

ACCESS Project Case Study: Roanoke Electric Cooperative

Leveraging Land Ownership Retention for Economic Empowerment through Solar Energy and Community Development



ACCESS Program

NRECA's solar energy project, *Achieving Cooperative Community Equitable Solar Sources* (ACCESS), is the flagship project of NRECA's *Advancing Energy Access for All* initiative. This initiative spotlights the innovative ways cooperatives approach community development and support for their consumer-members, as technology advancements continue to transform our industry.

ACCESS explored and amplified the use of innovative, cost-effective energy access programs to help increase solar affordability, with particular focus on assisting low and moderate income (LMI) consumers. ACCESS researched varying financing mechanisms and program designs to identify optimal solutions for small utilities, including field tests of diverse co-op solar projects around the country. Through this project, tools and resources were developed to assist electric co-ops and the broader industry as they deploy solar projects to benefit LMI consumers.

This case study provides example of how one cooperative, Roanoke Electric, is leveraging existing programs to provide solar affordability benefits to LMI households in its service area.

Cooperative Profile

Roanoke Electric Cooperative (Roanoke), founded in 1939, is a member-owned electric provider headquartered in Aulander, North Carolina and serving the counties of Bertie, Chowan, Gates, Halifax, Hertford, Northampton, and Perquimans in the northeastern part of the state. Roanoke maintains over 2000 miles of lines and serves more than 14,099 member-owners (84.8% residential, and 15.2% commercial & industrial) with a Winter peak demand of 78 MW. Their service area covers 1,500 square miles (See Figure 1).

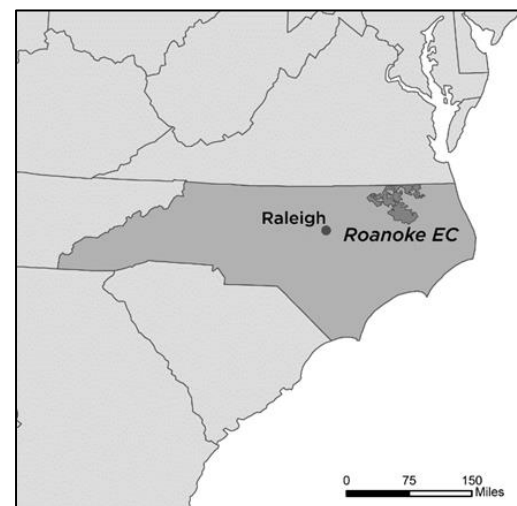


Figure 1: Roanoke EC Service Area.

About half of the counties served by Roanoke are persistent poverty counties (PPCs) (see Figure 2). PPCs are counties in which 20 percent or more of the population lives in poverty over a long period.¹ Electric cooperatives serve 92% of the persistent poverty counties in the U.S.² Specifically, an estimated 19% of the population in Roanoke’s service territory is living in poverty, higher than both the statewide poverty rate of 13.3 % and the U.S. poverty rate of 12.5%.³

According to the U.S. Census Bureau, North Carolina had the fifteenth lowest state household median income in the nation at \$67,481. All seven counties served by Roanoke have median household incomes below this statewide median and all are well below the national median of \$74,755.⁴ The racial composition of Roanoke’s territory is majority-minority, with 54.7% identifying as Black, and another 4% identifying as another racial minority, while the remaining 41.3% identify as White.⁵ Educationally, approximately 21.1% of the population (25 years and over) does not have a high school diploma, which is higher than the 13.9% statewide and 13.1% nationwide without a high school diploma. While parts of northeastern North Carolina served by Roanoke are considered to be persistent poverty, the area also has a rich history and like many parts of rural America, the territory is aesthetically beautiful with woodlands, wetlands, farms and pastures.

