Greater engagement for improved demand response

How smart energy technology improves grid resiliency

ecobee | UTILITY DIVE

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From wildfires and extreme heat in the Northwest to record-breaking arctic temperatures in the South, the U.S. has experienced a range of intense, damaging weather events and environmental unpredictability in just the last few years. As the climate continues to warm, these types of extreme temperatures will increase in frequency and severity across all regions of the country, putting greater strain on power grids. In 2022, for example, the North American Electric Reliability Corporation (NERC) found about half the U.S. to be at elevated or high risk of summer capacity shortfalls because of extreme heat.

Utilities are well aware of these risks, and they're actively developing solutions to improve grid resilience. That includes looking at new solutions to improve existing load flexibility and demand response (DR) approaches.

Utilities already rely on customer participation in DR programs to shift electricity away from periods of peak demand. But traditional DR programs often come with barriers to participation. For example, they may require the customer to enter their utility account number, which customers may not know how to locate, let alone have readily available, at the time of enrollment. They also require reading and accepting program terms and conditions, which can be intimidating and sometimes a deterrent to customer participation. Or customers may simply not be interested in a program that they perceive as helping utilities make or save money.

But there are approaches to DR that can avoid these barriers to entry. An innovative pilot program from smart thermostat company ecobee and San Diego Gas & Electric (SDG&E) in 2022 demonstrated how utilities can expand the pool of resources to complement traditional DR programs, giving every asset in their fleet value and ultimately improving grid resiliency and stability.

The Next Generation of DR

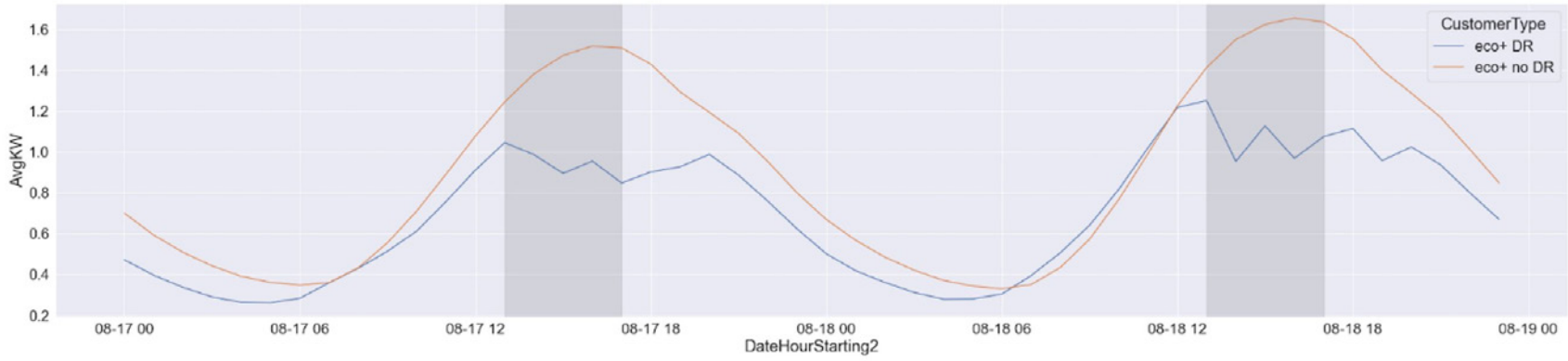
A recent study found that DR is the largest distributed energy resource in the U.S., with 59 GW of installed capacity. However, traditional DR smart thermostat programs that can access a customer's thermostat several times per season are only one tactic to access that resource.

"Customers may want to help with electricity reliability, but they don't necessarily know how," says Kari Binley, Senior Manager, Energy Partnerships at ecobee.

"Customers who are not enrolled in a DR program may not know it's available or don't want to be called upon frequently during the summer. They may, however, be interested in helping during the greatest times of need. For example, customers might participate in an energy-savings event or two per year by making behavioral changes when prompted by their utility company. **But by creating a way for technology to automate these actions, utilities get reliability and customers don't have to change their behavior."**

ecobee customer HVAC runtime during Rolling Blackouts in 2020

Automated response to Flex Alert is much more impactful than a behavioral response



