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March 2021

ACCESS Project Gap Analysis

NRECA

America's Electric Cooperatives

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Prepared By:

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NRECA
America's Electric Cooperatives

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 declined, but the soft costs are still substantial and result in a cost barrier that limits access to the benefits of solar for all. These higher costs are 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 as a result 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 that 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. The 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 gap analysis report reviews challenges around low to moderate income (LMI) access to solar energy, and solutions and pathways for tackling the challenges. Three complementary reports have been published and made available to DOE, industry, and the cooperative community.[1]

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

[1] https://www.cooperative.com/programs-services/bts/access/Pages/ACCESS-Project-Report-Series.aspx
ACCESS project report series: Evaluation of Existing Financing Mechanisms & Program Designs for Low to Moderate Income Solar PV.

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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

Our immense gratitude goes to the ACCESS stakeholders whose input from a series of meetings in October of 2020 helped form this report. They shared their experiences and ideas to help support the success of the ACCESS project and for the benefit of rural electric cooperatives nationwide.

Stakeholders and volunteers who provided extensive input and feedback to this gap analysis report include:

- Colorado Energy Office
- Holy Cross Energy
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Disclaimer

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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.

Executive Summary

Identifying promising, innovative, and cost-effective energy access programs that will serve co-ops' low- and moderate-Income (LMI) consumer-members,[2] especially in communities challenged by persistent poverty, is the goal of NRECA's Achieving Cooperative Community Equitable Solar Sources (ACCESS) project.

At the outset of the ACCESS project in 2020, NRECA recognized that most LMI customers could not afford solar photovoltaics (PV); capital costs and financing costs remain too high to drive significant penetration, resulting in a barrier that limits access to the benefits of solar energy for all. Today, a local 1.3 MW-DC system in co-op service territory costs between $1.50/Watt-DC and $2.00/Watt-DC.[3] At $1.75/Watt-DC, a 1.3MW-DC system would have a total project cost of $2.275 million.[4] In order to provide at least a 10% savings to LMI members, all-in costs need to be reduced to $1.52/Watt-DC. To achieve a 25% savings, costs need to be reduced to $1.19/Watt-DC.[5]

Through the ACCESS project, NRECA set a goal to identify existing, effective utility-managed programs that achieve 10% savings for LMI consumer-members, and to work towards developing programs to achieve 25% savings through test projects at six exemplar utilities. In the Fall of 2020, ACCESS convened electric cooperatives (co-ops), project partners, and a large host of expert stakeholder organizations in a series of workshops to begin to explore ideas and solutions.[6] The intent was to involve a diverse, wide-reaching group with interests in this area to collaborate on solutions to solar access for LMI. We asked - "What works in solar financing and program design for co-ops and their consumer-members?" Better, "What works ***now***, and what could be improved through policy and practice?"

Our cooperatives and stakeholders were steadfast in confirming ACCESS' goals, set out in our original project plan. ACCESS aims to answer two challenges:

1) Which financial mechanisms **reduce soft costs** (financing, program implementation, and member/ratepayer costs) the most, and
2) Which program designs provide the **greatest impact** in reduction in energy burden and/or solar access to the largest number of LMI members.

In this Gap Analysis, the ACCESS team has identified current solutions toward those challenges, and pathways to explore through pilot testing and modeling over the next two years with our co-op partners.

[2] "A household whose income does not exceed 80 percent of the median income for the area, as determined by HUD" https://www.hud.gov/program_offices/comm_planning/library/glossary/l

[3] NRUCFC, January 2020

[4] At this cost, using a Tax Equity Partnership Flip structure [assuming: 26% ITC and 8.5% target return for the tax equity investor] produces a Levelized Cost of Energy (LCOE) of $71.61/MWh. Assuming a distribution adder of half-a-penny per kWh for LMI members/subscribers, cost to the member would be $76.61/MWh (or 7.66 cents per kWh). NRUCFC 2020

[5] Note that these calculations result respectively in 13% and 32% reductions in energy costs resulting in 10% and 25% overall LMI savings.