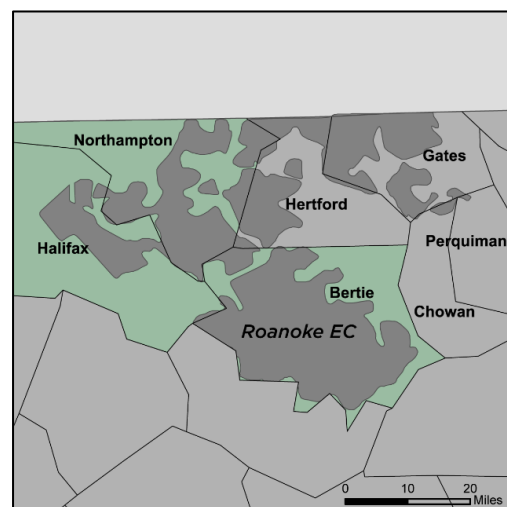


Figure 2: Roanoke Electric Counties

Research has shown that, in general, low-income⁶ households spend a disproportionately higher percentage of their income on energy bills, and that rural households throughout the U.S. spend a higher share of household income on energy bills than others in their region and urban/suburban households. In addition, about a quarter of homes in Roanoke’s territory are manufactured or mobile homes, which are generally less energy efficient than other housing stock of comparable size. While there is no widely accepted threshold used to establish energy burden, the U.S. Department of Health and Human Services classifies a burden of energy costs greater than 6% of household income as “unaffordable.”⁷

Keeping this front of mind, Roanoke has worked for years to address the intertwined problems of poverty and energy burden and the associated impacts. Programs offered to member-owners include:

- [Referral to USDA 504 programs](#)

¹ A “persistent poverty county” is a classification for counties in the United States, as defined by the Economic Research Service (ERS) of the U.S. Department of Agriculture that have had a relatively high rate of poverty over a long period.

² See <https://www.electric.coop/electric-cooperative-fact-sheet>.

³ NRECA estimates based on 2022 county level data from the U.S. Census Bureau’s Small Area Income and Poverty Estimates (SAIPE) Program. See <https://www.census.gov/programs-surveys/saipe.html>

⁴ 2022 American Community Survey 5-year Estimates Detailed tables, <http://data.census.gov>

⁵ In addition, 2% of the population of all races identify as ethnically Hispanic.

⁶ “Low-income” is defined as 80 percent of the median family income for the area, subject to adjustments for areas with unusually high or low incomes or housing costs. <https://www.huduser.gov/portal/datasets/il/fmr98/sect8.html>

⁷ https://www.acf.hhs.gov/sites/default/files/documents/ocs/comm_liheap_energyburdenstudy_apprise.pdf

- [Enrollment Assistance to obtain support through the U.S. federally-funded Low Income Home Energy Assistance Program \(LIHEAP\), section 8 and crises funding support](#)
- [Wi-Fi-Enabled Devices, part of their smart energy savings program for demand response](#)
- [Prepaid metering](#)
- [Upgrade to \\$ave](#) and [SolarShare](#) (currently in development) programs
- [Sustainable forestry and land retention project](#)

Roanoke’s Pursuit of Grid Advancements

As the U.S. economy continues to evolve and the electric industry undergoes a transformation driven by technology, Roanoke has become a strong proponent of embracing technology to help solve the challenges that have emerged with this transformation – income inequality, barriers to the adoption of renewable energy, and energy affordability. For Roanoke, the key to tackling these problems and more is in digitizing the Roanoke grid. (See Figure 3)

