

Business & Technology Report

March 2021

ACCESS PROJECT REPORT SERIES:

Evaluation of Existing Financing Mechanisms & Program Designs for Low to Moderate Income Solar PV Programs

Electric Cooperative Solar Market Analysis and Trends

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Electric Cooperative Solar Market Analysis and Trends

Prepared By:

The National Rural Electric Cooperative Association (NRECA)
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About this Report Series

Solar costs have declined dramatically in recent years to surpass the goals set by Department of Energy (DOE) for the year 2020. The cost of hardware, as well as soft costs including installation labor, permits and overhead costs, have both come down, but the soft costs are still substantial and result in a cost barrier that limits access to the benefits of solar for all. This higher cost is particularly important in a cooperative (co-op) territory where average incomes are lower than national averages and poverty rates are higher.

Many co-ops have been able to develop solar generation for their members because of prior DOE programs and action. DOE and NRECA's success with the **Solar Utility Network Deployment Acceleration (SUNDA)** project demonstrated that innovations in co-op solar business models could quickly move solar resources from niche-based to widely deployed technology nationally.

Recently, NRECA launched its initiative [Advancing Energy Access for All](#), which spotlights cooperatives' involvement in facilitating healthy communities, explores the innovative ways they do it, and uncovers new directions community assistance programs are taking. Advancing Energy Access for All helps ensure rural communities are not left behind and is also an essential element of every cooperative's existence. A flagship project from this initiative is the [Achieving Cooperative Community Equitable Solar Sources \(ACCESS\)](#) project, a federally funded three-year, research project and collaboration among U.S. electric cooperatives, CoBank, the National Rural Utilities Cooperative Finance Corporation (NRUCFC/CFC), Pacific Northwest National Laboratory (PNNL), GRID Alternatives, and NRECA. The ACCESS project is funded by the U.S. Department of Energy's Solar Energy Technologies Office (SETO) whose overarching goal is to improve the affordability, performance, and value of solar technologies on the grid. Through this project, tools and resources will be developed to assist electric co-ops and the broader industry deploy solar projects to benefit low- to moderate-income (LMI) consumers.



This is the third report in [this series](#). The first report explored the variety of programs and services offered by co-ops that help LMI members, while often simultaneously benefiting other members, the co-op, and the grid. The second report evaluated which of these existing program and financing structures could be most effective at facilitating access to solar energy for LMI members. This report complements the ACCESS Project's Gap Analysis document by providing on-the-ground observations to add context to solar industry market data that will be included in that report. The Gap Analysis reviews challenges around LMI access to solar energy, and solutions and pathways for tackling the challenges. The Gap Analysis document and related resources will be available in the second quarter of calendar year 2021.

For questions or inquiries, please contact our team at: SolarAccessProject@nreca.coop

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The ACCESS Project includes seven lead cooperatives and a broad group of industry stakeholders who provide diverse expertise that is essential to the project's analysis and resulting tools and resources. The participating cooperatives include the following:

- Anza Electric Cooperative, Anza CA
- BARC Electric Cooperative, Millboro VA
- Kit Carson Electric Cooperative, Taos NM
- Oklahoma Electric Cooperative, Oklahoma City OK
- Orcas Power and Light Cooperative, San Juan Island WA
- Ouachita Electric Cooperative Corporation, Camden AR
- Roanoke Electric Cooperative, Aulander NC

The list of participating stakeholders can be found on our [ACCESS website](#) on cooperative.com. Stakeholders who reviewed and provided feedback to this report are:

- Groundswell
- Holy Cross Energy
- Vesper Energy

For this report, the ACCESS Project interviewed 12 generation and transmission (G&T) cooperatives and other wholesale power suppliers. To maintain confidentiality of those organizations, their names are not listed. The authors thank all the interviewed wholesale power providers for their time and input, as well as other industry stakeholders for sharing their experiences and ideas to support the success of the ACCESS Project and to benefit of cooperatives nationwide.

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Background: The ACCESS Project

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 will explore and amplify 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 will research varying financing mechanisms and program designs to help identify solutions for electric cooperatives and other small utilities, including field tests of diverse co-op solar projects around the country. Through this project, tools and resources will be developed to assist electric co-ops and the broader industry deploy solar projects to benefit LMI consumers.

Introduction

The first two reports in the ACCESS Project report series investigated how electric distribution cooperatives have historically supported their low- and moderate-income (LMI) members with program and services, and how co-ops could leverage many of those same strategies for LMI solar programs.

This report provides an overview of co-ops' solar activities with input from a dozen generation and transmission (G&T) cooperatives or other wholesale power suppliers that have partnered with their distribution members to offer solar programs. Additionally, it provides on-the-ground observations around solar industry market data. The data on co-ops' solar activities reflects NRECA records and a comprehensive review of co-ops' websites and publicly announced plans. The inputs from wholesale providers offers additional perspective on what they see as best opportunities for solar, as well as some of the challenges, in the coming years.

The wholesale suppliers the ACCESS team interviewed were selected for one of several reasons:

- They are the wholesale supplier of one of the ACCESS Leader distribution co-ops (the seven lead distribution cooperatives listed on the Acknowledgements page).
- They were interviewed in 2017 for the SUNDA program, or considered participating in the ACCESS Project.
- They have active solar projects or power purchase agreements (PPAs), or plans for solar developments.

For this report, the ACCESS team was not able to interview every G&T with solar resources or innovative plans. Instead, the goal was to develop an up-to-date picture of co-ops' solar activities across the country and compare impressions with the experience of co-ops' wholesale power suppliers to see what trends and challenges emerged. This report is in no way a comprehensive study of these or other G&Ts, or electric cooperatives in general. Furthermore, to maintain the privacy of interviewees and their organizations, authors will not attribute opinions or perspectives to any co-op or individual unless the information is publicly available.

