develop those relationships.

– Tony Posawatz

They also can't adopt what they don't know about. Awareness on all fronts remains stunningly low, whether it's about vehicles or how to charge them, where the infrastructure is. Across the board, we have much more to do there.

One of the things I fight most over the years is complacency. Whether those who believe since things are happening finally after many years of not so much, that it's a rolling snowball and it can't be stopped, and we can all go off on holiday, or those that believe EVs aren't ever going to come to their area and it's not worth trying.

In both camps, we have plenty of motivation to do. We have new folks bringing their energy, which is a nice balance for us grizzled veterans, but no shortage of things to tackle.

Invictus iCAR's Tony Posawatz: One of the near term challenges is we've never had relationships with the auto companies and the refueling companies, at least nothing worth noting. We have to develop those relationships and intersections between the charging companies and the autos, charging companies and the utilities, and a host of intersections.

Ultimately, we'll have a transitional period where we're going from this two to three percent penetration of EVs where it will be dramatically greater. We have to manage this peaceful transfer of power from internal combustion engines to electric drive vehicles. That will be a major challenge to work on.

CMK Consulting's Ed Kjaer: Eighty percent plus of the charging is done at home. Having customer facing programs to help the customer get the equipment installed and then having the

right policies in place, rates in place in terms of helping to shape the load, that can happen.

If it's done correctly and all the levers are pulled in the right way, then there's relatively speaking small upstream impact. That is basically additional load, additional use of a system, downward pressure on rates, and cost of service that benefits all the rate payers. That's one of the biggest challenges that we have with utility filings across the country, is we're still having to justify this.

If a utility is considering doing a customer facing program, that's one of the hurdles they've got to get over with regulators. There's plenty of examples now, ICF has done great work. E3 has done great work. EPRI's done great work.

Look at the whole cost benefit analysis of EVs hitting the system and how they benefit all ratepayers. Focusing on residential makes all the sense in the world. Not overbuilding public is important. We need enough public charging out there to reassure customers they're able to fuel their car when they

want to. But it's a very small amount that gets utilized, it's five percent of charging.

I mean, workplace. The thing about workplace that's interesting is, that's the other eight hours a day their car is parked. You have a long time to be able to fuel the car. Yeah, it's during on-peak hours, but what we're starting to see more as the grid evolves, as we start to deploy more renewables, is the whole definition of on peak and off peak is starting to change. We're seeing that in California.

Workplace charging is going to be important. But if you're just starting out, residential type charging programs make all the sense in the world to begin with, then workplace, and then making sure there's enough public charging.

The final point is the utility can't do it all on their own. It has to be a coalition of the willing. So there has to be the mayor, the governor, the legislature, the regulators, the utility, the OEMs, the consumers, the advocates, it all has to be coalescing together. ○

Building a More Resilient System

Electrified communities, customers, and companies will need a more reliable and resilient electric system, from power plant through the customer, in both urban and rural settings. This panel discussed how to meet these customer needs and ensure electricity is available in all places and when ever needed.

Moderated by Rob Chapman, EPRI's VP of electrification, sustainability, and environment, the panel included Alex Fitzsimmons, deputy assistant secretary for energy efficiency, DOE, Diane Huis, senior VP of innovation and business development, North Carolina Electric Membership Corp., and Natalia Mathura, principal, utility business models, SEPA.

EPRI's Rob Chapman: One of the things that you are seeing within the utility industry is a transition to focus around customer and community, where that customer is the center of all of our strategies going forward. It's very interesting to me having come from the utility world in the past about how the customer has taken center stage, in that it is our primary focus at how we are managing our businesses going forward.

SEPA's Natalia Mathura: The need for equity and sustainability still advances the regulatory models, which ensures utilities innovate and serve every customer with clean energy options. The top three ways to continue that momentum are for regulatory bodies and utilities to coordinate and collaborate.

One, the kinds of grid modernization efforts you've seen a



Regulators should foster the pursuit of utility pilots to test out new technology and ownership models.

— *Natalia Mathura*

number of states go through is critical. This looks like stakeholder sessions with full third-party engagement and involvement to discuss mechanics and opportunities for storage programs, ownership models, community solar microgrids, interconnection, EV incentives, and time of use rates amongst a plethora of options.



Helping educate people about benefits of electrification, when it comes to transportation or their businesses, is good for everyone.

– *Diane Huis*

Two, regulators should foster the pursuit of utility pilots to test out new technology and ownership models, which isn't to say there are no constructs to guide a fast based approach to innovative pilots, but that needs to be in place. Utilities need the ability to pivot forward into this new sphere.

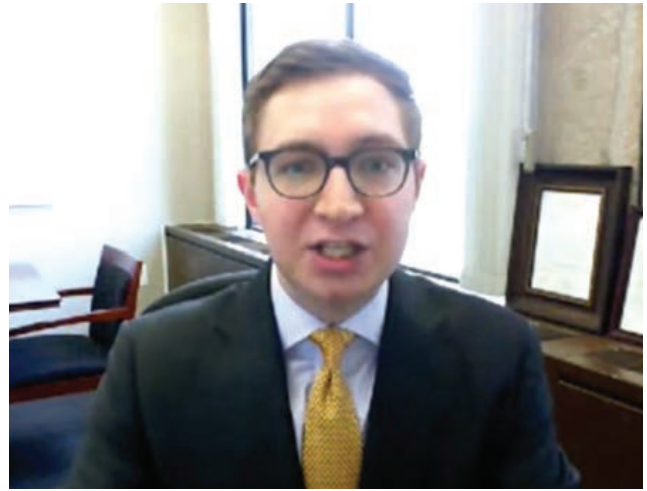
Third, ensuring that every new business model and program has an underserved community lens to its development is critical. You see almost every utility and co-op pursuing EV incentives.

There can be the sense that benefiting the wealthy who can afford EVs, which requires a higher upfront cost, but for instance, incorporating an LMI component to an EV program would look like innovating around what would help a low-income community. If you dig into the data with rideshare companies, the majority of their drivers and riders originate and terminate in low-income areas.

When you think about incentives for EV chargers, putting a charger in a low-income area without any thought to who would use it, and how they would use it, is less ideal than creating partnerships with a rideshare company, who may have a number of drivers in a particular area, who they can incent to use electric vehicles, and lease electric vehicles.

North Carolina Electric Membership Corp.'s Diane Huis: When it comes to communities, we have been focusing on economic development, and the health of our co-op, so we're concerned about the health of our communities, and economic development is a big part of that.

Helping educate people in these communities about the



The Connected Communities funding opportunity that DOE released requires applicants to submit a cybersecurity plan.

– *Alex Fitzsimmons*

benefits of electrification, when it comes to transportation or when it comes to their processes in their businesses, helping them understand how they can be more competitive, is good for everyone in that community if business can be efficient and sustainable and cost-effective, in how they run their business.

I don't know that there's many people other than the utilities that are helping spread that word and provide that information. We really appreciate all that EPRI has done to help us in our effort to bring this information to the communities, and to the businesses that we do serve.

DOE's Alex Fitzsimmons: All of those distributed energy resources, whether you're talking about solar panels, powerwalls, microgrids, smart appliances, they increase the surface area for potential cyber attacks. That's just the reality.

As you have more devices coming online on the Internet of Things, that are connecting back to the grid, you increase the attack vectors. That's why we have to develop ways to build cybersecurity into the initial design of these communities, instead of trying to bolt it on later.

Part of the Connected Communities funding opportunity that DOE released last week requires the applicants to submit a cybersecurity plan along with their application, so that we can assess the degree to which the applicants are addressing the cybersecurity concerns upfront, not totally obviating the risk, because there's always going to be some risk as long as you're connected to the internet, but looking at control strategies to minimize that risk as you begin to scale from a building level to a community level and beyond. ○

Community Electrification

How are advanced, efficient electric technologies enabling the conversion to decarbonized buildings and experiences? A variety of technologies is needed to affect change across key sectors, including those with inherent and persistent technical or economic barriers.

Moderated by Sheryl Carter, director, power sector, climate & clean energy program, Natural Resources Defense Council (NRDC), on the panel were Agustin Cabrera, director, RePower LA, LAANE, and Martha Guzman Aceves, Commissioner, California Public Utilities Commission.

NRDC's Sheryl Carter: We are facing unprecedented challenges with the pandemic, which has created an economic crisis and highlighted and exacerbated the existing inequities in our country. A racial justice reckoning that has us examining our institutional structures and how we think, and a climate change crisis, which has become more pronounced this year in the West, which has been besieged by growing number and strength of wildfires and extreme heat, and air pollution that has blanketed cities and regions. In Iowa and Louisiana, dealing with the devastation wrought by extreme weather events.

Here we look at efficient or beneficial electrification and how it can help us get to the cleanest, most efficient, equitable, and affordable system to power our transportation, homes, and



Make sure low-income communities are not bearing the burden of this transition, and they become the workers who build the infrastructure.

– *Agustin Cabrera*



How do we ensure that efficient electrification benefits all customers?

– *Sheryl Carter*

businesses, and to meet climate goals. This panel continues to look at a topic we started to explore in EPRIs Electrification Conference in 2018. How do we ensure that efficient electrification benefits all customers?

RePower LA, LAANE's Agustin Cabrera: Our coalition with about thirty diverse groups from community-based environmental justice to labor unions, are concerned about displacement and gentrification when it comes to these policies. Because what we've seen is landlords and big corporations using these types of climate policies to their advantage, to displace people who've been in their communities for sometimes decades.

We want to make sure there is deep engagement in community and less focus on rebates. More on no cost measures for low income folks. As we transition to fully electric appliances, we want to make sure that the most vulnerable, low income folks aren't left as part of that transition because they can't afford switching their appliances because of lack of capital, and then having to pay more on their gas bills, which further disenfranchises them and leaves them in a tight spot.

We want to make sure policymakers are thinking about how to cover the entire cost of this transition, particularly for renters and while doing so, we can build and increase the amount of jobs it takes to electrify buildings and roadways. There's huge potential, and we see this as a two-pronged approach of making sure low-income communities are not bearing the brunt or the burden of this transition, and people in those communities become the workers who build the infrastructure.



We regulate at the PUC, the Ubers and Lyfts. They committed to electrification. Everything a basic worker has, they don't want to commit to. They want a workforce that's independent contractors.

– Martha Guzman Aceves

California PUC's Martha Guzman Aceves: Many in our world, we hear, this is not our issue. It's not our jurisdiction. Things like displacement, which we did attempt a little to put some protections on, at least in the San Joaquin Valley pilot project and a couple others like the Mobile Home pilot project.

As recently as yesterday, in attempting to provide a consumer protection enforcement mechanism for NEM customers;

low-income customers that have been victims of predatory financing. It didn't have the support and much of that argument was because it was outside of our jurisdiction.

This is the conundrum, as we have to move in parallel. We have to protect customers. We have to protect workers and make this a better economy, not a worse economy.

The other perfect example in California right now is Prop 22. We have transportation network companies that we regulate at the PUC, the Ubers and the Lyfts. They have committed to electrification goals. That is one of their intentions. Their intention is to be electrified, yet they're not equal.

Everything that a basic worker has, they don't want to commit to. They want to have a workforce that's independent contractors. The reason I highlight this is all around us, constantly, this kind of juxtaposition that we cannot move forward on these things together.

When you go to a community based effort, like San Joaquin, those things are coming up at the same time. They're thinking about what is their bill at the end of the day? Of course, they want to be environmentally sound. As you know well in your research that most low-income people are environmental leaders.

We've started to get better by saying, here's a set aside for disadvantaged communities, whether it's twenty-five percent or fifty percent, we're getting better about that intention, but we're where we have to catch up to what the need is, which is that not only just the set aside has to be there, but all of these other protections need to be there.

I'll tell you, it was a challenge, and it's still a challenge in the San Joaquin pilot, where we were trying to be community driven. We even structured this entire pilot so the community would have the right to choose whether it's gas, electric. Most of them chose electric because it was cheaper. It was at no cost, based on how we did the amount of funding that was available. **PUC**

The lead article in the issue of Public Utilities Fortnightly published almost exactly eighty-eight years ago, on November 10, 1932, was entitled, "Our Under-financed State Commissions." The article provides the reader with a table showing the size of the state commission Staff for each of the forty-eight states at the time and the District of Columbia, in 1920 and then in 1929.

The total number of Staff in 1920 was 1,428. By 1929, this number had grown fourteen percent to 1,624. Today, in 2020, this number is well over 7,000.

The New York Public Service Commission had the largest Staff at that time. In 1920, there were 231 members of the Staff. This grew by sixteen percent during the nineteen twenties such that it was 268 in 1929. The Staff at New York's commission is more than twice as large presently.

But the state with the greatest number on Staff is California, with well over a thousand. In the twenties, California's commission had a Staff of 133 at the beginning of the decade, in 1920, and 144 at the end of the decade, in 1929. And, the state with the third most on Staff at its utility commission was Illinois. It had 194 at the beginning of the decade and 156 at the end. Today's Illinois Commerce Commission has a larger Staff than in the nineteen twenties, but not by that much.

Naturally, commission budgets were far smaller than today, even if you take into account how far a dollar went in those days as opposed to today. For example, The New York PSC's budget during the 1929-1930 state fiscal year was slightly over one million dollars. While no other state came close to this amount, a million is still much less than the PSC's current budget.

Ameren Chooses Net Zero

Conversation with Ameren Missouri's President,
Marty Lyons



few weeks ago, Ameren committed to achieve net zero carbon emissions by the year 2050. This path was included in Ameren Missouri's fifteen year integrated resource plan provided to the Missouri Public Service Commission.

It's a large step for the industry if only because utilities in the Midwest like Ameren have depended upon coal-fired generation for the affordability and reliability of their electric service. So, PUF caught up with the president of Ameren Missouri to hear more about his company's plan, a fascinating discussion. Listen in.

PUF's Steve Mitnick: Ameren made a big announcement in terms of your geography, serving a lot of customers in Missouri and Illinois, relative to where there's a lot of wind resource, for example. Talk about this amazing announcement.

Marty Lyons: We're excited. We recently announced the goal of achieving net-zero carbon emissions company-wide by 2050. It was a big announcement for us given where we are in the country and our current generation makeup.

While it's a company-wide announcement, more than ninety-nine percent of the emissions come from the fossil generation mix in Missouri. What enables us to get to that goal has to do with the transformation of our generation portfolio over the next twenty and thirty years.

The announcement was driven by the Integrated Resource Plan we filed with the Missouri Public Service Commission. Every three years we make a filing with the Commission where we engage stakeholders, obtain their input, look out, and ask, what do we think our customers' requirements are going to be from an energy and capacity standpoint, and how do we best serve their energy needs in a safe, reliable, affordable, and clean manner?

We look at a whole range of new technologies including wind, solar, battery storage, and other emerging technologies that could replace our current generation mix. It's a requirement to do that for twenty years but we went ahead and looked out thirty years, to 2050.

We look at the age, cost to maintain and to operate our existing fleet, as well as broader energy market fundamentals. We also look closer at potential key changes in energy policy. Then with stakeholder input, we determine our plan to meet future demand while maintaining reliability and affordability for our customers in Missouri.

Ultimately, based on a deep analytical framework, considering the factors outlined above, including the steadily declining cost of renewable energy in our region, and the current and future forecasted cost of the MISO energy market, what we decided is that for a couple of our coal-fired power plants, we needed to advance their retirement. For our Sioux Energy Center, we advanced it five years to 2028. For our Rush Island Energy Center, we moved it forward six years to 2039.

Later this year or early next, we're expecting to close on seven hundred megawatts of new wind generation in Missouri. That's about a \$1.2 billion dollar acquisition that we had announced previously. It's been exciting to participate in getting it built. We're excited to close on it.