[6] ACCESS stakeholder group members include financial, non-profit, philanthropic, educational, economic development, community, solar-related and cooperative stakeholders committed to achieving equitable access to solar for all.

We will be using a robust list of metrics to be captured for evaluation, including program feasibility, LMI impact, time requirement/ease of implementation, and scalability. Financial evaluation will include such measures as potential dollar savings per kWh for LMI members, kWh savings due to changed behavior, potential cost (to co-op/financier) per LMI member of program, among others.

In addition to amplifying successes, the ACCESS Gap Analysis aims to help co-ops, other small utilities nationwide, and the broader industry identify and be able to avoid, or at least take cautionary measures, when considering adoption of certain policies and programs that may not result in affordable solar delivery for LMI communities.

The Gap Analysis report is structured in six chapters:

1. Introduction: Who We Serve: LMI Definitions and Metrics for ACCESS Pilot programming
2. Market Analysis for Solar Affordability
3. Financing Solar for Co-ops: Direct, Indirect and Alternative Financing Structures and Programs to Address Financing Barriers
4. Current Programs Designed to Address Barriers to Solar Access for Rural LMI Communities
5. Next Steps: Pathways to Guide ACCESS Pilot Testing and Action
6. Resources/Appendices

Ultimately, ACCESS will work with our co-op participants and stakeholders to build a practical, effective “Toolkit” of resources to assist co-ops in pursuing a path to solar affordability suitable for each co-op – and helping their successful deployment of solar projects to benefit its LMI members. Other small utilities nationwide may also use these resources to plan and deploy solar projects that benefit their LMI consumers. Along the way and guided by the findings in this Gap Analysis, active stakeholders and engaged affiliate co-op network will help us develop and disseminate optional co-op models and tools to America’s ~900 electric cooperatives and the broader industry. These models would have been tested at participating ACCESS co-ops and may be replicable for other co-ops and smaller utilities nationwide.

Chapter 1: Introduction

Electric cooperatives (co-ops) are the service backbone of rural America. Co-ops support economic development, often leading technical innovations, such as wind energy, solar energy, efficiency, storage and more recently some provide broadband access for the rural, underserved, low-income communities they serve. In addition to providing reliable power, open membership, and democratic member control, electric cooperatives are tasked to "work for the sustainable development of their communities through policies supported by the membership," as described in Cooperative Principle #7, "Concern for Community".[7] Co-ops of all sizes take this mission to heart by offering programs and services to help members-in-need improve their homes, finances, and communities.

Delivering solar generation to every co-op member regardless of income is another way that some co-ops show concern for their community, by offering the benefit of solar energy to their members especially those who struggle to pay their bills. Co-ops are agents of economic development, investing in members and facilities throughout their service territories in ways that strengthen the grid and grow opportunities for businesses, and support the health and welfare of members. Co-ops now serve more than 42 million Americans in 48 states and provide electric service to more than 92% of US counties with "persistent poverty."[8]

Where solar resources are cost effective, electric cooperatives have included them within their resource portfolios, developing creative programs to include access for lower income members. But challenges remain, limiting access to the benefits of solar for all co-op members. On financing, cooperatives have small numbers of customers relative to municipally owned and investor-owned utilities, and so cooperatives' solar project sizes are proportionally smaller as well. Securing financing for small (less than 5 MW) solar projects is difficult and costly. As well, implementing programs for low-income members requires the capacity to create, communicate and deliver programs that result in substantial savings – without creating unintended cross-subsidies between members.

This report offers a view of where the gaps are in serving low- and moderate-income (LMI) households with renewable energy resources. What approaches and tools are working right now for co-ops and their consumer-members? What program and finance gaps are challenging co-ops and other utilities in providing financially feasible and reliable solar energy services to all consumers?

