“Powering America: Technology’s Role in Empowering Customers”

September 26, 2017

Before the Subcommittee on Energy

House Committee on Energy and Commerce

U.S. House of Representatives

Washington, DC

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SUMMARY

- The architecture of the U.S. electricity grid is rapidly changing from a centralized, "hub-and-spoke" model to a much more distributed, decentralized, and dynamic model that offers tremendous opportunity for consumers.

- This change in architecture is being driven by several factors, including technological progress in a number of areas, increased demands by consumers for more resilient and secure power supply, aging infrastructure, and the impact of digitalization.

- The Department of Energy's (DOE) Grid Modernization program is already yielding significant benefits for the nation as it responds to these changes, and merits continued support by this Congress.

- America's electric cooperatives are responding to these changes as well by leveraging new technologies, offering new services, and continuing to provide affordable, reliable power for the communities they serve.

- Changing technologies, evolving public expectations and the immense diversity within the nation's electric system will require local decision-making, innovation and flexibility. The Committee should keep this principle in mind when considering future legislation related to the electricity industry.

PREPARED TESTIMONY

Good morning Chairman Upton, Ranking Member Rush, and members of the Subcommittee. My name is Bryan Hannegan, and I am President and Chief Executive Officer of Holy Cross Energy in Glenwood Springs, Colorado.

Thank you for the opportunity to testify on how innovations in electricity technologies are empowering consumers. Our thoughts continue to be with those affected by the devastating hurricanes in Texas, Louisiana, Florida, Puerto Rico and the Virgin Islands, as well as those affected by the wildfires currently burning throughout the West. As residents of these states work to rebuild their homes, businesses and communities, I want to recognize the ongoing efforts of the thousands of utility employees that are working around the clock to safely restore power. It is during these difficult times that we are all reminded of the critical importance of our nation's energy infrastructure, especially the electric grid.

Holy Cross Energy, formed in 1939, is a not-for-profit, member-owned electric cooperative utility providing electricity, energy products and services to more than 59,000 consumers in the Western Colorado Counties of Eagle, Pitkin, Garfield, Mesa, and Gunnison. The more than 3,000 miles of transmission and distribution lines that we maintain deliver energy to the farmers, ranchers and hard-working communities and towns of the Colorado Western Slope. Our workforce includes 158 skilled and dedicated employees committed to serving the energy

needs of our member-owners, and we are governed by a seven-member Board of Directors that is democratically elected from the local communities in which they reside.

Working together, our Board and staff make decisions on long-term investments and near-term operations designed to efficiently optimize our resources on behalf of the members we serve, providing them with safe, affordable and reliable energy supply. The landscape on which we are doing this is rapidly changing, however, and I am pleased today to share with you our views on how these changes will benefit our members and the nation as a whole.

A Changing Landscape

For the last century, our extensive, reliable electric power grid has fueled the nation's growth. Access to electricity is such a fundamental enabler for society that the National Academy of Engineering named "electrification" the greatest engineering achievement of the 20th century.

Today's electric grid was built largely around a "hub-and-spoke" architecture consisting of several components, including:

- large, central-station power plants;
- a one-way transmission and distribution delivery system; and
- fixed, predictable and passive customer loads.

This architecture fit the purpose of the time – to provide safe, reliable and affordable supplies of electricity as an input to a growing economy. In more recent years, however, we have called upon the Nation's electric grid to take on additional challenges, including:

- a changing and increasingly variable mix of electricity generation resources;
- new opportunities for customers to participate in electricity markets with distributed energy and smart grid technologies;
- growing consumer and business demands for a more resilient and reliable grid protected from all hazards (including weather, cyber and physical attacks);
- an increasing dependence of the electricity grid on interconnected digital information and control systems; and
- an increasingly aging electricity infrastructure, much of which was first constructed many decades ago.

Meeting these additional challenges will require modernizing our electric grid for the 21st century following a new architecture comprised of:

- multiple sources of electricity generation of various shapes, sizes, and variability;
- a two-way, dynamic delivery infrastructure; and
- active, engaged customers that can both produce and consume energy as best fits their needs and the needs of the grid at the time.

In 2015, I was pleased to be co-leading a team of experts from our National Laboratories that identified six key challenges in grid modernization:

1. Development of *devices (vehicles, appliances, storage, etc.) and integrated systems of devices (like microgrids)* that can seamlessly provide grid-friendly energy services.
2. *Sensing and measurement technologies* that can allow us to better monitor and predict the condition of the grid at any point in time and space.
3. *New approaches to real-time operations and control of the electric grid* and the technologies connected to it, with the ability to scale from a few hundred large power plants to millions if not billions of connected devices on the grid of the future.
4. *Improved design and planning tools* that can be used to develop new blueprints for electric grids that blend existing assets with new technologies across multiple scales.
5. *Technologies and practices for grid security and resilience* that allow us to better identify threats and hazards (regardless of cause) and improve our ability to protect, respond and recover from those events.
6. *Institutional changes in policies, regulations, and business models* that may be needed to enable new services to consumers.

