Energy innovation

Rapidly evolving technology is changing customer preferences for more sophisticated products and services, and those customer preferences are driving change in how we serve our customers.

Within the next decade and beyond, we will have more change in our industry than we have experienced in the last half century, driven largely by technology. Through collaborations with researchers, technology developers, venture investors and others in our industry, we actively monitor and stay abreast of developments in emerging and advanced energy technology. We also have underway a number of pilot and demonstration projects that are testing the real-world application of cutting-edge technologies and are serving our customers today.

This work has become increasingly important because of our ambitious carbon reduction goals. To realize our vision for a carbon-free future, we will need clean 24/7 technologies to integrate high levels of renewable energy, as well as other advanced technologies.

Advanced technologies also make our operations more efficient, safer and cost effective. As powerful tools emerge to transform our work, they can reduce our costs, improve productivity and enhance the service we provide, benefitting our customers through their overall experience and the costs they pay.

2018 Results

- We launched our first set of voice actions using the Google Assistant as a seamless way for customers to access information to improve energy efficiency in their homes. It is part of a new collaboration with Google to deliver tools that customers can use to manage energy use.

- In Minnesota, we announced plans to build on our clean energy leadership by investing more than $25 million to increase access to electric vehicles (EVs), and help drivers and fleet operators start driving electric.

Achieve our vision to serve customers with 100% carbon-free electricity, we will need cost-effective advanced technologies not yet available today.
• In Colorado, we proposed and received approval for a residential demand response battery pilot. It will study the integration of batteries into utility systems, battery performance and customer preferences. We are seeking to work with two to four battery vendors and engage up to 500 customers during the pilot term, which will begin in late 2019 and continue for up to two years.

• We continue to gain valuable insights from our investment in Energy Impact Partners, which has now invested $325 million in 25 companies that support a number of advancements from distributed energy resources to storage, electric vehicles, advanced data analytics, microgrid applications, cybersecurity and other clean energy technologies.

• Xcel Energy became the first public utility to receive permission from the Federal Aviation Administration to inspect transmission lines using drones flown beyond the operator’s visual line of sight.

• We began piloting the use of bots to drive speed and accuracy in performing routine tasks within our Finance department, enabling employees to shift time to higher-value work.

Advanced Grid Intelligence and Security
Through our Advanced Grid Intelligence and Security (Advanced Grid) strategic initiative, we plan to transform the grid into an intelligent, integrated network that securely, efficiently, reliably and safely integrates distributed energy resources.

We have started building Advanced Grid technology infrastructure in Colorado where regulators have approved the initiative. This includes:

• Upgrading to advanced meters for 1.5 million Colorado electric customers from 2019 to 2024.
• Installing Integrated Volt-VAR Optimization technology (IVVO) from 2017 to 2022 which allows customers’ appliances to run more efficiently, and in turn, use less energy and potentially reduce monthly bills.
• Implementing the Field Area Network (FAN), a new communications network that provides the infrastructure necessary to enable two-way communications between intelligent devices on the grid — such as advanced meters — and the control center. These communications include automatically notifying us when customers lose or regain power, improving our ability to identify outages and more efficiently deploying repair crews. The FAN continues to be installed in the Denver metro area and the entire network will be complete by 2023.

We began deploying FAN advanced field devices in 2018 and implemented a secure, two-way private network that will function as the foundation for the technology in Colorado, as well as Minnesota, where we have regulatory approval for a time-of-use pilot that will launch in 2020. The network enables the secure flow of information between control centers, new advanced devices in the field and our customers.

The FAN infrastructure is critical for when we begin deploying advanced meters to Colorado and Minnesota customers in 2019. We plan to begin rolling out advanced meters to 13,000 Denver metro area customers in late 2019. Through the pilot in Minnesota, 17,500 meters will be deployed giving 10,000 customers from the Hiawatha West and Midtown area of Minneapolis and customers in the Westgate area of Eden Prairie the opportunity to save money by using electricity when it is less expensive to generate and deliver.

