ACCESS Project Case Study: Oklahoma Electric Cooperative

Sharing Sunbeams: Supporting Local Education and Local Energy

ACCESS Program

NRECA Research'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 an example of how one cooperative, Oklahoma Electric Cooperative, is leveraging existing programs and community partnerships to provide solar affordability benefits to LMI communities in its service area.

Cooperative Profile

Oklahoma Electric Cooperative (OEC), founded in 1937, is a member-owned energy provider in central Oklahoma (Figure 1). OEC maintains 5,700 miles of line, serving 62,801 consumer-members (91% residential and 9% commercial) in seven counties, with annual sales of over 1.5 million MWh and a Winter peak demand of 380 MW.[1] It is the largest distribution cooperative in the state by both members and sales, and employs 120 staff.

Figure 1: Oklahoma EC Service Area

OEC provides service to the urban areas of Moore, Norman, and parts of Oklahoma City in Oklahoma, Canadian, Grady,

[1] Annual Electric Power Industry Report, Form EIA-861 detailed data files, 2019, https://www.eia.gov/electricity/data/eia861/

and McClain counties (See Figure 2). As of the 2022 American Community Survey, the population of Norman was 127,701 while Moore's population was approximately 62,685. Portions of rural Caddo and Pottawatomie counties are also served.

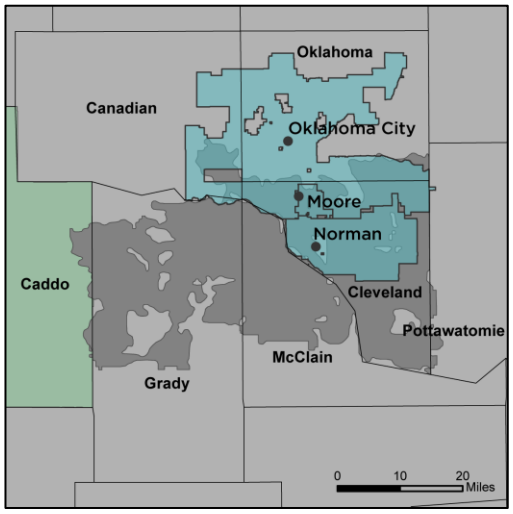

Figure 2: Oklahoma EC Counties

According to the U.S. Census Bureau, Oklahoma had the sixth lowest state household median income in the nation in 2022 at $59,673, well below the U.S. median of $74,755. Most of the counties OEC serves fall below the U.S. median (Caddo, Cleveland, Pottawatomie, Oklahoma, and Grady). Approximately 15% of households in OEC's service area have incomes below 200% of the Federal Poverty Level.[2] Eight percent of its members are in Caddo County, classified as a persistent poverty county (PPC). PPCs are those that have a long history of poverty rates above 20%.[3] The median income for Caddo County (2022) was $54,443.[4]

OEC serves a population of 133,240. The racial composition of OEC's territory is 81% White, 2.8% Black, 2.1% Asian or Pacific-Islander, 6% Indian/Native American, 7% of Mixed/Other, with 6.1% identifying as Hispanic. Approximately 11.2% of the population (25 years and over) does not have a high school diploma, which is slightly lower than the 13% statewide and 13.1% nationwide without a high school diploma. Thirty-five percent (35%) of students in Norman Public Schools are in families that have incomes at or below 200% of the federal poverty level.[4]

Background to OEC's Solar Program

OEC started a community solar program in 2017. Its first solar array, called the "Solar Garden," has 950 panels with a total capacity of 250 kW. The goal of this installation was to gain direct experience with solar energy technology from installation to managing related assets. The project was proposed by their generation and transmission cooperative (G&T), Western Farmers Electric Cooperative (WFEC). WFEC supports its distribution members that are interested in pursuing solar options by providing technical guidance and contracting support. The project has been a financial net positive and continues to exceed expectations for energy generation.

The Solar Garden was intended to be a research and development (R&D) endeavor for OEC. The project was sited near a substation for technical ease. While the siting decision was made from technical considerations, it was one that altered OEC's approach to solar and community engagement. The chosen location was near I-35, the largest and most travelled highway in Oklahoma, making the project highly visible to the public. OEC's members and educational groups began calling the co-op to find out more

[2] https://aspe.hhs.gov/poverty-guidelines

[3] A "persistent poverty county" is a classification for counties in the United States, as defined the United State Department of the Treasury. It is defined as any county that has had 20 percent or more of its population living in poverty over the past 30 years, as measured by the 2000, 2010, and 2020 decennial censuses.

