



Residential Energy Innovation: Xcel Energy's Battery Connect Pilot

Overview

Xcel Energy provides electricity to millions of homes and businesses across eight Western and Midwestern states. Renowned for its commitment to carbon emission reduction, the company leads the industry in delivering clean energy solutions from diverse renewable sources, all at competitive rates. In Colorado, Xcel offers residential and small business customers an incentive for their stored solar energy. The incentive program enables the utility to utilize solar power stored through eligible battery equipment during control events, consequently mitigating energy consumption, alleviating demand, and fortifying the reliability and resilience of the electric grid.

Opportunity

Xcel Energy partnered with leading battery vendors Tesla and SolarEdge to explore various battery demand management applications, including peak load reduction, solar time shifting, and controlled charging.

Resource Innovations (RI) was hired to evaluate the Residential Battery Demand Response (DR) Pilot, called Battery Connect, through September 2022. This pilot marked Xcel Energy's initial step in exploring how third-party services can enhance the energy grid.

The primary objectives of the pilot were to understand battery performance on days with and without intervention, explore the demand management capabilities of battery storage systems, and gather participant feedback about the pilot. Utilizing innovative battery storage technology, the pilot tested charging and discharging strategies in preparation for a larger-scale deployment.

PROGRAM SNAPSHOT

Program offerings:

In-depth interviews, customer surveys, baseline, and load impacts analysis

Number of participants:

125

Customer satisfaction rating:

94%

Program viability:

Pilot program is being used to determine the viability of a full-scale battery demand response program.

Solution

Xcel Energy's Residential Battery Connect Demand Response Pilot ran for 18 months, from March 2021 to September 2022. The pilot involved 125 residential customers with solar panels and battery storage systems, offering them a one-time incentive of \$1,250 in exchange for allowing Xcel Energy to control their battery systems, enabling the utility to dispatch forced charging or discharging, particularly during times of increased grid demand, on designated days.

During events, Xcel Energy tested three different use case strategies to manage discharging and charging at various times. These use cases, named Peak Load Reduction, Summer Peak Load Shed, and Solar Time Shifting, differed primarily in the timing of the charging and discharging instructions throughout the day. Over the pilot, about 31 battery charge events and 41 discharge events were conducted with the participating customers.

RI's methodology included assessing customer battery baselines, which measure the electricity participants' batteries would have charged and discharged without events.

A process evaluation was conducted to identify ways to improve program operations and services. This involved interviews with key program and utility staff and surveys of participants. The surveys explored participants' awareness of the pilot's marketing channels, their reasons for enrolling, and their regular use of battery backup systems. The evaluation also assessed battery performance, vendor capabilities, and customer preferences to determine the feasibility of a full-scale, cost-effective residential battery program.

Results

Our evaluation findings indicate that most participants had their batteries set by default to undergo daily charging and discharging cycles to support household energy needs, independent of the pilot's interventions. Participants on time-of-use (TOU) rates had their batteries programmed to align with TOU peaking periods, unlike non-TOU participants.

Xcel Energy's events took precedence over the user-selected battery modes, with little to no lag time between the event signal and the battery response. After a forced charge or discharge event concluded, the batteries reverted to their regular operational modes. Discharge events did not necessarily deplete the participants' battery energy; in many cases, the batteries continued to be used even after the discharge event ended.

On average, participant batteries began the day with around 9 kWh of discharge capacity, and the average daily charge reached approximately 16 kWh. During event days, batteries enrolled in the Battery Connect Pilot showed an incremental increase in charging or discharging compared to non-event days.

Based on the results of the Battery Connect evaluation, Xcel Energy is partnering with RI to move into the next phase of the program's development, called Renewable Battery Connect. This effort is expected to run through 2026.

ABOUT RESOURCE INNOVATIONS

Resource Innovations (RI) is an energy transformation firm. Women-led, purpose built, and focused on impact, we're constantly expanding our portfolio of solutions to guide utilities through increasingly complex, connected challenges. For communities across North America, we're leading the charge to power change.

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