



Case Study: Beneficial Electrification, Innovative Rates and Renewables

Overview

The following case study reviews how Lake Region Electric Cooperative manages load to reduce costs.

Cooperative Profile

Lake Region Electric Cooperative (LREC) is a distribution co-op serving more than 28,000 member accounts across a 3,200 square-mile area in west central Minnesota (as shown in Figure 3.1). LREC operates and maintains 5,800 miles of distribution lines and receives its power from Great River Energy (GRE), a generation and transmission cooperative whose generation mix will be almost 95 percent carbon-free and very low cost by 2023. With its portfolio of innovative programs and pilot technology applications, LREC is a forward-looking utility and a bellwether among electric cooperatives.

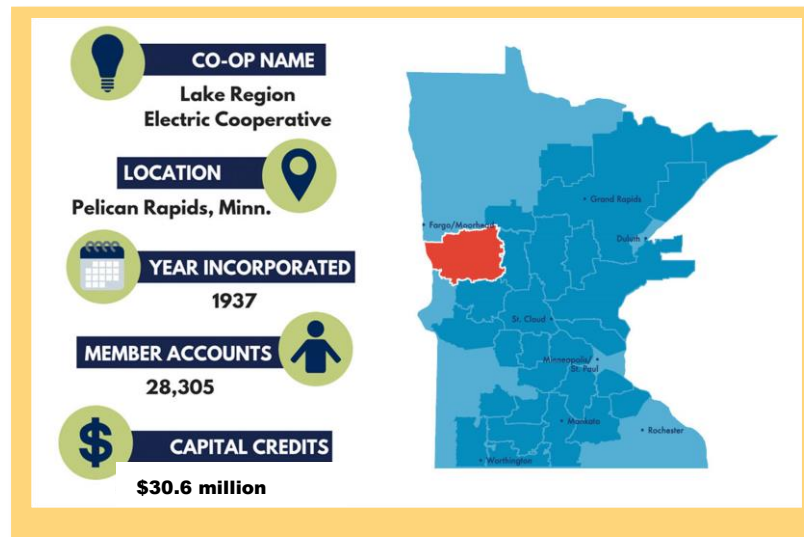


Figure 3.1: Overview of Lake Region Electric Cooperative.
Image courtesy of Great River Energy

Impetus for Beneficial Electrification

The drivers behind LREC's efforts toward greater electrification came from multiple sources. First and foremost, the co-op takes very seriously its responsibility to provide value to its members, many

of whom have expressed strong and substantial support for electrification when it is backed up by renewable resources. This is an evolutionary situation. LREC has operated a Conservation Improvement Program (CIP) as required under Minnesota law since 2007.¹ CIP is a program that has successfully reduced the need for new power plants by limiting overall electricity usage and peak demands in households and businesses with the help of rebates and other incentives that encourage conservation. Investments in high-efficiency appliances and machines have been among the measures promoted. However, the programs previously targeted reductions in electricity usage and often overlooked potential opportunities for greater efficiency and improved environmental performance where end-uses could be converted from fossil fuels to electricity, thereby increasing electric load. The current trend toward electric vehicles (EVs) is the most obvious example.

A major change in where LREC’s power comes from has also pushed LREC toward greater electrification. In May of 2020, LREC’s power supplier GRE announced plans to close its 1,151 megawatt (MW) coal-fired generating station at Coal Creek in late 2022, repower a smaller coal plant to run on natural gas and add 1,100 MW of wind generation capacity through power purchase agreements (PPAs) by late 2023. These are consequential changes. Coal Creek station is one of the largest power plants in the upper Midwest. When the transition is complete, GRE’s power supply portfolio will be more than 95 percent carbon dioxide-free.² The transformation to a cleaner power supply mix gives LREC and other GRE members the opportunity to promote electrified end-use technologies that lower cost and benefit the environment.

Beneficial Electrification Programs

LREC currently offers several beneficial electrification programs:

- ChargeWise EV program.** Members are eligible to receive an EV charger installation rebate if they agree to charge under one of two specially designed rates: an off-peak electric storage rate or a time-of-use rate, as illustrated in Figure 3.2. The program is currently limited to Level 2 in-home chargers. To add further value, GRE currently offers consumer-members participating in this program a free wind energy upgrade.