These ideas have been developed and implemented as the Department of Energy's (DOE) Grid Modernization Initiative, a multi-year collaboration among 14 DOE National Laboratories and regional partner networks of utilities, grid operators, technology firms, academia, and civil society organizations. This portfolio of Federally-funded activities will help set the nation on a cost-effective path to an resilient, secure, sustainable, and reliable grid that is flexible enough to provide an array of emerging services while remaining affordable to consumers.

Several of the many projects supported by the Grid Modernization Initiative are already having a significant impact on how we think about the future electric grid:

- In Hawaii, the electric utility is partnering with solar providers to use “advanced inverters” to reduce the impact from large amounts of rooftop solar on the local distribution grid. The advanced inverters can function as shock absorbers to the grid by modifying how they convert the DC power from the solar panels into the AC power needed on the grid or in the home.

- In California, these advanced inverters are doing the same thing with utility-scale solar plants up to 300 MW in size. This allows a utility solar installation to provide more flexibility to the grid in the form of “ancillary services” such as ramping control and frequency response, which help keep the grid stable and avoid the need for backup generation capacity. Similar functions are now standard issue for all wind turbines.

- In Vermont, the local utilities and their main technology providers are deploying a new form of software known as an Advanced Distribution Management System, or ADMS, to directly control energy storage on the distribution grid in new ways that avoid the need for system upgrades and optimize asset utilization.

- In Washington State, two universities and a National Lab are teaming to form a multi-campus network allowing for testing of “transactive energy” concepts that allow individual buildings to respond to real-time price signals with specific changes in their

energy use that help the grid and also save money.

- In Louisiana and Alaska, communities and villages are designing and deploying "microgrids" of local resources, including energy storage, to improve the resilience and reliability of their electricity supply where grid service either does not exist or is prone to impacts from natural events like hurricanes.

These are but a few of the important projects comprising the Grid Modernization Initiative, which is a vitally important investment in our Nation's energy future, and one that I hope you will see fit to continue.

Implications for Electric Cooperatives

Because they are member-owned, member-governed, not-for-profit utilities, America's electric cooperatives like Holy Cross are naturally "consumer-centric". Through a variety of mechanisms we regularly hear from our members about their wants and needs for energy services, which are rapidly changing given the array of new technologies able to serve them.

At Holy Cross, we have responded with an array of "consumer-centric" programs, particularly in the area of energy efficiency and renewable energy:

- Through our “WE CARE” program we provide an array of energy efficiency services and incentives that are intended to achieve a 0.5%/year energy savings across our system. Under this program we provide:
    - free energy audits for existing homes and businesses;
    - rebates for residential lighting, thermostats and appliances;
    - rebates for commercial lighting, heating/AC systems, and efficient motors; and
    - partnerships with incentives for our largest commercial/industrial members

- We also provide our members with “green power” options that enable them to purchase blocks of wind energy or local hydropower resources if they so choose. We are exploring expanding this program to include solar energy as well.

- We have nearly 30 MW of distributed clean energy resources on our system, including:
    - 11.5 MW of biomass fueled with beetle-kill salvage lumber from nearby forests;
    - 3.5 MW of community solar, including the first such community solar project anywhere in the nation;
    - 6 MW of small hydro resources;
    - 3 MW from coal mine methane; and
    - 6 MW of distributed and utility-scale solar.

  Additionally we have 10 MW in new solar under development, expected in 2018.

- We were one of the first electric cooperatives to have Advanced Metering Infrastructure fully deployed throughout our distribution system.
    - Our “smart meters” and related communications and control infrastructure allow us to detect outages in many cases before the member calls us.
    - We can also use this data for several purposes:
        - to optimize our maintenance activities;
        - to determine where best to install distributed energy resources; and
        - to sequence our future investments to maintain a reliable grid.
    - In the future, we may be able to use this data to predict the future state of the grid in real-time, at a specific location, so that we can take steps to prevent outages and disruptions in service **before** they occur.

Cooperatives like Holy Cross are benefiting their members across the country through an array of projects reflecting new technologies and new ideas.

- In South Dakota, co-ops help ranchers deploy solar-powered stock wells in remote locations to avoid the need for expensive grid extensions and upgrades.
- In New Mexico, a co-op installed a solar micro-grid on a community campus to provide extra reliability and access to generation resources desired by members.
- In Minnesota, a co-op is providing a free water heater to members so it can be used as energy storage for power generated by solar and wind.

- Seven Colorado co-ops (including Holy Cross) are partnering with a regional non-profit organization to construct community solar facilities dedicated to serving their lowest-income members.
- In states around the country, co-ops are providing high-speed broadband service to consumers who otherwise lack access.

As the future electric grid evolves towards a 21st century future, cooperatives like Holy Cross will continue to invest in new technology, develop new programs and services, and evolve their businesses to meet the local needs of their consumers in light of local conditions, needs, and consumer preferences. Changing technologies, evolving public expectations and the immense diversity within the nation's electric system will require local decision-making, innovation and flexibility from our industry. We encourage the Committee to keep this principle in mind as it considers any future legislation affecting the electricity industry.

I thank the Subcommittee for this opportunity to testify, and would be pleased to respond to any questions you might have today or in the future.