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EFFICIENT ELECTRIFICATION

In this month's *Efficient Electrification*, we take a look back at some of the key conversations from Electrification 2022. This year's event welcomed stakeholders and thought leaders from energy, industry, building, and transportation sectors for collaborative conversations on how to build a net-zero future for all. Be sure to catch the event recap video and join the mailing list to stay in the loop about Electrification 2024 in Savannah, Georgia.

We hope you enjoy this edition and appreciate your ongoing collaboration.

Why Cooperation Will Determine the Success of Net-Zero Initiatives

When EPRI President and CEO Arshad Mansoor addressed this year's *Electrification 2022* conference in Charlotte, North Carolina, he had history – both recent and distant – on his mind. Indeed, it's difficult to convey all that has changed in the world since the last in-person electrification conference took place in Long Beach, California in 2018. A global pandemic that's still ongoing forced the shutdown of much of the world's economy, fundamentally altering how we live, work, and learn.

In his remarks, Mansoor opened his remarks highlighting the legendary rivalry between Thomas Edison and Nikola Tesla that shaped the emergence and development of the modern power grid.

In the century-plus since electricity was a novelty worthy of marvel at the Chicago World's Fair in 1893, it has become a foundation of the modern world. However, in many ways, its growth to supplying 20% of end-use energy today will be dwarfed by the role electricity must play in a decarbonized world. "This 20% will have to at least double if we have any chance of reaching net-zero," Mansoor said. "You're looking at a pace of 3X or 4X compared to the first 120 years."

A Venue for Forging Partnerships

If the early years of the electric power industry were defined in large part by competition and rivalry, the future of this increasingly vital sector must be marked by unprecedented cooperation and collaboration, Mansoor noted. The massive deployment of clean electricity and the infrastructure and technologies needed to support it can only happen by collaboratively working together.

That underlying theme of forging critical partnerships to accelerate progress towards an equitable net-zero future was central to many of the presentations and exhibitions at the conference, which brought together over 1,500 attendees, 115 exhibitors and over 200 speakers.

As critical as partnerships are to achieving decarbonization goals, increased collaboration also demands big changes in how energy providers operate. For example, in his remarks, Brian Savoy, Duke Energy's executive vice president and chief strategy and commercial officer, noted how energy providers have operated successfully using what he termed as insider thinking. "The new world we are migrating to is an outside in, integrated model," he said.

That paradigm shift is obvious across the entire energy provider and grid ecosystem. Rather than a power system that depends almost exclusively on the internal planning and operational expertise and experience of energy providers, the energy transition relies on a much wider constituency.

For example, everyone from individual EV drivers and technology startups to industrial customers and energy providers must all work together to maintain a resilient grid while driving towards net-zero. "We need to partner in ways we never have before," Savoy said. At Duke Energy, those partnerships take many forms, including with policymakers and regulators in the seven states the energy provider serves, as well as the large group of startups Duke works with to drive innovation, he explained.

Regional Differences, Unique Approaches

Obviously, the composition of partnerships will vary depending on utility type, state policy objectives, and the needs and priorities of customers. For example, Joe Brannan, executive vice president and CEO of North Carolina's Electric Cooperatives, described the pivotal role of partnerships in meeting the company's 2050 net-zero emissions goal. A few years ago, the organization embarked on the Brighter Future initiative, a pathway to achieve sustainability goals while also improving grid reliability and affordability, he explained.

As part of that work, the cooperatives have worked directly with members to manage energy usage during times of peak demand and to transition towards new electric technologies. For example, Brannan cited collaboration with a hog farm owner to deploy a bio-digester, solar panels, and a backup generator outfitted with a control system that could help serve other customers. Another example: Assisting in the deployment of a microgrid to help an egg farmer meet sustainability standards required by Wal-Mart.