As we looked ahead and at the reducing costs of renewables, we decided we could roll out as much as fifty-four hundred

We recently announced the goal of achieving net-zero carbon emissions company-wide by 2050.

forward and conservatively operating them in order to reliably integrate all of these renewables into our system, while continuing to operate our Callaway Energy Center and other forms of clean energy such as hydro, allows us to hit fifty percent carbon dioxide emission reductions by 2030, and eighty-five percent by 2040, as compared to 2005 levels. This is a meaningful acceleration versus our prior carbon reduction goals and they set us up to hit that net-zero carbon emission goal in 2050.

Our region is a coal heavy region. The reality is our coal-fired energy centers provide a lot of reliability in our region at a low cost.

The Labadie Energy Center, which will retire in 2042 and Rush Island Energy Center, which will retire in 2039, are reliable and dispatchable low-cost energy producers. They have high capacity factors today.

Those are the energy centers, along with the nuclear-powered Callaway Energy Center and our hydro plants that are going to allow us to make this pivot because they're going to provide that reliability base that allows us to then transition into more renewables.

Some of our peers are investing in gas assets. We can maximize the value and affordability to our customers by phasing out coal-fired generation over time, out through 2042, and at the

megawatts of new renewable energy by 2040. Now that fifty-four hundred megawatts includes the seven hundred I mentioned, but nonetheless, it's an escalation in the amount of wind and solar that we would plan to bring onto our system.

Our balanced approach of advancing some of those coal-fired energy centers' retirements



**Get as clean as you can, as fast as you can.
Provide reliability. Be affordable.
Get to net-zero by 2050.**

same time reliably transition into renewables.

Our plan offers a lot of flexibility as we can cycle our coal-fired energy centers to meet dynamic energy needs and market conditions. We also have almost three thousand megawatts of simple cycle gas peaking units that can provide reliability needs throughout the transition. That's the most affordable path forward.

PUF: You're saying that instead of having an interim step of build some gas combined cycle, you're going to make the jump from the early retirement of the coal directly to the zero emission sources.

Marty Lyons: Yes. It's a balanced approach. Some environmental organizations and other stakeholders have called on us to reduce our reliance on coal sooner and invest more heavily sooner in renewables.

I believe a majority of our customers and other stakeholders are primarily concerned about reliability and affordability, which

they know our current fleet provides. This transition to more renewables over the next approximately thirty years, through 2050, to responsibly do this in a consistent and phased manner, makes a lot of sense for our customers and our region.

That ultimately gets us to that goal that everybody wants. Get as clean as you can, as fast as you can. Provide reliability. Be affordable. Get to net-zero by 2050.

PUF: On these two vital criteria, reliability and affordability, some in the public, might say, wow, Ameren might be having to raise our bills. We've heard about renewables and maybe our lights will go off like in California. But you're saying you can pull that off.

Marty Lyons: We can pull it off. It's not just an inconvenience when your power is not reliable. I've got a son upstairs studying from home. People are working at home. Energy reliability is as important today as it ever has been.

Reliability is big, and there's also a safety and security factor too. It's fundamentally important to the quality of our lives. It takes time and planning to make sure we make this transition reliably.

This whole region and its reliability has been built around our baseload energy centers, including our coal-fired energy centers. Even with the Sioux Energy Center, which we are going to retire in 2028, it's going to take between now and then to make sure we build out the transmission to properly support the electrical system to ensure we maintain the reliability of the region.

For our first energy center to retire, we've been planning this for a long time. We're retiring our Meramec Energy Center in 2022. We're still making the transmission investments that are needed to make sure we can retire it and provide reliability.

A safe and reliable retirement of a coal-fired energy center takes many years of planning to ensure the integrity of our electric grid. This planned phase out strikes the right balance for all stakeholders.

PUF: Ameren is one of the premier innovative utilities. How does that figure into this plan?

Marty Lyons: Innovation comes in many forms. One is in customer programs, with some of the renewables that we have planned in the near term, to meet some specific customer needs. Another is in our Smart Energy Plan that will provide higher levels of reliability for customers while allowing integration of various forms of renewables and battery storage.

We've rolled out community and neighborhood solar programs

for example. Having these programs that are there for both our residential customers, as well as our business customers, to be able to buy into universal solar and the economies of scale that we can achieve, is going to help them make this transition to renewable energy affordable to meet their own unique carbon reduction goals.

Innovation will also play a role longer-term in getting to net-zero. The reality is when we model out to 2040 and we're trying to get from eighty-five percent emission reductions to net-zero emissions, we need and expect to achieve breakthroughs in technology and innovation to provide the path forward in terms of clean, reliable energy resources.

Today, if we had to do that, it would be extremely expensive and technically challenging if not impossible. But we believe with innovation over time through the further development of battery technologies or other storage methods, carbon sequestration, breakthroughs in hydrogen technologies, possibly modular nuclear reactors, we're going to be able to make that jump from an eighty-five percent reduction to net-zero.

There's going to be research, development, and innovation that's going to be required to make sure we can do it reliably and affordably, but we believe that'll happen.

PUF: It's not just being a public utility, you've got to talk to a lot of external folks. How are you engaging everybody to tell this story and say you can do this affordably, reliably, and meet these aggressive goals?

Marty Lyons: It's been a busy few days. It's going to be busy still for the remainder of this week, and into next, and I'm sure after that. I was just talking to somebody today about the numbers of stakeholders that have an interest in this.

Everyone has a different point of view. Some people would like us to be even quicker in our pivot toward renewables. Others understand the affordability of our current fleet. They understand the intermittency of renewables and wonder, why are you doing this?

We're going to invest eight billion dollars over the next twenty years in renewables. There are thousands of jobs associated with that. On the other hand, people say, what about the workers you have in those coal-fired energy centers?

We're having ongoing open, transparent conversations. We came at it from the standpoint of affordability and reliability, given the realities and assumptions that we've got going forward.

Our coal plants are aging. When we get to the retirement dates I spoke to earlier, each one of these energy centers will be somewhere between sixty and seventy years old. Longer term, we can't continue to make the investments in those plants to make sure they are run safely, reliably and preserve the economics. Those are reasonable lives for those assets.

Then we have to explain to folks that the costs of renewables have come down dramatically. I'm not just talking about the

cost to physically build it, but when you look at the production that comes out of these facilities, that's much greater than it was a few years ago.

PUF: Absolutely. Ben Fowke at Xcel talks about fifty-three or fifty-four percent capacity on some of these wind farms.

Marty Lyons: We look forward to getting that high. In parts of the country, that's exactly what's being achieved. We have to tell

The reality is when we model out to 2040 and we're trying to get from 85% emission reductions to net-zero emissions, we need and expect breakthroughs in technology and innovation.

the story of the economics and how the capacity factors of the renewables have gotten much better and the coal plants are getting older.

Now's the time to make that pivot. There are economic benefits, and thousands of construction jobs associated with these renewables. I was in Northern Missouri a few weeks ago, where a wind facility is under construction. I've seen the positive impacts on the economies of the towns where these facilities are being built.

Some of those are going to be permanent in terms of payments to landowners and in terms of jobs, as well as tax payments to local folks. On the other hand, at the coal-fired energy centers, we're doing this phased over time.

We have time now to work with our coworkers in those facilities, and with the union leadership to make sure we find other jobs for our coworkers. They're highly skilled coworkers. We have enough time as we phase this out to find meaningful roles for those folks in other parts of our operations.

One of the things in our announcement too, is we expect in the future to seek extension of the life, out through eighty years of the Callaway nuclear facility. That's going to be important to our ultimate ability, again, to hit that net-zero carbon emissions goal.

PUF: Just like around the country, that existing nuclear fleet is the key to zero emissions.

Marty Lyons: Yes. Absolutely.

PUF: What do you find most rewarding about this initiative?

Marty Lyons: I feel like we're doing the right thing for our customers, and leaving the right legacy for future generations. We're doing the right thing for the planet and for Missouri. I'm proud of it. We've struck a good balance that is, at the end of the day, beneficial to all three.

The key is reliability and affordability, but also getting as clean as we can, as fast as we can. That's going to be rewarding. I'm ready to go in terms of implementation. The announcement is great. What's going to be rewarding is to make it happen. **PUF**

Southern Co. Exec on Decarbonization and Customers

Conversation with Southern Co. Gas CEO, Kim Greene.
With an introduction by Dan Hahn of Guidehouse



utilities are heavily invested in a decarbonization journey as a pathway to a clean energy future for their customers and the communities they serve. More utilities are setting net-zero targets by 2050 or earlier. They will need to change their strategy, investment and divestiture plans, business and regulatory models, products and services, and operations and people to capitalize on the opportunities of their decarbonization journey.

Recently, we, meaning PUF's Steve Mitnick and Guidehouse's Dan Hahn, talked with an inspiring utility CEO about what she is doing to help customers decarbonize, the impacts, and the most promising paths to decarbonization for the companies and customers.

We heard from Southern Company Gas CEO, Kim Greene, on her perspectives and tangible actions the company is taking to meet decarbonization and customers' decarbonization goals. We hope you find the conversation interesting and meaningful as you think about how you are helping your customers decarbonize for the future.

— Dan Hahn of Guidehouse

PUF's Steve Mitnick: How is the drive to decarbonize a customer centric strategy?

Kim Greene: At Southern Company, customers have always been, and will always be at the center of everything we do. We even have a diagram that we use to describe that, and we call it the circle of life.

At the center of the circle of life are our customers. That is important, and it's something we take seriously. We believe that access to clean, safe, reliable, and affordable energy is critical to helping our customers and our communities thrive.

We know customers are becoming more environmentally conscious. Southern Company Gas, and organizations like us, are tasked with building a future fueled by clean energy. Natural gas is the foundation for a clean energy future.

PUF: You're a great leader to head that up.

Kim Greene: I appreciate that. It's a privilege. It's a great business that I have come to be closer to in the last two and a half years. It's fascinating. The people who work in this business are incredible, and natural gas has enabled, again, the entire country to move forward toward its climate goal.

Dan Hahn: I love the circle of life diagram with customers in the center. What is Southern Company, and Southern Company Gas, doing specifically and also for the group you lead, to help customers decarbonize?

Kim Greene: Caring for the environment is not something new to us. We continue to empower our customers to reduce their personal carbon footprint. We provide numerous energy efficiency programs to our customers to help them manage their energy use.

We have a program in Illinois, where we have our Nicor Gas business, that has been in operation for almost a decade. It's a mature program. Over that period of time, our customers have saved more than eight hundred and forty thousand metric tons of carbon dioxide emissions, which is equivalent to almost a hundred thousand homes' energy use over the course of a year.

Greener Life enables Georgia customers to take control of the emissions associated with their natural gas use by purchasing carbon offsets on their behalf.

We're proud of our energy efficiency programs, particularly in Illinois. Our other businesses are looking to offer our customers opportunities to save energy and reduce their environmental footprint.

We also have an offering from our retail marketer subsidiary, Georgia Natural Gas, called Greener Life. The program enables Georgia customers to take control of the emissions associated with their natural gas use by purchasing carbon offsets on their behalf. In the first six months of the program, which was launched in 2019, Georgia Natural Gas helped customers offset nearly five million pounds of greenhouse gas emissions.

Those carbon offsets come from projects in the Southeast, either from a station project, or a landfill project. We are seeing many customers sign up for that. It's a small fee and it again allows our customers directly to access a product to help them be carbon neutral. Those are two areas.

For the third, we're helping in the transportation sector, and we're seeing fleets use CNG and RNG at rapidly increasing volumes, such as UPS and Waste Management. In Georgia, we supply CNG to MARTA, the bus transportation system. There are a lot of ways that we're working with our customers to help all of us partner to meet our goals of a clean energy future.

PUF: There's an increasing number of investors that are ESG focused. How does that drive your company to decarbonize and address their aspirations?

Kim Greene: We recognize that is moving more toward the mainstream. ESG is something that many of our investors



Kim Greene

We also have, particularly in our gas business, one of the strongest supplier diversity programs in the country.

care about. We're proud of our record, and we know that we're continuing to get better.

We're proud of our efforts on the environmental side, and we're proud of our efforts in the social side. Of course, we believe in a terrific culture, a diverse workforce, an inclusive culture, and we have been recognized in many rankings for our terrific workplace.

We also have, particularly in our gas business, one of the strongest supplier diversity programs in the country. We're promoting social justice and we give back to the communities we serve. I'm sure you heard Tom Fanning [CEO, Southern Company] say that, and it is true. Everybody at Southern Company believes that communities we serve should be better off because we are there.

We know investors expect companies like us to have a strategy, to communicate these strategies to address the climate goals, and for utilities like ours, a strategy to support our communities. It's economy-wide decarbonization, not just our own emissions and working with our customers to provide energy efficiency programs

along with some of the examples that I gave earlier.

We're committed to this and we recognize that it's important to our customers. Keeping customers at the center of everything we do leads to our ability to have constructive regulation and our ability to be allowed to earn fair returns, which benefit our investors.

Dan Hahn: How can your company be successful while decarbonizing?

Kim Greene: Natural gas is the foundation for a clean energy future. As more clean power sources are developed, natural gas will be the bedrock on which they stand. When I talk about clean power sources, that includes renewables.

For renewables to be reliable, we must have some backup generation, and that is best served by natural gas. Continuing to make these investments can allow us to be successful. Again, our customers are interested in this, and that will allow us to continue to be successful. All of our companies have made great strides toward a sustainable future.

We've done some of the infrastructure replacement. On the electric side of our business we've made significant progress in retiring coal, adding renewables, and adding natural gas. On the gas distribution side of our business, we are looking now at ways to utilize renewable natural gas, and to purchase natural gas that is supplied by companies that have pledged to reduce greenhouse gas emissions in their operations.

Along the value chain, we're downstream, as compared to our suppliers who are upstream. Then in the midstream with transport companies, Southern Company Gas is working with the entire value chain to bring these producers, transporters, and deliverers of natural gas together, to commit to lower our carbon and methane emissions.

Southern Company Gas is one of the founders of a group called ONE Future, meaning Our Nation's Energy Future. We've all voluntarily made commitments to collectively lower our methane emissions to one percent or less across the natural gas value chain.

Already, at Southern Company Gas, our system operates at almost 99.9% efficiency in its delivery of natural gas. We recognize we need to be as clean and responsible as possible though, and we can play a role to influence our industry partners, which is why we continue to engage with the coalition.

That is something that our regulators expect, and our investors expect. While energy is so fundamental to our economy, to our way of life, we need to provide that energy in the most sustainable way forward, as we believe that will allow us to continue to be successful.

PUF: What are the most promising paths to meeting your

LOWER EMISSIONS: THE FUTURE OF NATURAL GAS

Beginning November first, in 2019, Virginia Natural Gas began purchasing one-fifth of its customers' annual natural gas supply from select wells operated by Southwestern Energy. Both VNG and SWN are founding members of Our Nation's Energy Future, or ONE Future.

That's a big deal because VNG aims to be the first natural gas utility in America to provide its customers with natural gas that is one hundred percent sourced, transported, and distributed by companies that have pledged to reduce greenhouse gas emissions to less than one percent across the natural gas value chain. As a down payment on that pledge, VNG announced a deal to source a large percentage of its annual gas consumption from such companies beginning in 2019.

A natural gas industry-led

organization, ONE Future is dedicated to voluntarily achieving reductions in methane emissions across the natural gas supply chain. Members are focused on achieving a science-based average rate of methane emissions that is equal to one percent or less of total natural gas production by 2025.

VNG's distribution system and all the interstate transportation pipelines that serve it participate in the ONE Future program. The purchase of next generation gas reflects VNG's desire to help move the market in this direction, a first of its kind from well head to burner tip, and the method by which VNG aspires to source all its gas by 2025.

Virginia Natural Gas is one of four natural gas distribution companies of Southern Company Gas, a wholly owned subsidiary of Southern Company. ○

decarbonization goals, which are big, and within the timeframe you've set forth?

