

AN ARTICLE FROM  **UTILITY DIVE**

The real-world benefits of advanced load shifting



Permission granted by Jason McCullough, Armada Power



Though much of the electric-power industry has begun paying close attention to the importance of **load shifting and demand response** in recent years, Central Electric Power Cooperative, Inc. (CEPCI), has been focused on their benefits for decades. Based in Columbia, South Carolina, CEPCI is a nonprofit provider of wholesale electric service to the state's 20 electric cooperatives and their 800,000 customers, often referred to as members. CEPCI's use of sophisticated demand management technology allows it to call load optimization events responsive to time-of-use pricing on a regular basis.

Not only does CEPCI serve the state's electric co-ops by securing low-cost electricity via long-term power purchase agreements and more than 800 miles of transmission lines, but it also continuously tests new technologies that can benefit co-ops and their members. "We are looking for ways to reduce the coincident peak and the big costs related to that every month. That's how our co-ops derive value from load management," said Scott Hammond, CEPCI's member programs manager. "We've had water-heater programs since the 1980s, and we've probably got about 60,000 or 70,000 water-heater switches we do control with as well as smart thermostats and some older AC switches that we use."

Though CEPCI has pioneered load shifting and demand response, a few things have changed to make them more important and more achievable throughout the industry.

One major reason is how the power system, particularly generation, has changed in recent years. “As our grid adds more and more intermittent renewables, like wind and solar, it has become increasingly important for utilities to be able to shape or control demand,” said Jesse Smith of Demand Side Analytics, LLC, a consulting firm that works with utilities to better use data and technology to improve demand response, energy efficiency, time-varying pricing and other initiatives. “Thermal generation has always been controllable, and demand was the question mark. Now generation is more intermittent and variable but there are more options available to manage demand.”

Big investments in AMI and the availability of other technologies that empower utilities and their customers to control demand and shift load in a mutually beneficial way are additional critical developments. For example, Armada Power’s Grid Optimizer controller allows utilities to leverage real-time data to optimize water heaters by allowing load shifting away from expensive peak hours to benefit the grid **without affecting customer experience.**

Given that water heaters are the second-highest energy-consuming appliances in homes, shifting this load quickly is extraordinarily important. “What Armada Power is doing allows utilities to respond very quickly to add or subtract load,” Smith said. “That kind of fast response has become more valuable as utilities have less control over the generation side.”

Happier Customers and Co-Ops in South Carolina

One of the primary reasons CEPCI opted to deploy Armada Power's technology to control water heaters is that it's a load that can be shifted without consumers noticing. Indeed, Armada Power's controllers allow water to be preheated in advance of a load-shifting event so that a residential customer can access hot water as the shifting occurs. "It's a load that we like because we can control it with minimal interruptions to our members," said John Becker, member services analyst with CEPCI. "That's especially important because we are running these events every day as a way for our members to lower their consumption during peak periods when costs are higher."

Given the location of CEPCI and the co-ops it serves, another big benefit of tapping Armada Power's technology to shift loads is that it does not affect HVAC systems. Even offering generous incentives to control thermostats during peak summer demand periods would likely be rebuffed. "People are not going to let you control their thermostat up to four degrees every day in South Carolina during June, July and August. They're just not going to do it," Hammond said. "You can pay them \$100 a month, and they're still not going to do it, but water-heater control means minimal interruptions."

The availability of a steady stream of real-time data from water heaters is also a big benefit. For CEPCI, it enables fast analysis and verification that individual water heaters respond precisely to commands during events. This translates into real money. "We used to pay a lot of money to do a yearlong analysis of devices to make sure they were working as expected. Then we'd use those findings for 10 or 15 years before we paid for another study," Hammond said. "Having almost instantaneous data coming back from these devices is crucial. We have a level of detail and insight we've never had before."

The data CEPCI receives also allows for rapid response when water heaters aren't working properly. This proactive maintenance can boost satisfaction among co-op members. "We not only know how much peak we are clipping during events, we've been able to identify issues with water heaters within 24 hours after the issue started," Hammond said. "The member won't be aware that an element has gone out or there is a leak, and you can call them and tell them about it and send someone out to fix it."

Other potential benefits of advanced control of water heaters are emerging. For example, Smith of Demand Side Analytics is working on a study in California where water heaters are basically being used as storage. "They're preheating the water during the middle of the days when solar generation is cheap and abundant," Smith said. "Then, as the demand ramps up later in the day, the water heater is already preheated. I really think water heaters are going to get more and more attention in the future."