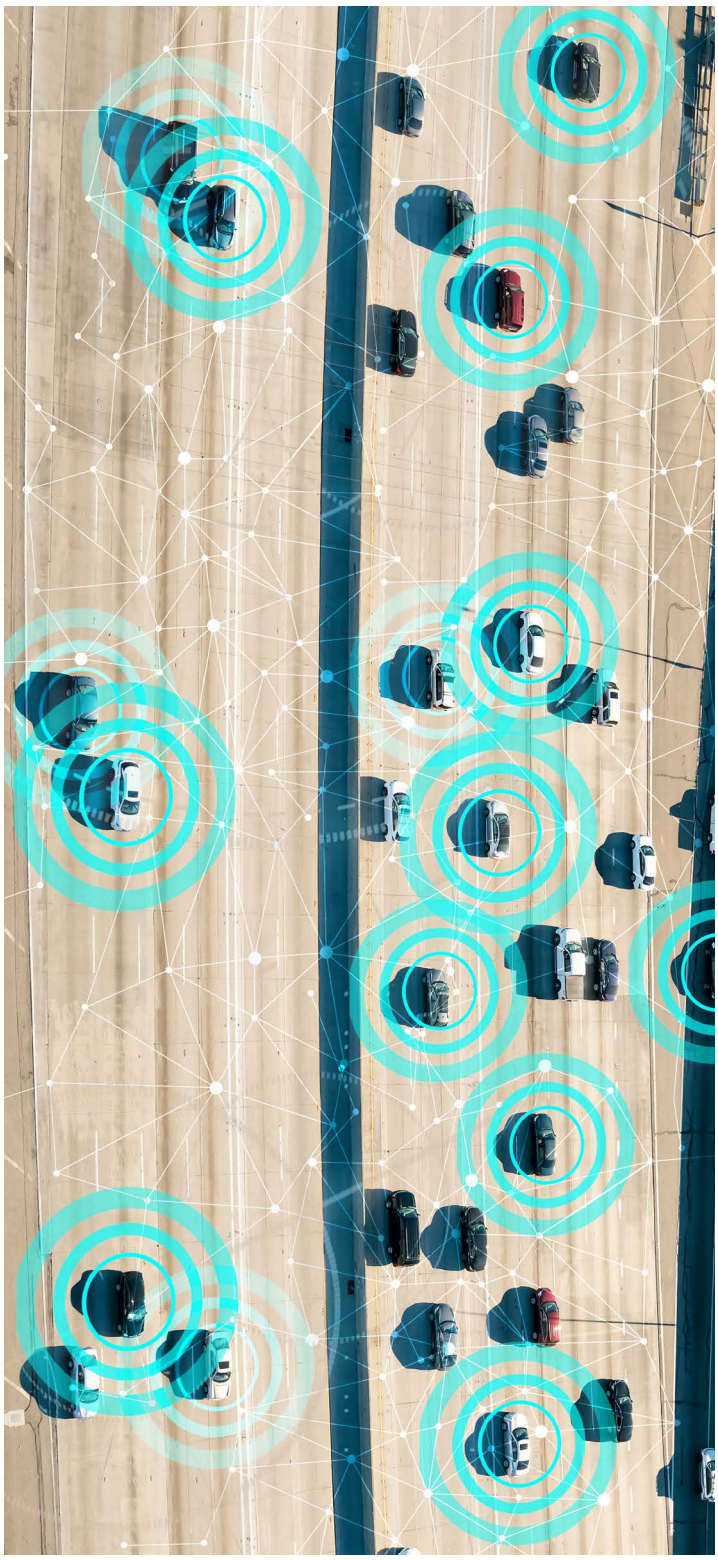
A panel discussion of energy provider executives held on the first day of the conference surfaced unique regional issues that need to be addressed to make progress towards net-zero. The panel brought together Steve Powell, executive vice president of operations for Southern California Edison (SCE), Thomas Kent, president and CEO of Nebraska Public Power District, and Carim Khouzami, president and CEO Baltimore Gas & Electric.

In Nebraska, for example, achieving a goal of net-zero by 2050 requires working closely with the state's large agriculture industry. Because of the industry's importance, Kent said the energy provider was proactively engaging with farmers to find ways to manage demand and costs, while also exploring new opportunities for electrification. At the same time, the energy provider is exploring how data and analytics can help utilize the grid in ways that ensure reliability even as the generation mix expands to include more wind, solar, and potentially small modular nuclear power and hydrogen.

Kent pointed out that successfully engaging partners also requires communicating in ways that resonate with stakeholders. In Nebraska, that means framing net-zero targets around the business risks changing climate poses to farmers. "Nebraska is a conservative state," Kent said. "We can't approach this as climate change but as the right thing to do to manage business risk."

One topic that all three executives raised was the need to work with communities, regulators, and policymakers to ensure that net-zero efforts are affordable and don't negatively impact disadvantaged communities. This is a real concern as the average household making $45,000 a year spends about 10 percent of their income on energy.

In the area served by SCE, that energy burden can be much higher. SCE's Powell noted that the energy provider's lowest income customers pay 25 to 30 percent of their income on energy. The good news is that SCE's analysis shows that future energy costs can go down with increased electrification and decarbonization. But that's only possible, he said, by following the right pathway and establishing and expanding strong partnerships.