Kim Greene: There are many pathways to reach net zero by 2050, and for Southern Company to achieve a future where energy's clean, safe, reliable, and affordable, we believe the best option is an all-of-the-above strategy that capitalizes on the unique benefits of gas, but also nuclear power. Southern Company's subsidiary Georgia Power is completing two units, Vogtle units three and four in Georgia, and I'm proud of that.

Additionally, there should be some negative carbon initiatives. Southern operates the nation's carbon capture research center in Wilsonville, Alabama. We're doing more to progress the science of carbon capture technology than just about anybody.

We're investing in ways to utilize direct air capture of carbon dioxide. We're also working to find opportunities to utilize renewable natural gas or natural gas created from biomass or



Dan Hahn

landfill, some other way of harnessing what otherwise might be methane emissions that would go straight into the atmosphere, but yet harnessing them and using them in a more efficient way, which can be carbon negative.

I could spend a lot of time talking about the importance of research and development, because all these options are going to be necessary for us to meet our goals. I don't think there's going to be one technology, or one certain path that's going to get us there. We're going to have to be open to all of these options.

I should add hydrogen, which is important. There's poten-

tial for us to understand more about how we can utilize that in our existing infrastructure and with new infrastructure.

The most important thing for us is to be open, using an all-of-the-above strategy, to continuing to invest in research and development and to recognize that all of these options and probably then some, are going to be necessary for us to meet our

We believe the best option is an all-of-the-above strategy that capitalizes on the unique benefits of gas, but also nuclear power.

goals. But we're confident that we will get there.

PUF: The last time we saw you, was participating with the launch of the EPRI's Low-Carbon Resources Initiative or LCRI.

Kim Greene: The wonderful thing about the Low-Carbon Resources Initiative is we can pool our financial and intellectual resources together and move the development of those technologies along much faster than we would otherwise.

These collaborative research and development opportunities are valuable. It's unique that we do them this way in the United States. That creates lots of benefits for us and I'm excited to be a part of it. **PUF**

A Public Power CEO, on Leadership

Conversation with Seattle City Light's CEO,
Debra Smith



fter the PUF team attended the American Public Power Association leadership summit in August, we were left wanting more. We interviewed several amazing leaders who spoke there at that summit in the October issue of PUF, but due to time constraints missed out on one important voice, Debra Smith, CEO of Seattle City Light.

PUF is fortunate, with the cooperation of APPA, to bring you Debra Smith here, and she has a lot to say about leading a utility in Seattle, a city in the national spotlight. Her advice on leadership is thoughtful and useful, leaving PUF with the realization that Seattle is indeed fortunate to have her leading the way in a most difficult year.

PUF's Steve Mitnick: What's the utility like that you are the GM and CEO of?

Debra Smith: City Light is an interesting and very cool utility. This is the third electric utility I've worked for. I got my start at the Eugene Water & Electric Board (EWEB), so I have some experience running a multi-line of business.

I was not the general manager, but I was there for seventeen years and when I left, was second in charge. The board brought in somebody from outside, who was great.

I worked with him for three years, and I continue to work with him on regional issues. But I realized I was ready to lead at a higher level. When the job at Central Lincoln came about, I decided to throw my name in and was pleased to get that opportunity.

Central Lincoln was a small utility with its own elected board. It was a PUD or People's Utility District. EWEB was a municipal utility, with its own elected board. The PUD governance model is easy to work with, and PUDs are kind of specific to the Northwest, but they cross municipal and county lines, so you have a board that's focused on one thing – providing electric service – without a lot of political involvement.

Seattle City Light is also a municipal utility, but we report into the City of Seattle; we are essentially a department of the City of Seattle. I report in through the city council, and I work for the mayor. The mayor hires and fires her directors.

Seattle City Light is an awesome utility. It was progressive and green long before states and utilities started putting carbon reduction legislation and regulations in place. City Light has been carbon neutral since 2005.

One of our taglines is, The Nation's Greenest Utility. At the time when that was adopted, that was certainly true. Most of our power supply is carbon-free, primarily hydro. But we've been greening anything that we couldn't directly identify as carbon free, by purchasing carbon offsets.

An offset is an investment that allows a project to move forward that would otherwise not move forward. It is bringing more green power to our collective supply, and it is different than a renewable energy certificate.

When I arrived, City Light had just about completed installing AMI meters. We have about twenty-seven thousand of three hundred sixty-seven thousand meters left to convert; it was hard to get ahead given the rate of growth in the city. One of the things we are working on now, which we also did at Central Lincoln, is to deliver on the customer value proposition.

We're starting to understand that recovery, especially in urban areas, will be slower than we had hoped.

Initially both utilities put the AMI systems in place and like many organizations, the return on investment was around billing and metering, but the opportunity to deliver value to customers is significant. We did a lot of that at Central Lincoln and we are now able to do the same at City Light.

We have about two thousand-megawatts – capacity – of utility-owned hydro generation. Actual generation is dependent on water levels, particularly spring river flows. Our Skagit Project, which is northeast of Seattle, is comprised of dams at Ross, Diablo, and Gorge. Our facility at Boundary is located west of Idaho, near the Canadian border.

We generate a lot of our own power, we are a vertically integrated utility, and we are moving forward with lots of customer initiatives. When I joined the utility, there were two primary issues that demanded my attention.

One was around customer service and the other around employees and lack of respect in the workplace. Seattle is a city that grew quickly for a number of years. Staying current with that growth was challenging. It continues to challenge us. As we have experienced COVID and new ways of working with our customers and each other, we have grappled with a workforce that is smaller.

We have employees who are unable to work right now for various reasons and that impacts the timeliness of our service delivery. We have lots of opportunities to improve the customer experience. We've also made tons of progress. It's just slower right now.

Switching to a respectful workplace, two plus years ago, there was quite a bit of press around some unfortunate and unacceptable employee situations. Many had to do with gender and workload, but



It's about leadership. Success is not about specific technical skills. It's not what you know but how you can work with and inspire people. Our supervisors collectively, we are called people leaders.

the overall goal is to provide a respectful workplace where everyone comes to work and they feel safe and supported to do their best.

We've been working to recenter ourselves on that goal. As with customer issues, there is much left to do, but we've made a lot of progress.

Seattle's an amazing city. Like many downtowns, most of the business that's here supports a commuter workforce that comes into the city and leaves. With people not coming into the city, it puts some of these businesses in a bad position.

We're working through that and are in a period of social reckoning or racial reckoning that is still ongoing in Seattle and in places like Portland and elsewhere. That was tough for us for a while, and we are doing a lot of soul searching right now about how we can stand ourselves back up as a better and more just city.

In the meantime, with almost daily protests, there are a lot of downtown buildings that are still boarded up. That's sad to see. We're starting to understand that recovery, especially in urban areas, will be slower than we had hoped.

PUF: Historically, many women in our industry have kind of hit a glass ceiling. Yet you had the ambition and felt you were ready for top leadership. Have you talked to other women about those experiences?

Debra Smith: I have had the opportunity to talk to some groups of women about the path my career took. My college degree was in finance, and although I'm not a CPA, I grew up in this industry, definitely on the accounting side of things, and I speak numbers.

I've known for a long time that my strengths are around communication and people. I love working with people and I especially love being at a point in my professional life where I get to help folks figure out their careers.

If you go way back, there was a time when, especially at smaller utilities, people made it all the way up to the top job after starting as a lineman. Then you had years where most people leading came through on the engineering side.

I took this job at a time when increasingly we are seeing women who aspire to, and are selected for, GM/CEO type jobs. Some of them were engineers, some were accountants, some were marketers, some were regulators, and some were attorneys.

Some of them were a good match. But we are also learning that at the highest level, it's about leadership. Success is not about specific technical skills. It's not what you know but how you can work with and inspire people.

There's a blog called Chief Executive by Patrick Lencioni who is a business author. He's written a lot of books. They're short, like parables.

He had a column today, which I loved. He said, and I'm obviously paraphrasing, if you look at the CEO, a lot of times people lose sight of what the E means, the executive. What does that mean in terms of what we deliver?

He took a cue from Einstein and offered, "E equals LMC2." That is, L as in labor, M as in management, C2. The translation is leadership, management, culture, and communication. He also suggested that the title should perhaps be chief leadership officer, not executive, because executive is a weird word that people don't know what to do with.

Our job is to provide effective leadership. I still believe in the magic. When I flip the switch, the lights come on and I'm happy. I've been around long enough that I can go to a substation, know what I'm looking at and understand at a high level how it all works.

But that isn't what excites me about my job. My job is to get

stuff out of the way, to support the people that look to me for leadership. Our human resources department is called People & Culture. That's what they do. They support people and they support culture. Our supervisors – everyone from frontline supervisors, to me – collectively, we are called people leaders.

Right now, we are focused on shifting the culture, and are doing so in a way that supports continued telework, because we don't know how long we will continue to have a big chunk of our employees working from home.

Last is communication, which has never been more important. I never took a class on how to lead in a pandemic and it is challenging. A lot of the struggle is, how to provide a level of personal connection to your employees when you aren't in the room with them?

We're trying all kinds of things. Some of it works and we say, let's keep doing that. Some of it doesn't quite go, and we say, that's not what we need to do.

PUF: How do you look at dealing with all those pressure points simultaneously between customers and your managers?

Debra Smith: I do the best I can. I get up in the morning and I never know what's going to happen. I usually start my week by making a list of things that I need to get done, understanding that from day-to-day, I may have a crisis that takes my attention. I prioritize people issues. I don't let time lapse without checking in, correcting, supporting, or encouraging.

Often we avoid hard conversations and then they not only become harder, but the destruction or the damage in other relationships that happens while we try and figure out how to do something perfectly can wind up being a bigger problem than the initial issue we didn't want to address. I prioritize hard conversations.

Those are two things. If there's something going on at the mayor's office, that's a priority for me. When I came here, I said, let's be a good city partner.

At City Light, we're very different than a lot of city departments. There is another sister utility, Seattle Public Utilities, that is quite similar, but they have multiple lines of business, different funds, et cetera.

But our relationship with Seattle Public Utilities is super important as is our relationship with all the other city departments because we work together and recognize that customers generally don't care who provides the service they need.

If there's a delay in us getting something completed for someone, they don't care whether it was us or whether the Seattle Department of Transportation didn't issue the permit. They just know they've been impacted.

We're trying to increase the effectiveness of our relationships across the city so we can help customers solve problems without pointing fingers. Those are my tricks. It's hard, but it's also rewarding.

PUF: What advice do you give to others not far along in their careers?

Debra Smith: I tell them, first of all, be clear about what you want. A lot of people aspire to positions of authority or larger spans of control because they want the money, the responsibility, or the challenge.

You also have to like the people. If you don't like dealing with people, whether it's a customer who's unhappy, or an employee who's not thrilled, you may not like the job. You've got to enjoy, or at least get satisfaction from dealing with people across all kinds of situations.

There are all different styles of leadership and they all work.

I believe in a shared leadership model, and I'm at a point in my career where one of the most important things I do is develop people underneath me.

I believe in a shared leadership model, and I'm at a point in my career where one of the most important things I do is develop people underneath me. I am always trying to figure out how I can push more accountability and leadership down in the organization.

I'm still on the hook, and I'll always have people's backs, but that's how they learn. Bottom line be careful and make sure you enjoy this thing you're going after.

Number two is, take lateral assignments. I do not have an advanced degree. The one thing that I regret in my life is that I don't have a master's degree.

But on some level, I learned the hard way. I've taken every lateral assignment that came my way. I took on new challenges without increased compensation because that allowed me to learn.

Third, go look at stuff, especially if you aspire to be in that top seat. Make sure you are comfortable being out and about because your employees want to see you, they want to connect with you, and you'll grow by going and looking at the stuff they've built.

Last of all, create for yourself or ask your leader to help you create some customer facing experience. I don't think you can run a small utility, no matter how good you've been at your job, if you haven't had a customer service job or a customer facing job, because when you get to that small utility, like for me at Central Lincoln, customer escalations go to you.

Right now, I'm probably fielding five or six escalations a week that come to me. I don't talk to all of those customers. Sometimes they find me because I'm the findable person in the night. But I track every one of their issues because the customer called me. I'm responsible for making sure they have a positive experience. Those are my pieces of advice. **PUF**

Edison International CEO on Diversity Transparency

Conversation with Edison International's CEO, Pedro Pizarro,
and Chief Human Resources Officer, Jacqueline Trapp



Edison International and its operating utility, Southern California Edison, have decided to take the next step in diversity, equity, and inclusion. It's all about transparency.

Not only are they accelerating their programs to increase racial equality within the utility and among its suppliers, they're showing everybody what they've accomplished, and what challenges remain. In considerable detail, no matter how encouraging or discouraging, they are rating relative to indicative metrics of equality.

Here, we talk about this transparency initiative with Edison's CEO, Pedro Pizarro, himself a rarity among Fortune 500 CEOs given his Latino heritage. Joining him in the conversation is Jacqueline Trapp, a key player in executing the initiative as the company's chief human resources officer.

PUF's Steve Mitnick: We read about this diversity, equity, and inclusion announcement you made, and it breaks through some new boundaries. What makes it different in terms of the information you've put out?

Pedro Pizarro: We start with the clear commitment Edison has had to diversity, equity, and inclusion for a long time. This is not just a thing for 2020, though clearly the events this year have changed the nature of the conversation nationally.

What feels different now is that the discussion is one that's happening not just inside the African American, Latino, and other ethnic communities. It's a discussion that's happening across our society and with a greater sense of understanding and urgency that we do have systemic racial and social injustices in the country, and it's time we do more.

Our board of directors is diverse, so it starts from the top. We believe we're providing a deeper and more impactful level of transparency.

We're hoping we won't be the only company doing this for long. We believe our data disclosure can be a template for increasing transparency, because without that, you can't have a real conversation about what's going on in society.

Companies like ours are big parts of the economy. We're a big part of the broader society. We can't solve all the problems, but we can do something about them, and this starts with having an honest discussion.

When you look at Edison's Diversity, Equity and Inclusion Report, it addresses all three categories. It talks about our people, procurement, and philanthropy.

Focusing on the people piece, we listened to our folks. We also looked at data. We analyzed that to understand what's going on. What we put in the report was information spanning some of the typical representation data, like our employee population divided by ethnic categories. You don't have to make that public; you just have to provide it to the government. We did both.

Jacqueline Trapp: In 2017, only three percent of Fortune 500 companies were publicizing these data. Now we are starting to see a larger number doing so.

Pedro Pizarro: We went beyond that a couple of years ago when we started providing pay data by gender. We had questions from our women's business resource group.

In the Diversity, Equity and Inclusion report we went beyond pay and gender data and provided pay data by race as well.

— *Pedro Pizarro*

Our business resource groups are a big part of the equation for us. This one asked, do we have pay equity? We said, typically that's data that we and most companies don't make public.

There are legal reasons why companies don't disclose that. But we took a hard look and said, we should make that public. We did, and we've been including this in our sustainability report since then. In the Diversity, Equity and Inclusion report we went beyond pay and gender data and provided pay data by race as well.

That's one of the pieces I don't think we've seen other companies provide. In taking a hard look at these data, it's clear they require context. In our case, we made sure to provide our pay equity information relative to people in similar jobs.

In our view, a job-to-job comparison is the more appropriate way to go. When you see the charts in our report, you'll see we generally pay dollar for dollar, in comparing Hispanics, Asians or Blacks in a given job to white males in the same job. Although it would be fair to do, we didn't take into account individual experience or performance. These can be factors as well, but we wanted to take some of that complexity out.

We also provide group-to-group comparison data, which then shows different outcomes because now you have the influence of how many folks from any given category do you have in higher paying jobs.

The data came as no surprise to us. Over time, we'd like to see



Our company can make sure we're doing everything possible to have a level playing field, and open doors, to create a place where all talents can thrive.

– Pedro Pizarro

that number get more equal as we get into deeper representation, including seeing more diversity in senior level jobs.

Seventy percent of our workforce is diverse across gender and race. In looking across the levels of jobs, we compared our data to market benchmarks and to the local labor availability for most of our workforce, and national availability for executive positions, based on where we recruit talent. In general, we line up very well with market availability.