Solar at Electric Cooperatives

In 2013, the average co-op solar deployment was 25 kW (typically a demonstration system at a distribution co-op), and the largest co-op deployment of solar was 20 MW (a utility scale system via a G&T). Deployments of systems as large as 250 kW seemed out of reach for most, especially at the distribution level. However, there was increasing interest from some distribution co-ops' members, and the price of solar was poised to come down. Distribution co-ops started talking with their power providers and exploring options, which included:

- Distribution co-ops deploying (via ownership or PPA) local systems within carve-out allowances in their power supply contracts;
- G&Ts deploying local systems on behalf of the distribution co-op and its members;
- G&Ts deploying utility scale systems as part of the power mix; or
- A combination of these.

From 2013 to 2018, local systems, whether deployed by the distribution co-op or G&T, often started including community solar programs in which a group of members opt in to buy a portion of, or buy the power from, a solar deployment. Early offerings were tailored to members who wanted solar and were willing to pay more. The offerings typically required long-term contracts and up-front payments. As it increasingly made better economic sense to build 250 kW, 500 kW, 1 MW or even 2 MW systems rather than the 25 kW demonstration systems, there was more opportunity to involve more members. Many co-ops found that offerings developed to be more consistent with traditional services, i.e., small, monthly fees with no long-term contracts, made their community solar programs more accessible and increased the probability of full subscription.

Despite the many successful co-op community solar programs, the G&Ts interviewed for this report commented that they get fewer requests to support community solar projects from distribution co-ops than they got a few years ago. Some possible explanations include:

- **Contractual caps reached.** Some distribution co-ops have reached limits on the percentage of energy they are allowed to generate outside of their supplier contracts.
- **Mixed results with existing community solar programs.** While some cooperative-run community solar programs have been very popular, others have had less success. This could be attributed to program structure, marketing efforts, member interests, cost to participate, or other reasons.¹ Regardless, co-ops with partially subscribed community solar gardens may be averse to building more.
- **Increasing share of solar energy in some suppliers' wholesale mixes.** Some distribution co-ops may be less inclined to develop their own community solar programs as their suppliers add solar to their generation mix.

¹ Research from NRECA's SUNDA project suggests that programs without upfront payments or long-term contracts are the most successful.

- **Economies of scale.** Utility-scale solar can be significantly less expensive to develop than small-scale distributed community solar gardens.
- **Decreasing cost of rooftop solar.** With federal and state tax credits, as well as the industry-wide reduction in the cost of solar, some members who previously would have subscribed to community solar may be installing their own systems.
- **No longer novel.** Several years ago, community solar gardens may have garnered interest from members because they were a novel concept and represented a new energy choice, and therefore, were appealing to early-adopter members. Two interviewees wondered if the early-adopters in the membership were now focused on newer technologies and program opportunities like electric vehicles and energy storage. Meanwhile, consumers increasingly assume their utilities are adding renewables based on economics and policy.
- **Co-op solar is community solar.** Community solar is a mini version of the co-op model. A group of consumers pools their resources to collectively gain the efficiencies of scale. Community solar has been an effective way to remind members of how their membership in the co-op works. As costs have come down, solar no longer requires special treatment.

Co-ops that are actively engaged in developing and offering new community solar projects are often doing them as an effort to engage members who were not able to participate in premium programs and/or otherwise invest in solar. NRECA's [*Advancing Energy Access for All*](#) program (which includes the ACCESS project) covers several examples in the following reports and case studies..

- *Advancing Energy Access for All Case Study. Bringing the Benefits of Solar to Low-Income Households: The Case of Cherryland Electric Cooperative*
<https://www.cooperative.com/programs-services/bts/energy-access/Documents/Advisory-Advancing-Energy-Access-for-All-Case-Study-Cherryland-June-2019.pdf>
- *ACCESS Project Case Study: Anza Electric Cooperative. Shifting Peak Demand with Solar Energy to Assist Native American Economic Development*
<https://www.cooperative.com/programs-services/bts/access/Documents/Advisory-ACCESS-Case-Study-Anza-Oct-2020.pdf>
- *ACCESS Project Case Study: Roanoke Electric Cooperative. Leveraging Land Ownership Retention for Economic Empowerment through Solar Energy and Community Development*
<https://www.cooperative.com/programs-services/bts/access/Documents/Advisory-ACCESS-Case-Study-Roanoke-Oct-2020.pdf>
- *ACCESS Report Series: Evaluation of Existing Financing Mechanisms & Program Designs for Low to Moderate Income Solar PV Programs*
<https://www.cooperative.com/programs-services/bts/access/Pages/ACCESS-Project-Report-Series.aspx>

Finally, despite anecdotal observations of a decreasing interest in community solar gardens, none of the interviewed suppliers stated that they had ruled out supporting community solar in the future, if one of their distribution members had an interest and a viable agreement could be reached.