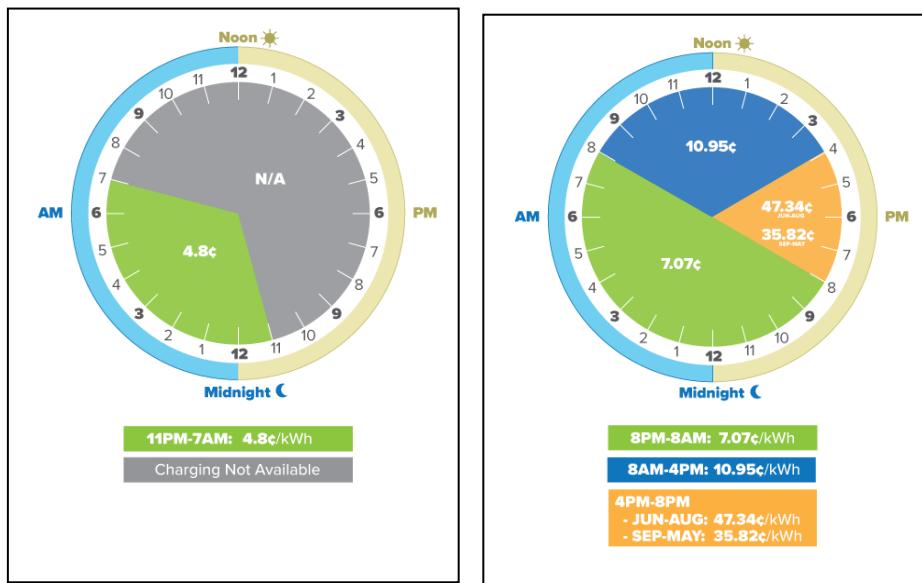


Figure 3.2: LREC’s off-peak EV charging rate (left) and time-of-use rate (right).

¹ <https://www.lrec.coop/your-co-op/news-events/news/modernizing-cip-promote-efficient-and-affordable-energy>

² <https://www.electric.coop/great-river-energy-announces-transition-to-wind-market-power/>

- Grid-interactive ETS water heater pilot program.** One of the most promising technologies being tested by LREC involves what are called “grid-interactive electric thermal storage (ETS or GETS) water heaters.”³ ETS water heaters use off-peak energy and store the hot water for use during on-peak times of the day. The co-op launched a pilot program in 2019 to test the ability of ETS water heaters to optimize its utilization of renewable energy production from a local wind-solar hybrid project. According to Dan Husted, LREC’s Vice President of Business Development, “We’re building a wind-based renewable energy infrastructure so we need to encourage end-uses that can take advantage of intermittent power supply.” The co-op’s pilot program relies on the interconnection of a wind and solar hybrid project to a distribution feeder supplied by its rural Erhard substation. Dedicating a hybridized renewable supply source to a single feeder on which an innovative end-use technology is being tested is a novel and highly advanced approach.⁴ The complexity associated with operating and evaluating such a pilot test is made clear by the 24-hour electricity supply vs. demand graphic in Figure 3.3.