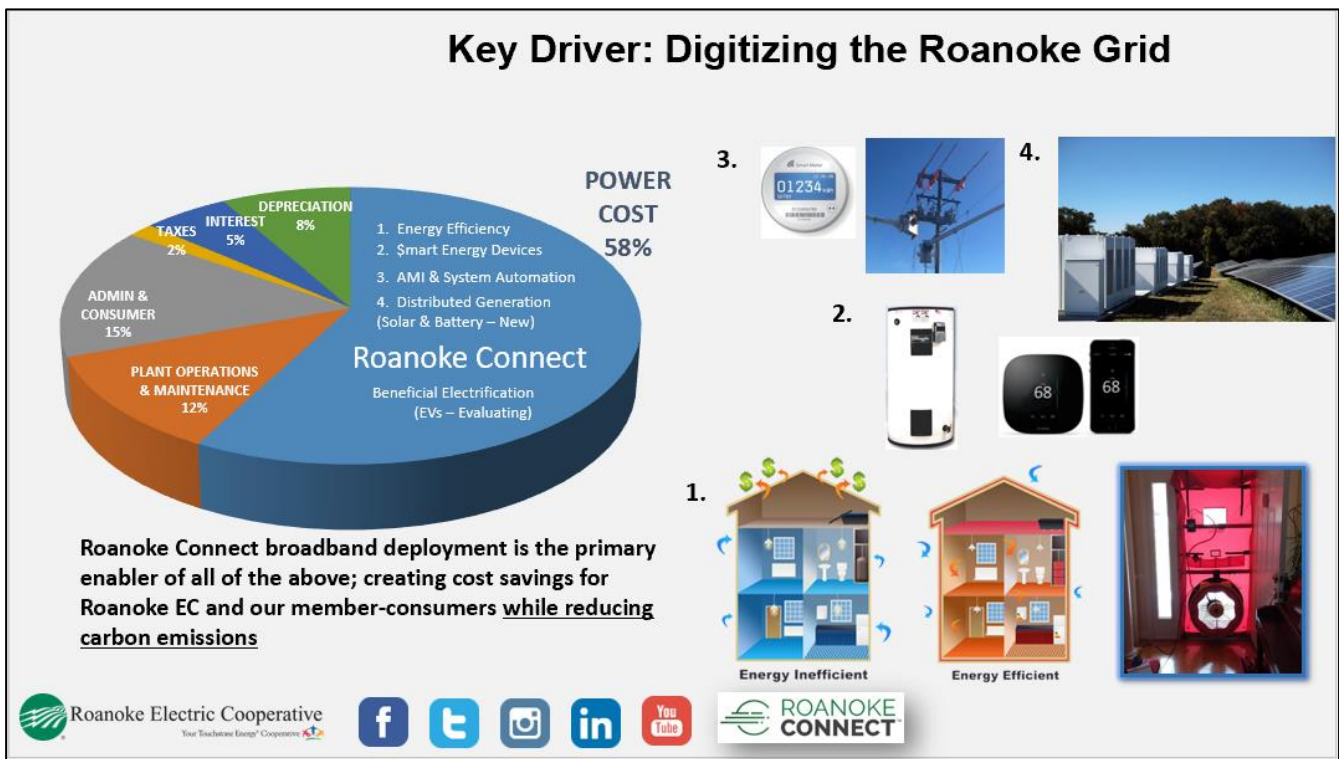


Figure 3: Elements of Digitizing the Roanoke Grid

This transformation includes pursuing distributed generation (specifically solar generation and battery storage), energy efficiency programs, smart energy devices, and automated metering infrastructure. The primary enabler for these programs is Roanoke’s broadband deployment initiative, which began in 2018 under the name “Roanoke Connect” and is now known as “Fybe”. This initiative’s goal is to close the digital divide in the area by connecting residences and businesses in Roanoke’s territory with reliable broadband services. According to Ajulo Othow, the CEO of EnerWealth Solutions and an energy

consultant for Roanoke, digitizing the grid is Roanoke’s approach to addressing the load loss that is a by-product of population loss in rural communities.⁸ Roanoke’s territory, like many small rural communities, deals with the twin problems of high unemployment and low population. Through digitization and the programs it enables, Roanoke aims to control the cost of electricity and create savings for members, build the infrastructure that is necessary to attract industry and jobs to the community, support economic development, and help retain the local population. As Othow notes, “in rural communities, even marginal changes have impact; we don’t need to necessarily wait to be able to move mountains to solve problems. It could be something much smaller, and it has a ripple effect in the community.”

This grid digitization approach also supports one of Roanoke’s primary operational goals, which is to displace 10% of its demand – 6 MW – by 2025. Roanoke has already made strides to modernize its grid to support new technologies that can help improve its load shape; Advanced metering infrastructure (AMI) is fully deployed throughout its territory. The co-op has displaced about 1.8 MW of load to date through behind-the-meter, consumer-facing measures, primarily water heater and thermostat controls. Roanoke is looking into using conservation voltage reduction (CVR) and other front-of-the-meter strategies to further reduce demand.