As of the end of 2020, co-ops have nearly 1.3 gigawatts of solar online (including community, distributed, and utility-scale solar), growth is accelerating, and most co-ops have some solar energy as part of their supply — either directly or in partnership with their power providers. An increasing number have carbon reduction or renewable energy goals. The total capacity of announced projects coming on-line in the next three years is 4.8 GWs. By the end of 2023, 75% of electric cooperatives across the country will have solar as some portion of their energy.²

To understand co-ops’ solar activity across the nation, the ACCESS team reviewed all member co-op websites to update data from NRECA’s SUNDA Project³. Based on this research, nearly 25% of distribution co-ops have solar energy as part of their power supply, and nearly 30% of distribution co-ops have local systems that they own or have power purchase agreements (PPAs) through their traditional power providers or a 3rd party. About 5% have announced plans to deploy (more) solar. About 6% have small demonstration systems (< 100kW). From 2016 to 2021, the percentage of co-ops that do not have solar as part of their local or generation supply but do provide information about interconnections and/or optional green programs increased from 3% to 17%. NRECA’s records show that most of the remaining distribution co-ops have accessed SUNDA and/or ACCESS resources. See Figure 1.

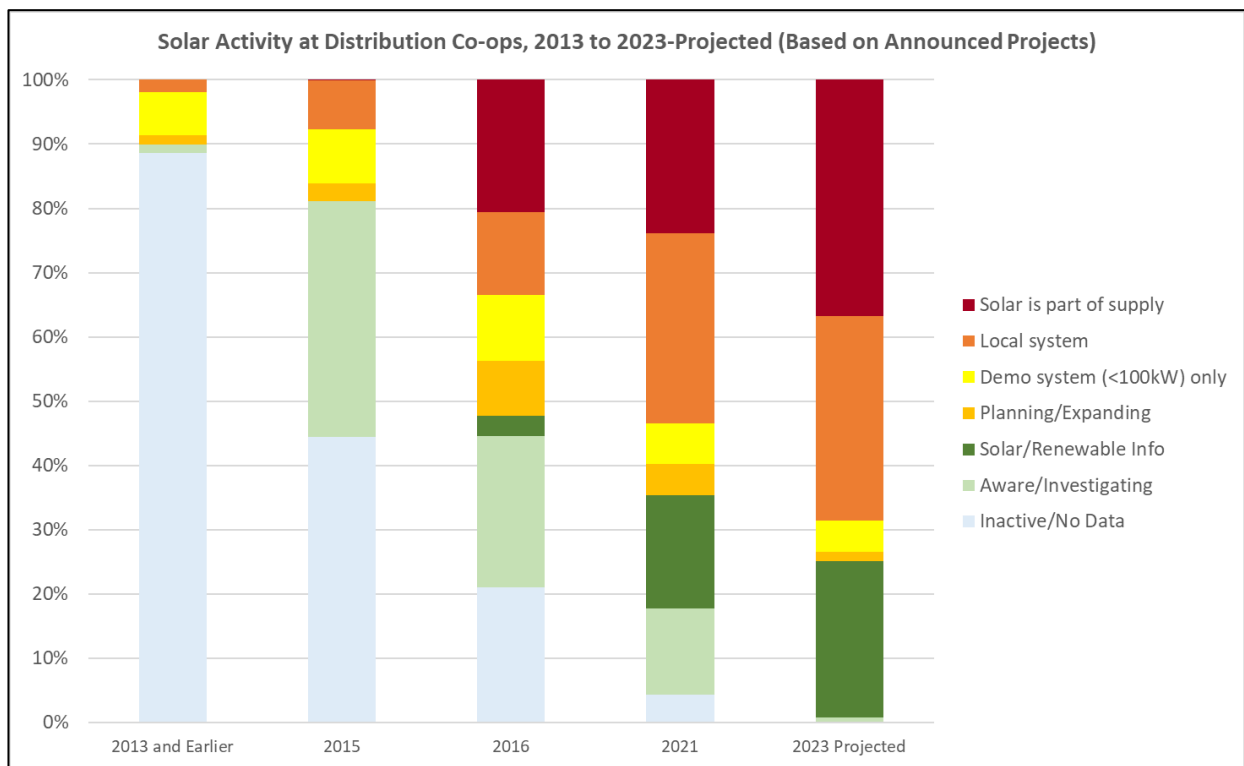


Figure 1: Solar Activity for 819 Distribution Co-ops in 48 States.²

Source: NRECA SUNDA data, updated by Evigglad Community Power, LLC (through 2021)

² Planning/expanding numbers may be underestimated as the projections are based only on publicly announced plans rather than interviews.

³ <https://www.cooperative.com/programs-services/bts/sunda-solar/Pages/default.aspx>

G&T deployments as of February 2021 show a modest increase over what was on-line or planned in 2016. However, the size of deployments and the number of systems under development have increased significantly. At the end of the SUNDA project, the average co-op (distribution or G&T) solar deployment size was 1 MW. Today, the average size is 5.9 MW⁴, and several G&Ts are planning/adding one or more large scale deployments totaling between 50 and 735 MWs.⁵ By 2024, we conservatively expect 70% of NRECA’s member G&Ts to have solar and more than 85% to have renewable energy (solar, wind, and/or hydro) as part of their generation mixes. See Figure 2.