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

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about the project and to tour the facility. Although the location and the project were not originally set up for this educational aspect, OEC staff have led more than a thousand people through the Solar Garden.[5]

Figure 3: OEC and Norman Public Schools Solar Array
(Image courtesy of Oklahoma Electric Cooperative)

Among those that toured were local teachers with an interest in helping the City of Norman to reach its goal of obtaining 100% of its power from renewable sources by 2035.[6] The teachers knew about parcels of unused land that Norman Public Schools (NPS) owned and approached OEC about the possibility of using it to collaborate on building solar arrays and to create educational opportunities that introduce students to renewable energy technologies. The outreach from the teachers served as an entry into discussing options with the school systems' energy efficiency specialist and eventually the superintendent of schools. There was enthusiasm for solar energy, but the costs and risks of a solar array large enough to provide economic benefit were too high for a school system facing increasing budget pressures to pursue alone. A 15-acre parcel was offered to OEC on a 30-year lease. The school district already has made substantial strides toward energy conservation with technology upgrades, lighting changes, and awareness campaigns. Since the start of their energy conservation program, NPS has avoided energy costs of more than $2.8 million. The revenue from leasing the land to OEC will continue to help the school district offset energy costs and support educational opportunities for students.[7]

Program Design

OEC completed construction of its new 2 MW/7,208 panel utility-scale solar farm as part of a Solar Park and Learning Center in Norman, Oklahoma. The entire project is sited on land leased from NPS, for which the school district will receive guaranteed revenue for three years. Unlike the Solar Garden, which was not planned as a community focused development, this project has the road infrastructure to meet the needs of being a flagship learning center.

With construction complete, OEC is developing the educational portion of the program. Proposed plans for program design show innovation on the part of OEC. NPS receives lease revenue, which helps support the school system where 57.3% of the students receive free or subsidized lunch. OEC also transferred the renewable energy credits (RECs) to the school district, which can help the city of Norman meet its renewable energy goals or be sold to obtain additional income for NPS. WFEC facilitates the sale of NPS's RECs and has already helped generate additional income for NPS through these means. OEC

[5] https://okcoop.org/schedule-a-solar-garden-tour/

[6] https://www.normantranscript.com/news/local_news/norman-becomes-first-okla-city-to-commit-to-clean-energy/article_b625209a-37a9-5dd8-8d97-10265a18e4a1.html

[7] https://www.normanpublicschools.org/site/default.aspx?PageType=3&DomainID=100&ModuleInstanceID=2252&ViewID=6446EE88-D30C-497E-9316-3F8874B3E108&RenderLoc=0&FlexDataID=63227&PageID=2249

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worked with Grid Alternatives (a partner on the ACCESS project) to develop initial designs for the philanthropic and educational components of the project. The details of the educational component were defined further in collaboration with local architect group Copeland Design Collective, who produced a full 3-D model of the proposed educational center inside the solar park, as well as the features that are publicly available outside the park's fence. The intent is to create a showpiece that excites the community and gets them involved. To accomplish this, OEC has included opportunities for community co-branding or sponsorship of specific features at the park. The sponsorable features of the park were designed such that they are independent of the other features, allowing the park to scale up as more philanthropic donations are received.