Defining Energy Burden versus Energy Cost – and Reducing Both

Providing reliable power at financially feasible prices for all members is one goal all co-ops share. "Powering communities and empowering members to improve the quality of their lives," a common mission among electric cooperatives, generally includes delivering resources at the lowest possible cost

[7] https://www.electric.coop/seven-cooperative-principles%E2%80%8B/

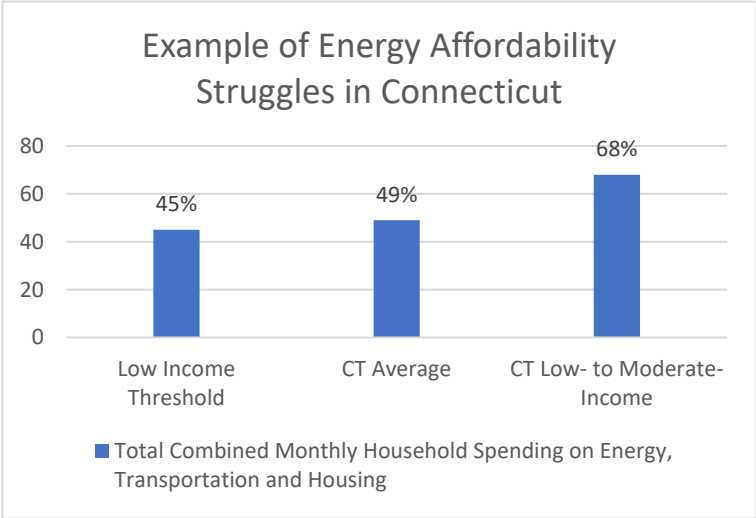
[8] See: https://www.ers.usda.gov/topics/rural-economy-population/rural-poverty-well-being/ According to ERS, USDA: " ERS has defined counties as being persistently poor if 20 percent or more of their populations were living in poverty based on the 1980, 1990, and 2000 decennial censuses … . Using this definition, there are 353 persistently poor counties in the United States (comprising 11.2 percent of all U.S. counties). The large majority (301 or 85.3 percent) of the persistent-poverty counties are nonmetro [rural], accounting for 15.2 percent of all nonmetro counties."

– as well as looking for opportunities to support community economic development. Monthly residential electric bills within the cooperative system have declined slightly since 2010 on an inflation-adjusted basis, according to the most recent NRECA Vital Signs Annual Report.[9]

In line with the ACCESS project goals, adding new solar generation assets to **reduce members' monthly bills** (as a financially feasible option to more expensive generation and/or through providing additional value streams to the co-op) presents its own challenges. As well, offering solar and community solar programs to also **help reduce energy burden for LMI members** adds another layer of complexity to the ACCESS pilot efforts.

Energy burden is the total household cost of acquiring energy services (electricity, natural gas, and/or heating oil). The U.S. Department of Energy provides calculators to estimate energy burden,[10] with useful recommendations for authorities seeking to reduce overall energy costs. These suggestions skew toward urban populations served by large investor-owned utilities, however. ACCESS is poised to explore rural solutions.

Rural communities need a more encompassing approach to reducing energy burden, because of structural challenges influencing income disparity between urban and rural populations. "Energy" is not the only cost impacting low-income households. "Energy affordability" is generally defined by advocates as total combined monthly household spending for energy, transportation, and housing of less than 45% of monthly income. For many rural populations, energy, healthcare, and housing choices are as or more expensive as in urban areas, with fewer options for service. Even in highly urban states such as Connecticut, a recent study showed that combined spending on energy, transportation, and housing in Connecticut households exceeds 49% of monthly income statewide, which is above the 45% threshold for affordability. Low- and moderate-income Connecticut households are burdened at a higher rate – 68% of monthly income – than wealthier residents, since these costs



Source: Created from data in report *Mapping Household Energy and Transportation Affordability in Connecticut*, by VEIC on behalf of the Connecticut Green Bank and Operation Fuel. Available for download from: https://www.ctgreenbank.com/ct-energy-transportation-costs-unaffordable/

[9] *Vital Signs*, Slide 23, NRECA Annual Report, November 2020.
[10] Low-income Energy Affordability Data (LEAD) Tool https://data.openei.org/submissions/573

consume a larger portion of their household income.[11] In some U.S. counties, low-income households face an energy burden that is 6 to 7 times higher than moderate or affluent households.