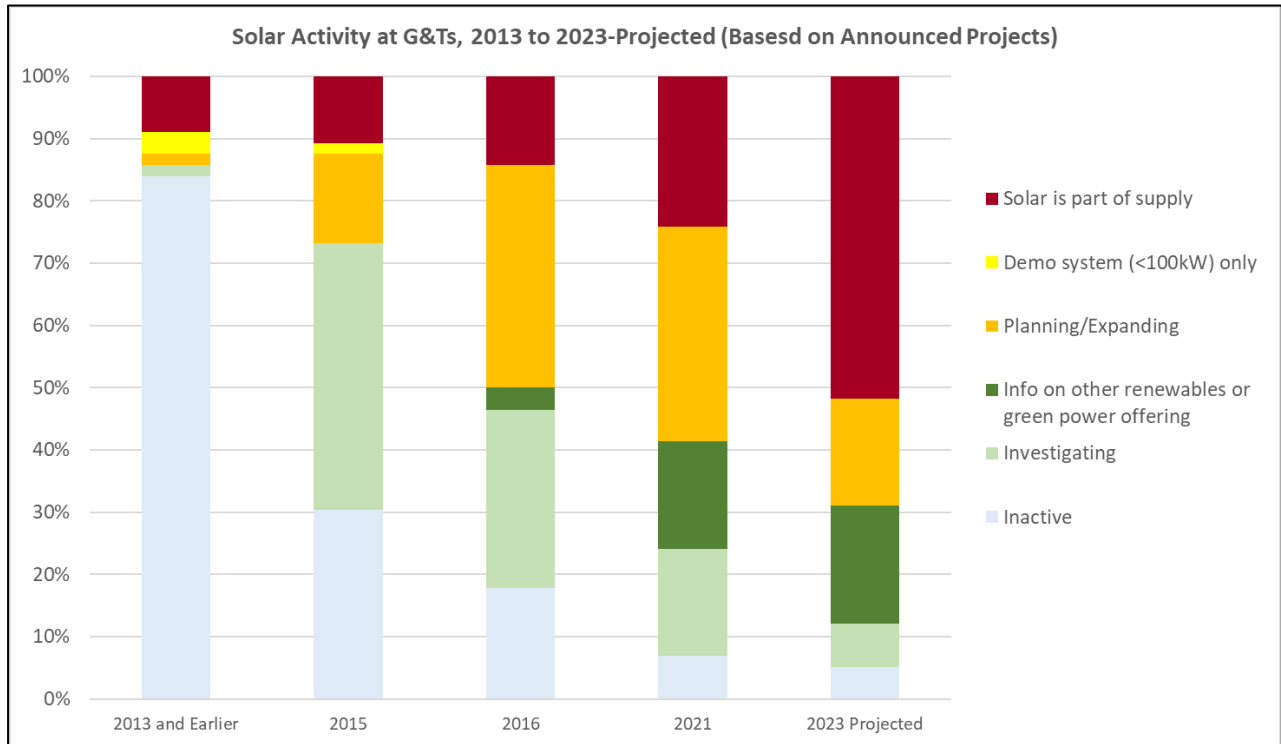


Figure 2: Solar Activity for NRECA Member G&Ts. ²

Source: NRECA SUNDA data, updated by Evigglad Community Power, LLC (through 2021)

Utility-scale solar has become part of co-ops’ regular activities. Where solar is competitive or even cheaper than traditional sources, G&Ts are adding large scale deployments as part of a diverse portfolio to keep costs affordable and reliable. G&Ts that are not adding large scale solar at this time typically have good wind and/or hydro resources that provide clean energy at more competitive pricing. Systems

⁴ Internal NRECA data: Projects that are at or above the SUNDA “utility scale” threshold of 250 kW

⁵ <https://www.powersouth.com/energy-resources/renewables/> and <https://solar.bigrivers.com/our-solar-generation/> and <https://cooperativeenergy.com/renewable-energy/> and <https://dailyenergyinsider.com/news/28560-basin-electric-makes-progress-on-wind-and-solar-projects-in-2020/> and <https://www.ecsc.org/content/cooperative-look-for-more-solar-power> and <https://www.odec.com/generation-transmission-overview/renewables/> and <https://tristate.coop/sites/tristateq/files/PDF/Responsible-Energy-Plan/Responsible-Energy-Program-Progress-Highlights-2020.pdf> and <https://www.seminole-electric.com/seminole-contracts-solar-facilities-with-florida-renewable-partners/>

at the distribution level have helped to satisfy members' immediate interests and raise co-ops' visibility in their own communities.

Meanwhile, it is increasingly common for more than 5% of a co-op's members to have behind-the-meter systems (BTM). Interest in BTM solar, storage, and microgrids is growing. Co-ops are considering questions about their role in supporting, providing, and/or controlling BTM systems in order to ensure safe, reliable, affordable, and equitable systems for their entire memberships.

Hidden Resource

One surprise in reviewing co-ops' websites was that while most co-ops have some solar as part of the energy they supply to members, many do not highlight it — even in cases where distribution co-ops and their power suppliers have worked together to site solar locally.

While co-ops do not generally highlight other energy resources, this may be a missed opportunity given 1) the increasing consumer interest in cleaner energy and environmental stewardship, 2) co-ops' concerns about vendors who make good sales pitches but may be unable to provide the promised cost savings, and 3) the likelihood of additional state and federal requirements driving the adoption of more carbon-free energy sources. It may be helpful for members and decision makers to know that some co-ops are continuing their work to integrate technologies, keep costs low, and respond to members' interests independent of regulation.

Looking forward, G&Ts and distribution co-ops are exploring the implications of more distributed energy resources. As wholesale power supply contracts are coming up for renewal or existing assets need maintenance, G&Ts are considering their options and the full range of costs and benefits. Some are working with their distribution co-ops to identify locations where solar or solar plus storage could help to address issues such as voltage regulation, resiliency, or demand management. On the ACCESS team, co-ops are integrating solar plus storage and microgrid concepts to address local capacity issues and defer asset upgrades, as well as working to understand the resulting dollar value of these capabilities with a particular focus on ensuring equity across the membership. These efforts are steps towards enabling the future grid and to ensure that utility systems keep pace with changing technologies.

