

# // INNOVATIONS TRANSFORMING THE ELECTRIC POWER SECTOR

BY LISA WOOD

---

*Electric companies are keeping pace with the future by improving resiliency, integrating renewables and distributed energy resources into the energy grid, and anticipating their customers' needs.*

---

**T**he transformation of the electric power industry is unfolding state by state as electric companies across the country modernize and digitize the energy grid to enhance reliability, resiliency, and security; to integrate and manage growing numbers of renewable and distributed energy resources (DERs); and to provide customers with more options for using and managing their energy. The examples on the following pages appear in the Institute for Electric Innovation's new book, *Innovations Transforming the Electric Power Sector* (available in December), which offers a broad overview of the solutions electric companies and technology companies are creating together. >>



## Building a Resilient Energy Grid

For the past decade, the electric power industry has been deploying both hardware and software to enhance energy grid resiliency, reliability, and efficiency. The rate of deployment varies significantly across the states. Some electric companies already have deployed smart meters and other technologies and are now moving into the second wave of grid modernization.

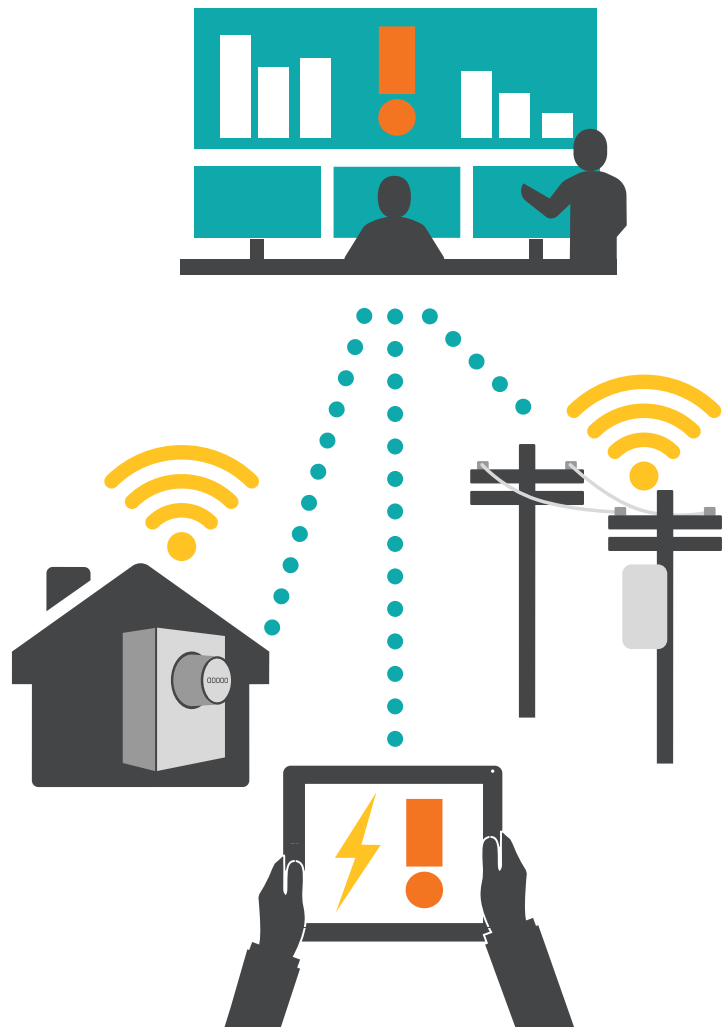
Since 2009, CenterPoint Energy has been investing in smarter energy infrastructure. The company has deployed advanced meters to virtually all of its 2.4 million electricity customers in the Houston area, automated 31 of its substations, installed 872 intelligent grid switching devices (IGSDs) on more than 200 circuits, and built a private wireless radio telecommunications network across a 5,000-square-mile footprint.

In 2012, CenterPoint created an asset management analysis and strategy unit, which coordinates business intelligence and data analytics activities across the entire company, enabling the information generated by these technologies to be used more efficiently.

Advanced meters and data analytics provide situational awareness so that crews can determine—and be sent to—the highest priority outage locations. On circuits that have IGSDs or automation, controllers using an advanced distribution management system (ADMS) are able to isolate faults on circuit outages and to restore a large percentage of customers within minutes.

