



The Next Generation Electric Grid

By Lisa V. Wood, executive director of The Edison Foundation Institute for Electric Innovation and vice president of The Edison Foundation.

Significant changes are underway across the power sector. Innovations and new technologies are changing how electricity is generated, delivered, and used. The digitization of the electric grid is in progress. But now, the integration of information technology (IT) and operations technology is delivering transparency and value to grid operators, while also changing grid visibility and asset management. In addition, cost reductions in new technologies like solar photovoltaics, energy storage, and sensors are providing new opportunities for energy solutions.

Electric utilities, through partnerships with technology companies and with oversight by state regulators, are positioning the power grid as a platform for energy services—both basic grid services such as reliability and resiliency, as well as enhanced grid services such as the integration of distributed generation resources, renewable energy, energy storage, energy optimization, and the management of grid assets.

The Edison Foundation Institute for Electric Innovation's 4th annual "Powering the People" event in early March, which drew more than 250 electric power industry leaders, technology company partners, policy makers, and other stakeholders to the Newseum in Washington, DC, focused on the next generation electric grid through panel discussions and an Innovation Alley exhibit space.

Embracing Technology

The program began with a panel discussion moderated by Kevin Fitzgerald, executive vice president and general counsel at Pepco Holdings, on the role of technology in the electric power business. With roughly 2 million customers in the Mid-Atlantic region and more than 1 million smart meters, Pepco is on the leading edge of incorporating IT solutions from a multitude of vendors to develop and deliver value to its customers.



Lisa Wood welcomes more than 250 electric power industry leaders, technology company partners, policy makers, and other stakeholders to Powering the People.



Kevin Fitzgerald, executive vice president and general counsel at Pepco Holdings, moderates a discussion on how new technologies are changing the power sector.



(L to R): Massachusetts Department of Public Utilities Commissioner David Cash, Oregon Public Utility Commission Chairman Susan Ackerman, DC Public Service Commission Chairman Betty Ann Kane, Missouri Public Service Commission Chairman Robert Kenney, and Wisconsin Public Service Commissioner Ellen Nowak discuss the role of regulation in supporting innovation.

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Innovation Alley showcased three critical areas where new technologies and innovations are occurring—customer apps, game-changing resources, and the next generation grid.

Using technology to optimize the energy value chain and ultimately provide enhanced services to customers is critical. Based on actual experiences, the technology company executives on the panel discussed immediate opportunities in the areas of outage and risk management, grid investment management, and customer service optimization.

According to the panelists, data analytics are already providing insights to customers, so they can make more efficient use of energy, and to grid operators, so they can deliver power more efficiently and more reliably. For example:

- ▶ By overlaying operations technology with IT, utilities are using technology to create a digital network atop the physical grid infrastructure. The resulting visibility into the grid makes it far more manageable—yielding improved performance and cost savings.
- ▶ Technology also serves as a bridge to the customer. By using social media and other digital communications platforms to transmit and receive information to and from customers, utilities are working with their customers to tailor energy use and customize energy management.
- ▶ Ed Abbo, president and chief technical officer at C3 Energy, described how C3 performs audits to gauge how efficient utilities are and what actions they can take to improve their efficiency. C3 Energy estimates the average annual value associated with this technology at \$300 per customer.

The die has not been cast on the next generation grid, and approaching the future with flexibility and an open mind is important. Brad Gammons, general manager at IBM Global Energy and Utilities, noted that the “whole technology fabric is moving rapidly at the moment, and

we need people to move really fast.” Gammons cautioned that when working in a large organization, such as IBM or an electric utility, it is critically important to listen to divergent voices and to be ready to embrace a big shift in technology.

Open communication among utilities and regulators about the pace of change, the investments required, and the resulting benefits is crucial. Rodger Smith, senior vice president and general manager at Oracle Utilities, commented on the current regulatory environment: “The industry is changing and some of the old regulatory paradigms just won’t work in the new world... I suggest an open dialogue to resolve some of these questions. You want to incent the right behavior and [that means] doing things a bit differently in the future than we have done in the past.”