How ACCESS will Approach Our Work

Since 2011, solar has grown from a niche technology to a widely accessible source of power for homes and businesses across the United States. This growth has mostly been due to dramatic cost reductions for residential- and commercial-scale solar. Between 2010 and 2019, these costs have declined from $0.52 to $0.16 per kWh and from $0.40 to $0.11 per kWh, respectively. (See *Chapter 2: Market Analysis for Solar Affordability* of this Gap Analysis for more detail on co-op solar costs.) The increasing affordability of solar energy makes it even more important that consumers in need can access the resource as an option for managing their energy costs.

Working with a broad and diverse team of seven (7) "leader co-ops", thirty-two (32) industry Stakeholders, and a continually growing number of Affiliate Co-ops, NRECA's goal for ACCESS is to build on our current "solar aware" co-op network to identify financial models and program designs that are replicable and scalable for solar generation and delivery to all members. The ACCESS project aims to decrease energy burden on low-income members, while increasing grid benefits and opening opportunities for economic growth through rural cooperative solar initiatives. Importantly, we seek to reduce the costs of solar investments for the co-ops as well, to further facilitate the ability for co-ops to provide solar options for all their consumer-members. A key component of this effort is to extend beyond initiatives that currently exist and develop *new* financial models and program designs, which will be field tested by the leader co-ops.

The participating cooperatives are as follows:

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

[11] *Mapping Household Energy and Transportation Affordability in Connecticut*, by VEIC on behalf of the Connecticut Green Bank and Operation Fuel. Available for download from: https://www.ctgreenbank.com/ct-energy-transportation-costs-unaffordable/

Details on their various projects can be seen in the table below:

Leader Co-op Size of co-op/ # of meters/# LMI members to benefit	Deployment plan (anticipated)	Finance Elements to Pilot/Evaluate	Program Elements to Pilot/Evaluate
ACCESS Project Budget Year 1			
Roanoke Electric Cooperative (NC) 14,284 members *~750 LMI participants*	4 to 8 arrays of 250 kW each with storage	• Catalytic Finance • PAYS for Solar – bundled EE and solar service financial terms • Federal funds for LMI solar (WAP)	• Solar PAYS structured on-bill tariff • Hybridization of solar and energy efficiency • Local agency partnership for service delivery • Philanthropic partnerships
Anza Electric Cooperative (CA) 5,100 members *~ 250 LMI participants*	2MW already deployed, Adding 2.4MW (2 projects; 1MW and 1.4MW) + 2MW/4MWh battery deployment	• Rate programs (internal IRR) • Battery enabled energy arbitrage pricing	• Special Rate Program • Integration of new technology
Orcas Power & Light Cooperative (WA) 15,198 members *~ 400 LMI participants*	Solar + storage between 500kW & 3MW	• Private Finance (CRFIs/CDFIs) – mixed funding streams • Financial impacts for island-based system and transmission upgrade deferral	• Partnership with local institutions and non-profits for service delivery • >50% LMI community solar
Oklahoma Electric Cooperative (OK) 57,800 members *NA – public benefits*	New 2MW solar addition Benefits Norman Public Schools (50% LI students)	• Mixed funding streams • CDFI for project finance	• Behind-the-Meter systems to serve local school (partnership)
ACCESS Project Budget Year 2			
BARC Electric Cooperative (VA) 10,295 members *~600 LMI participants in rural Appalachia*	2.5MW with potential for battery storage; 1.25MW to LMI community solar	• Split revenue streams • Community Solar	• Special Rate Program: Solar-based LMI retail tariff for Community Solar combined with savings from peak demand reductions