Background to Roanoke’s Solar Program

The Sustainable Forestry and Land Retention (SFLR) project has been a long-standing initiative at Roanoke. The program started in 2013 as a partnership between the [U.S. Endowment for Forestry and Communities](#), the [Natural Resources Conservation Service](#), the [U.S. Forest Service](#) and, more recently, the [American Forest Foundation](#).⁹ Practices related to sustainable forestry include detailed forest management plans, timber sales,¹⁰ developing wills for landowners, and most importantly, clearing the title of heirs property. *Heirs property* is the term for land that is owned by two or more people, usually people with a common ancestor who has died without leaving a will.¹¹ The land has often been passed down through generations without written documentation that establishes clear title. Many descendants may own the same parcel, and without clear ownership, it limits the ability of the owners to invest in the land, which ultimately leads to land loss.¹² While the issue of heirs property predominantly impacts African Americans, any landowner in the Roanoke territory can participate in the SFLR project. Not all the landowners participating in the SFLR project have heirs property issues, but participating in the SFLR project and learning about the various resources available to help with conservation, estate planning, wills and deeds help family farmers and landowners protect their land for the next generation and avoid it becoming heirs property.

⁸ Roanoke loses a quarter of 1% of their net meters every year.

⁹ <https://www.roanokeelectric.com/roanoke-sustainable-forestry/about-us/>

The project works to reinstate and preserve vulnerable forest land in REC’s service area by increasing income available to forest landowners and the asset values of the land.

¹⁰ The SFLR project also helps family farms and landowners sell their timber directly to purchasers in the timber market, helping the landowners keep their land, generate revenue which in turn can be put back into the community in the form of taxes.

¹¹ <https://features.propublica.org/black-land-loss/heirs-property-rights-why-black-families-lose-land-south/>

This term is most common in the Southeastern United States. Generally, the land considered heirs property was purchased or deeded to African Americans after the U.S. Civil War. It has been identified as the leading cause of involuntary land loss among African Americans.

¹² “Fractional ownership greatly increases the risk that an heir (or a land speculator who has purchased an heir’s share) will attempt to force a partition sale, or that the land will be lost to tax default” <http://hprc.southerncoalition.org/?q=node/5>

As North Carolina was rising to its current number two ranking in solar capacity nationwide (second only to California),¹³ the leadership at Roanoke realized that not many of the landowners in their service territory were participating in the opportunities available to landowners who lease their land to solar developers. According to Othow, “the typical lease payment is \$100 an acre for crop production of tobacco for example, which is considered high end, and \$35 an acre for soybean or corn, per year. Additionally, the lease goes from year to year. With the solar sites, the typical lease rate is no less than \$500 an acre, and for landowners participating in Roanoke’s land lease project, lease payments are \$750 an acre. Additionally, the lease terms for land used for solar development is not less than 35 years to 45 years – long enough for a consistent rate of revenue and to be passed on to multiple generations.” Additionally, since solar leases are much longer-term and less volatile than crop leases, solar leases generate stable and predictable tax payments to support the local economy and meet community needs.

In the eyes of Roanoke’s leadership, providing opportunities for their member-owners to benefit from innovative technologies would be a “win-win” opportunity for the landowners and the Roanoke community at large. Additionally, it demonstrates the cooperative mission and epitomizes the cooperative principle of concern for community.

Leveraging Existing Programs

To provide equitable access to its member-owners while using programs that were already familiar to them, Roanoke paired its long-standing SFLR project with its more recent energy-efficiency and weatherization program, Upgrade to \$ave, and its emerging community solar program (including a proposed battery storage component) to create even more benefits, especially for those who struggle to pay their bills. Upgrade to \$ave is based on the PAYS[®] model, an investment and cost recovery model that benefits both the member and the cooperative, as shown in Figure 4.