Positioning the 21st-Century Power Grid

Despite the changes already underway in the power sector, electric utilities must continue to provide reliable, affordable, secure, and increasingly clean electricity. Ted Craver, chairman, president, and CEO of Edison International, moderated a panel discussion on the challenges and opportunities in enhancing the power grid in real time while still providing basic services. The key takeaway? Investments in the power grid are well underway and having a big impact.

Florida Power & Light (FPL) President Eric Silagy sees the value of grid investments through the lens of customer experience. Remarkably, in the last five years, FPL customer bills are down 15 percent (net). As Silagy noted, “customers are paying us less than they did five years ago—actually, in real terms, they’re paying at the same levels we were charging in 1982.” Some of the cost savings have to do with FPL’s investment in new, clean, efficient generation technology, but it is also the productivity of the company itself, including its workforce. “We’re actually doing more with fewer people, because we’re relying more on technology,” Silagy continued. “In the mid-1980s, FPL was a company with 2.6 million customers and 14,600 employees. We’re now serving 4.7 million customers with just 8,900 employees and providing better reliability than we’ve ever had before, at 99.99 percent. Technology is allowing us to be smarter and more effective.”

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(L to R): Edison International Chairman, President, and CEO Ted Craver, FPL President Eric Silagy, and NV Energy CEO Michael Yackira discuss how utilities can best understand and serve their customers.

Leslie Sibert, vice president of distribution at Georgia Power, recognizes the return on grid investment in the ability to keep costs low for customers. “About 48 percent of Southern Company customers earn \$40,000 a year or less, so energy cost is very important to them. The efficiencies we’ve gained with some of these deployments have helped us keep costs down. Because we have self-healing networks, we’ve seen a significant reduction in outage minutes, so we’ve improved our reliability and service levels as well,” said Sibert.

Craver summed up the challenge: “We have a bit of a balancing act here, between trying to have a really resilient, reliable grid, and a very clean grid, while trying to keep service affordable.”

Transparency is an important component of the balancing act. “The first really important conversation to have is the one with the customer,” said David Sparby, senior vice president and group president at Xcel Energy and CEO and president at Northern States Power—Minnesota. “Explaining to customers the investment that we’re making and how they benefit from that is step one.”

“We need to be dealing with the customer in the way the customer wants to be dealt with,” said Michael Yackira, CEO at NV Energy.

In addition to clear communication with customers, candid discussion with regulators and other stakeholders on the real economic and technical impacts of distributed resources and other new technologies on the grid is absolutely necessary for a fair outcome.

Regulating a Rapidly Changing Power Sector

Taking a long view on the evolving electric grid and the role of technology ultimately leads to questions about the regulatory paradigm in a rapidly changing power sector. Balancing the need for change and innovation while keeping a power system operating 24/7, and including a myriad of players—some of which are

regulated and some of which are not—isn’t easy. But overall, regulators are engaged and excited by new technologies in the power sector and see them as an opportunity to improve service levels to customers.

Massachusetts Department of Public Utilities Commissioner David Cash led a spirited discussion on how state utility regulators are addressing the impact of new technology on customers and the role of regulation in supporting innovation. Central to this discussion is the need to balance the value of a new technology or resource to one party while also being mindful of how cost allocation through regulation can negatively influence other customers. Ultimately, whether the utility is vertically integrated or restructured, the backbone of the local electric grid—the distribution system—must be supported and costs must align with the use of the system.

The Wisconsin Public Service Commission is heavily involved in balancing the cost of service to the cost-causer in upcoming rate cases. As Commissioner Ellen Nowak points out, “It’s a wonderful thing to have the customers engaged with distributed generation [DG] and have a two-way system, but if you don’t have an honest discussion about the fact that the DG customer is using the grid and its services, and what those costs are, you aren’t getting anywhere. You need to know what DG customers are using from the system, as well as what they’re putting into it.”