Smart thermostats are already a reliable tool with potential for even greater energy savings. Smart technologies, specifically automated solutions that can adjust for factors such as vacancy, humidity, and time-based energy costs, have made demonstrable impacts on home energy usage. This was proven even during the height of the pandemic, when people spent more time in their homes. "A smart thermostat is fundamentally a home comfort device," says Jesse Smith, partner with Demand Side Analytics. "Customers trust that their comfort will be managed by that smart device."

ecobee first explored grid resiliency events in 2018, when it updated its customer terms & conditions to allow automated temperature adjustments during times of need. The company tested the concept during the rolling blackouts in California in 2020. ecobee conducted an EM&V study in 2020 to measure if grid resiliency events – or automated responses to Flex Alerts – could effectively reduce demand in times of need. The study demonstrated that automated responses to Flex Alerts were much more impactful than behavioral demand response. The encouraging results inspired ecobee to scale this model through a dedicated grid resiliency feature on its smart thermostats.

As ecobee and SDG&E learned through the subsequent 2022 grid resiliency pilot, these approaches are key to the future of DR.

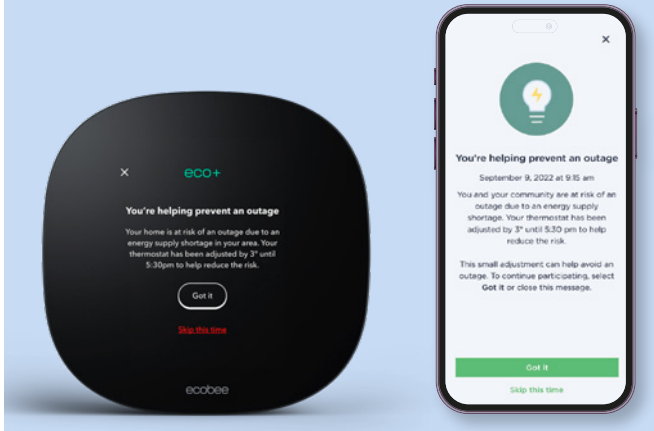
The Pilot Program in Action

In September 2022, California's grid operator, CAISO, issued an EEA1 Alert, meaning the grid was at capacity and customers needed to conserve energy. In coordination with SDG&E, ecobee dispatched an emergency event to its pilot group of customers on the day of the event. These customers – who were not part of SDG&E's demand response program – received a notification in the ecobee mobile app and on their thermostat asking whether they would like to participate in an automated energy-savings event. If customers did not ask to be removed from the event, their thermostats were automatically adjusted to conserve energy.

This was a key innovation in terms of driving DR participation. Typically, when a Flex Alert is called, customers not enrolled in a DR program are asked to manually reduce their energy consumption. In this pilot, customers were informed of the energy-saving opportunity and any adjustments were automatic.

Of the customers in the pilot program, **55.6 percent completed the full energy-savings event**. **Only 5 percent of customers chose to skip the event** after receiving the second notification just before it began. Both ecobee and SDG&E were satisfied with the engagement rates; the 5 percent who reacted to the second message was a small percentage of customers, meaning that most customers who didn't want to participate reacted to the prompt when they first received it. "This is all about customer choice, and we want customers to have the agency to not participate if they don't want to," Binley explains.

SDG&E ran a traditional DR event at the same time as the ecobee pilot, and the load shifting in the ecobee event mirrored that of the typical DR program. **The predictability of the energy savings can be a vital asset for planning, and, crucially, customers in the pilot responded favorably**, indicating no adverse effect on customer comfort or sentiment for SDG&E or ecobee.



The ecobee-SDG&E Grid Resiliency Pilot: How it Worked

- California called an Energy Emergency Alert 1 (EEA1) alert on September 9, 2022.
- ecobee sent both an in-app notification and an on-screen message on smart thermostats to customers not enrolled in SDG&E's DR program that an energy savings event was going to happen.
- Customers could acknowledge and accept participation, or choose to skip the event.
- The event began at 4:00 p.m. local time.
- ecobee sent an additional notification confirming the event was taking place, providing participants another opportunity to opt out.
- ecobee thermostats raised home temperatures automatically by one to four degrees, depending on the individual customer's comfort and savings preferences, for the duration of the event (two hours).
- The event ended with positive customer response and load shifting that matched the concurrent SDG&E DR event.