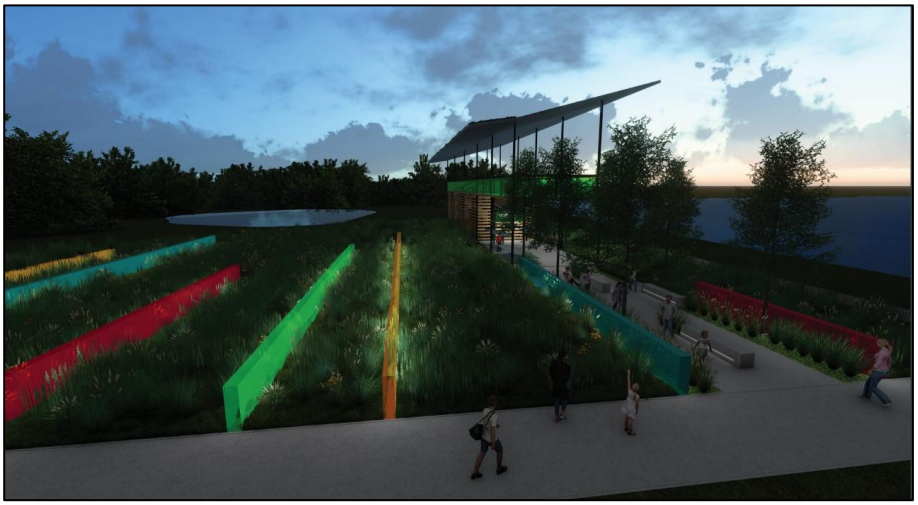

Figure 4: The Norman Solar Park and Learning Center (3D Model)
(Image courtesy of Oklahoma Electric Cooperative)

Once built, the project will be used as a science and learning center to increase education and community engagement with the hopes of possibly increasing solar energy adoption in the community. The learning center is intended to provide students an opportunity to learn more about solar energy and renewable energy technologies, giving them a chance to explore potential career options. The Board of OEC is supportive of the project and sees value in public relations and providing benefits for the community. The planned design for the Norman Solar Park and Learning Center was approved by the co-op CEO and the NPS superintendent in 2023, and the project team is currently seeking allies in local government and the local community for philanthropic donations.

Specific project objectives include:

- Provide the low- and moderate-income community (LMI) with access to renewable energy.
- Investigate the possibility of using a portion of the energy for scholarships and or energy savings to the school district focusing on LMI students.
- Use the project as a science and learning center to increase education and community engagement.

Program Economics

The financing mechanism is a combination of partnerships with local institutions and non-profits. Out-of-pocket costs to OEC were approximately $200,000 for a transformer, 1.5 miles of interconnection line, and a road to the site. NextEra owns, operates, and maintains the solar array and receives the 30% federal tax credit for the project. OEC has a long-term power purchase agreement (PPA) with Western Farmers Electric Cooperative (WFEC) and NextEra which is worth $7 million over the 30-year lifetime. NextEra sells the produced energy to WFEC, who then sells it directly to OEC. Because of this arrangement, NextEra absorbs the risk for the project; OEC pays nothing if the panels are not generating. Additional

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costs to OEC include about $10,000 to develop the design and presentation materials for the park and approximately 700 hours of co-op labor over the course of four years.

Since the array is on land leased from NPS, the school district is guaranteed to receive lease revenue for the next three years, with renewal options in five-year increments. The value of the land lease is $7,350 annually. The array offsets the equivalent of 30% of the entire school district's energy usage or, alternatively, offsets 95% of the energy used by the district's two high schools over one year. The design plan for the Solar Park and Learning Center has been approved by all stakeholders and OEC is currently working to identify and approach community organizations and individuals who may be interested in funding the science and learning center through philanthropic partnerships.

Challenges and Opportunities

COVID-19 Pandemic

The COVID-19 pandemic created some struggles in completing the project. The project was finished on schedule and on budget, but planning had to start further in advance. Equipment delays from the pandemic required OEC, NextEra, and NextEra's subcontractors to get creative with sourcing and to use existing equipment.

The pandemic also interrupted the timeline for developing the philanthropic and educational components of the project. The instructional changes to support remote learning and ensure the safety of staff and students superseded all other priorities for NPS. As such, OEC and ACCESS partner, Grid Alternatives, worked to incorporate the resulting instructional and health and safety changes into the solar park's design and education program to take some administrative pressures off an over-stressed school system.

Winter Storm Uri - February 2021

The new solar farm was operational in January and provided power during Winter Storm Uri. It provided steady output during a time of low energy availability with higher than usual prices. It produced an impressive 1.5 MW most days in February. Through its fixed-price PPA with WFEC, OEC was able to save money, as the solar energy produced was priced significantly lower than the open market at that time, offsetting the tremendous costs associated with fuel over those weeks.