The other type of transparency we provide is around employee sentiment, sharing insights from our pulse surveys of employees. We went beyond the numbers and we also listened to employees.

We've seen that our employees are generally engaged, but among Black employees there seems to have been a different

experience. Last year we started a series of listening sessions with Black employees, with support from the Networkers, our business resource group that focuses on the priorities of Black employees.

We ended up doing about a dozen listening sessions involving nearly two hundred Black employees who were willing to share their experiences. Some of these occurred a long ago, and some were more recent. We learned we had more work to do, particularly in recruiting and developing Black people.

We also provided data on our philanthropy and procurement. For philanthropy, we donate at least twenty-million dollars a year in shareholder funds, and we target having eighty percent of that go to underserved communities, including diverse communities.

Making a difference in diversity, equity, and inclusion requires listening and understanding, but that's not enough. Action is required. We provided information about what we do today to support diversity, equity, and inclusion, and we also made new commitments, including additional programs for employees, such as career counselors. We committed to a new scholarship program to expand diversity in the skilled craft workforce pipeline. We also made another million-dollar commitment to organizations in our community that are targeting racial justice issues.

We want to understand where we are today, what are we doing, and what else can we do to improve diversity, equality, and inclusion internally. Then we want to look at what we can do to help the community around us.

PUF: Jacqueline, you're in a key position in human resources. How does your operation fit into this?

Jacqueline Trapp: In most companies, human resources is the moral compass of the organization. HR leaders help provide context and understanding of what's happening inside the organization and externally with other companies.

My role is to provide these insights for our company and be the steward of the culture for the organization. While we don't own the culture, we can help reflect it, to be a mirror for the rest of the organization, helping leaders hear what's going on and what we should be doing.

We started conversations with Black employees across the company in Q3 of 2019, including the listening tours. We spent a lot of time in these, as Pedro said.

We had to listen first. We wanted to truly understand what

people were telling us about their experiences before we knew what actions we should take. Many of those earlier steps were things that the human resources organization and our diversity and inclusion group were helping to push forward to make sure we were not just looking at the data, which are important, but also making sure we understand the context of the data.

We want to create lasting impact, based on the insights from the data and sharing the data publicly to make it clear that we're expecting to be held accountable to our commitments.

Our employees helped to come up with some of the solutions we are pursuing, and we're doing this together. When you share data to the degree we have, you create a greater level of buy-in accountability and shared purpose.

We in human resources need to have employee partners who help us understand what it means to be Black and what the company can do to help create equal and fair opportunities. Beyond human resources, the whole management team of Edison came together to make our disclosures and commitments happen.

Pedro Pizarro: I'm comforted that our colleagues within the Edison Electric Institute are taking diversity, equity, and inclusion seriously, looking for ways to take action. In our case, we felt that particularly with our company and the communities we serve, it was important that we go ahead and step out with this level of transparency.

PUF: Jacqueline, there's the challenge of reaching out broadly to attract talented folks, including African Americans, having a good environment so they stay, and can meet their maximum potential. How do you think about that?

Jacqueline Trapp: There are a lot of elements to diversity and inclusion, and one of them is concerned with talent attraction and retention, but it goes beyond that. How do you unleash the maximum potential, to ensure people are giving their full selves?

Diversity without people feeling like they can fully participate is nothing. We shared our data because we know that having diversity of thought and diversity of experience, we're going to get better outcomes, better business processes, and better results.

First, we listened, then we understood, and next we're taking action. We have ten different actions, six of which are internal, things we can do that make working at Edison better.



We want to create lasting impact, based on insights from the data and sharing data publicly to make it clear we're expecting to be held accountable to our commitments.

– Jacqueline Trapp

To be sure, there are risks in just publishing our information. We're not perfect. People are going to see our work, and they're also going to see what we're doing well, and not well enough. Our take was, come look at our work and help us resolve these issues.

To us the data transparency helps shed light on where we can get better. We're doing that when we provide data internally to our different operating units so they can see how they are doing and have personal accountability for making improvements.

We're doing things like offering career counselors to help people with their careers and trajectories through the organization, to help them get into other positions. That's another example.

A bold measure is we're going to use a third party to audit some of our HR and Ethics processes to see if there's any bias within those processes. It's difficult for us to necessarily see this ourselves so using a third party should help us reveal if we have any blind spots.

When we did the listening tours, we heard about some bad experiences our employees had. We want to make sure we're

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United States Energy Association Looks Back and Forward

Conversation with USEA Acting Executive Director,
Sheila Hollis



he USEA was rocked in August by the passing of executive director Barry Worthington. Upon hearing the sad news, PUF published a statement from USEA Chairman Sheila Hollis in the September issue, trying to articulate the Association's grief.

Now, Sheila Hollis is appointed acting executive director at USEA, as the Association finds its footing. That puts USEA in good hands, as Hollis is chair of the law firm, Duane Morris, LLP Washington, D.C. office, well known in energy circles, and simply brilliant, as you will find out when you Google her.

Here, Hollis expands on the transition at USEA, what it means looking back and ahead for the great work this Association is known for. USEA Staff is busy all around the world, even during a pandemic, so you will want to listen in on what is going on.

PUF's Steve Mitnick: What is the mission of USEA?

Sheila Hollis: There are two major missions. The first is the convening of ideas and people. You could analogize it to the Aspen Institute of Energy.

The second mission is the expansion of energy access in emerging economies. One mission is not greater than the other. They are both pillars that stand together.

This is the outreach to the world. The unique contributions that USEA is making are extraordinary in the international and national communities.

Either mission would be the basis of a whole organization unto itself but through the vision to be able to do both, it's not just meetings of smart people talking to each other. It's the outreach and the impact that we're having to deliver safe, reliable, environmentally responsible energy as a human right.

That is what comes through to me and that's what we're trying to continue to do. Everything I see in USEA is strong and in place. The biggest challenge is that we must operate virtually for now. We're missing the camaraderie and the sharing of ideas that doesn't happen remotely.

We don't want to be a lesser USEA. Despite the tragedy of Barry's death and mourning his loss, we remain strong. We want there to be more USEA. Thus, the burden is on the board, the leadership, and the staff of USEA.

PUF: What do you have planned to try to make USEA the same or better than before?

Sheila Hollis: USEA has never been more needed in the world, and there's never been more action on the topics. The record will speak for itself. In the past two months, we've done fifty-eight webinars and workshops of various types and sizes.

There have been at least a thousand different registrants, and maybe more. But sometimes people register and can't participate live because of time zone differences. These aren't just locals. These are people all over the world who are tuning in.

Recordings of the event are made available so they can watch the whole discussion, like the Advanced Energy Technology Forum. This was also possible with the NPC Dynamic Delivery report, which has tremendous consequences. We are continuing educational outreach and placing it in high gear, especially given the restrictions that we have with respect to in-person meetings.

The unique contributions that USEA is making are extraordinary in the international and national communities.

How do we make things meaningful? How do you make it click when you can't all be in a room together? It's the natural human condition to want to be together. We're continuing on with convening, albeit through a screen, and continuing with the educational forum portion.

We're also continuing our work worldwide on various efforts and our mission to develop our internal teams.

The teams are in place, but we're trying to get them talking more amongst themselves because of the nature of the beast of what USEA was. There were so many brilliant minds who were on planes all the time, and they had limited interaction with each other. Thus, we had one group doing one segment of the USEA initiatives and another group doing another segment of the initiatives.

We're starting from the ground up to have more internal communications. We've had one big town meeting of everybody in USEA, a good lengthy one, and that was to roll out the idea of team building because we won't see each other at the office.

We are doing group team meetings. They've proven to be amazing because everyone can concentrate together. One of the drawbacks of large in-person meetings is that everybody is distracted by incoming calls and messages.

Being completely virtual has offered advantages. We are encouraging more virtual team meetings on an ongoing basis.



We have a strong set of women on USEA staff too, and they are not to be trifled with. Our staff is diverse and from every corner of planet Earth.

It's so easy to schedule a call and have everyone join in to talk, share ideas, and coordinate. It's been quite helpful.

Our large forums have also benefitted from being hosted virtually. First, there are no longer any physical barriers. Our Advanced Energy Technology Forum, held in mid-September, had three hundred and twenty registrants from thirty-three countries. That global participation is only possible because it was held online.

The second benefit is there are less distractions. In a big conference room, for example, there are people getting up and sitting down, people are whispering to each other, et cetera. Virtual forums eliminate that.

There are so many moving parts in USEA. It's the nature of our organization. We are active all over the world, and we work with diverse groups with different needs. It's a unique organization. Considering this, it's important for us to communicate effectively internally and externally.

It's critical to get the story out about what we are doing and the energy industry's impact throughout the world. There's hydro, nuclear, oil, gas, and all forms of alternative energy. With the teams, you are overwhelmed by the intellectual firepower.

PUF: How does that work when the need is greater because the pandemic is international, but talking about American values and ideas in energy, to whether it's South Asia or Africa or Eastern Europe or wherever?

Sheila Hollis: There are a lot of three a.m. phone calls for our staff. That's the dedication we have and they're in continuous contact. It's heartbreaking that we can't travel because that was a key part.

We're playing the hand we're dealt here and the hand that everybody else has to play too. Unless our partners want to stop, the expansion of knowledge is essential for the betterment of their country, environment, and people. I don't think they have any interest in stopping. They want to keep moving forward and I know we do.

They can't just wander off and say, too bad. People want progress. This is impacting millions of people throughout the world. We can't throw up our hands and say, we're not going to do this anymore and we're not going to give it everything we've got.

PUF: Who's going to step up and lead?

Sheila Hollis: That's not my decision, and the board will decide when they're ready to.

PUF: How will you proceed in the interim?

Sheila Hollis: The board will continue their meetings and subgroup meetings; it's a sophisticated board representing the entire energy industry. Vicky Bailey chairs the board, and she is knowledgeable.

They are up to speed about what we're doing and what we see as the needs for the future. We want to keep all hands-on deck in USEA and continue our mission.

That's what we're proceeding on. Following the initial shock of the first few days when we were all completely stunned by Barry's loss, we are now going on full force.

PUF: You've been a successful energy lawyer and involved in a lot of big matters over your career but been a fan and involved and loyal to USEA as an institution. What's rewarding about that?

Sheila Hollis: The reward is knowing that the purpose of the organization is fulfilling and so important to the world and to this country. I like to say, energy never sleeps, and we can't sleep either.

As an example of the speed and unpredictability of the energy world, some years back I was out on the West Coast for a bar association meeting in San Diego. I got up in the morning and was looking at the ocean and the wide waves were particularly enormous.

That was the beginning of the impact of Fukushima, the typhoon, and everything related. I hadn't turned on the television. I was just out on this beautiful balcony and that's how fast it changes.

There are very few businesses like energy, that A: have the consequence, B: move as fast, and C: have the technical challenges, not just on a computer, but what effects real people in the real world. It's gratifying.

My biggest challenge has been learning all the new tech issues that are necessary to survive in this job. I receive a lot of hand holding on that from USEA staff because it's challenging to be on four or five different platforms for meetings like this. People are all over the place, there are technical difficulties, and you try to keep your cool.

Although virtual offices are great, I miss being physically with other people in the work context, so those are the challenges. I love what USEA is doing and when you find something you love to do, it's not really work because every day there's so much to learn. You can't rest on your laurels for even a minute because there's another challenge and the emails keep coming in.

PUF: Talk about the staff.

Sheila Hollis: Those people are crown jewels. The intellect, impact, and dedication are extraordinary. It's made more



Our Advanced Energy Technology Forum, held in mid-September, had 320 registrants from 33 countries.

extraordinary by the fact they didn't all even get together physically that much, because they were on planes most of the time, but they were together on particular projects.

I want to talk to every individual, and it's not a superficial conversation. We are going into everything that's going on and it's an intellectual challenge, but it's great to see such good people trying so hard under these mad circumstances that we're all operating in.

Security worldwide has been a worry for many years, and I've done a lot of international gigs and it's stressful. We have a strong set of women on USEA staff too, and they are not to be trifled with. Our staff is diverse and from every corner of planet Earth.

It's an amazing group of people and it's an honor to work with them. You never get tired of talking to smart people, although they are smart, they could get on your nerves sometimes. Yet, they're quite self-effacing, and there's not much self-promotion. I've been amazed. **PUF**

"Edison, meanwhile, was searching for a site for his central station... He found real estate priced so high around the spot he had selected as the best and most economical for his station, that he had to abandon the location. Thinking that in the slums district he might find a much cheaper price of property, he toured some of the streets near the water front... He found that at 255 and 257 Pearl Street two buildings were up for sale." — Menlo Park Reminiscences, by Francis Jehl.

USEA Advanced Energy Technology Forum

Meaningful Moments at the Forum



The United States Energy Association held its virtual 2nd Annual Advanced Energy Technology Forum in mid-September, exploring technological innovation in the energy sector. The event focused on research and development in the corporate and government sectors, including national labs and universities.

Technology and innovation are of great interest to PUF readers, so PUF Staff attended the USEA Forum, highlighting here two speakers who exemplify great achievements in research in our industry. Arshad Mansoor, EPRI's President and Michael Webber, ENGIE's Chief Science and Technology Officer, leaders in the race toward decarbonization, gave fascinating insights as to the energy future that research at those pioneering entities will bring.

Mansoor and Webber look at the past, present, and future, of the journey toward a lower or no-carbon regime. Provocative, insightful, and captivating are but a few of the descriptors to use for what they have to say.

Arshad Mansoor

President, EPRI

USEA's Sheila Hollis: Thank you so much for joining us at our Advanced Energy Technology Forum. We welcome all three hundred-plus participants in thirty-two countries around the world.

I'm Sheila Hollis, the acting executive director of the United States Energy Association. Before we start our formal program, I wish to note that the untimely passing of Barry Worthington only a month ago has been a tremendous blow to people throughout the world who knew him and call him a friend and leader.

He is one of the instigators, one of the dreamers that brought this program into being and brought it to fruition. We mourn him, but know that his deepest, most sincere wish after thirty plus years with the USEA is to see us keep going and be committed to reaching out to the world with the most cutting edge, most significant issues of our day in energy and related fields.

We have tremendous leaders in all aspects of energy technology, who are influential, not only vis à vis government, but in the impact directly and indirectly on lives throughout the world.

Thank you to the staff, who have been so committed to carrying on in the midst of this tremendous period of upheaval. They have carried Barry's vision.

I welcome our first speaker, Arshad Mansoor, who is the president of the Electric Power Research Institute and is responsible for the institute's operation and portfolio of the research and development programs.

He's been with EPRI for twenty-one years and served as senior vice president of research and development and vice president of power delivery and the utilization sector.

Mansoor holds five U.S. patents in power, electronics, and distributed energy resources. He's a senior member of IEEE and served as a VP of the U.S. National Committee of CIGRE. He's a member of the board for The Energy Production and

We have to clean electricity. There will be more coal to gas. There will be more renewables, but we need to make sure the largest source of clean energy, nuclear, stays online.

Business School Advanced Management Program.

EPRI's Arshad Mansoor: I want to share some of the work that we're doing at EPRI with our members, with our partners like GTI, on what is a powerful way to transition to a clean energy future.

But before I share my thoughts, let me just pause and say we all miss Barry. Barry has been a larger than life influence in the global energy arena. He was a visionary, but he was a pragmatic visionary. He knew the need for clean energy for the world, but he also knew we need to do this powerfully, reliably, and affordably, for all the people in the world, some of whom don't have access to any energy.

I thought it would be appropriate for me to talk about some of the work we have done over the last, almost a decade, to look into not just the electric sector, but the transportation sector, the buildings, and the industry, and see what is a powerful way we can transition to a clean energy future. We call that our Project 2X to 2050.

Infrastructure Center at the University of North Carolina at Charlotte.