Electric Vehicles
The future of transportation is dramatically changing, and as more electric vehicle options become available, a growing number of customers want to reduce their carbon footprint through the cars they drive. We are uniquely positioned to support our customers and communities and to work with electric vehicle (EV) stakeholders to make this change and ensure it truly benefits customers, the environment and the power grid we all rely upon.
Through our EV strategy, we are focused on:

- Raising awareness and increasing access to information on the benefits of EVs
- Helping reduce the upfront costs of infrastructure needed to charge EVs
- Establishing time-varying rates and smart charging technologies to ensure that EVs can charge as much as possible on low-cost, low-carbon energy

While EVs create a significant opportunity for drivers and fleet operators to save on fuel and other costs, barriers exist to wider-scale adoption, such as customer awareness, high up-front costs and the availability of charging infrastructure. We can help overcome these barriers by developing new services, piloting them and then rolling out our most successful ideas to customers on a broader scale.

We developed a portfolio of innovative pilots in Minnesota that will benefit drivers, customers and the environment. The initiatives and pilot programs focus in three main areas: home charging, public charging and fleet operations. This includes a two-year pilot in Minnesota to 100 residential customers that offers a turn-key approach to charger installations by reducing the upfront costs for equipment and providing off-peak pricing benefits. Future options could include a new subscription service that would provide drivers with a set bill for EV charging and equipment each month, and we are exploring dynamic digital tools to help customers understand all their options when it comes to vehicle choices, pricing options and charging solutions.

For public charging, our fast-charging-corridor pilot will seek to leverage public and private funds to increase the availability of fast-charging stations on highways and other major corridors. We are also working with the cities of Saint Paul and Minneapolis on a pilot to support a charging network for everyone, including those who may not own vehicles. Through a partnership with HOURCAR, a local, independent, nonprofit car-sharing service, Xcel Energy will support a new, all-electric, one-way car-sharing service and other innovative mobility services in the Twin Cities. This project is intended to increase access to the benefits of electric transportation, including those in low-income, underserved communities.

We also plan to make it easier and more affordable for large fleet operators like Metro Transit, the Minnesota Department of Administration and the City of Minneapolis to integrate electric vehicles into their fleets. We will provide the electrical infrastructure needed to charge the first eight of Metro Transit's electric buses and are looking to provide charging infrastructure for the State of Minnesota and the City of Minneapolis EV fleets and other customers over time.

We expect to expand our EV efforts to other states, and as we pursue our EV Plan, we are focused on these objectives:

- Empower customers with information, tools and options
- Increase access to electricity as a transportation fuel in an equitable manner
- Encourage efficient use of the power grid and integrate renewable energy
- Improve air quality and decrease carbon emissions
- Ensure reliability, interoperability and safety of equipment
- Leverage public and private funding opportunities
- Provide benefits to all customers, both EV drivers and non-EV drivers
- Ensure transparency and measure results
**Colorado Innovative Clean Technology Projects: Battery Demonstration Projects**

Our Colorado Innovative Clean Technology program was first approved in 2009 to test emerging technologies intended to lower emissions. We have and continue to test several new technologies and evaluate their cost, reliability and environmental performance on a small, demonstration scale before determining whether to deploy them more widely for our customers.

We have two battery-storage demonstration projects currently under the program:

- As demand for solar energy at our customers’ homes and businesses increases, we are examining how battery storage can help integrate higher concentrations of customer solar energy on our system. Through a project in Denver’s Stapleton neighborhood, six homeowners have received Sunverge customer battery systems to test with their rooftop solar installations. We also have installed six larger grid battery systems, supplied by Northern Reliability, Inc., in right-of-ways or easements.

- Through a public-private partnership, Xcel Energy, Panasonic and Denver International Airport are collaborating to test a battery storage system that can both serve as a microgrid to provide backup power to Panasonic’s Denver headquarters and to support Xcel Energy’s grid at other times. As part of the project, Xcel Energy owns a 1.3 MW-AC solar carport installation and a 1 MW/2MWh lithium ion battery. Panasonic also owns a 0.20 MW-AC solar array located atop its building, which is tied into the system.

With both projects, we are testing various ways to operate the battery systems, and are evaluating and analyzing performance. Testing will be completed in 2020. We are finding that the battery systems perform well and are learning many things that will influence future battery system design and associated integration with our system.