An Often-Overlooked Area for Innovation

Charting a net-zero course that doesn't harm vulnerable communities will require changes in rates, smart planning, big investments in electric vehicle (EV) charging infrastructure, and, of course, close collaboration with communities themselves. But successful net-zero efforts can't just be about not harming disadvantaged communities; they also must actively benefit and include communities in decision-making and workforce development.

This was exactly the point that Evette Ellis made in a panel discussion on the second day of the conference. The panel was focused on innovation and the technologies needed to accelerate innovation. But Ellis, co-founder of ChargerHelp, a company that services and repairs EV charging stations, made the point that a broader definition of innovation is needed. "Innovation can't just be in technology. We have to be innovative in the ways we do things in our country," she said. "It would be silly to use the same practices as 20 years ago to determine who can become a part of this [energy transition] and who is making decisions."

For Ellis, innovation in workforce development is central to achieving equity in the move towards net-zero. "Workforce development is how you make electrification equitable," she said. "You can't have mass EV adoption without workforce development."

Driving Partnerships to Scale EV Adoption

The need for increased collaboration was keenly apparent during a panel discussion about electric transportation. Britta Gross, a commissioner for the Orlando Utilities Commission and EPRI's new director of transportation, moderated the panel, which included Rachel Nealer, deputy director of the U.S. Department of Energy's Joint Office of energy and Transportation, Nadia El Mallakh, area vice president for clean transportation and strategic partnerships at Xcel Energy, and Maria Bocanegra, a commissioner at the Illinois Commerce Commission.

The discussion revolved around partnerships. To achieve mass adoption of EVs, federal and state governments must work closely together. So, too, must automakers, energy providers, charging companies, fleet operators, and communities. "We need a whole stakeholder approach," Nealer said.

One area where innovative partnerships can make a big impact is in the deployment of the charging network needed to support EVs. As Nealer pointed out, the National Electric Vehicle Infrastructure program provides $5 billion to states to build out charging corridors.

One emerging and important area of collaboration this funding is assisting in involves working with regulators and state departments of transportation (DOT) to improve planning. In Illinois, the state's DOT has been an active participant in workshops with energy providers and other stakeholders about how to optimally plan EV charging, Bocanegra said.

As speakers explained, many of the partnerships that will be needed to rapidly accelerate progress towards net-zero are already in place, yet others are in the infancy stage or not yet imagined. Another opportunity to increase collaboration and forge new partnerships will take place in less than two years, when *Electrification 2024* is held March 12-14 in Savannah, Georgia with host utility Southern Company.

Jigar Shah's Vision of Decarbonization: Doubled Electricity Sales and Lower Rates

In the technical world of clean energy and decarbonization, Jigar Shah is what passes for a celebrity. Shah is director of the U.S. Department of Energy's Loan Programs Office, where he oversees billions of dollars in loans and loan guarantees to fund the future of energy systems and technology.

It's a job he has held since the early days of the Biden administration and Shah's position is helping accelerate decarbonization by providing debt financing to emerging technologies that private lenders consider too risky. Prior to this role, Shah was known as the founder of the solar project development company SunEdison and later as president of the decarbonization-focused investment firm, Generate Capital.

But Shah also has garnered a following for his sharp, provocative, and sometimes counterintuitive insights about the energy transition as one of the former hosts of the popular podcast, *The Energy Gang*. Shah brought his wealth of experience and unique perspectives on all things electrification and decarbonization to a fireside chat with EPRI President and CEO Arshad Mansoor on the first day of the *Electrification 2022* conference.

"The loan program office provides a bridge to bankability for new asset classes," Shah explained to the audience. Shah pointed to electric vehicle charging and virtual power plants as examples of the kinds of assets that commercial lenders won't back until they are confident that they have achieved full market acceptance.

"We are doing work to figure out the enduring revenue streams from these asset classes and how to underwrite it," Shah said. "That can be copied by the commercial banks." Through the end of fiscal year 2021, projects supported by the loan program office have produced over 9 million megawatt-hours of clean energy, built over half a million advanced technology vehicles, and created 37,000 permanent jobs.

A whole new world

In a wide-ranging conversation with Mansoor, Shah delved into many of the challenges and opportunities involved with creating an equitable and reliable net-zero economy. Not surprisingly, electrification is critical to achieving that objective. For example, Shah says meeting the Biden administration's goal to decarbonize the electric power grid by 2035 will require a huge increase in electricity consumption. "If you decarbonize transport and heating and cooling with heat pumps and water heating, the only way to do it is to double electricity sales," Shah said. "It's an entirely new world than utilities and regulators have been used to over the past 20 years."