Mansoor has a BS in electrical engineering from Bangladesh University of Engineering and Technology and an MS and doctorate in electrical engineering from the University of Texas. He's also completed the MIT Reactor Technology course and Harvard



Sheila Hollis



Arshad Mansoor

Before we look at what is the technology pathway that our research is eliminating, it's good to look at the past and see what we have done, in the U.S. Our emissions in 2005 related to energy production, delivery, and use was approximately six gigatons per year. The electric sector was the largest emitter. Forty percent of those six gigatons came from the electric sector, then transportation, industry, and buildings.

Today, if you look at January 2020, we have been able to reduce, in the U.S., that six gigatons emission to five gigatons, and if you look at the way we did that, it was primarily the electric sector.

In January 2020, the electric sector was not the highest emitter, but transportation is, and energy has become almost thirty percent cleaner from 2005 to 2020. This contribution that the electric sector made primarily came from the fact that almost two thirds of that was using natural gas. It was a coal to gas conversion.

One third of that was new wind, new solar, and the price of renewables going down, but it's important to keep in mind that we were able to mostly keep all the nuclear plants operating, and that's the largest carbon free energy that we have in the U.S. today.

If we look globally, the global emissions went up from 2005 to 2020. There were forty countries that reduced emissions. The U.S. was one of them and has contributed to more than half of the emissions reduction.

One of the most important factors is during this last fifteen years our economy grew, but with the retail price of electricity that the consumers pay, inflation adjusted in real dollars remained essentially flat. Going from six to five, mainly using cleaner electricity, and energy efficiency is always the first resource that we use.

But we use two tools in our toolbox, energy efficiency and cleaner electricity, to get from six to five, and do that affordably. Then we paused and looked at, what can we do in the future?

What can we do in the next ten years? What can we do in the next twenty to thirty years? The way we do this is we have a comprehensive energy system modeling tool that is informed with the research that we do across different technologies to see how technologies will progress in the next five, ten, fifteen, or twenty years.

If you look at the technology progression and cost reduction,

We need alternate energy resources, the low-carbon resources, hydrogen, liquid ammonia, synthetic fuel, and biogas.

what is a reasonable estimate? If we looked at 2030, ten years is the next decade and we think that we can get to four gigatons, five to four, in ten years, so it's almost a fifty percent acceleration. We can do that, but we've still got to do energy efficiency.

That's the best resource for our consumers. We have to clean electricity. There will be more coal to gas. There absolutely will be more renewables, but we need to make sure that the largest source of clean energy, nuclear, stays online. But we have to bring a third tool into the toolbox and that third tool is efficient electrification, especially on the transportation sector.

So, that five to four progression, we think we can do that fully, reliably, and affordably. In addition to energy efficiency and cleaner electricity, there are some new technologies that this industry will need to deploy at scale.

Our model is showing that we'll need approximately thirty gigawatts of flexible resources. Some will be batteries, and some will be flexible demand enabled by grid modernization. That's a big amount. That's the amount of hydro that we have today that took us decades to build.

Our model also shows that we will be reaching cost parity over the next three to four years on electric vehicles and gasoline vehicles. In 2020, four out of ten new cars could be electric. If you look at an average U.S. customer, with forty-five thousand dollars of annual income for a residential household, almost ten percent of that, forty-five hundred dollars, is their energy bill.

The energy bill is gasoline, electric, and natural gas. If EVs reach cost parity, not if, when, and if we replace combustion engines with EVs, that customer in that residential household can reduce a thousand dollars of their energy bill, but we need infrastructure for charging that is widely available.

That's not just for the upper income people, but in

disadvantaged communities, in places where your average residential neighborhood is. This will require a significant amount of charging infrastructure. It's almost like 1936, when we made a decision that electricity is good for all and we needed to do rural electrification.

That's the first time we can do that, and cleaner transportation enables us to do that. Then we paused and said, how do we go beyond 2030? How do we go from low to no? When we say, low to no, it could be zero ton, or it could be 0.5 gigatons, but it's a low to no carbon future.

That's where we came up with the realization that even if we do energy efficiency, people bring in more renewables, and add nuclear, and they're electrifying our buildings and transportation.

Even with that we will not be able to go to net zero or even close to net zero across the economy. That's where we need alternate energy resources, the low-carbon resources, hydrogen, liquid ammonia, synthetic fuel, and biogas. One opportunity is we can use the clean electricity grid and use clean electrons to produce clean molecules.

That's the genesis of what we launched earlier this month, happening with GTI, the Gas Technology Institute, which is the Low-Carbon Resources initiative. It's a long shot that the industry is undertaking, so that in this decade while we are deploying EVs, while we are deploying batteries, bringing more renewables, keeping our nuclear grid operational, we're also doing the research.

We're looking at advanced nuclear. We're looking at electrolysis. We're looking at how new molecules, like hydrogen and liquid ammonia, could clean the transportation sector, the shipping sector. We're looking at how the natural gas infrastructure that we have in the U.S. could be carrying, maybe initially, a blended fuel, natural gas and biogas, biogas and hydrogen.

Natural gas has been a key ingredient over the last fifteen years to go from six to five. It will be a key ingredient, key molecule, going from five to four. Industries will be replacing crude with natural gas as their raw material.



We'll need something, another molecule, as we start looking into a zero-carbon future, a low to no carbon future. And that's what LCRI is going to do. It's a 5-year initiative.

There will be more coal to gas conversion, but we'll need something, another molecule, as we start looking into a zero-carbon future, a low to no carbon future. And that's what LCRI is going to do. It's a five-year initiative.

We are excited, but it just started. We have almost twenty entities, gas companies, electric companies, technology providers, GE, and Mitsubishi, that are part of it. Our goal for the moonshot is we will, through coordinated research, development and demonstration, advance technologies that will help us to take the electric sector from seventy or eighty percent to a hundred percent clean, but it will also take the transportation sector there.

It will also take the buildings and industry, where you can electrify everything, but you have other low-carbon resources that will help in the decarbonization. I'm excited about it all. ○

Michael Webber

Chief Science and Technology Officer, ENGIE

USEA's Will Polen: Our keynote speaker and closing address, is brought by Michael Webber, who is the Chief Science and Technology Officer at ENGIE. He is based in Paris.

In his capacity as the Chief Science and Technology Officer at ENGIE, he is responsible for global energy and infrastructure. He is the Professor in Energy Resources at the University of Texas at Austin.

Mr. Webber's expertise spans research and education at the

convergence of engineering, policy, and commercialization on topics related to innovation, energy, and the environment. His latest book, *Power Trip: The Story of Energy* was published on May 7th, 2019 by Basic Books with a six-part companion series that aired on PBS, Amazon Prime, and iTunes starting Earth Day 2020.

His first book, *Thirst for Power: Energy, Water and Human Survival*, which addresses the connection between the earth's most valuable resources and offers a hopeful approach toward a

sustainable future, was published in 2016 by Yale Press and was converted into a documentary by Alpheus Media.

ENGIE's Michael Webber: I have a few comments about the energy world as I see it. There are a lot of trends afoot that will affect the kinds of decisions we have to make now. The six demographic trends that are driving the energy system now are: population growth and economic growth, along with urbanization, industrialization, electrification, and motorization.

These are the six fundamental drivers of what's happening with energy in that there's population growth, which means more people. Each person wants to consume energy as well as food and water.

Economic growth, which means each person as they get richer is consuming even more of those things than they would if they were poor. That's mostly a good news story, but there's some bad news there as well if we're not careful.

Then there's urbanization and industrialization, which means we're moving from farm to factory, from small town to large city. There might be some countertrend on that temporarily from COVID, but generally speaking, the story of urbanization's been afoot for hundreds of years and I don't think that's going to stop.

Then there's electrification and motorization, which is as we get rich and as we change our services, sectors, and different makeup of the economy, electricity and mobility become desired.

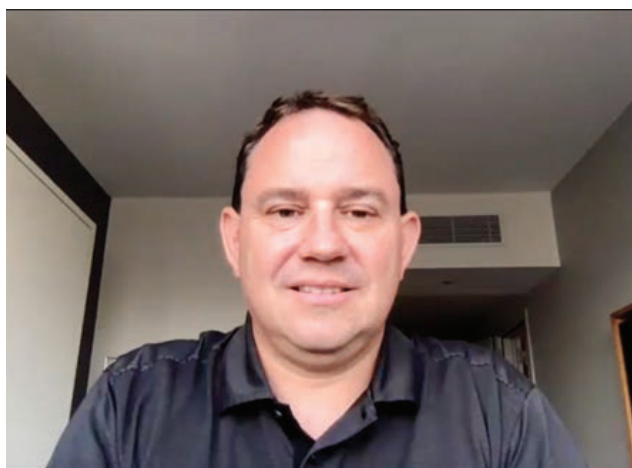
The fuel of the rich is electricity. That's something everybody wants and it's the greatest pathway to affluence and prosperity. Mobility is one of those great outcomes where we like to move around when we're rich, and moving people and goods around is one of the ways we can get rich, or have prosperity and security because of global supply chains of what's enabled by energy.

These are the six fundamental drivers of energy. With these six demographic trends, there's more of us getting richer, moving from small towns to big cities. We're going from farmers to factories, as well as desiring electricity and mobility.

That means everything's changing for energy. We're changing how much we consume. We're changing the types of fuels we get. The quantity, the quality of it, the nature and application energies are all changing. This creates a massive energy transition. Those are the demographic trends.

At the same time, we have three technology trends. One is the trend toward efficiency using less mass and less energy for particular goods and services. It takes less energy today to operate a light bulb, move a car, or cool a room, so that can be more efficient, which is good news. We're using less of stuff to get a particular outcome we want.

The second trend is increasing information intensity. We're using more data and information to achieve the same goals we used to achieve. That's one of the reasons why we're more efficient is because of the information intensity. The energy intensity is dropping, but the information density is increasing. It means they are countertrends.



The six demographic trends driving the energy system are: population growth and economic growth, along with urbanization, industrialization, electrification, and motorization.

The third technical trend is decreasing centralization of energy, but it happens for other sectors as well. Instead of having a large power plant far away and then moving the power to the city, we might have a localized energy production with rooftop solar panels, or local fuel cells and energy communities. We're changing the way we move our energy around.

We're doing the same with health care with telemedicine. We're doing the same with manufacturing with 3D printers at factories. This rise of decentralization is unique because it changes the way we allocate our capital, what we build, and where we build it.

The six demographic trends have these three technology trends that are: efficiency, information intensity, and decentralization. It's all wrapped up in this two-sided challenge, which is, how do we increase resource access? How do we increase energy access? At the same time, we decrease its impacts.

This is a challenge. There are a billion people in the world who don't have access to electricity today. There are three and a half billion people who don't have access to reliable electricity. There are people who have access to electricity, but it's not reliable.

The challenge is, how do we increase energy access for those who don't have it? But we also have to decrease the impacts from those who do have access because of the accumulated effects of the environmental pollution on land, water, and the atmosphere.

In particular as we accumulate carbon dioxide or other greenhouse gases in the atmosphere, it has long-term consequences on everything else because it accelerates and intensifies the

hydrologic cycles. It affects the way the water flows, and that affects where we get rain, snow, drought, heat waves, and so on.

There are a lot of problems with our energy consumption that we have to solve. Telling a billion people they cannot have access to energy is not a moral, humane, or appropriate solution. We must increase energy access, but decrease the impacts for them, as well as for those of us who have a lot of access.

This is the challenge I live and breathe at ENGIE, which is a global energy company. We're in seventy countries. We are the largest independent power company in the world. We also sell a lot of gas and energy efficiency services. We want access to those new markets from a corporate view to sell more energy to people.

But we also have a philosophical mandate to decrease our carbon emissions. As a company, we are rapidly decarbonizing. We've cut our carbon dioxide emissions about fifty percent in the last four years, which is incredible for an energy company. We're living this.

In my role as Chief Science and Technology Officer, I run the research programs. This becomes my research mandate. How do we decarbonize in a way that's robust, resilient, sustainable, affordable, and scalable?

We can't do the same thing we've done for decades. Some of the easy, obvious solutions are to shut down dirty, outdated, inefficient coal plants and replace them with natural gas, wind, and solar.

Keep your nukes, hydro, and geothermal wherever you can. Those are the obvious first steps. That's what the United States is doing with cheap gas, wind, and solar. It's what the United Kingdom is doing, so the U.K. and U.S. are decarbonizing, which is great.

That's the easy part. After you shut down coal and build cleaner, the next parts become harder, which is decarbonizing transportation, industry, and home heating. Maybe you can electrify a lot of our mobility with light duty vehicles that serve people like cars. Maybe we can electrify building heating and cooling, and that will help.

But then what do we do for the heavy industrial loads or the heavy duty aviation, marine and shipping, and what do we do with buildings that have been running for a couple hundred years, where it might not be so easy to electrify them because they have gas pipes?

This becomes the research agenda, which is how to decarbonize heat, fuels, and gases. This includes things like biogas and synthesized methane from hydrogen in hydrogen as a fuel, or other hydrogen carriers like ammonia and methanol.

It means using batteries and storage to accommodate more variable renewables on the grid like wind and solar. It means non-variable renewables like geothermal, biomass, and hydro, where you can do it if it makes sense.

Do all these things rapidly, because every year we delay, it makes the challenge more difficult and becomes more expensive to deal with the consequences of climate change and it's also more expensive to mitigate.

We're in a foot race to solve this and even though I run the research program at one of the largest research portfolios on clean energy in the world, at a very large energy company, it's not enough. This is too big a problem for any one company or any one country.

We have to have collaboration from company to company, country to country, and sector to sector, because the energy sector is becoming integrated with the mobility, healthcare, and the building sectors.

We've been pushing for that energy to do more collaboration. Now we're collaborating with the Googles, Amazons, and Dell Technologies of the world.


After you shut down coal and build cleaner, the next parts become harder, which is decarbonizing transportation, industry, and home heating.

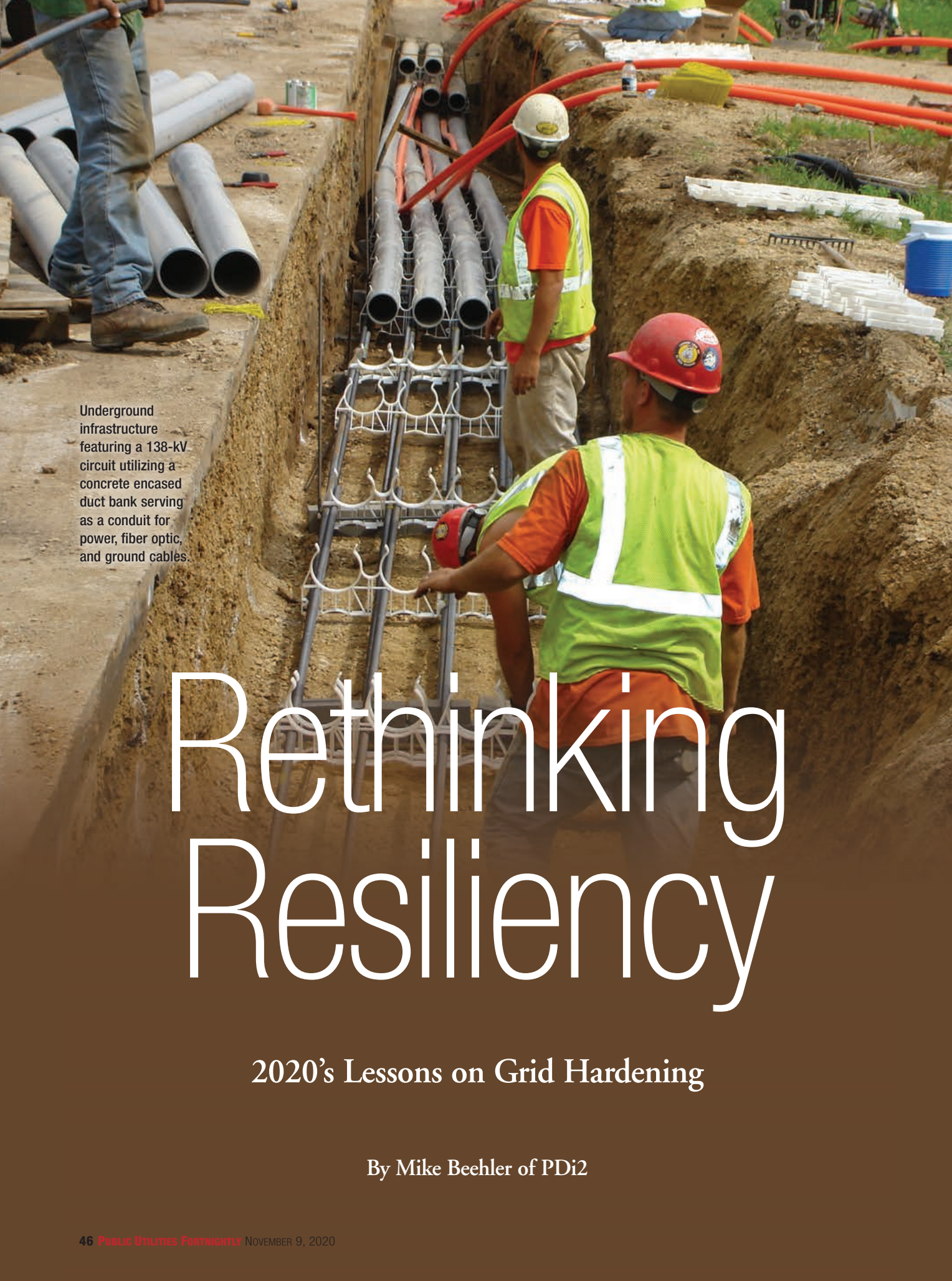
We're also looking at companies that used to be our competitors, like Shell, or our providers like Siemens, and General Electric that are getting into this business more. The traditional fault lines that define where one industry ends are getting fuzzier because we're all moving into each other's spaces and this creates disruptive opportunities, but also unique potential to solve the problem.