Siting

NPS selected the parcel it was willing to lease to OEC, which happened to also meet the co-op's technical needs. The array is not next to a substation, but it is next to the main three-phase backbone with its load downstream to avoid using the bulk electric grid. This siting allowed OEC to broaden the zone where a solar array could be installed. Since the load is primarily downstream of the array and the power flow was relatively unchanged, OEC did not need to make additional system upgrades to integrate with the distribution grid. Furthermore, ensuring the solar energy would be used locally proved advantageous to OEC by eliminating the need to do additional feasibility studies and work to integrate the system with the bulk electric grid. The project required only that an interconnection line and transformer be built to integrate the array into the system. Identifying a site with low connection costs that was located within the community to avoid using the bulk electric grid were drivers for making the project financially successful.

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Key Lessons and Insights

The current focus on solar energy by OEC is less about the technology and more about community involvement. The key message from this project is how to make something purposeful that integrates with the local community. Nick Shumaker, Manager of Systems Engineering, views the project as a fundamental change to the way projects are conceived: “This is where the engineering isn't in the solar panels anymore. The engineering is in the design of the project within the community. I think we're going to get away from a bunch of energy production in the middle of nowhere. I think these are going to get more and more integrated into our daily lives.” Existing relationships between a co-op and local institutions, even when those relationships are not readily apparent, are opportunities to be explored. The high visibility of both OEC’s solar projects has prompted other local businesses and officials to contact the co-op to explore sponsorships and future collaborations.

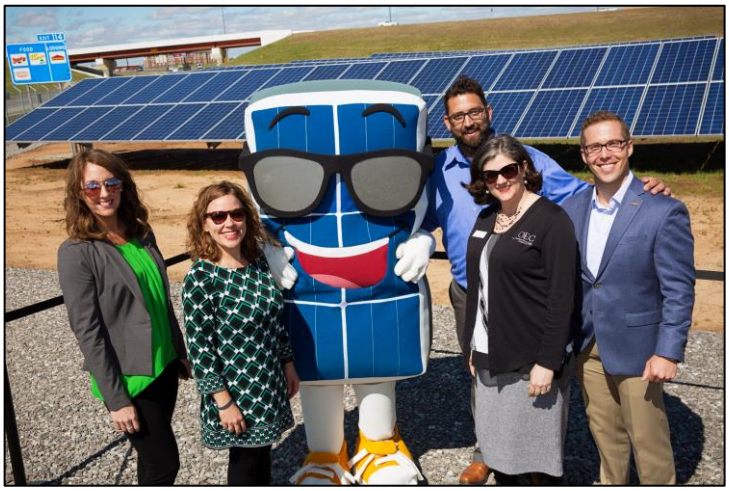

Figure 5: Solar Sam and OEC Staff
(Image courtesy of Oklahoma Electric Cooperative)

In addition to the benefit of surprisingly high interest from the community to tour the original Solar Garden, OEC’s experience prompted some technical changes in the design of the NPS array. The first project utilized a fixed-tilt system, whereas the panels of the NPS solar farm are on single-axis trackers that allow the panels to follow the sun’s path over the course of the day. This increases the amount of direct light aimed at the panels and yields up to 30% more generation output. The functionality also creates a better ability for the panels to adjust to capture diffuse sunlight on cloudy days.[8,9] OEC also overbuilt the panels on this project relative to the inverter size, which causes generation peaks to be flattened or “clipped”. This allows more production while keeping inverter costs the same and simultaneously reduces the apparent variability of the power generated.

While it is generally desirable for generation projects to make engineering and financial sense, these community-centered projects provide additional value to the cooperative. OEC decided that, even if the project failed to be a net positive on the balance sheet, there was still a desire to meet the needs of the public-school system and to better understand options for OEC’s energy future. The ability to inspire future energy careers and to optimize the co-op’s energy future were important non-economic markers of success.

Additional Resources on NRECA Research’s ACCESS Project

- **ACCESS Project Website**

Contacts for Questions:

[8] https://www.solarpowerworldonline.com/2020/01/what-is-a-solar-tracker-and-how-does-it-work/

[9] This part of Oklahoma has historically seen several high wind events, including two of the five most destructive tornadoes in U.S. history. This project uses articulating arms that can sense high winds and change position accordingly.

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