Kit Carson Electric Cooperative (NM) 28,984 members *115 (Picuris Pueblo)* *Up to 8,000 members (generally)*	22MW of PV and 15 MW of battery storage already deployed Add'l 1.5MW + storage specific to Picuris Pueblo in consideration	• Leveraging Opportunity Zone Incentives • Financing with sovereign nation (CDFI, Federal and Tribal funding sources)	• Unique LMI rate design • Microgrid w/ battery • Service delivery of distinct LI population within a member base (partner with Tribal program branding and comm solar subscriber sign-ups)
Ouachita Electric Cooperative (AR) *Up to 7,000 members (generally)* *~3,930 members are in poverty (21.4%)* *~ 66 LMI participants to start in a pilot*	1 array of 600KW – 1MW of PV	• Reduce the cost per watt for LMI members and extend the time for financing to eliminate the co-payment on the members' end. • Possibly leverage state LIHEAP funds to support LMI participation	• Member participation via net metering • Design a program that extends its PAYS program to solar programs and include more LMI participants

How is LMI Defined?

To include both low- and moderate-income households in ACCESS metrics and evaluation, the ACCESS project is adopting 200% of the Federal Poverty Level (FPL) as a single, national average income calculation and measurement standard to guide how populations we discuss are characterized as Low and Moderate Income. We will determine what percentage of ACCESS co-op's members are below 200% of the Federal Poverty Level to assess pilot program impacts. The following are some useful statistics for reference:

- Nationally, 200% of 2020 FPL for a 4-person household is $52,400.
- The median U.S. household income in 2020 was $68,400.
- Moderate income (50-80% of AMI) using the median U.S. household income would be $34,200 - $54,720.
- However, according to a 2018 report by the American Council on an Energy Efficient Economy (ACEEE), "About 41% of households in rural areas have incomes below 200% of the federal poverty level (FPL), compared with roughly one-third of urban households." [12]

[12] *The High Cost of Energy in Rural America*, Lauren Ross, Ariel Drehobl, and Brian Stickles, American Council for an Energy Efficient Economy, July 2018, Available from: https://www.aceee.org/sites/default/files/publications/researchreports/u1806.pdf

Poverty levels vary among the ACCESS co-ops. Annual household income profiles for each participating co-op can be seen in the table below:

ACCESS Leader Co-op Name	Households with Income Less than $15,000	Households with Income $15,000 to $24,999	Households with Income $25,000 to $34,999	Households with Income $35,000 to $49,999
Anza Electric Cooperative	8.5%	7.2%	10.6%	15.1%
BARC Electric Cooperative	10.4%	8.1%	9.1%	12.5%
Kit Carson Electric Cooperative	18.6%	11.9%	11.2%	15.2%
Oklahoma Electric Cooperative	7.9%	6.6%	7.5%	11.1%
Orcas Power & Light Cooperative	8.5%	7.3%	8.3%	12.2%
Ouachita Electric Cooperative	17%	12.4%	12.2%	14.3%
Roanoke Electric Cooperative	16.2%	11%	11%	13.4%

Source: NRECA data, 2019

From NRECA's own research, the average income for co-op-served households is approximately 12% lower than the national average. Nine-in-ten (90%) of electric co-ops serve territories in which the average household income (HHI) is below the national average, and four-in-five (80%) serve territories where the average HHI is lower than their states' average.

ACCESS will emphasize solutions for all rural lower income households, regardless of a well-defined "income dividing line."

An added challenge through 2020 and currently is the COVID-19 pandemic, which has brought widespread economic suffering– causing significant losses of income, catalyzing home abandonment and food insecurity in many communities. ACCESS will remain sensitive to both chronic and more recent economic challenges for rural households by monitoring the Federal government's income definitions, set through the Census Bureau. The U.S. Department of Housing and Urban Development and USDA Rural Housing Service both use Census data establishing income levels for public housing eligibility, for example.[13] The government bases eligibility for many government benefits – SNAP, WIC, LIHEAP, WAP - through Federally-defined income status, establishing annual levels for household income adjusted for household size.[14] These figures update each year in January. Income levels using 2020 data will undoubtedly be dramatically lower than previous years, due to the impacts of COVID-19. Furthermore, slower economic recovery patterns in rural areas may depress income levels for the next decade.