We need long-term global thinking. If you take the long-term view, the tension between the environmental answer and the economic answer goes away. Today for the economic solution, the cheap solution might not be the same as the environmental solution.

The environmental solution might be triple pane windows, a more efficient car, or a more efficient air conditioner, which usually costs more upfront, but then saves you money over the operational lifetime. If you go far enough into the future, the environmental answer and the economic answer converts are the same.

The pollution we used to emit would be damaging to the ecosystem of the people right at the point of pollution. But now with climate change, the pollution happens at one place, but the people who were affected live halfway around the world and haven't been born yet.

This is a unique kind of environmental and policy challenge. But if we take global long-term thinking, we'll get there. That's what we need along with collaboration. 

A photograph of a construction site showing a deep trench. Two workers in orange shirts, yellow safety vests, and hard hats are visible. One worker is in the foreground, looking down at a metal rack holding several large white pipes. Another worker is further back, also looking at the pipes. The trench is lined with concrete, and the pipes are arranged in a row. Orange cables are visible running along the top of the trench. The background shows more construction materials and equipment.

Underground infrastructure featuring a 138-kV circuit utilizing a concrete encased duct bank serving as a conduit for power, fiber optic, and ground cables.

Rethinking Resiliency

2020's Lessons on Grid Hardening

By Mike Beehler of PDi2



ven working within the most ideal conditions, operating a safe, reliable, affordable, and sustainable electric utility is a challenging task. Unfortunately, 2020 has been anything but ideal. A global pandemic, supply chain disruptions, massive fires in the west, and a significant increase in severe weather are just a few of the challenges utilities have faced and are still facing. This year has forced us to learn some hard lessons and ask important questions about the future of resiliency and hardening North America's electrical grid.

Utilities Prepare to Handle Multiple/Concurrent Crises

Utilities are no strangers to preparing for and responding to emergencies. However, decades of experience could not have prepared us for multiple and concurrent crises. With COVID-19 promptly followed by annual weather events and devastating fires, many utilities find themselves confronting a new crisis before having time to fully address the previous one. This Black Swan event has strained resources in ways that few would have predicted.

The historic effects of COVID-19 have had widespread implications on utilities usually well-prepared for and accustomed to crisis management:

Early on, lockdowns and social distancing requirements made it difficult to provide good customer service and respond to outages; Working with new pandemic guidelines meant prioritizing critical maintenance over non-critical work. Some utilities responded by increasing the number of shifts, staggering hours, and deploying small, fixed crews; and Supply chain disruption and limited availability of personal protective equipment increased restoration times and created financial stress for residential customers and businesses that remained open.

Though restrictions are beginning to ease in some areas, utilities are still dealing with the longer-term ramifications. Fortunately, much has been learned. Today, most utilities are prepared for the possibility of another wave and are bracing against further business and service disruptions.

Severe weather events and massive wildfires have not pulled their punches because of a global pandemic. The National Oceanic and Atmospheric Administration (NOAA) predicted an above-normal hurricane season with as many as twenty-five named storms (more than double the historical yearly average). As of September 2020, the U.S. has seen fifteen named tropical storms and eight hurricanes this year.

Hurricane Isaias (August 4, 2020) left four million without power on the east coast. Damage from the storm could cost

The new normal of COVID-19 and pandemic-related health requirements has coincided with the new reality of increasing severe weather events and fires.

Hurricane Laura (August 27, 2020) left an estimated nine hundred and eighty-nine thousand without power across Texas and Louisiana. Entergy's restoration costs may be anywhere from 1.5 to 1.7 billion dollars. With critical transmission structures damaged beyond repair, full restoration did not occur until late September.

Hurricane Sally (September 16, 2020) brought heavy rain and catastrophic flooding to the Gulf Coast, leaving five hundred and fifty thousand without power in Alabama, Georgia, and Florida. In Pensacola, the storm brought four months of rain in four hours and rainfall was measured in feet instead of inches in some areas. Total damage and clean up after Sally will cost eight to ten billion dollars.

For the second time in history and the first since 2005, the end of the list was reached used for naming Atlantic storms, making it necessary to move to the Greek alphabet with Hurricane Beta making landfall the third week of September.

Even more concerning, data from NOAA shows the frequency of severe weather events is steadily increasing. From 1980 to 1989, billion-dollar weather events occurred on an average of only 2.9 per year. From 2010 to 2019 the average increased to 11.9.

As of July 2020, there has already been ten of these billion-dollar weather events. While calculating the value of billion-dollar events is affected by current inflation-impacted replacement costs, it is still a noteworthy metric indicating the increasing frequency of severe weather.

In addition to hurricanes, 2020 has been a particularly active year for wildfires. Between January 1 and September 28, 47,520

utilities more than three hundred and fifty million dollars in repairs. In Connecticut, Eversource removed thirty-five hundred downed trees and replaced a hundred and thirty-seven miles of power lines. "That's like building a whole new distribution system from scratch," said Frank Poirot, Eversource's senior media relations specialist.

Mike Beehler has nearly forty years of electric T&D experience at Tucson Electric Power, Hawaiian Electric Co., and Burns & McDonnell. He is a civil/structural engineer and registered professional engineer in eight states. He is founding member and Chief Opportunity Officer of Mike Beehler & Associates, LLC and serves as National Spokesman for the Power Delivery Intelligence Initiative, www.pdi2.org/. Beehler is a Fellow in ASCE and Member of IEEE and CIGRE.

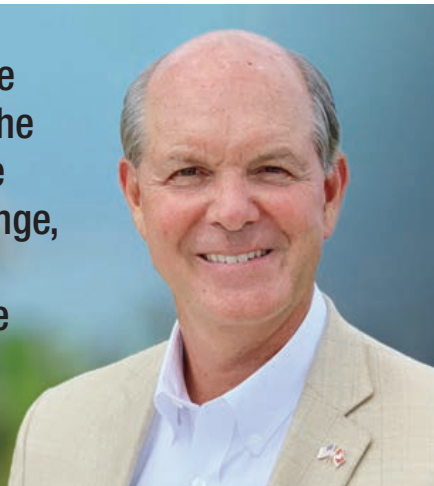
U.S. wildfires have affected over 7.4 million acres of land, an area nearly the size of the state of Maryland (compared to 39,476 wildfires and 4.3 million acres for the same period in 2019).

Are we prepared to handle the collision of two new realities? The new normal of COVID-19 and pandemic-related health requirements has coincided with the new reality of increasing severe weather events and fires. Utilities should not only reevaluate disaster-response playbooks but must also consider the most cost-effective ways to build a more resilient power grid.

“Historically, the costs of installing and maintaining underground lines have been prohibitive and utilities have turned away from that option because it didn’t make financial sense. I would challenge that today. The cost structure around undergrounding is changing and the cost of keeping overhead through storm season is going up. Going underground is beginning to make financial sense in certain areas.” – Biren Patel, Electrical Engineer/PM at Biren Patel Engineering

“Electric utilities are best able to lead the dialogue, advocate for regulatory change, and propose cost-effective resilience solutions.”

– Mike Beehler



Utilities Poised to Lead on Cost-Effective Resiliency Efforts

System resiliency is achieved by grid hardening, or physically changing infrastructure to reduce its susceptibility to damage. Resiliency is the ability to withstand a high-impact, low-probability event with little or no customer impact. Or, according to the North American Reliability Council, the effectiveness of a resilient infrastructure or enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event.

Hardening the grid increases its durability and stability – making it better able to withstand the impacts of severe weather and fire and potentially reduce the impacts of unexpected worldwide events like COVID-19. Utilities have a unique opportunity to take the lead on building system resiliency and developing best practices for monitoring, measuring, and assessing the results.

Electric utilities have the best data and access to world-class capabilities to assess resiliency levels, their cost-effectiveness, and

life-cycle value versus initial capital cost. New metrics may be needed such as Total Length of Restoration to define the benefits to all customers.

Additionally, electric utilities are the key point of communication between consumers and regulators. Positioned between all relevant parties, electric utilities are best able to lead the dialogue, advocate for regulatory change, and propose cost-effective resilience solutions for long-term improvement that will provide stakeholder and shareholder value.

Unfortunately, electric utilities have the financial risk. Normally not adversely impacted by stock market volatility, U.S. utilities saw share prices fall by ten percent to thirty percent during COVID-19. Increasing severe weather and fire events bring financial risk.

The Need for A New Paradigm Is Clear

The events of the past year have sent many of us searching for better solutions. How do utilities cost-effectively improve resiliency and harden the grid to withstand future disasters?

New technology and construction methods are making resiliency programs more cost-effective. For example, the electric power industry has long held that overhead electric distribution is more cost-effective than underground distribution.

While the capital cost of overhead was less than underground distribution, the total life-cycle cost of ownership of overhead versus underground distribution has changed significantly. Recent construction, health profile assessment, component, and material

technology advances now make underground more safe, reliable, and resilient than overhead over the life of the asset.

The life-cycle benefits of resiliency (undergrounding in particular) are being clearly documented and demonstrated. There is a growing body of evidence on the benefits of resiliency. For example, Dominion Energy and Florida Power & Light and their regulators are leading the way with strategic undergrounding. These utilities have started to underground poorly performing overhead distribution lines to shorten restoration times following major storms.

Dominion Energy’s Strategic Underground Program (SUP) is a “system-wide initiative to shorten restoration times following major storms by placing certain outage-prone overhead electrical distribution lines and equipment underground.” Stated benefits include:

Undergrounding lines that historically see the most damage reduces outage frequency and duration in the most damage-prone neighborhoods; Undergrounding significantly reduces restoration

Wildfires ravaged California, the Pacific Northwest, and other parts of the nation in 2020, a difficult year for natural disasters.



A crossarm topples, which has become more common as the number of natural disasters increases.

Advances now make underground more safe, reliable, and resilient than overhead over asset life.

time (by days); Faster restoration decreases the economic impact of major storms; and Undergrounding the most outage-prone parts of the distribution system will increase overall reliability.

“In recent years, new electric lines serving housing developments, office parks, and campuses are placed underground. However, in many older neighborhoods, power and communication lines remain overhead, making them vulnerable to weather events. The COVID-19 pandemic has increased customers’ needs for a more reliable and resilient power grid, with many residences acting as home offices and home schools.

Dominion Energy in Virginia has been investing in programs to increase the resiliency of its distribution system. For example, the Strategic Underground Program, which started in 2014 and targets the most outage-prone overhead tap lines and seeks to place them underground. One of the most effective tools to prevent tap line outages has been converting those lines to underground.

The goal of the SUP is to reduce the number of work-repair locations required to restore power outages following a major weather event, which will decrease the length of time other customers across the Dominion Energy service area are without power. Using a data-driven process to convert four thousand miles of the most outage-prone lines to underground could reduce restoration times following severe weather events by up to fifty percent.

Dominion Energy has a resilient electric distribution system that benefits our customers because we started such programs as the Strategic Underground Program and formed partnerships with our customers to underground more than fifteen hundred miles since

its inception.” – Karen Kinslow, Director of Grid Resiliency at Dominion Energy.

Florida Power & Light strategically targeted its worst-performing lateral feeders and is putting them underground. Approximately forty percent of the electric distribution across Florida is already underground.

Existing storm data and early pilot reports suggest a forty percent improvement in reliability and much better resiliency during major storms. Underground outage rates are around eighteen percent versus eighty-two percent for non-hardened overhead distribution lines and sixty-nine percent for hardened overhead distribution lines.

Resiliency Is the Answer For 2021 And Beyond

2020 has shown us the need to prepare for multiple new realities. Utilities are on the front lines of operating and maintaining critical infrastructure in North America. Electric utilities and their stakeholders will lead the way toward a new resiliency paradigm.

To that end, the Power Delivery Intelligence Initiative, or PDi2, is here to help support the industry. An organization of suppliers, consultants, and other stakeholders, the purpose of

(Cont. on page 60)

Demand Charges?

What are They Good For?

By Mark LeBel and Frederick Weston
of Regulatory Assistance Project



emand charges, rates that are applied to an individual customer's maximum short-term usage (typically fifteen, thirty or sixty minutes) in a billing period, have existed since nearly the beginning of the electric industry. While utilities often favor them, economists have continually questioned whether demand charges are an efficient form of pricing. Alfred Kahn wrote in 1970 that they are "basically illogical."

The widespread adoption of advanced metering provides an opportunity to reconsider demand charges, even for industrial customers, and replace them with more efficient time-varying energy (kilowatt-hour) rates. With technical assistance from engineer Ronny Sandoval, we recently published a paper examining demand charges and cost causation.

Like many analysts from the past, we conclude that demand charges have only made sense as a proxy and are not a general solution for shared capacity costs. Furthermore, the changes occurring with a modern grid are undermining the conditions that made such a proxy reasonable. With a few narrow exceptions, the technological capabilities of the twenty-first century electric system are rendering demand charges obsolete.

For most customers, traditional monthly demand charges have always provided a perverse incentive that does not reflect cost causation for shared system costs. In a system with a wide diversity of customers and usage patterns, individual customer noncoincident peaks (NCP) do not reflect the coincident peaks that drive shared generation and delivery capacity costs.

The price signal that demand charges send – to lower individual customer NCP and to level a customer's load over time – is substantially different than a price signal to reduce usage at the time of coincident peaks.

As a result, demand charges penalize customers for usage at times that do not impose particularly high costs on the system, and encourage them to waste effort and money shifting loads off their own maximum hour (and sometimes onto high-load system hours).

The historic exception to this rule is a customer that has a nearly a hundred percent coincidence factor with the relevant peaks. The prototypical example of this in the mid-twentieth century was an industrial customer with very high load factors. Demand charges could be reasonable in the past only as applied to this specific category of customers.

But in today's electric system, even this justification for

With a few narrow exceptions, the technological capabilities of the twenty-first century electric system are rendering demand charges obsolete.

with wind – becomes cheaper to serve than load that is inflexible and unable to respond to these changes.

