



## Case Study: Beneficial Electrification and Sustainable Technology Solutions

### Overview

The following case study reviews how North Carolina Electric Membership Corporation (NCEMC) and its member cooperatives are working towards sustainability goals.

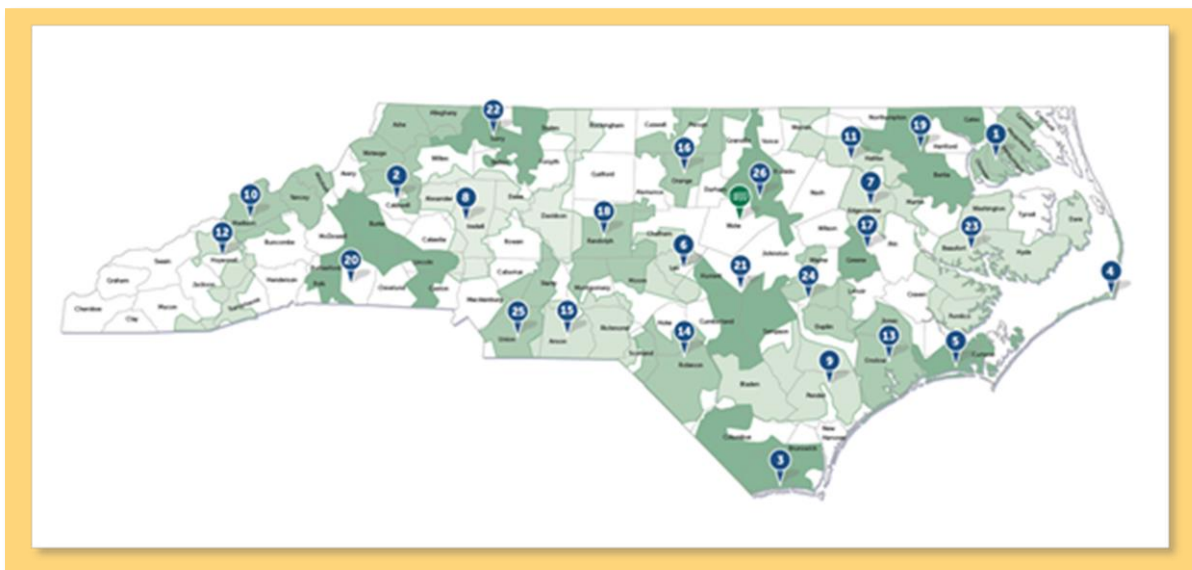


### Cooperative Profile

North Carolina's 26 electric distribution cooperatives collectively serve 2.5 million people at 1 million metering points across the state. This network of cooperatives serves consumer-members in 93 of the state's 100 counties, operating distribution grids that cover approximately 45 percent of the state (see Figure 4.1). The state's generation and transmission cooperative, North Carolina Electric Membership Corporation (NCEMC), supplies wholesale power to 25 co-ops in this network, meeting a total peak demand between 3,500 and 4,000 megawatts (MW).

Together, NCEMC and its member cooperatives are working towards two important sustainability goals, recently announced through their shared *Brighter Future* initiative:

- 50 percent reduction in carbon emissions from 2005 levels by 2030.
- Net-zero carbon emissions by 2050.



**Figure 4.1: North Carolina's electric cooperatives**

For further details, visit:

<https://ncelectriccooperativesaction.com/aboutus/>

## Drivers of Electrification in North Carolina

According to Diane Huis, NCEMC's Senior Vice President of Innovation and Business Development, beneficial electrification is a key component of *Brighter Future*, which aims to achieve sustainability goals while upholding a commitment to reliable and affordable electricity. Specifically, beneficial electrification has the potential to:

- Reduce carbon emissions across all energy sectors
- Lower costs to consumers by increasing utilization of the grid.
- Provide choices for convenience and control to consumer-members, including commercial and industrial businesses with environmental sustainability goals.
- Support clean energy legislation.
- Create economic development opportunities for rural communities.