[13] See: https://www.huduser.gov/portal/datasets/il.html
[14] See: https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html

Descriptor	Percentage of Relevant Area's Median Family Income
Low Income	<50
Moderate	50 to <80
Middle	80 to <120
Upper	≥120

Source: US Department of Housing and Urban Development, Office of Policy Development and Research, (PD&R).

Area Median Income is used to calculate many Federal benefits, and can be calculated for specific states, counties and census tracts using the HUD USER tool: https://www.huduser.gov

METRICS – How ACCESS will Measure and Evaluate Its Pilot Programs

To create comparable data across ACCESS projects, participating co-ops will be asked to report data according to a set of shared metrics. These metrics were selected from the Department of Energy's issue brief *"Using Data to Set Priorities and Track Success of Low-Income Energy Programs,"* developed as a part of the Clean Energy for Low Income Communities Accelerator (CELICA).[15] The included metrics were selected based upon 1) the ability of participating rural electric co-operatives to capture and track the appropriate data, and 2) their applicability to the ACCESS project goals.

The success of the solar projects completed as a part of the ACCESS field tests will be measured according to the identified goals of the ACCESS program, and are placed in three categories:

- **Increase participation:**
  - Maximize the number of households who benefit
    - Total Participation – Sum of the total households participating
  - Ensure access to LMI households
    - Participation by Income Level: Percent of participation made up of LMI households

[15] US Department of Energy, Office of Energy Efficiency and Renewable Energy, Better Buildings Program: See: https://betterbuildingssolutioncenter.energy.gov/CELICA-Toolkit

- LMI Participation: Percent of identified LMI households who are participating in program
- Housing Type: Percent of participation by housing type (single family versus multifamily)
- Number of Homes with Health and Safety Issues: Number of program applicant households who were not able to participate in the program due to health and safety issues at their residence (may not apply to all programs)
- Percentage of Homes with Health and Safety Issues: Percentage of total program applicant households who were not able to participate in the program due to health and safety issues at their residence (may not apply to all programs)

➢ **Deliver savings:**

- Reduce energy burden for participants
  - Dollar Savings: Aggregate cost savings for participants
  - Average Cost Reduction Percentage: Average cost savings for participants
  - Average Change in Electricity Usage: Average annual change in energy usage for households
- Maximize cost savings toward LMI households
  - LMI Percentage Savings: Percentage of the cost savings delivered to participating low- and moderate-income households
  - Cost Reduction: Percentage reduction in energy burden for participating low- and moderate-income households

➢ **Reduce financing costs:**

- Minimize cost impact to the participating co-op
  - Total Program Funding: Total funding leveraged as part of solar program
  - Total Program Investment Financing: Total amount of investment financed, e.g. through the housing tax credit projects, on-bill programs, etc.
  - Expenses for on-going operations: Estimated annual cost to manage the program
  - Cost per LMI member of program: Total cost of the program divided by the number of low- and moderate-income households

Workforce development metrics, such as the number of jobs and contracts created, will not be measured, as they are not in-scope for ACCESS.

Additional information on metrics to be used by the ACCESS program is included in the Appendix.

Chapter 2: Market Analysis for Solar Affordability

Ownership Models for Solar

Residential consumers may access solar energy in several ways. Households may purchase solar energy that is generated by their co-op or through a community solar project. This model is known as "front-of-the-meter" (FTM). In this model, the utility will include any costs for solar energy in the given monthly utility bill to the consumer. Households may alternatively own their own solar photovoltaic (PV) panels mounted to their rooftops or installed on raised structures anchored to the ground on their property. This ownership model is known as "behind the meter" (BTM). Rooftop solar panels are often not an option, however, because some consumers live in a shaded area or they live in apartments or dwellings in which they do not own the roof.