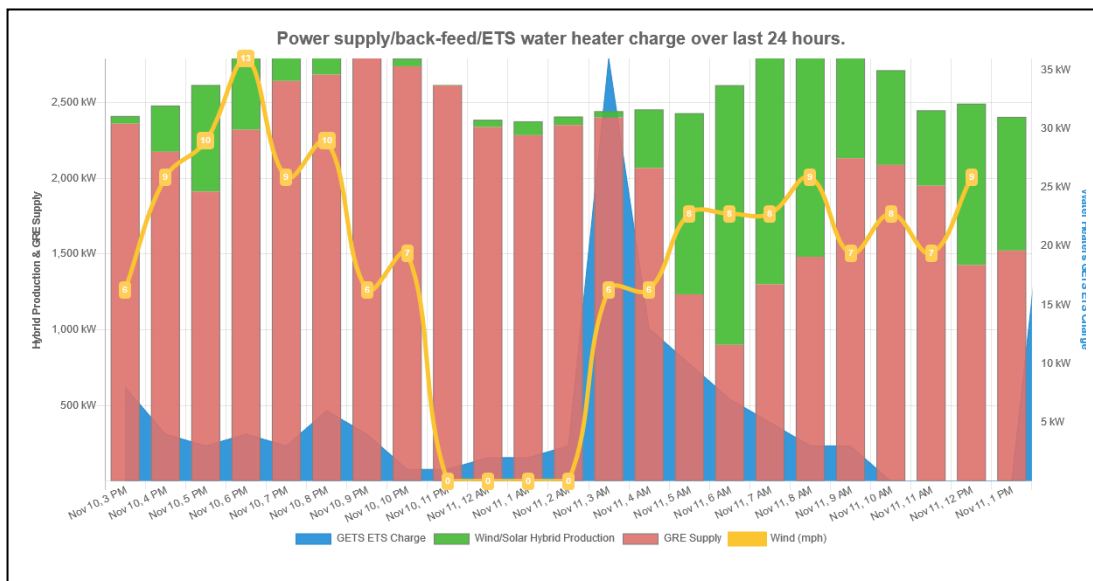


Figure 3.3: Twenty-four hours of supply and demand in the life of LREC’s grid-interactive ETS water heater pilot program utilizing a wind and solar hybrid project.

- Air-source heat pump (ASHP) promotion.** LREC offers residential energy efficiency rebates for installation of high-efficiency ASHP heating and cooling systems as well as water heaters. Rebates can be as high as \$1,500. This program is offered throughout GRE member service territories.
- On-bill financing of qualifying electric appliances and systems.** LREC offers its members *EASY-PAY* on-bill financing of any product the co-op sells, including high-efficiency water heaters, standby generators and high-efficiency heat pumps.⁵

³ The pilot project relies on Grid-Interactive Electric Thermal Storage (GETS) storage water heaters from North Dakota-based Steffes.

⁴ “Using Grid Interactive ETS Water Heaters to Optimize Local Utilization of Wind Solar Hybrid Production and Shape Load Curve (A Beneficial Electrification Pilot),” a fact sheet available from Lake Region Electric Cooperative.

⁵ <https://energynews.us/2019/10/24/midwest/minnesota-co-ops-tap-on-bill-financing-to-help-shift-consumption-overnight/>

Outlook for Beneficial Electrification

Husted sees beneficial electrification as a growth opportunity and focus for utility investment over the next five to ten years. “With rebates for converting equipment and processes to electricity, attractive rates and on-bill financing, why wouldn’t our members take advantage of this?” He adds that in Minnesota there is broad support for beneficial electrification from the electric utility industry, state government and nongovernmental agencies. Most view a shift toward electricity as a natural fit with increasingly prevalent renewable energy resources. Nevertheless, he sees challenges ahead in the selection of, and investment in, the most appropriate and cost-effective demand-response technologies and the high-speed communications infrastructure necessary to support them, citing legacy communications systems still in place at many electric cooperatives. As Husted points out, continuing energy efficiency and demand management efforts are essential for electrification to be accomplished in a way that lowers members’ costs.

Lessons Learned

LREC’s multi-faceted approach to managing loads to take full advantage of GRE’s rapidly greening power supply — relying on energy efficiency, beneficial electrification and innovative rate structures — is a highly advanced experiment. By focusing its pilot project on a site-specific, solar and wind hybrid generation resource and a single feeder on which advanced technologies (GETS water heaters) are being tested, the co-op has created a new utility supply and demand model on a test scale. A distributed energy resource is married to an advanced end-use technology, creating a new variant on the microgrid concept. With this model LREC is examining a future in which electricity supply resources are dynamic and intermittent and demand patterns must be trained to work with them. As such, this co-op’s pilot project results should be of significant interest throughout the utility industry.

This Case Study is part of NRECA’s report: [Case Studies in Beneficial Electrification – Electric Cooperatives Develop Programs to Build Consumer Value and Meet Climate Change Goals](#), written by Eric Cody, Cody Energy Group, codyenergygroup@gmail.com.