Huis notes that North Carolina's electric cooperatives see beneficial electrification as an economic development opportunity and have brought in an NRECA trainer to deliver key accounts training with beneficial electrification specifically in mind. The technologies NCEMC and its member cooperatives currently promote improve business productivity and reduce carbon emissions. Beneficial electrification beyond electric vehicles emerged as an area of interest for North Carolina's electric cooperative when the Electric Power Research Institute (EPRI) released its April, 2018 [U.S. National Electrification Assessment](#).<sup>1</sup> Following that report, EPRI provided a North Carolina-specific Electrification Assessment, which revealed that significant electric load growth in the state could only occur through the electrification of transportation and industrial processes. The impact of electrifying these processes is made even greater because of NCEMC's existing, low-carbon portfolio, which comprises more than 50 percent emissions-free nuclear energy.

## Program Development

NCEMC turned to the consulting firm ICF to build on EPRI's research to help develop beneficial electrification programs its members could implement.<sup>2</sup> The investigation relied on analysis of a large volume of data to determine where conversion to electricity makes most sense and what end-use technologies offer opportunities for improved productivity, better environmental performance and lower cost. Many questions were posed. Can ultraviolet light be used in place of chlorinated water in cleansing processes? Can infrared heating be used for agricultural harvest drying? Where should electric pumps be deployed to improve efficiency and lower costs for irrigation systems and swine lagoon pumping? The analysis is providing North Carolina co-op employees with a better understanding of potential electrification opportunities and is equipping them with tools and resources to engage members in a greater understanding of costs, savings and other benefits.

## Beneficial Electrification Programs Offered

NCEMC and its network of member cooperatives offer an array of electrification programs:

- For residential consumer-members, programs focus mainly on electric vehicles (EVs) with educational materials to promote greater awareness and provision of EV charging infrastructure. The team built a website, [www.ncdriveelectric.com](http://www.ncdriveelectric.com), with a designated page for

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<sup>1</sup> <https://www.epri.com/research/products/000000003002013582>

<sup>2</sup> <https://www.icf.com/insights/energy/implementing-beneficial-electrification-programs>

each member cooperative. It is target-marketed to cooperative consumer-members to help them understand the benefits of driving electric. Electric vehicle charging infrastructure includes a residential charging program and installation of destination chargers that include Level 2 and DC fast chargers.<sup>3</sup>

- For commercial and industrial (C&I) accounts, a program called “BEST Solutions” is offered, with BEST being short for Beneficial Electrification and Sustainable Technologies. Agriculture is North Carolina’s top industry with many pork and poultry farms and processing facilities, so it became a natural focus for beneficial electrification. Programs are aimed at conversion of diesel-fueled end-uses such as irrigation to electricity, as well as electricity used in place of chemicals in certain food-industry processes. Equipment such as electric forklifts is also a focus.<sup>4</sup> Advanced Energy, a nonprofit energy firm in NC, was a key asset in program development.

Huis points out that BEST Solutions was created to meet the needs of C&I, agricultural, and other members facing pressures in the supply chain to be cost competitive, and to meet sustainability goals and mandates. She emphasizes that the program is structured to create an opportunity for distribution cooperatives to partner with their C&I members to meet these business goals, emphasizing the cooperative’s role as trusted energy partner. “BEST will provide sustainable energy options through renewable power solutions and actionable information on converting from fossil fuel technologies to electric technologies,” Huis says. “The program’s integrated approach will bring key partners and vendors into the discussion, along with the common tools that will help us all drive greater value and innovation to C&I members.”

## Innovations with End-use Technology

North Carolina electric cooperatives provide online fact sheets to their member businesses that enable them to make more effective technology choices. These fact sheets highlight the cost, efficiency, flexibility, emissions, quietness, and safety benefits of converting from propane, diesel fuel or natural gas to electricity. Potential barriers to beneficial electrification are also identified. End-use technologies discussed in the fact sheets include the following:

- **Electric forklifts** — while electric forklifts are slightly higher in upfront cost compared to propane-powered forklifts, annual fueling and maintenance costs are significantly lower, leading to better economic performance over the equipment’s lifetime (see Figure 4.2).