Perspectives from Wholesale Power Suppliers

Across the country, G&Ts and other wholesale power suppliers face many of the same solar market dynamics, but not all. Views on the three- to five-year horizon for solar energy are affected by each supplier's location, political climate, member interest, age and mix of existing generation sources on the regional grid. In addition, wholesale suppliers's plans are affected by the rules of the public utilities commission (PUC) and/or regional transmission organizations (RTOs)⁶ that they operate under, and conditions vary from one to another. For example, one interviewee described how, in the Southwest Power Pool (SPP), solar and wind, due to their lower power production costs, are forcing the traditional base load generating units like coal and nuclear plants to run less and/or go offline, presenting challenging operational conditions at times when the sun does not shine or the wind does not blow as forecast.

That said, several wholesale suppliers interviewed for this report are at various stages of planning for or evaluating future opportunities to add more solar to their generation mixes as prices drop and battery technology advances. In some areas of the country, the price for utility-scale solar energy is now significantly lower than legacy sources. In fact, some suppliers view solar as less risky than legacy sources, due to the zero fuel cost renewable fuel (sun), compliance with current and future energy and environmental legislation, and resiliency benefits in the case of fossil fuel supply chain disruption.

Across the board, these suppliers find the lowest-cost opportunities to develop solar in large, utility-scale projects, but they are often willing and interested in developing or supporting small, distributed projects that support distribution members' needs in other ways, like micro-grid capabilities or community solar programs.

Wholesale power purchase contract requirements between G&Ts and their distribution members also vary. Some contracts require distribution members to purchase all of their power supply through the G&T. Others have allowances for set percentages (e.g., up to 5%) of a distribution member's energy or demand to be generated or purchased elsewhere by a member. In efforts to support distribution cooperatives, some suppliers indicated that they are working with member cooperatives to allow increased self-generation through different contractual solutions. In some cases, wholesale suppliers are responding to distribution member needs by owning and/or developing small, local solar arrays in their territories to accomplish various local goals.

Despite the unique environments that wholesale power suppliers operate in, several common themes emerged regarding what they see as the future for solar energy. This report summarizes themes from the ACCESS team's conversations with selected suppliers, with the recognition that this is not a comprehensive list of all G&T's considerations. The themes are as follows:

- Economies of scale
- Value of smaller distribution projects

⁶ <https://www.ferc.gov/industries-data/market-assessments/electric-power-markets>

- Replacing legacy power plants
- State and Federal policy
- Corporate sustainability goals
- Battery storage

Economies of Scale

Nearly all suppliers indicated that large, utility-scale solar projects (>30 MW) are much more cost-effective than smaller, distributed solar projects. Small distributed projects can cost three times as much or more, (per kW) to develop than large utility-scale projects – and prices for large utility-scale solar are extremely low in some areas. Duane Highley, Tri-State Generation and Transmission Association’s CEO, noted that they have observed an 85% decrease in solar pricing over the past ten years. “Our recent wind and solar prices have averaged below 2 cents per kilowatt-hour, which is lower than the variable cost of most of our thermal units,” Highley said.

Most of the interviewed suppliers already own or have long-term PPAs for utility-scale solar. Several have announced plans to build more. For example, in addition to its existing five utility-scale solar projects, Western Farmers Electric Cooperative (WFEC), which serves distribution co-ops in Oklahoma, New Mexico, and small areas of Texas and Kansas, is adding 200 MW of solar as part of a 700 total MW wind/solar/battery hybrid project expected to come online in 2023.⁷ See Figure 3.



Figure 3: Western Farmers Electric Cooperative's Tuttle Solar Farm. Courtesy of WFEC.

⁷ <https://www.cooperative.com/programs-services/bts/Documents/Secure/Advisories/Advisory-New-Energy-Resource-Model-Case-Study-WFEC-Nov-2020.pdf>

Old Dominion Electric Cooperative (ODEC), which serves co-ops in Virginia, Maryland and Delaware, is adding to its existing 30 MW of solar by entering into a PPA for output from a 75 MW solar project that will come online in 2022, possibly an additional 100 MW starting in 2023, and more in discussion for 2025. And Tri-State announced it will bring 735 MW of solar energy online by the end of 2023, with six developments ranging from 40 MW to 200 MW. On top of 85 MW of existing projects, this will give Tri-State the largest cooperative solar portfolio in the nation.⁸

From a strictly dollars per kW perspective, economies of scale often make large projects less expensive to build than smaller, distributed projects. Suppliers point out that this helps them provide solar energy to their members at the lowest possible cost. However, cost may not be the only decision factor. Several suppliers said that they do not rule out small projects if there is another reason or benefit, such as demand from the private sector or governments on economic development, local or state climate commitments, local resiliency goals, or grid optimization or back up plans. Some of the benefits described by the interviewed power suppliers are discussed in the following section.

Value of Smaller Distribution Projects

In several cases, local benefits of smaller, distributed solar arrays made some projects viable. Several wholesale suppliers already partner with one or more distribution members on smaller, local projects and others have plans to develop more in the future.

For example, the Arizona G&T Cooperatives (AzGT) owns the SunAnza 2 MW PV array (to be expanded to a total of 3.4 MW) with a 2 MW lithium-ion battery that serves Anza Electric Cooperative (AEC), one of their distribution cooperatives located in southern California. See Figure 4. Anza purchases all system output through a PPA with AzGT. This development is strategic for both the distribution co-op and the G&T, because Anza is served by a single radial transmission line that is in danger of exceeding capacity due to increasing peak loads in Anza's territory. Furthermore, the line crosses U.S. Forest Service land and is subject to outages from wildfires.



Figure 4: AzGT's SunAnza array that serves Anza Electric Cooperative. Image courtesy of AEC.