With on-site energy storage becoming increasingly affordable, more and more customers will be able, and more inclined, to respond to price signals that reflect system conditions. Such a response would likely decrease a customer's load factor, something deliberately discouraged by demand charges.

Historically, demand charges have frequently been sized to recover most or all shared system capacity costs. Again, this may have been reasonable enough in the mid-twentieth century for certain customers, but it does not reflect the economics and engineering of a modern electric system.

The choices that system planners make are trade-offs between different types of costs. Much capacity investment today aims to reduce energy costs and is not incurred to meet peak reliability needs.

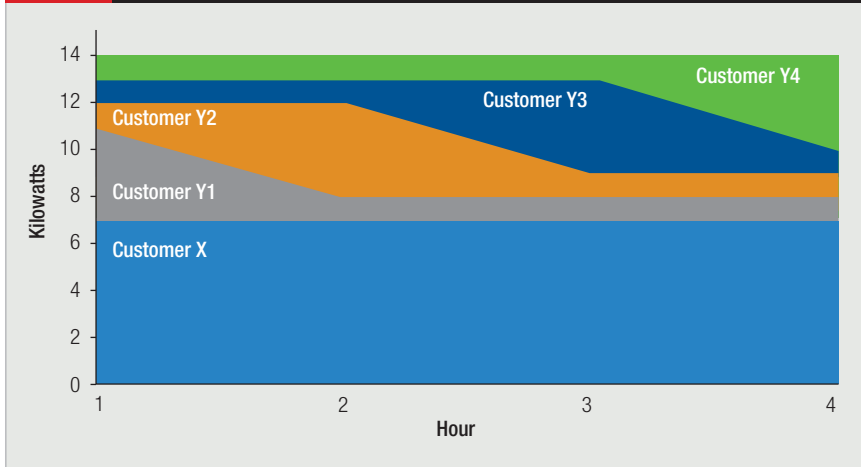
This means that a significant portion of costs for generation, transmission, and distribution capacity cannot be reasonably described as demand-related or driven by peak reliability needs. Any pricing structures that reflect the marginal costs of peak system capacity should be sized properly to reflect these distinctions. That includes demand charges, if appropriate, but it also

demand charges falls away, because a hundred percent load factor is unlikely to be – from a system perspective – the most desirable load shape. As power grids incorporate larger shares of variable renewable energy, flexible load – demand that can respond to swift changes in the availability of supply, perhaps in the middle of the day for solar and late at night

Frederick Weston is a principal and director of policy at the Regulatory Assistance Project, focusing on identifying and developing responses to new trends in energy production and use, greater integration of RAP's regional programs, and development of RAP's staff and intellectual resources. He joined RAP in 1999 after more than a decade as an economist and hearing officer at Vermont's PSB, and directed RAP's China program from 2011 to 2018.

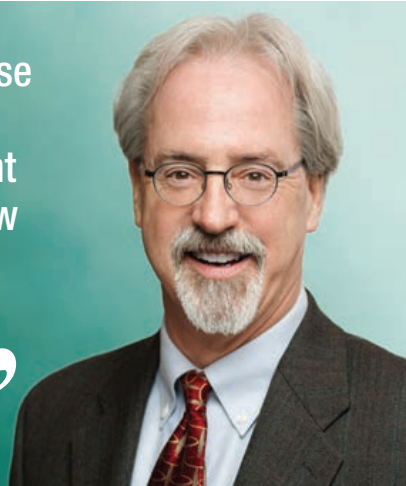
Mark LeBel is an associate with the U.S. program at the Regulatory Assistance Project, focusing on rate design and regulatory reform, including compensation for distributed energy resources, the evolution of the electricity system, and beneficial electrification. He was a staff attorney at the Acadia Center, working on electric utility reform and broader clean energy issues across the Northeast.

FIG. 1 CUSTOMER LOAD COMPARISON ILLUSTRATING ABILITY TO SHARE CAPACITY



“Simple time-of-use rates are fairer and more efficient than peak window demand charges and can be made even more so.”

— Frederick Weston



includes time-varying energy pricing.

It is fair to ask whether a properly sized peak window demand charge – where the billing determinant is the maximum demand in a limited number of peak hours, similar to the peak period for a time-of-use kilowatt-hour rate – solves these issues.

While such a charge is superior to traditional demand charges for the pricing of shared capacity costs, peak window demand charges nonetheless retain several of the shortcomings of their traditional counterparts. They inefficiently underprice usage at times when a customer is not likely to trigger a higher demand charge, and they unfairly subsidize customers with continuous usage at the expense of customers with significant load diversity.

Figure One elaborates on the second issue, showing usage for several customers over a four-hour peak period.

See Figure One.

Customers Y1, Y2, Y3, and Y4 have, in the aggregate, the same load profile as Customer X. Each of the Y customers has a peak of four

kilowatts for a total billing determinant of sixteen kilowatts under a peak window demand charge.

However, Customer X has a billing determinant of seven kilowatts under a peak window demand charge. This means that Customer X is charged less than half the amount that the Y customers are for the exact same aggregate load pattern. The four diverse customers can efficiently share capacity, and they should not be penalized by a price structure that fails to account for their diversity.

Time-varying energy pricing avoids this problem and provides superior incentives to optimize usage at all relevant times. Simple time-of-use rates are fairer and more efficient than peak window demand charges and can be made even more so by overlaying them with pricing that is responsive to critical peak conditions.

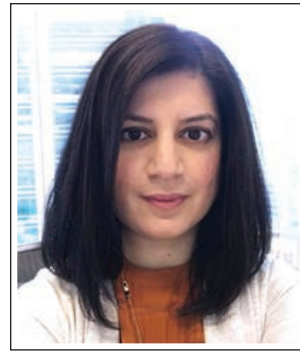
A few analysts have identified several narrower applications where pricing structures akin to demand charges could be appropriate and reasonably efficient: transformers and service drops for individual customers, risks related to customer variability at peak times, and timer peaks.

While more research into these applications might be merited, each appears relevant in limited circumstances and only applies to narrow subsets of capacity costs. Just like the historic application of demand charges to industrial customers, these more limited uses of demand-based pricing would only be a second-best approximation of a more efficient but potentially more administratively complex system: one that prices electricity based on the granular time and location of its use. **PUF**

“Time-varying energy pricing provides superior incentives to optimize usage at all relevant times.”

— Mark LeBel





Alberta Utilities Commission Wants to Know What You Think

Conversation with AUC Staff Darek Kogut,
Darrin Low and Sarah Akhtar

The Alberta Utilities Commission is on a quest to be the best it can be. And it needs you to get there. We all know innovation is here to stay and how we work is changing. The AUC realizes that means the workforce has to change too.

Digging deep into exactly what that means, is why the AUC wants to start an industry-wide conversation. The AUC asked PUF for help engaging all of you, our readers, to help understand what the employee of tomorrow will look like and what that means for the employee of today.

It's an exercise that can benefit any entity, so help out the AUC, and take a look at their questions, engage with our regulator friends in the north, and let's see where this goes. We all can learn from it, meet new people, and have some fun along the way.

PUF's Steve Mitnick: You have an interesting reach-out request to the entire PUF community. But first, let's hear about what brought you to this point, because the Alberta Utilities Commission has been focusing on priorities within its strategic plan. What's that about?

Darek Kogut: What brought us to Public Utilities Fortnightly is, we're subscribers to the magazine and most recently our departing Chair had a feature article in the September issue.

I've been reading the magazine for

a while now, looking into insight for a priority initiative that the AUC is actively working on. That stems from our latest three-year strategic plan, which will guide our efforts here in the short to medium term.

The strategic plan encapsulates four themes to help us focus on fundamental changes in the utility sector, including those around increasing technological change that's shifting expectations.

I'm responsible at the AUC for our HR function, amongst other corporate functions. One of our key challenges

identified in our people theme within our strategic plan is to attract, develop, and retain people with the skills, experience, and education required to understand and analyze how emerging technologies will affect the energy grids, consumer behavior, operation of emerging competitive markets, financial assessments of investments in new technology, and analysis of data generated by advancing information technology.

This is a big challenge, and in reading the monthly PUF magazines, I've been hoping that other organizations are also encountering this problem or this changing workforce requirement, and that's what brought us here to PUF today.

PUF: Public Utility Commissions are looking at their legacy workforce, and at the new skills in technology and digital required, and the innovative technologies utilities are considering and proposing. What skill sets do you need to have and how can you attract and retain workers with required skills at the Commission?

Sarah Akhtar: We hire a lot of highly technical employees, mainly coming from traditional backgrounds such as legal, accounting, finance, engineering, and economics. To provide some background, I would start with going back to 2015 when we introduced a competency-based framework at the Commission.

We reviewed all of our roles and in partnership with leaders, we determined which set of skills and competencies does one need to be successful in the role. This led to the development of detailed job descriptions for all roles in the organization.

This allowed us to focus on and be intentional with developing our employees. We were able to tailor and customize competency development plans at the employee level. This exercise we did a few years ago has served us well.

Looking forward, we know we have to retool our existing competency framework. The buzzwords in the HR world are artificial intelligence, agility, resilience, and change management, but really, how are our existing jobs going to evolve? What skill-set should we be looking for when we're attracting future talent?

What do we need? How do these competencies need to change? What is it that we need to be focusing on when developing our employees internally?

Darrin Low: Sarah mentioned some of the areas that we're looking at like artificial intelligence and other technologies. We are also thinking employees will need to be inquisitive, agile, and be thought leaders.

While this is what we suspect are going to be some of the areas where we have to invest either in our existing employees or those we hire, we also want to touch base with regulators and the utilities community as a whole, to see if there are any other areas that they're identifying.

We don't profess to say that we know

AUC Asks!

Key questions for future engagement or discussion include:

How is technology transforming the utilities sector and what are you doing to prepare your workforce for this transformation?

Are you partnering with academia, professional firms, etc.?

What skillset is required for the regulator to succeed in an evolving utilities industry, specifically beyond traditional expertise in engineering, economics, accounting, and law?

Are regulators looking for multi-disciplinary skill sets, students with multi degrees spanning IT and traditional expertise in engineering, economics, accounting, and law?

What work or research have you already undertaken to address this important issue?

The AUC is interested in initiating a conversation or partnering with other utility sector participants on how best to evolve its current workforce to meet the challenges required to be a best in class regulator in the years ahead.

The AUC welcomes participating regulators to contact Darrin Low or Sarah Akhtar from the AUC, or the PUF staff, to bring this important issue to discussion in the near future.

Sarah Akhtar can be reached via email at sarah.akhtar@auc.ab.ca or by phone at 403-592-4357.

Darrin Low can be reached via email at Darrin.low@auc.ab.ca or by phone at 403-592-4375.

The buzzwords in the HR world are artificial intelligence, agility, resilience, and change management, but really, how are our existing jobs going to evolve?

—Sarah Akhtar

exactly what we need, and that's part of the exercise and why we've engaged with PUF and hopefully the utilities community as a whole. We want to initiate meaningful conversations, to think and talk about it, and try to figure out what three, five, ten, and twenty years down the road looks like.

PUF: How can Commissions around the U.S. engage in discussions with you? What kind of questions do you want to ask them and have them think through with you? They're probably looking at a lot of the same things.

Darek Kogut: Maybe one alternative to getting there is to initiate the conversation, and that's why we're here today. Partner with Public Utilities Fortnightly,

to use it as an avenue to reach out to other regulators, to other members of the utility sector industry, to understand if or how they are evolving their workforce to broaden core competency areas beyond the traditional expertise Sarah spoke to earlier, in engineering, economics, accounting, and law.

Something that is important for us moving forward is to conduct an environmental scan to help identify the skill sets required to keep pace with an evolving utility industry. When I say initiate a conversation, we have a number of questions we'd like to have answered from the broader utilities sector industry, or participants, and those are questions we have here today.



Alberta Utilities Commission Staff, from left, Brijesh Modha, Abhinav Ayri, Kloria Wen, and Geoff Bourque.



Alberta Utilities Commission Staff, from left, Derrick Ploof, Rhonda Lemoine, and Oscar Saenz.

When I say initiate a conversation, we have a number of questions we'd like to have answered from the broader utilities sector industry.

—Darek Kogut

PUF: Looking at the questions, one of my favorites is, what work or research have you already undertaken to address this issue? I know of a number of Commissions that have done this and have run into roadblocks. Maybe their pay scales, or benefit scales, are difficult compared to private industry, or they've had some good experiences collaborating with certain organizations or academia.

Darrin Low: In addition to what

Sarah said about some of the early work we did in the competencies area, we realized that while that's a good underpinning, we know that model needs to evolve.

That's part of the outcome we're hoping to achieve. As far as research we've already done, we're in the early stages. We're asking the questions of ourselves and we want to ask these questions of others.

As we start speaking with other participants in the Canadian utilities industry, we've started to build relationships. A lot of these relationships are early, and some of them aren't at the strategic level – they're more at a tactical level.

We're hoping to leverage those tactical relationships at a more strategic and executive level. While I'm sure there's lots of early research that's been done, we are in the early stages of either identifying that and/or starting to talk about it.

PUF: It's valuable for Commissions that have collaborated, whether it's within CAMPUT in Canada, or within NARUC in the United States. They seem to always learn so much by relating and sharing problems and solutions.

Darek Kogut: The AUC has an extensive relationship and is a member of CAMPUT. Being a member of CAMPUT, being responsible for the regulation of matters that affect the utilities industry and being able to come together and share ideas, makes it a great association to be a part of.

Working with CAMPUT and NARUC is something that we will be doing, and we're already in early conversation internally to start to do that outreach. Working with an organization like Public Utilities Fortnightly is a further extension of that, because of its reach into North America, in particular regulators in the United States.

That's an outreach that will touch, I believe, hundreds of potential different industry groups or regulators, and that breadth is something that would enable us to get this important issue out there for discussion, and hopefully somebody reaches back out to us to engage in further dialogue. **PUF**

On November 4, 1890, a hundred and thirty years ago, the Prince of Wales opened the world's first electric underground "tube" in London. The City and South London Railway had six stations that ran for over three miles.



EPRI's Smart Homes Event, Charlotte, October 13

Conversation with Energy Department's Deputy Assistant Secretary for Energy Efficiency, Alex Fitzsimmons

In mid-October in Charlotte, U.S. Energy Secretary Dan Brouillette announced a sixty-five million dollar U.S. Department of Energy funding opportunity for technologies that allows energy-efficient buildings to interact with each other and the electric grid, to reduce emissions and improve grid flexibility. Perhaps as impressive in this time of pandemic, the event was held in person at EPRI, and while touring a smart home in Charlotte.

EPRI hosted DOE's Energy Secretary Brouillette to highlight residential building efficiency technologies that reduce carbon emissions from the electric sector and increase grid resilience. Here in PUF, DOE's Deputy Assistant Secretary for Energy Efficiency, Alex Fitzsimmons, dives deep into what that means.

DOE's Deputy Assistant Secretary Fitzsimmons explains how this funding builds on a foundation of fascinating smart neighborhood projects DOE co-funded along with EPRI, utility companies, and DOE's national laboratories, including Oak Ridge National Lab. It aims to demonstrate the capacity of grid-interactive efficient buildings, and to validate use of buildings for providing flexibility and resiliency to the energy system as a whole. Even better, DOE has more opportunities available.

PUF's Steve Mitnick: Tell us about the big announcement.

Alex Fitzsimmons: The Secretary of Energy, Dan Brouillette, was in Charlotte recently to announce a sixty-five-million-dollar competitive funding opportunity to establish a national network of grid-interactive energy efficient connected communities.

This funding opportunity announcement builds on a foundation of smart neighborhood projects that the Department of Energy co-funded along with EPRI, major utility companies, and DOE's national laboratories, including Oak Ridge National Lab.