As a first step, the member homeowner contacts Roanoke and signs up for a free energy audit. Through the energy audit, cost-effective energy efficiency upgrades are identified, and Roanoke sends a crew to the home to make the upgrades at no cost to the member-owner. Instead of loaning the members money, Roanoke finances the upgrades and recovers the investment costs by adding a fixed tariff to the meter that is significantly lower than the estimated post-upgrade savings. Financial risk to Roanoke is low, because they do not have to act as a bank for their members. The

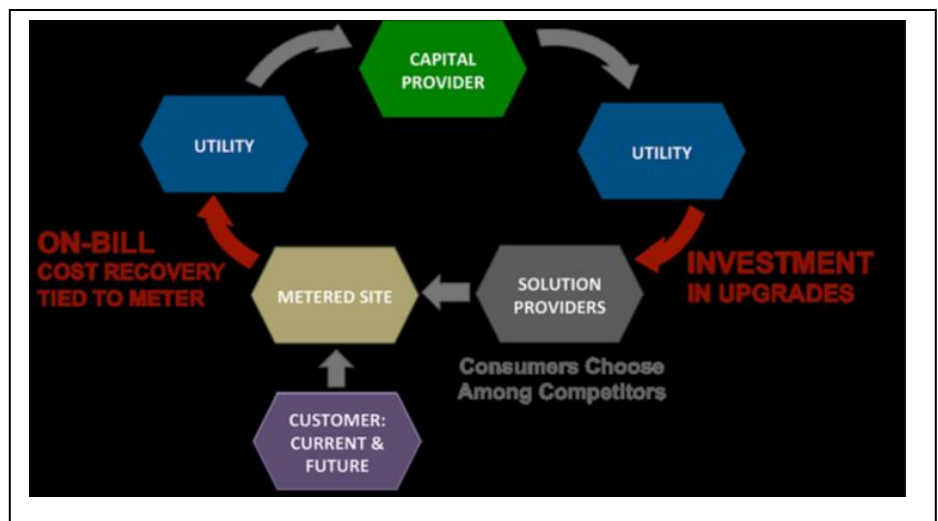


Figure 4: Investment and Cost Recovery Model Underlying PAYS[®]
Graphic courtesy of Energy Efficiency Institute, Inc.

¹³ <https://www.seia.org/state-solar-policy/north-carolina-solar>

members do not take on any debt to finance the upgrades, and they also do not need good credit scores nor do they even need to own their homes to participate in the program. Since the tariff is tied to the meter instead of the individual member, when customers move, the charge simply transfers to the new member at that location. The member's cash flow improves due to lower energy consumption from the energy efficient upgrades and Roanoke can control costs through demand management.

The Upgrade to \$ave program has been underway for approximately six years. While the savings for participants and the cooperative have been positive (see Figure 5), the level of ultimate participation by member-owners requesting upgrades has not been satisfactory to Roanoke. The fact that 40% of inquiries were unable to fully participate due to health and safety concerns around their dwellings did not sit well with the co-op's leadership, including Marshall Cherry, Chief Operating Officer. This led to a push at Roanoke to find innovative ways to solve the participation problem and ensure that many of their members were not being left out of the program.

At the same time, in January 2018, the board at Roanoke agreed that the cooperative needed more solar energy and battery storage to reduce peak demand costs, which are sometimes seven to eight times the cost of their base energy.¹⁴ Roanoke already had a 100 kW community solar garden located at their headquarters in Aulander (see Figure 6). The new solar and battery projects (Phase II) would also have a community solar portion, while simultaneously addressing the issue of peak demand costs.

The cheapest way to build solar arrays is to obtain as much land as possible – at least 100 acres today – and build a large multi-megawatt solar site. Roanoke, under the leadership of CEO Curtis Wynn, chose to build their solar and battery installations on four smaller sites (250 kilowatts each). This allowed more landowners within their service territory to benefit from the land lease for the solar project, while also retaining some of their available land for crop production. Using Roanoke's existing SFLR project, Wynn made the opportunity available and accessible for his members to participate.