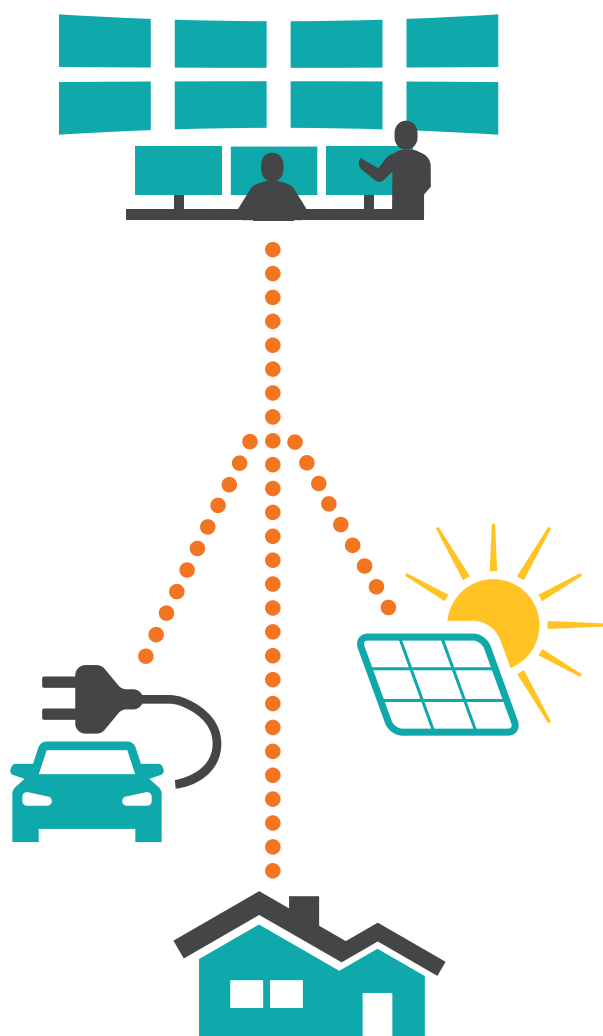
Over the past few years, CenterPoint's service area has been impacted by three "500-year" flood events: the Memorial Day flood in 2015, the Tax Day flood in 2016, and, most recently, Hurricane Harvey in September.

During Hurricane Harvey, CenterPoint operated more than 250 IGSDs, covering more than 140,000 customers. The company also flew 15 drones over more than 500 locations to assess damage,



*CenterPoint has installed **more than 2 million smart meters**, allowing the company to electronically read meters daily at a **99.5 percent accuracy rate**, remotely fulfill **14 million electronic customer service requests**, and enable **restoration of more than 1.5 million outage cases** without a customer phone call.*

Hawaiian Electric is **integrating and managing high levels of private solar PV on its energy grid**. The company is investing in technology to provide **enhanced grid visibility and fast, precise control** under variable conditions, supporting Hawaii's 100-percent Renewable Portfolio Standard vision.



efficiently direct crews to accessible locations, and, using infrared capabilities, identify equipment needing further inspection. Real-time analytics were used to correlate weather and flood information with outages and to provide operations crews with critical situational awareness and decision-making tools. Thanks to these steps, the company avoided almost 41 million outage minutes and saved 16.71 System Average Interruption Duration Index minutes. This data also informed the proactive communications the company sent to customers, which led to 22,000 new enrollees in CenterPoint's Power Alert Service.

### Thinking About Renewable and Distributed Energy Resources Differently

In areas where renewables and DERs are growing rapidly, integrating, managing, and ensuring the stability of these resources within the energy grid present new challenges for electric companies.

In 2015, Hawaii established a 100-percent renewable energy mandate for electricity generation. To meet this target by 2045, Hawaiian Electric Company has become a leader in testing and demonstrating new technologies and approaches for integrating renewable energy, in particular private (or rooftop) solar photovoltaic systems. In just eight years, private solar installations in Hawaii grew from 24 megawatts (MW) in 2009 to 665 MW by mid-2017. This is 20 times more than the national per-customer average of private, customer-sited solar, making the state an ideal laboratory for renewable energy integration.

While the rapid growth of private solar helps Hawaii reach renewable energy milestones ahead of schedule, one key challenge is controlling the voltage profiles of these solar installations. Solar variability on circuits with high levels of private solar can cause large voltage fluctuations, which degrade power quality for all customers on the energy grid.