The relatively small solar plus storage project enables AzGT to defer significant costs to upgrade transmission service to Anza, and provides Anza with a source of back-up power and islanded microgrid

⁸ <https://tristate.coop/renewable-energy>

capabilities in the event of a sustained outage. So far, the project is exceeding expectations by covering 45% to 47% of average midday usage with solar and battery output.⁹

Pacific Northwest Generating Cooperative (PNCG) Power, headquartered in Portland, Oregon, supported member cooperative Orcas Power and Light Cooperative (OPALCO) to develop a solar array with battery storage. PNCG Power helped OPALCO navigate regulations, interconnection, and contracting, as part of their agreement with members that allows for community resource development. OPALCO serves islands off the coast of Washington state and power is supplied to them via an undersea cable. The distributed solar plus battery development provides much needed grid resiliency in this remote location through voltage regulation, outage mitigation, and energy cost reduction.¹⁰

In addition to its large utility-scale projects, ODEC has plans to develop 60 MW of distributed solar projects across 15 sites throughout its territory in response to member input. Whether these sites will contribute to ODECs overall mix, be made available directly to consumer members through community solar programs, or both, has yet to be determined.¹¹ As part of this effort, ODEC will develop a 2.5 MW solar project in collaboration with with BARC Electric Cooperative, one of their distribution members. ODEC will purchase all generation through a long-term PPA with the developer, then sell half of the project's generation to BARC to be used for BARC's existing community solar program, which already includes a 550 kW array.¹² The other half of the project's generation will support a shared savings arrangement between BARC and ODEC that reduces peak demand costs for both co-ops.

An interviewee from a different G&T described that, for G&Ts without much solar experience, this kind of partnership can benefit both distribution co-ops and G&Ts. G&Ts may gain experience and lessons learned to help their members build their own systems in the future. In addition, smaller distributed systems sometimes provide a less risky glide path to knowledge for G&Ts before jumping into a large, utility-scale project.

Some of the interviewed G&Ts indicated that they will leave the development of small, distributed solar projects up to their distribution members within the terms of their wholesale power supply contracts. In some cases, distribution co-ops are joining together to procure a series of solar farms. For example, 12 Kansas co-ops are working with Today's Power, Inc.¹³ to build a total of 20 MWs of solar to reduce peak demand and lower member costs. These projects fall within the co-ops' wholesale power contract, which was modified in 2017 to give distribution members the ability to self-procure up to 15% of peak demand, including 5% specifically set aside for the addition of solar resources.¹⁴ In Texas, five distribution co-ops collectively entered into a 20-year PPA for 7 MW of solar, to be located throughout

⁹ <https://www.cooperative.com/programs-services/bts/Documents/Reports/Battery-Energy-Storage-Use-Cases-January-2021.pdf>

¹⁰ The Pacific Northwest National Laboratory (PNNL) supports this project with economic analysis and technical support. Additional information can be found: <https://www.opalco.com/wp-content/uploads/2021/01/batteryupdate12-2020.pdf>

¹¹ <https://www.cooperative.com/programs-services/bts/Documents/Advisories/Advisory-New-Energy-Resource-Model-Case-Study-ODEC-Dec-2020.pdf>

¹² <http://www.barcelectric.com/communitySolar>

¹³ <https://www.todayspower.com/>

¹⁴ <http://www.todayspower.com/tpiblog/2020/11/17/kansas-electric-cooperatives-join-forces-to-provide-rate-stability-with-solar-power>

their territories.¹⁵ The co-ops worked with the Rocky Mountain Institute's (RMI) Shine™ Program¹⁶ to design the collective arrangement.

Regarding serving consumer-members with solar, some G&Ts expressed that residential and commercial energy efficiency measures should be integral to any solar program to maximize the benefit of the renewable generation.

Replacing Legacy Power Plants

Top of mind for many interviewed suppliers is the replacement of legacy sources being phased out, including some coal and nuclear plants, with cost-effective renewable generation sources. In addition to solar being cost-competitive with fossil fuel in many locations, there are other reasons suppliers are looking to solar to replace legacy sources with solar. Phil Schaeffer, WFEC's principal resource planning engineer, explained that, in the past, suppliers would manage costs by hedging coal prices against natural gas. Now, as electricity generation from coal is decreasing, suppliers are looking to hedge natural gas prices with wind, solar, and eventually batteries. For this reason, WFEC "is maximizing the benefits of increasingly cost-competitive renewables by entering into an arrangement with NextEra Energy Resources to build what will be one of the largest combined wind, solar and battery storage projects in the United States – the 700 MW Skeleton Creek system."¹⁷

To utilize existing transmission systems and available land, both Tri-State and ODEC are developing solar arrays on the grounds of coal plants recently retired or slated for closure in the coming years. A supplier in a different part of the country is evaluating replacement of a nuclear facility with solar, but other generation sources are also under consideration. Some suppliers are reviewing contracts that will expire in the next few years, considering options, and asking questions, such as where distributed solar systems in the 1-20 MW range might provide system benefits as well as low and predictable costs.

State and Federal Policy

State and federal policies impact many decisions about the addition and removal of any generation source. For states that have renewable energy and carbon dioxide reduction goals, large-scale solar generation can be a tool to support these goals or comply with mandates.