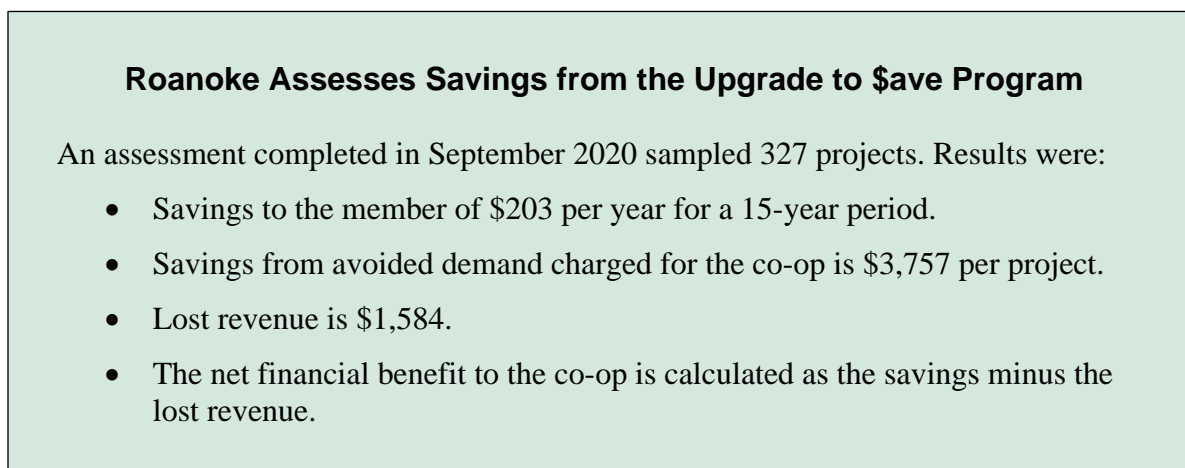


Figure 5: Savings from Upgrade to \$ave Program

¹⁴ Peak demand electricity is more unpredictable than base load electricity, the minimum amount of electricity needed over a time period. Peak demand can soar if the AC is turned on a very hot day or the heater is turned up on a really cold night. Peak electricity is more expensive than base electricity.

Roanoke’s innovative solution was to combine the benefits that can accrue from all three existing programs – SFLR, Upgrade to \$ave, and their community solar program – into a new program called SolarShare. This combined approach aims to increase program participation and share the benefits that result from such participation with the member-owners.

Program Concept and Design

SolarShare Strategy: The Path to Increased Program Participation

The essence of Roanoke’s programs and their philosophy is best described by Cherry as follows:

“...address member pocketbook issues, address energy burden and create a sustainability model for the cooperative – ensuring a win-win for Roanoke and their member-owners.”

The overall goal of the SolarShare program according to Cherry is to increase member-owner participation in community solar benefits and ensure that LMI members are not left behind. Consistent with this vision, detailed objectives include the following:

- Increase the subscribership in the current community solar garden
- Include a community solar offering alongside the proposed solar array and battery storage installations
- Seek philanthropic support for low and moderate income (LMI) participation in community solar through grant funding and donations, so that LMI members can receive a low or no cost subscription with an immediate credit
- Leverage those same credits available to the LMI member to offset the investment needed to address health and safety concerns that prevent the member from fully participating in the Upgrade to \$ave program

Siting

A key element to making this program a reality was identifying the sites for the new installations. Working with EnerWealth Solutions, Roanoke’s engineering team led by Roanoke’s Vice-President of Engineering, George Stamper, overlaid maps showing the locations of their electrical infrastructure with various land maps. In the first cut, the staff identified about 10 to 15 landowners whose properties could be viable locations. After further discussions, Roanoke selected four landowners participating in the SFLR project and crafted this innovative approach to achieve multiple economic and rural community development goals – the cooperative way.

Installation

The solar and battery installations are a joint effort between Roanoke and their generation and transmission (G&T) cooperative, North Carolina Electric Membership Corporation (NCEMC). Roanoke’s all requirements contract with NCEMC included a 3% cap on solar energy. However, during discussions about adding new installations to Roanoke’s current capacity, it turned out that NCEMC was interested in

owning more solar and battery projects across their network, in order to take advantage of distributed generation and distributed energy resources. Roanoke worked out an arrangement where NCEMC will own the four projects, thus avoiding the cap restriction and allowing additional deployment of these types of projects on Roanoke's distribution grid. Roanoke will now add more sites which, in turn, supports NCEMC's overall renewable energy portfolio goals. Rounding out the partnership with NCEMC is the [National Renewables Cooperative Organization \(NRCO\)](#), whose role is to provide services related to origination, contracting and project development for the new installations.