Key Takeaways for Utilities

This pilot uncovered three key takeaways that utilities can use to inform grid resiliency efforts going forward:

1. Don't Treat DR as One-Size-Fits-All

Customers want flexibility and choice. By expanding the types of DR programs they offer, utilities can provide a true menu of options for customers to participate in energy-saving events. Standard DR programs that offer an incentive for more frequent events are a valuable tool, but grid resiliency events reframe participation for customers. "People understand it's not good for anyone if the grid blacks out," says Smith, who helped analyze the impacts of ecobee's technology. "Presenting them with the option to pitch in and help during a grid emergency is a different way of framing the demand-side management that's needed."

Knowing the grid is at risk and having agency to help increases participation because it also increases transparency for customers.

2. Some Customers Will Participate Without Financial Incentives When the Grid Is at Risk

While financial incentives are certainly desirable for many customers, they're not the sole motivating factor; all the participants in the ecobee and SDG&E pilot agreed to reduce energy consumption without a rebate or payment. Because the pilot program was transparent about the state of the grid, explained what to expect and informed customers at multiple touchpoints, customers were more engaged and informed than they might have been with a one-time registration in a standard DR program.

The communications also came through the ecobee app, which is a regular part of customers' daily lives. The pilot communications met customers where they were instead of asking them to change their behavior. "It's part of the user experience and asks customers, 'Are you willing to help out during a grid emergency?'" Smith adds. As smart devices proliferate in homes, these interactions become normalized for all users.

3. Automation Is Key to Reliability

Behavioral changes are difficult, so asking customers to manually reduce energy usage if they're not in a DR program is challenging. Automated devices like ecobee smart thermostats are crucial to these flexible programs because they don't require users to do anything. As Smith points out, **"These programs allow customers to play a direct role in improving grid reliability for their household and community, without needing to manually change their device setting or behavior or sacrifice their comfort at home."**

"Imagine being able to double or triple your smart thermostat resources during a grid event," says Binley. "With ecobee's Grid Resiliency offering, you can now add smart thermostat devices in your area that you didn't have access to previously." Enlarging the pool of resources for grid resiliency events while relying on automation is a win-win for utilities and customers. Utilities can also rest assured that every ecobee device in their territory can provide value at the most important times.

The data available from smart devices also creates predictability in available load shifting. The opt-out rate from customers ahead of the event provided SDG&E with reliable information about the exact number of devices that would adjust their energy usage during the event. Rather than request behavioral changes in an emergency and estimate the response rate, utilities can leverage the information provided by automated solutions for an accurate picture of energy being conserved.

Building a More Resilient Grid for the Future

Grid resiliency events like that conducted by ecobee and SDG&E demonstrate that innovative approaches can make DR programs more impactful. By offering customers the chance and the choice to participate outside of traditional DR programs and focus on moments of greatest need, utilities can engage more consumers and make load shifting more predictable.

These events also act as a safety net for utilities when the grid is under the most stress. "Recent grid emergencies highlight the need for diversity in utilities' strategies," says Smith. "Grid resiliency offerings are like an insurance policy. Hopefully they are not needed during a given season, but they offer grid operators an additional pool of resources to tap into if a grid emergency does occur."

For utilities, partnering with smart device providers on innovative DR programs is a natural progression given the growth in IoT. These collaborations expand the pool of resources available for energy savings, and their automated nature is not just reliable but also presents a new way for customers to engage with energy usage. Interacting with in-app messages is ubiquitous, so automating and normalizing these interactions benefits the utilities who ultimately see the energy savings. And with HVAC accounting for nearly half of home energy usage, it simply makes sense for utilities to leverage the energy savings that can come from partnerships with smart thermostat providers.

Smarter tools and flexible approaches can support the energy transition and build tomorrow's resilient, low-carbon electrical grids. With innovations to demand-side management and the devices that support it, utilities can create better options for DR programs and provide the power we all rely on now and into the future.

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ecobee Inc. was founded in 2007 with a mission to improve everyday life while creating a more sustainable world. Since launching the world's first smart thermostat in 2009, ecobee has helped customers across North America save nearly 28 TWh of energy, which is the equivalent of taking all the homes in Los Angeles and Chicago off the grid for a year. Today, ecobee continues to innovate with smart home solutions that solve everyday problems with comfort, security, and conservation in mind. In 2021, ecobee joined Generac Holdings Inc. (NYSE: GNRC). Generac and ecobee share a vision to deliver a cleaner and more sustainable energy future for customers and communities. The Generac and ecobee home of the future will be more comfortable, resilient, and efficient.

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