In today’s society of blogs, social media, and a growing customer interest in energy, regulation also has a public-facing component. “If you are in a state where you’re compensating net metering at a full retail rate but you’re contemplating changing that, you owe it to consumers to explain why, and to explain to them that the cost of their retail rate includes all of these different components [in addition to energy costs],” said Missouri Public Service Commission Chairman Robert Kenney. “If you’re changing settled expectations and want

consumers to behave differently and consume energy differently, they need to understand why they should consider doing it.” Kenney believes it is incumbent on regulators to proactively explain both the rational process and effect of regulation to the customer.

Creative solutions and partnerships to address reliability and resiliency are alive and well in the District of Columbia. Betty Ann Kane, the Public Service Commission’s chairman, explained how the city government, transportation department, people’s counsel, and Pepco came together to pass legislation for a new approach to financing and managing system additions, including putting a significant portion of the distribution system underground. “When we started 18 months ago and looked at each other around the table, we thought we’d never reach agreement. Now we have a billion-dollar, seven-year program that will have minimal negative impact on the consumer. I think it’s time to start thinking not only about what you’re delivering but who you’re working with and who needs to be pulled in [to the discussion],” said Kane.

Oregon Public Utility Commission Chairman Susan Ackerman stressed the importance of innovation: “You want utilities to be innovative, to be creative, and take risks, but they have to be prudent risks. [Utilities] still have to demonstrate how an investment saves costs, improves services, and benefits the customers in the long run.”

Next Generation Utility

NorthWestern Energy President and CEO Bob Rowe led the wrap-up discussion that included participants from the three previous panels. He noted that even with all of the excitement and enthusiasm around innovation, the utility of the future must balance technology, public policy, and the utility business model to stay in harmony. “At the center of that triangle is the customer,” he said. “It comes down to our infrastructure, our people, and service to our customers. Making sure customers have good service and that both employees and customers are safe is where we should start and finish our focus.”

“We have to be the ones who understand our customers as well as possible and serve them in the way they want to be served, with a bundle of offerings that they

can pick and choose from,” said NV Energy’s Yackira. “They may want a premium rate, a flat rate, a time-of-use rate, or a green rate. We have to change the way we think about our customers.”

The mantra of staying customer-focused was echoed by other panelists as well. “It’s very difficult to predict where it’s going to go, but ultimately the winners are those who are most adaptable and most able to flex and find ways to stay as close to the

mission as possible: serving customers,” added Edison International’s Craver. “At the same time, since we’re investor-owned utilities, we have to do that in a way that provides a fair return to our investors. That won’t be a straight line by any means.”

Oracle Utilities’ Smith noted that he’s in the business that’s trying to get to where the electric utility is—being able to simply plug in. “I take any device I want, plug it into my outlet, and it works. Whatever you do to this business, don’t lose that!”

Other participants stressed the importance of communication—particularly with regulators and customers. “There has to be a very honest communication with the wider public so that we all understand that pilots, demonstrations, and such are needed to find out what works and what doesn’t,” said the Massachusetts Department of Public Utilities’ Cash. “Sometimes there’ll be a technology investment that doesn’t work, but we learn from that.”

Pepco Holdings’ Fitzgerald concluded by highlighting the significance of embracing change and innovation in a company’s culture. “Since Pepco is a wires and poles company with customers as our primary focus, one of the big things that we are working through is a cultural change. In the past, there would be a decision made at the CEO level and it would be pushed down. Now, as an organization, we’re going to seek out different innovation from all areas of the business—say from a lineman—who may have an idea on a better way to serve a customer. That’s a major commitment, and it’s something we’re going to have to continue to work on as an industry.” **EP**

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NorthWestern Energy President and CEO Bob Rowe (far left) leads the wrap-up discussion on the challenges and opportunities for the next generation electric grid.

The Edison Foundation Institute for Electric Innovation focuses on advancing the adoption and application of new technologies that will strengthen and transform the power grid. The Institute’s members are investor-owned electric utilities that represent about 70 percent of the U.S. electric power industry and are committed to an affordable, reliable, secure, and clean energy future.