**Figure 4.2:**  
**Electric forklift.**  
Photo courtesy of North Carolina Electric Cooperatives.



<sup>3</sup> <https://chargehub.com/en/electric-car-charging-guide.html>

<sup>4</sup> <https://www.ncelectriccooperatives.com/best-solutions/beneficial-electrification/>

- **Electric irrigation pumps** — agricultural pumps are widely used for cultivating crops, raising livestock, improving land utilization and revegetating disturbed soils. As such they are a major energy consideration across North Carolina. Electric motor-driven pumps have been replacing diesel pumps over the past two decades due to their increased efficiency, lower operating costs and better reliability. The annual maintenance cost of a 75-horsepower electric pump is as much as 90 percent lower than its diesel counterpart. Table 4.1 illustrates a sample cost comparison.

Cost Comparison		
	Electric Pump*	Diesel Pump
 Rated Output (HP)	75	75
 Operating Efficiency	94.5%	25%
 Input Power (equivalent kW at rated output)	59.2	237
 Hourly Operating Cost	\$4.74 per hour (at \$0.08 per kWh)	\$13.74 per hour (at \$3.00 per gallon)
 Estimated Annual Run Hours	750	750
 Estimated Annual Maintenance Cost	\$25	\$250

\*Similar results for single-phase BELLE™ Written-Pole® or conventional three-phase electric motor. This table is an example only, with data adapted from Single Phase Power Solutions, LLC. For actual projects, official equipment quotes from relevant vendors must be obtained to determine payback.

**Table 4.1: Sample cost comparison - electric vs. diesel pump.**  
Courtesy of North Carolina Electric Cooperatives.

- **Electric transport refrigeration units (TRUs)** — TRUs are mobile refrigeration systems that preserve perishable goods during transport and storage. Products that require TRUs include meat and other foods, pharmaceuticals and cosmetics, plants and flowers and certain types of delicate furniture and equipment. A shift is underway from diesel internal combustion engines to hybrid diesel/electric refrigeration units which use electricity to power the unit when it is not in motion. Upfront costs are higher but are largely offset by fuel savings and lower maintenance costs, so the lifetime cost is lower.

## Challenges to Continuing Success

Huis sees beneficial electrification as a program with a major positive impact over the next few years and a potentially historic opportunity over the longer term, likely to attract increasing levels of public and private investment. However, progress will be slow unless some barriers can be overcome. Current North Carolina law, for example, could be amended to streamline, and thus expedite, the process by which co-ops move from program conceptualization to implementation. Huis also sees some risk that beneficial electrification could be forced to happen too quickly. “A well-informed and balanced approach needs to be taken,” she says. “Our beneficial electrification team, including people from both NCEMC and our member cooperatives, is acutely aware that the devil’s in the details. We don’t want to promote new uses for electricity that will bump customers demand charges to the point that they are unhappy with their co-op or eliminate the cost savings from the new technology for the member. Rate restructuring has to go hand-in-hand with electrification for this to

work as intended.” She notes that line extension policies may also need to be revisited as agricultural customers seek to electrify irrigation pumps.

## **Lessons Learned**

With these electrification programs in place, North Carolina’s electric cooperatives are poised to help inform others in the electric utility industry about the opportunities and risks associated with beneficial electrification. They have learned that many factors play into electrification, including regulatory policies. Some of these factors are in fact prerequisites for successful programs, becoming barriers if they are not addressed proactively. Huis puts it well when she says “This is a marathon, not a sprint, and it takes a lot of training to get ready to race. Educating members now so that they are willing to look at new technologies when they are ready to replace equipment is really important.”

*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](mailto:codyenergygroup@gmail.com).*