To create a more stable energy grid and to provide customers with energy savings opportunities, Hawaiian Electric successfully integrated 1 MW of energy storage—which can be used as a dispatchable resource—across 29 commercial customers, in partnership with Stem, Inc. and Elemental Excelsior. Hawaiian Electric also is strengthening its grid by testing advanced inverter technology; expanding the use of sensors and automated voltage management tools at the substation and neighborhood circuit levels; and integrating energy storage systems into an energy management platform to manage a diverse set of DERs better, while providing greater energy grid stability and visibility into when, in what quantity, and where DERs are coming onto the grid and how long they will stay on.

The business of energy storage continues to evolve as the electric power industry gains valuable experience in deploying different types of storage to meet different needs, including renewable energy smoothing, reducing peak demand, and other services. Building on the successes of its 6-MW sodium-sulfur energy storage systems, Pacific Gas & Electric Company (PG&E) installed a 0.5-MW lithium-ion energy storage system at its Browns Valley substation. The system provides important services for balancing energy supply and demand, helps to support greater integration of renewable energy generation, and improves quality and reliability for customers.

Browns Valley is PG&E's first lithium-ion energy storage facility, and it features Tesla Powerpack technology. The facility charges batteries when demand is low and sends reserved power to the energy grid when demand grows, providing up to 500 kilowatts of power to alleviate overloading on the Browns Valley substation transformer bank.

Browns Valley represents the first time a Tesla energy storage system has been integrated fully into an energy company's Supervisory Control and Data Acquisition system. Browns Valley was energized for the first time in January 2017 and

placed into service on PG&E's distribution system in early February. Over time, the Browns Valley energy storage system will provide lessons for PG&E and the industry on how to integrate energy storage functionality better.



## Providing Customer Solutions

Electric companies today are able to provide an array of services beyond the creation and maintenance of the energy grid. These can range from renewable energy to energy management, and more and more customers are demanding these new services.

Utah is one of the sunniest states in the West. In a recent survey, Rocky Mountain Power (RMP) found that 75 percent of Utah's residential customers would be interested in subscribing to a solar energy program at the right price. Another independent study found that Utahns want more clean energy, but most do not want to pay extra for it.

With customer preferences in mind, RMP created its "Subscriber Solar" program, which allows residential and commercial customers to get some or all of their energy from solar energy resources. Under the program, RMP customers can subscribe to solar power generated from a 20-MW solar farm in central Utah. The program gives customers who otherwise would not use solar panels on their own—renters, condo owners, those living in homes with flat roofs, and those who don't want to own solar panels—access to cost-effective solar energy. The program subscribers pay all costs.

The Subscriber Solar program has been a huge success. The program allows customers to subscribe in 200-kilowatt-hour (kWh) blocks up to their total usage for up to 20 years, and allows them to take their subscriptions with them if they move within RMP's Utah service territory. The program was fully subscribed within six months, with a waiting list for future subscriptions.

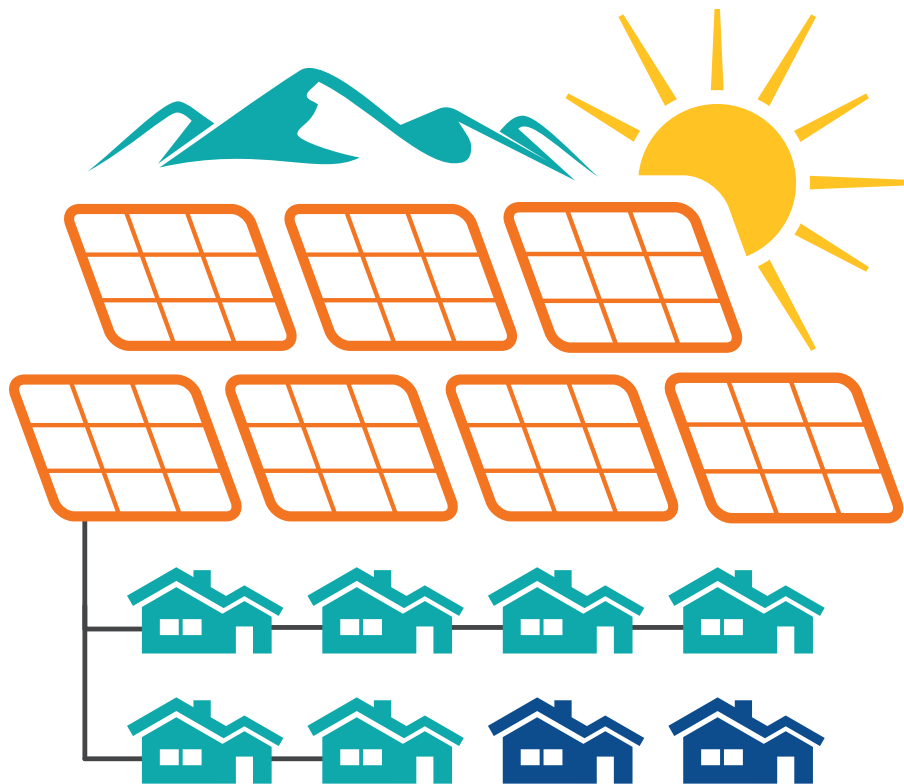
Pivoting to commercial customers, Baltimore Gas and Electric's (BGE's) Retro-Commissioning (RCx) program had been running successfully for several