To Shah, that new world demands new thinking and approaches. For example, he pointed to a paradigm that began in the 1990s that led to huge investments in grid infrastructure yet paid very little attention to electricity demand. "As a result, our grid utilization has never been lower. It's at 40 percent and even in the 30s," Shah said. "If we build infrastructure in a way that starts to take advantage of all the technology we invented and popularized since SunEdison in 2003, you can increase grid utilization to 50 percent and do most of the work."

Fully leveraging the existing grid infrastructure also means being smart about new investments. Shah gave the example of adding batteries at every EV fast charging station. "There's no reason for the grid to handle an absolute load of one megawatt at a fast charger station," Shah said. "There is a way to do this that leverages the existing infrastructure and a way to do that makes everything much worse and more expensive. The goal should be to make it better."

Tapping the Potential of New Resources

One avenue for enhancing grid reliability and speeding decarbonization is to take full advantage of the investments energy providers are making in distributed energy resources. "The cold

war we had between utilities and DG (distributed generation) has now moved into a new phase…It's how to figure out how to control loads where customers invested money," Shah said. "The ability to integrate all of that and get a tariff on the other side is done deal by deal and that has to be easier to do. And utilities must understand the benefits those assets provide and talk clearly with regulators about that."

Shah also made the point that, if done right, electrification can lead to both decarbonization and a rate reduction for customers. The reason: growth in the sale of kilowatt-hours. "As a regulator, the thing that bothers you most over the last 10 or 15 years is that we have had no kilowatt-hour sales growth," he said. "You have five percent rate increases forever because there's no growth in sales."

To Shah, load growth changes everything. "If you do this right, you can get rate reduction because you paid for T&D infrastructure and if you get utilization from 41 percent to 55 percent you could reduce rates for everyone," he said.

Towards the end of the conversation, Mansoor asked Shah about how the DOE is looking at the supply chain for critical minerals like lithium and cobalt that are necessary for EVs, batteries and other clean energy technologies. Mansoor pointed out that five countries in the world, including China, produce most of the critical materials.

Shah said there was no reason that the current critical mineral supply chain will remain in perpetuity. "When people say China dominates the supply chain, they dominate a tiny koi pond," he said. "When we talk about where we need to be in 2030, we need to be 20x of where we are today. They dominate five percent of the 2030 market. The trajectory is not foretold."

In the weeks since Shah's appearance at the conference, the role his office plays in driving decarbonization has increased. As part of the recently signed Inflation Reduction Act (IRA), the DOE Loan Program Office is authorized to provide $250 billion in loans to retool existing infrastructure, like transmission lines and power plants.

In the News

EPRI's Haresh Kamath shares how distributed energy resources, and the way in which they are integrated to the grid, may be key to addressing grid reliability and decarbonization goal. Read more in a new opinion piece in T&D World.

A new article from Utility Dive explores how the Inflation Reduction Act may provide a significant boost clean energy deployment. Projections from S&P Global Commodity Insights show the U.S. will source 45% of its electricity from zero-carbon sources by 2023, and 62% by 2040.

The District of Columbia approved a three-year slate of energy efficiency and demand response programs for utility partner Pepco, designed to cut greenhouse gas emissions and assist low- and moderate-income residents. Learn more about the $92 million program on SmartCities Dive.

Upcoming Events

World Conference on Photovoltaic Energy Conversion, September 26 – 30, Milan, Italy

Distributech International, February 7 – 9, 2023, San Diego, Calif.

EPRI Resources

Electrification & Sustainable Energy Strategy (E&SES) Quick Reference Guide – 2022 (August 2022)

Assessing Transmission Resilience to Future Climate Risk and Extreme Weather Events (August 2022)

About EPRI's Efficient Electrification Initiative

In developed economies, electrification refers to the expanded use of electricity. This may involve powering new uses (such as cellular phones, computers, and server farms) or switching everyday technologies (such as automobiles, forklifts, and furnaces) from direct combus-tion of fossil fuels to electricity. Electrification offers potential to transform utilities and other industries in which power is a key input. As the electric supply becomes cleaner, electrification can reduce society's overall emissions. It can also lower costs and energy use for utility customers and improve economic efficiency, water use efficiency, grid utilization efficiency, productivity, indoor environments, and safety. Through collaborative research, development, and demonstration, EPRI's Efficient Electrification initiative is examining the impacts and tech-nical aspects of electrifying the end use of energy—where it is more efficient to do so—for the benefit of customers, the environment, and society.

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