At the federal level, the Investment Tax Credit (ITC)¹⁸ reduces the cost of solar and solar plus storage developments significantly for entities with tax appetites. While non-profit cooperatives cannot currently utilize the ITC directly, many partner with for-profit developers or utilize a for-profit subsidiary of the co-op to pass along the savings. In December 2020, Congress extended the ITC for two additional years. Owners of new residential and commercial solar can deduct 26% of the cost of the system from their

¹⁵ <https://solarmagazine.com/5-texas-electric-coops-sign-collective-solar-power-purchase-agreement/>

¹⁶ <https://rmi.org/our-work/electricity/shine-community-scale-solar/>

¹⁷ See WFEC Case Study: <https://www.cooperative.com/topics/power-supply-wholesale-markets/Pages/New-Energy-Resource-Model-Initiative.aspx>

¹⁸ <https://www.seia.org/initiatives/solar-investment-tax-credit-itc>

taxes for projects that began construction between 2020 and year-end 2022, provided the project is complete by year-end 2025. Beginning in 2023, the ITC will step down to 22%. In 2024, the ITC will only be applicable to new commercial and utility-scale solar projects, and will step down to 10% permanently. (See Figure 5.) This ITC step-down is top-of-mind for suppliers because, as one supplier put it, the ITC “helps with economics a lot.” Many suppliers and their developer partners are trying to bring solar and solar plus storage projects online before the end of 2023, when the 26% tax credit drops to 22%. “We've actually signed up a decent amount of solar that isn't online yet, so we can take advantage of the investment tax credit because that improves the pricing pretty significantly,” said another interviewee.

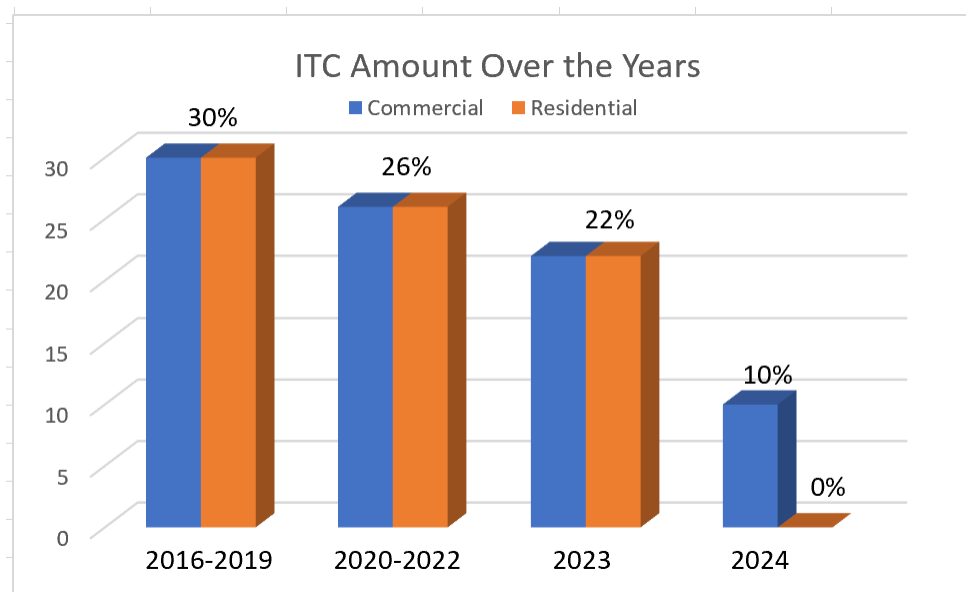


Figure 5: Created from data on EnergySage

While the ITC is generally considered helpful for solar development, some G&Ts expressed that they would strongly prefer to own their own solar developments, but the ITC’s rules make it more cost-effective to partner with a taxable entity. Most G&Ts are not taxable entities, with a few exceptions like Hoosier Energy.¹⁹ For this reason, some G&Ts would support a shift in the ITC so that electric cooperatives could benefit directly. This would also benefit public power utilities, which are similarly not taxable.

A direct-pay option, which would theoretically provide a cash payment rather than a tax credit, was included in the Moving Forward Act,²⁰ which passed the U.S. House of Representatives in July of 2020;

¹⁹ <https://www.hoosierenergy.com/facts/>

²⁰ <https://rules.house.gov/sites/democrats.rules.house.gov/files/BILLS-116HR2-RCP116-54.pdf>

however, this bill has not yet been signed into law.^{21, 22} It is unknown at this time when the Act will be brought before the Senate.

With a new administration in place as of January 2021, other future federal policies are also unknown at this time, but an expectation among suppliers is that there will be increased emphasis on renewable energy and carbon emission reduction.

Many suppliers are already working to meet state goals and/or mandates. In fact, as of January 2021, 24 states and the District of Columbia have “established economy-wide greenhouse gas emissions targets.”²³

One supplier stated that they were planning to build solar that exceeds current requirements in anticipation of future state or federal regulation. This supplier believes it is highly likely they will see increased environmental legislation, and their goal is to be out in front. They believe being proactive will enable them to have more control over their resource planning compared to waiting for and reacting to any new guidelines.

Corporate Sustainability Goals

In addition to government regulation, private sector requirements are another emerging factor influencing solar energy development. Most suppliers interviewed for this report are getting increased requests from large commercial, industrial, and agricultural operations for green energy, in accordance with corporate commitments to reduce greenhouse gas emissions. The wholesale power markets allow corporate purchasers to sign PPAs, if they are located between two utility territories or large enough that they are allowed by state or regional regulations to seek bids for power supply in a wholesale market. These businesses often want new solar or wind developments that they can take credit for helping to bring online as opposed to purchasing renewable energy credits (RECs), the “green” attribute of renewable energy. Corporate sustainability goals have fueled a demand of over 35 GW in the last 7 years, where over 80% of the deals can only be done in wholesale markets.²⁴

G&Ts may or may not be able to meet wholesale market requirements depending on location and climate, applicable RTO rules, and transmission capabilities. The corporate buyers of renewable energy also demand PPAs at scale to take advantage of lower wholesale power prices. In addition to these potential constraints, one supplier noted that electric cooperatives might be in danger of being less competitive than other utilities for these accounts by not offering “green tariffs.” Green tariffs are offered in regulated electricity markets and must be approved by state PUCs.