"Behind" and "front" of the meter solar designations are relative to the utility, not the customer.

Example of BTM: Rooftop Solar
(Source in graphic)

Example of FTM: Solar Farm
(Courtesy of Oklahoma Electric Cooperative)

In this chapter of the Gap Analysis, we will discuss market trends for solar energy, including the benefits of FTM versus BTM for low- to moderate-income (LMI) households. We will also briefly discuss policies and behavioral patterns regarding energy use that may highlight where cooperatives can address service gaps in solar access for LMI members.

Front-of-the-Meter Solar for Distribution Cooperatives

For economic and structural reasons, FTM solar power has become increasingly affordable relative to other sources of power. In many cases, adding solar generation to a cooperative's resources can lower its overall power supply cost. Lower power supply cost can then be passed through to members via lower monthly utility bills.

Due to decreasing capital costs, improving technologies and increased competition, the unsubsidized levelized cost of electricity (LCOE)[16] for FTM solar power has seen significant historical cost declines in recent years (Lazard, 2020).

The relative affordability of FTM solar power (or utility scale solar that is directly connected to the grid) for an electric distribution cooperative depends on what it will cost to build the solar installation versus the cost of the power being retired or displaced by that solar generation. The cost of procuring solar power can be estimated by modeling the LCOE of owning the project.

The LCOE of a solar project is primarily driven by the upfront capital costs and the expected capacity factor of the project. Capacity factor potential in particular will drive variations in the LCOE of solar from project to project, because solar irradiance varies throughout the United States. In other words, **the potential economic value proposition of a solar project is not standard** and will be unique for each project.

Federal Investment Tax Credit (ITC)

One factor that has influenced affordability of solar PV over recent years is the Federal Investment Tax Credit (ITC). The solar ITC has been a key federal policy aiding the growth of the domestic solar industry. For FTM solar projects, the ITC allows a federal tax credit claimed against the tax liability of the business that installs, develops and/or finances the project. The federal ITC allows owners of residential solar systems to deduct a percentage of upfront price paid for installation from their taxes.

The ITC provided a 30% tax credit prior to 2020 but is currently phasing down and now provides a 26% tax credit as of early 2021. The schedule of the phase down is as follows:

- 2020–2022: Owners of new residential and commercial solar can deduct 26 percent of the cost of the system from their taxes for projects that began construction between 2020 and year-end 2022, provided the project is complete by year-end 2025.

Continued…

[16] LCOE is a lifecycle measure of initial, fixed and variable costs on a present value basis. It represents the average revenue per unit of electricity generated that would be required to recover the costs of building and operating a generating plant during an assumed financial life and duty cycle (U.S. Energy Information Administration, 2020). LCOE ignores important economic and technical evaluation factors, but it can be utilized as a summary measure of the overall competitiveness of different generating technologies.

...continued:

- 2023: Owners of new residential and commercial solar can deduct 22 percent of the cost of the system from their taxes for projects that begin construction in 2023, provided the project is complete by year-end 2025.
- 2024 onwards: Owners of new commercial solar energy systems can deduct 10 percent of the cost of the system from their taxes. There is no federal credit for residential solar energy systems.

Congress may change how the ITC is administered or alter tax policy completely at its discretion. Importantly, the solar ITC was recently extended at the end of 2020 with the passage of the Consolidated Appropriations Act of 2021, which was signed into law on December 27th. The law included several clean energy provisions, but the primary impact to the solar industry was extending the previous ITC schedule by two years at the then prevailing rates. This Gap Analysis provides tax policy considerations as of Winter 2021.

This topic warrants close monitoring from the cooperative industry. For tax-exempt cooperatives, the ITC is of particular importance in terms of deciding to own solar capacity directly versus executing PPAs with Third Party Ownerships (TPOs).

For community solar projects, the IRS has issued a private letter ruling addressing community solar projects which allowed partial owners to receive a pro rata share of the costs as a tax credit also.