**Drones**

We are using unmanned aircraft systems or drones in a number of applications. From inspecting power lines to wind turbine blades and evaluating substations for equipment upgrades, drones are making these tasks easier, safer and helping to reduce costs.

We were the first in the nation to enter into a partnership for safety with the Federal Aviation Administration (FAA), and now hold one of five of the partnerships, along with GE, Amazon, Google, and Florida, Light and Power. In 2018, we increased the use of drones as we became the first public utility in the country to receive FAA permission to fly drones beyond the operator’s visual line of sight and without a visual observer to inspect transmission lines. The flights, which began last summer and continued monthly through the year, are part of a program to prove the value of using unmanned aircraft to inspect critical infrastructure in the power industry.

As a regulated utility we are required to inspect electric transmission lines on a routine basis. Traditionally, we have conducted these inspections with helicopters and foot patrols. Using drones to inspect our 24,000 miles of electric transmission lines delivers value on many fronts, starting with ensuring reliability for our customers thanks to better data. It is also safer for employees, especially in remote mountainous areas, and less costly. As technology improves, the cost to operate drones continues to fall, which will save even more money for customers.

The program started in Colorado, and pending FAA approval, we plan to expand the transmission inspection program in other states in 2019.
Energy Impact Partners

With the pace and scale of emerging technologies and changing customer interests, the energy industry is evolving in ways it never has before. Xcel Energy joined Energy Impact Partners in 2015 as an opportunity to better understand technology’s impact on our business and to drive greater efficiency and innovation as we meet customer needs.

EIP is a collaborative, strategic investment platform that provides capital primarily to clean-tech companies that seek to optimize energy consumption and improve sustainable energy generation. Our planned $50 million investment over five years represents a new era for us, where we move beyond clean energy implementation for our customers and into the clean-tech investment space.

Xcel Energy was an original participant in the collaboration that now includes more than 15 utility and industrial participants. By joining with peer companies, we gain greater visibility into the business models and technologies of promising companies and have the opportunity to influence emerging business models so that energy companies and third parties can collaborate and grow together. Also EIP brings together energy companies from around the world to share diverse, global perspectives and insights into policy and regulations, helping position us for new trends, rules and other requirements in the states we serve.

We are gaining insights that are helping inform our strategic decisions and how we conduct our business across the organization from energy supply to distribution, customer solutions and cybersecurity.

Electric Power Research Institute (EPRI)

Through our long-time membership with EPRI, we gain insights into the challenges and opportunities for using advanced clean energy technologies and reducing carbon emissions. This includes EPRI’s work on electric system resiliency, climate scenario analysis and greenhouse gas reduction goals, as well as integrating renewables, electric vehicles, combined heat and power, customer demand response and energy efficiency.

EPRI also informs our regulators and customers on technical and economic issues, opportunities and challenges related to the use of new grid technologies, including large-scale and customer-sited distributed energy resources, such as energy storage and distributed generation. In this collaborative research environment, we can engage with the industry, technology developers and other stakeholders who test and evaluate new technologies and products, develop tools and methodologies to analyze the effects of distributed energy resources on the power delivery network and optimize their use.

GridNXT at SolarTAC

The Solar Technology Acceleration Center (SolarTAC) in Aurora, Colorado, is a world-class facility for demonstrating and validating advanced solar and distribution grid technologies in a real-world, grid-connected environment. Even before the project’s grand opening in 2011, Xcel Energy recognized the potential benefit of the facility and signed on as an original founding member.

Our investment has paid off for customers. Not only have we tested important battery projects at the site, solar technologies fine-tuned at SolarTAC serve our customers in Colorado and New Mexico with more cost-effective, efficient solar energy. Through testing, solar developers were able to make adjustments for adverse weather conditions before installing the technology in our service areas.

To continue evolving with technology and developer needs, the 74-acre site has transitioned to become a test-bed for solar, storage and other distributed energy enabling products and components. GridNXT at SolarTAC now supports the demonstration of advanced technologies for integrating distributed generation and storage, including microgrid capabilities at the edge or end of the electric distribution system.