The new installations will be connected to the feeders and not to the substation, which allows Roanoke to avoid significant electrical losses by not carrying power over long stretches of lines to the substation. Roanoke has 12 substations and over 40 feeders across its service territory. Connecting to the feeder makes it possible to site solar installations with more landowners, which again supports greater investment in communities as opposed to locating at a substation since there are relatively fewer substations on their grid. Furthermore, since Roanoke has figured out how to make this beneficial for the landowners, they are raising philanthropic dollars from organizations interested land retention and are using these funds to offset the higher cost of building multiple smaller projects instead of a single large-scale one. Additionally, the money raised will help to offset the subscription costs of the community solar array for their member-owners. The SolarShare program is currently being advertised to Roanoke's membership and is expected to be fully subscribed by early 2025.



Figure 6: Solar Garden at Roanoke's Headquarters.
(Courtesy of Roanoke Electric Cooperative)

Program Eligibility and Recruitment

The SolarShare program specifically targets LMI members by reserving 100% of Roanoke's utility-scale solar capacity for LMI subscriptions. If there is still excess capacity after most of the LMI subscribers seem to have joined, Roanoke may open up the program to their general membership. Roanoke is using LIHEAP eligibility requirements to pre-qualify program participants,¹⁵ but acknowledges the need to enroll members beyond only those who qualify for LIHEAP. They will also consider members who do not participate in any energy subsidy programs but who could otherwise benefit from the program, such as families with children who receive free or reduced-price lunch at schools in the community, for example. Roanoke aims to engage with faith-based leaders, since they often play a large role within the community and can help identify additional members in need. The program's initial goal is to benefit 75 LMI members annually, but this goal could change as the program grows and more is known about the potential subscribership.

¹⁵ Roanoke has an MOU with NC's Department of Environmental Quality and related CAP agencies to share member data.

How the Program Works

A qualified LMI member can subscribe to the community solar program at no cost because their participation has been funded by a philanthropic institution or other outside entity. Instead of the member immediately receiving the full amount of direct credits, a portion of them are first used to cover the costs of necessary health and safety repairs and upgrades identified during the initial Upgrade to \$ave home energy audit. Once the health and safety concerns have been fully resolved, the member will begin receiving credits directly, and will also be able to fully participate in the Upgrade to \$ave program, which is funded by federal government funds.¹⁶ Helping the member reduce their energy bills with the repairs to the house and additional energy upgrades through the Upgrade to \$ave program also helps Roanoke lower their peak demand and wholesale energy costs, keeping the cooperative's costs stable overall and helping to reach their goal of 10% system demand reduction by 2025.

Measuring Success

To be successful, the SolarShare program must be sustainable without philanthropic support while also overcoming barriers to renewable energy availability for LMI households, homeowners, and renters alike. The success of the program in meeting its objectives will ultimately be judged on the following metrics:

- The measurable decrease in the energy bills of the program participants, indicating a favorable impact to their “pocketbook”
- Number of health and safety improvements that Roanoke made with the increase in philanthropy dollars
- Extent to which housing improvements through the Upgrade to \$ave program alone reduced the energy costs for subscribers
- Extent to which the Upgrade to \$ave program in combination with SolarShare credits reduced energy costs for subscribers
- Number of members joining the program annually relative to the goal of serving 75 members
- Impact to Roanoke's peak demand and wholesale costs

Cherry notes it will take at least one year of program experience to yield enough data to measure the program's overall impact according to these metrics. Roanoke has designed the program to provide every subscriber with at least a 20% reduction in the energy bills of the program participants.