years, delivering significant savings by doing continuous “building tune-ups” for customers with large buildings. However, few customers with mid-sized buildings enrolled in the program. To increase engagement with this important customer segment, BGE leveraged advanced data analytics to provide mid-sized customers with a more personalized, easy-to-understand experience.

*With customer preferences in mind, Rocky Mountain Power created its “Subscriber Solar” program, which **allows residential and commercial customers to get some or all of their energy from solar energy resources.***

The redesigned, customer-centric building tune-up program created a paradigm shift in BGE’s RCx program performance. Program enrollment increased dramatically. The program redesign focused on three key areas:

- **Refining customer targeting:** BGE leveraged analytics to find buildings that, due to their size and energy use, were prime candidates for the program. This intelligence produced a target list, enabling BGE and its contractors to market selectively to customers who would benefit most from participating in the RCx program.
- **Improving customer interaction:** BGE provided customers with a building analytics report, featuring extensive graphics and simplified descriptions, which enabled customers to understand the specific areas of inefficiency and the savings they could expect after addressing these issues.



■ **Creating value for trade allies:**

With each customer's permission, BGE made the buildings analytics reports available to service providers to give them quick insights into the state of the building, saving them hours of preliminary research. This allowed service providers to bid on jobs more confidently and to lower their prices.

To date, the program has been highly effective at engaging this under-served customer base. More than 49 million kWh in energy savings have been identified, and customers have expressed serious interest in 110 energy equipment tune-ups and upgrades, amounting to 7.9 million kWh in savings. Of the customers who received personalized energy reports through the program, about 75 percent plan to take action to reduce their buildings' energy consumption.

At the community level, Georgia Power—in partnership with AT&T and Current by GE—is supporting the city of Atlanta in its efforts to become a global, top-tier smart city. In the world of smart cities, the prized real estate is the streetlight network, which can function as the heart—or brain—of a smart city's analytics. Georgia Power already has started to upgrade 600 of Atlanta's 39,000 streetlights to smart LED lights, which will result in a 60-percent reduction in energy consumption and will enable improved maintenance and management.

Georgia Power plans to utilize the streetlight network as part of a 12-month pilot and will install 200 of the country's first CityIQ 2.1 nodes—manufactured by GE—across five locations in Atlanta. By using advanced cameras, sensors, and software, these nodes will transform the city's existing street lighting infrastructure into a sensor-enabled data network that will help to address issues such as traffic flow, parking space availability, and crime.

There is tremendous opportunity for electric companies to support the move toward smart communities. Smart communities are built on smarter

energy infrastructure and leverage the power of data and technology to improve sustainability, spur economic development, help drive efficiencies, and enhance the overall quality of life for citizens—the energy grid connects these features and brings them to life.



### **Getting to “Yes” for All Things Energy**

It is vital for electric companies to find ways to say “yes” to customers for all things energy. Customers in every segment are seeking solutions ranging from resiliency and reliability to savings to sustainability, and more. Electric companies' knowledge and understanding of customers' specific needs are a vital part of the transformation of the electric power industry. To meet those needs, each company must keep pace with the technologies that make doing so possible. **EP**



**Lisa Wood** is executive director of the Institute for Electric Innovation and vice president of The Edison Foundation.