The purpose of this funding opportunity is to demonstrate and evaluate

The purpose is to demonstrate capacity of grid-interactive efficient buildings to improve energy intensity of homes and businesses, and to validate buildings' potential to provide flexibility and resilience to the energy system as a whole.

the capacity of grid-interactive efficient buildings to improve the energy intensity of our homes and businesses, and also to validate the potential for buildings to provide flexibility and resilience to the energy system as a whole.

PUF: What does competition mean in this scenario?

Alex Fitzsimmons: The way it works is we issue what's called a funding opportunity announcement, a FOA. This announcement is essentially a request for proposals that will be merit reviewed and selected based on a series of criteria.

The goal is to select projects that are geographically diverse and technologically innovative. They incorporate cutting edge energy efficiency technologies, including advanced building envelope technology with smart and connected devices and appliances.

They also incorporate the use of distributed energy resources, up to and including solar PV, energy storage, and microgrids. We are encouraging a diversity of partners and technological solutions because we believe strongly that America's energy future is going to require an energy system that's more flexible, more resilient, and more secure. That is going to take a comprehensive approach to technology development to get us there.

Energy Secretary Dan Brouillette at EPRI on a tour of a smart home.



PUF: What kinds of organizations would submit proposals?

Alex Fitzsimmons: We welcome a diverse group of partners. I can tell you about some of the existing smart neighborhood projects. Two projects we've been involved in during the last few years are in Alabama and Georgia.

The first project, in Hoover, Alabama, is the first smart neighborhood project that we supported along with Southern Company's Alabama Power, EPRI, Oak Ridge National Laboratory, and home builder Signature Homes. It also includes technology providers such as AT&T, Carrier, Rheem, and Samsung.

The other project is in Atlanta, Georgia. That one is another collaboration among DOE, Southern Company's Georgia Power, Oak Ridge, EPRI, and home builder Pulte Homes. That project's technology providers include Amazon, AO Smith, and LG Chem.

In both of those projects, you're looking at major utilities being involved, along with national labs, research organizations, and home builders, which demonstrates that these are not just science experiments

We see a future where buildings can serve as virtual batteries that can contribute valuable services back to the grid, which enables a more flexible and resilient energy system.

but real-world projects with significant financial backing.

The connected communities funding opportunity announced by Secretary Brouillette is even broader because we are open to residential projects, but we're also welcoming applications for commercial real estate projects. Then you might not make a smart neighborhood, you might make a connected campus, for example. You might have a commercial real estate developer being added to the mix, in addition to a utility, a lab, and some other partners. We're looking forward to seeing what people come up with.

PUF: How did this program or concept come about?

Alex Fitzsimmons: Within the office of energy efficiency and renewable energy, we have a Building Technologies Office, which is one of the offices I oversee. This office invests

in energy efficiency technologies for residential and commercial buildings. Buildings account for seventy-five percent of U.S. electricity demand, and forty percent of our overall energy use.

We spend ninety plus percent of our time, particularly now, inside buildings. That's also where we generate and consume the vast majority of our power.

Developing technologies that can make the building sector more energy efficient is a priority for us, but it's not just about increasing the energy efficiency of the building sector. We've been re-imagining the role that energy efficiency can play in the energy system as a whole.

Traditionally, buildings have been viewed as passive consumers of energy. They consume energy and the grid has to manage around that load.

But we envision a future driven by



At the EPRI smart home event, on stage from left to right, EPRI President Arshad Mansoor, Energy Secretary Dan Brouillette speaking, Duke Energy's EVP Doug Esamann, and Meritage Homes Corp., CEO Steve Hilton.

the types of technologies we're investing in through this connected communities funding opportunity that can enable buildings to not just be passive consumers of load, but actively and dynamically manage their load. We see a future where buildings can serve as virtual batteries that can contribute valuable services back to the grid, which enables a more flexible and resilient energy system.

PUF: Looking ahead, how big can smart community, and smart buildings be? Is this something that can move forward so that five or ten years out, there'll be a real change in buildings around the country?

Alex Fitzsimmons: It's already happening. You can see there is growing momentum for connected communities. We know that because of all of the partners who are making serious financial commitments to making this happen.

DOE is investing in this, but these projects are cost shared and built by utilities, home builders, and technology providers. When I talk to utilities and home builders, both say, yes, these are demonstration projects, but they are committing to investing in more.

They agree the future of residential communities will be more connected.



Energy Secretary Dan Brouillette speaking at EPRI on smart homes.

And we see equally promising opportunities in the commercial sector, so we look forward to seeing what proposals come in.

PUF: Do you also look at existing buildings, and how we can get them into a two-way flow?

Alex Fitzsimmons: Yes, we invest in research and development for existing residential and commercial building retrofits, so we have worked in this area. The challenges of retrofitting existing buildings are unique.

That's exactly why the DOE takes them seriously and why we invest in

them. Most things that are worth doing are hard. We don't invest in what's easy because the private sector can do that. We're trying to invest in grand challenges that can make a real impact in people's lives.

PUF: What's the most rewarding aspect for programs like this for you?

Alex Fitzsimmons: It is seeing promising ideas that turn into real solutions. It's matching the expectations with the reality. When you're in research and development, you get accustomed to thinking big and then managing your expectations later and adjusting on the fly. You want to push the limits of what's possible, and if everything you do from an R&D standpoint works, then you're probably not taking enough risks.

Particularly in the federal government, we can tolerate a higher degree of risk because we are taking risks that the private sector is generally unwilling to take. What's most rewarding for me is to see promising ideas become reality, so that we can have an energy system that is more affordable, efficient, resilient, clean, and improves people's productivity and wellbeing. That's what it's all about. It's about improving people's lives. **PUF**

DATABAS

UTILITIES

FORTNIGHTLY

ANNOUNCING DATABASE UTILITIES FORTNIGHTLY

The PUF team proudly introduces Database Utilities Fortnightly. This extraordinarily extensive, granular, and timely database provides an unprecedented capability to better understand utility customer behavior and economics and the transforming performance of the grid.

To authoritatively address critical questions in utility regulation and policy, in real time virtually. Such as,

- How affordable is utility service?
- How do different kinds of utility customers pay for and use utility service differently?
- At what pace is the grid decarbonizing?
- How are grid operations integrating renewables?
- Are load duration curves flattening?
- Where are utility sales heading generally and by utility?

It's built to be a credible litigation-quality tool, suitable for regulatory proceedings. And it's based on reliable federal government surveys, that are conducted by three agencies of the government.

We are not aware that any of the data we are making available through Database Utilities Fortnightly is available to the industry from any other commercial service.

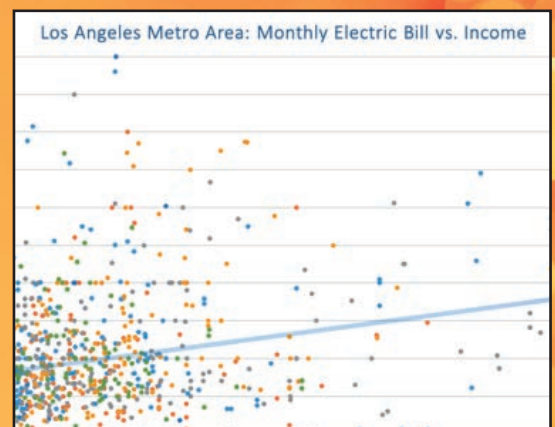
Database Utilities Fortnightly consists of seven Microsoft Excel-based modules encompassing fifteen sub-modules. The hundreds of unique data tables, each of which was developed by the PUF team, are thoughtfully organized to be easy to manipulate and graph. And to create

customized tables, reports, and presentations. And to support specific studies.

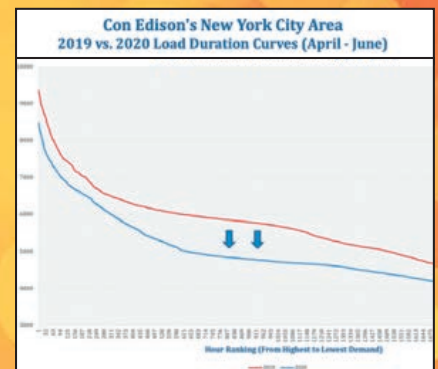
We expect that Database Utilities Fortnightly shall become a regular resource for regulatory proceedings, strategic planning, public affairs and communications and employee training.

Database Utilities Fortnightly is licensed to state utility commissions, other state agencies, investor-owned, public power, and cooperative utilities, industry associations, vendors, and professional firms. It's free to state utility commissions, available to other PUF member organizations for a nominal annual fee, and is available to organizations that aren't PUF members, but for a higher amount.

The license agreement provides that any employee of an organization can use Database Utilities Fortnightly during a one-year term via password access at fortnightly.com. To obtain the license agreement for your organization's review and consideration, without any obligation, or for more information, please contact Alexandra Revel, arevel@fortnightly.com.



Sub-Module: Real-Time Hourly Sales By Service Territory				
Service Territory: Nevada Power/Berkshire Hathaway Energy				
Unit: Megawatt Hour (MWh)				
Year	Month	Day	Hour	Electricity Demand
2020	6	30	1	3,907
2020	6	30	2	3,691
2020	6	30	3	3,542
2020	6	30	4	3,486
2020	6	30	5	3,488
2020	6	30	6	3,460
2020	6	30	7	3,538
2020	6	30	8	3,729
2020	6	30	9	3,961
2020	6	30	10	4,214
2020	6	30	11	4,477
2020	6	30	12	4,750
2020	6	30	13	5,008
2020	6	30	14	5,270
2020	6	30	15	5,554
2020	6	30	16	5,803
2020	6	30	17	6,027
2020	6	30	18	6,129
2020	6	30	19	6,089
2020	6	30	20	5,839
2020	6	30	21	5,613
2020	6	30	22	5,327
2020	6	30	23	4,940
2020	7	1	0	4,540



Rethinking Resiliency

(Cont. from p. 49)

PDi2 is to achieve power grid resiliency and reliability at the lowest life-cycle cost.

In gathering and disseminating industry-leading data and information, we aim to help electric utilities determine which power delivery solutions – overhead or underground – add the greatest value.

A free resource, the Utility Infrastructure Resiliency Playbook, is designed to support electric investor-owned, municipal, and cooperative utilities throughout the U.S. and Canada in planning, gaining approval, and successfully implementing an electric infrastructure resiliency program that delivers quantifiable value.

Some of the individuals quoted in this article will participate

Diversity Transparency

(Cont. from p. 35)

being responsive to both the specific circumstances and to any underlying systems that are creating barriers.

PUF: If you had to look a few years out, where are we going to be?

Pedro Pizarro: We want an open, fair, equal society. That's the aspiration. We're going to make sure we are doing everything possible so that Edison today, and years from now after we're gone and folks behind us are there, will continue to be a place that's leading the way in terms of being able to access the best talent with diversity of thought.

One of the things I love about the American experiment is that this country is unique in a global historical context. We are a society that's this melting pot, an amalgam of the best the world has to offer.

In that history, there's also been slavery and a lot of pain and racism, things that persist today, and there remain wrongs that we need to right. Our company can make sure we're doing everything possible to have a level playing field, and open doors, to create a place where all talents can thrive.

I want to make sure I, for one, can look an emerging young, Hispanic leader in the eye and say, you didn't get promoted because you checked the Hispanic box. I sure hope I didn't get promoted to CEO because I was checking somebody's box. It's got to be based on skill.

A free resource, the Utility Infrastructure Resiliency Playbook, is designed to support utilities implementing an electric infrastructure resiliency program.

in the upcoming scheduled panel discussions at Distributech 2021. Consider joining us to hear more about their experiences and perspectives on strategic undergrounding.

What have you learned from 2020? How has this affected your resiliency plans for 2021 and beyond? Let's continue the conversation and explore the most cost-effective resiliency programs and undergrounding strategies to deliver benefits now and in the years to come. **PUF**

I'd tell that young person that this is a place where your skill can take you all the way, and you can bring your whole self to work. You can add to the diverse fabric of Edison and you can help us understand, reflect, and power our communities.

Broadly speaking, we're one small company in a large economy. It's going to take lots of companies to come together to move the economy forward, and not just companies, but organizations,

A bold measure is we're going to use a third party to audit some HR and Ethics processes to see if there's bias. It's difficult for us to see so using a third party should help reveal if we have blind spots.

– **Jacqueline Trapp**

schools, and every element of society, to get to the place where we're getting maximum benefit and maximum value out of the rich diversity we have in our country.

When you think about racism, it's essential to know about the economic consequences of it, and that's where the systemic elements connect. If we do our part and inspire others to do theirs and give everyone a fair shot, I hope our kids or their kids will read about today in the history books and see that we truly made racism and its effects things of the past. **PUF**

On this date fifty-five years ago, November 9, 1965, the Great Blackout took place around five in the afternoon, at rush hour in New York City and elsewhere in the northeast. The electric grid serving thirty million people, a sixth of the nation's population – plus Ontario and Quebec – went out for up to twelve hours. It was the largest outage in history as of then.

PUBLIC UTILITIES FORTNIGHTLY

Impact the Debate



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

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

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PUF's New Book on Lewis Latimer's Inspiring Story

Free for You to Read

Stirred by the Spring's disturbing developments in racial inequality, PUF's Editor-In-Chief Steve Mitnick started exhaustively researching the founding father of our industry largely forgotten because of his race, Lewis Latimer. Now available for you to read, for free, "Lewis Latimer: The First Hidden Figure" tells the story of this Forrest Gump of the Second Industrial Revolution that was literally everywhere, from decisively helping Alexander Graham Bell secure the telephone patent, to competing with Thomas Edison with a superior light bulb filament and manufacturing process that Edison adopted, to then being hired by Edison to lead his patent defenses and offenses.

Uniquely respected by the European American captains of industry of the late nineteenth century and early twentieth, as well as the African American intellectuals of the period, at a time when blacks endured terrible injustices and violence, Latimer's inspiring story is an important addition to today's conversations about how our society can progress to the point in which all Americans are free to reach for their greatest potential.

CPS Energy, Dentons, Energy Impact Partners, First-Energy, Guidehouse, and Xcel Energy have sponsored this book enabling Public Utilities Fortnightly to distribute it throughout our industry at no charge or obligation. Read and enjoy the book, and pass it along freely. The sponsors have also enabled us to establish the PUF Latimer Scholarship Fund, to be administered by the American Association of Blacks in

Energy, to help young African American women and men to reach for their greatest potential.



It tells the story of this
Forrest Gump of the
Second Industrial
Revolution that was
literally everywhere.

The hardcover version of this book – beautifully illustrated on the cover with a painting by NARUC First Vice President Paul Kjellander and inside by PUF artist Dennis Auth – will become available in early December. Utilities, agencies, associations, vendors and firms in our industry can purchase a hundred hardcovers which they can then distribute to employees and external constituencies. For each hundred hardcovers, these organizations will be asked to contribute \$5,500 of which \$1,500 will be donated to the PUF Latimer Scholarship Fund. Additionally, Commission Kjellander has agreed to provide each such purchaser a signed print of his cover painting, suitable for framing and display, and we'll recognize purchasers in a tribute to be included in an upcoming issue of Public Utilities Fortnightly.

To read the book digitally, just go to fortnightly.com/lewis-latimer. There you'll be able to download it in common formats. And, catch a glimpse of Latimer's genius and courage, through the eighties growing up amid the clashes over fugitive slaves and the extension of slavery to the western territories, through the sixties manning a Union Navy gunboat during the Civil War, through the seventies securing Alexander Graham Bell's and Hiram Maxim's patents, through the eighties helping Thomas Edison establish our industry, and much more. **PUF**

Also Coming This Month



NARUC President, First VP and Second VP on NARUC's Three-Year Theme
Fortnightly Top Innovators 2020
Black & Veatch, CPS Energy and Energy Impact Partners on Innovation

Strong, smart and sustainable: modernization for the grid.

Distributed energy resource interconnection requests can challenge your organization. We can help you create policies, streamline processes, perform studies, and take projects through design, construction and commissioning.

This will reduce risk and create a sustainable system.

Learn more at burnsmcd.com/PUFsustain20.