According to the U.S. Environmental Protection Agency (EPA), “Under a green tariff, utilities supply the organization with up to 100 percent renewable power from projects either owned by the utility or

²¹ <https://pv-magazine-usa.com/2020/06/24/houses-1-5-trillion-infrastructure-bill-packed-with-pro-solar-pro-storage-provisions/>

²² <https://www.congress.gov/bills/116/congress/house-bill/2>

²³ <https://www.c2es.org/document/greenhouse-gas-emissions-targets/#:~:text=Currently%2C%2024%20states%20and%20the,%E2%80%9Cnet%2Dzero%E2%80%9D%20targets>

²⁴ <https://rebuyers.org/blog/reba-announces-top-10-u-s-large-energy-buyers-in-2020-2/>

contracted with independent power producers in the local grid or utility region.”²⁵ Some cooperatives may avoid offering these rates, even if they are allowed to, because co-ops generally make the same rates available to everyone within a customer class, for legal or other purposes. A supplier suggested that G&Ts that are allowed by state and PUC regulations to offer green tariffs may want to carefully evaluate industry trends in this area. Similarly, a different supplier emphasized that solar projects can be a beneficial economic development tool, by retaining and attracting organizations with corporate sustainability goals to the area. If corporate sustainability goals change to include distributed, small-scale and higher LMI impact objectives, corporate demand may spur purchasing in smaller distribution and smaller scale projects.

Battery Storage

Suppliers are interested in coupling battery storage with solar developments; however, several indicated they are waiting for pricing to drop or to see successful demonstrations of utility-scale battery storage. WFEC’s 700 MW hybrid wind/solar/battery Skeleton Creek project will be watched by many when it comes online in 2023.

One supplier pointed out that a benefit of hybrid systems, like wind and solar, or solar plus storage, is that the developer can maximize the value of interconnection. Battery storage, for example, can use the transmission capacity when the solar array is not generating. But because rules for grid interconnection of batteries vary from region to region, interviewees noted that different regulatory and transmission environments have impacted their decisions to add storage. However, going forward, RTOs and Independent System Operators (ISOs) are developing new rules around the integration of distributed energy resources (DERs), including storage, in response to two 2020 Federal Energy Regulatory Commission (FERC) Orders – Number 2222²⁶ and Number 841²⁷ – that remove barriers and open markets to grid-connected energy storage.²⁸

An interviewee also observed that battery storage projects are increasingly common on smaller, distribution scale projects where they can be tested with less total capital cost and risk than a large utility-scale project. Batteries can support micro-grids and remote areas with limited or no transmission capacity, as well as help distribution co-ops manage demand charges from their suppliers. See Figure 6 for example at North Carolina EMC. As co-ops gain more experience with these smaller distribution projects, they may pave the way for larger-scale storage projects at G&Ts, similar to the pattern of some distributed community solar gardens being developed ahead of large utility-scale solar farms.

²⁵ <https://www.epa.gov/greenpower/utility-green-tariffs#:~:text=Utility%20green%20tariffs%20are%20optional,a%20special%20utility%20tariff%20rate.>

²⁶ <https://www.ferc.gov/news-events/news/ferc-opens-wholesale-markets-distributed-resources-landmark-action-breaks-down>

²⁷ <https://www.ferc.gov/media/order-no-841>

²⁸ <https://www.ferc.gov/news-events/news/ferc-opens-wholesale-markets-distributed-resources-landmark-action-breaks-down>



Figure 6: North Carolina EMC’s microgrid campus on Ocracoke Island includes diesel generators, battery storage, and solar generation.
(Photo By: Cathy Cash, NRECA)

Conclusion

The thinking about solar energy from wholesale power suppliers interviewed for this report has some common themes, but suppliers have different inputs into their decision-making processes based on their unique operating conditions, including regional climate, existing power supply, state energy policy, RTO rules and procedures, and membership needs.

Solar projects at the transmission and distribution levels have unique and practical benefits to G&Ts and distribution co-ops. Beyond the consensus around solar energy's economies of scale, many interviewed suppliers are considering the potential of solar generation to reduce risk in some way. For some, adding solar is a way to reduce risk around pricing, as it can replace coal as a hedge for natural gas pricing. Others feel that solar reduces risk around state or regional environmental regulations, both existing and potential future regulations. Said one interviewee, "We want to take advantage of the PTC and the ITC while they're around, knowing that future environmental legislation is probably coming down the pike. We see it as reducing risk going forward." Suppliers are also adding solar based on member interest, or to support resiliency or other needs at member distribution cooperatives.

As for specifically serving low-income members, wholesale providers' general thinking about solar energy currently is that large, utility-scale solar projects offer the best price and opportunity to keep costs low for all members. However, costs continue to come down, including for smaller projects. Meanwhile, there are only so many places to put 100+ MW solar arrays, and local projects are already helping some co-ops reduce peak demand. The expectation is that the next three to five years will see more distributed systems alongside larger utility-scale systems, and power providers are beginning to explore options for optimizing these resources.

This report's goal was to provide an update on solar across the co-op community with perspectives from wholesale power suppliers. By owning large, utility-scale solar projects, or purchasing the power from them, G&Ts and other wholesale power suppliers are adding low-cost solar energy to the grid to benefit all members. While some of these efforts may be under-publicized, power suppliers play an integral role in making solar accessible and affordable for millions of electric cooperative members, regardless of their ability to participate in LMI solar programs or purchase it on their own.