¹⁶ “Non-energy measures such as health and safety repairs to a home, are often ineligible for efficiency financing programs. If the program requires that savings pay for financing payment obligations, adding such measures to a project may not pencil out. “Energy Efficiency for Low and Moderate Income Households: Current state of the market, issues and opportunities”, accessed September 10, 2020 <https://emp.lbl.gov/sites/default/files/news/lmi-final0811.pdf>

Program Economics

As noted earlier, Roanoke’s goal is to raise philanthropic funding to support phase II of their community solar program. The cooperative has identified a fundraising goal of \$1.7 million to offset the subscription costs for the community solar program.¹⁷ So far, Roanoke has raised over \$400,000 with the help of [Mary Reynolds Babcock Foundation](#) and other philanthropies. Roanoke aims to use these funds for a one-year subscription of panels for each subscriber, to grant enough panels to ensure credits will offset health and safety tariffs applied to the member’s home, and discontinue panel ownership when the tariff ends, thereby making it a revolving fund open to all qualified member homeowners.

The health and safety tariff is a one-year tariff necessary to recoup program operator fees (with interest) and other funds that Roanoke invested to address health and safety concerns at the member’s home.¹⁸ After considering the various elements – program operation fees, tariff interest rate, number of panels granted, one-year subscription term, and SolarShare investment – the average project costs (repairs to member homes) of approximately \$1,800 should produce total solar energy credits of approximately \$2,200. The total tariffs billed when deducted from the solar energy credits available to the member will still leave subscribers with a credit (additional savings) on their monthly bill. Roanoke anticipates that SolarShare subscribers will experience a minimum of 20% savings by participating in the program. The operational costs and overhead associated with the program are minimal and no additional fulltime staffing has been required. Roanoke uses local contractors for the home repairs as well as the energy assessments and hopes to continue doing so for the life of the program so that local jobs are also supported through the SolarShare program. Through this multi-pronged approach, Roanoke is lifting up their membership and addressing their most problematic concerns while managing to keep their services low in cost and high in reliability.

Key Insights

Roanoke’s President and CEO, Marshall Cherry, is justifiably proud of the cooperative’s programs to support their members and the economic development of their service territory. For Cherry, who is a son of Bertie County and whose parents are members of Roanoke, there is a high sense of responsibility and a personal “calling” to make an impact in the community and make life better for its residents. Initiatives such as SolarShare, Upgrade to \$ave, and Fybe go a long way toward improving the wellbeing of the community. The COVID-19 pandemic, which has caused many previous in-person activities such as schooling and visits to the doctor to be conducted virtually, has highlighted the impacts of a digital divide and the need to bridge that divide so that large areas of the country are not left behind in a digital transformation that goes beyond the boundaries of Roanoke’s service area.

While participation in Roanoke’s programs (aside from SolarShare) are open to all members and not limited to low-income households, a significant portion of Roanoke’s service territory is located in areas of persistent poverty, and the benefits of these programs will help their low-income members reduce their energy burdens. The key lesson for Roanoke in their quest to combine program initiatives to tackle the challenges stemming from income inequality and energy affordability is to have a good business case for

¹⁷ Roanoke expects the \$1.7 million to help 800 members.

¹⁸ Program operation fee is approximately \$325, with a tariff interest rate of 3%. Monthly tariff runs around \$179.97 for participating member-owner.

the changes they want to implement at their cooperatives and to find the most effective partnerships to help implement those changes.

Roanoke recognizes that each cooperative is different and that their relationship and wholesale contract with their G&T, NCEMC, allows them the flexibility to explore various models for their members to benefit from renewable energy. Roanoke's Upgrade to \$ave program is operated by [EEtility](#), so that the co-op's staff are not tasked with a steep learning curve from mastering the intricacies of a new program and subsequent steep increases to their workload. [Clean Energy Works](#) also played a key role in helping to accelerate the Upgrade to \$ave program and philanthropy model. Access to capital, whether through federal government grants and loans or private capital, is vital to the success of new programs.

This case study serves as an example of one cooperative's pursuit of various program models to help ensure solar access and affordability, particularly for communities in need.

Additional Resources on NRECA's ACCESS Project

- [ACCESS Project Website](#)

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