NOTE: IRS private letter rulings (PLR) are issued to a requesting taxpayer. The PLRs interpret and apply tax laws to the taxpayer's specific set of facts. A PLR may not be relied on as precedent by other taxpayers.

Procuring Solar via Third Party Ownership (TPO)

Purchasing solar directly from a for-profit TPO that can readily harness the available tax benefits can be an efficient way for distribution cooperatives to access lower-cost solar, achieving both economies of scale and minimizing risks. Although there are instances of cooperatives with taxable subsidiaries, many distribution cooperatives do not have sufficient tax appetite to readily take advantage of these benefits directly. Further, the transaction costs involved in harnessing these benefits via tax-advantaged financing models (e.g., tax equity partnership flip[17] and operating lease) are often too high to make sense for smaller solar projects, particularly those under 2 MW. Another primary benefit includes risk mitigation, as contracts can be drafted to minimize risk by allocating responsibilities to the third party, as well as

[17] See Chapter 3 of this Gap Analysis for further details on ownership options.

negotiating appropriate indemnification and limitation of liability clauses in an agreement (NRECA, 2018).

In recent years, the utility industry has procured most of its solar supply via power purchase agreements (PPAs). According to the Smart Electric Power Alliance, from 2015 to 2018, PPAs accounted for between 75% and 88% of all utility-supply solar deployed annually.

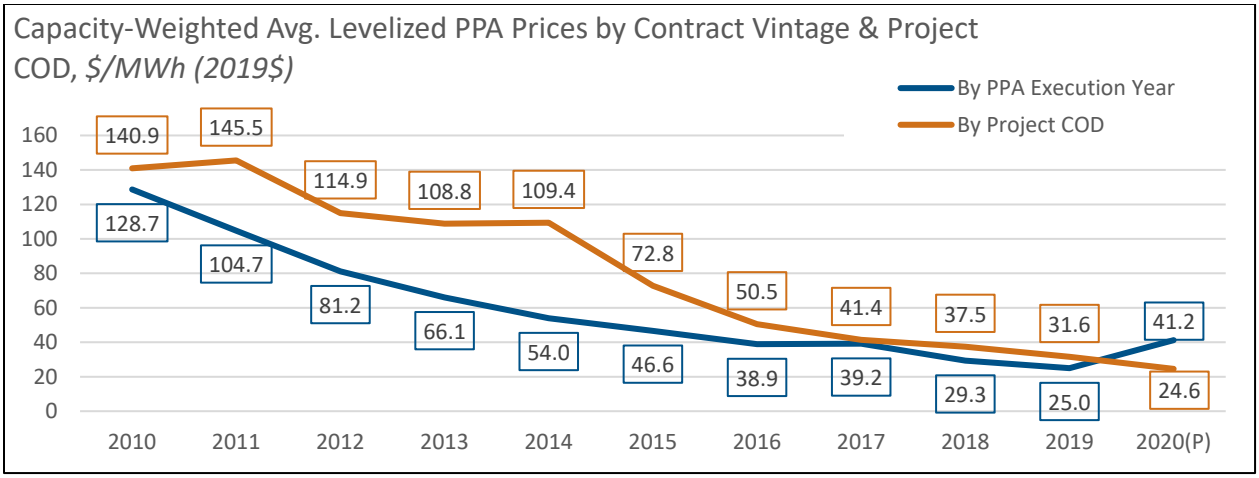
TABLE 5: ANNUAL UTILITY-SUPPLY SOLAR DEPLOYMENT BY DEPLOYMENT TYPE (MW-AC)

	2015 CAPACITY	2016 CAPACITY	2017 CAPACITY	2018 CAPACITY
PPA	2,980.6	5,710.7	3,172.6	3,112.9
MERCHANT	249.9	245.0	164.4	163.4
UTILITY OWNED	204.4	500.1	290.2	898.0
TOTAL	3,434.9	6,455.8	3,627.2	4,174.3

Source: Smart Electric Power Alliance, 2019

PPA Price Trends

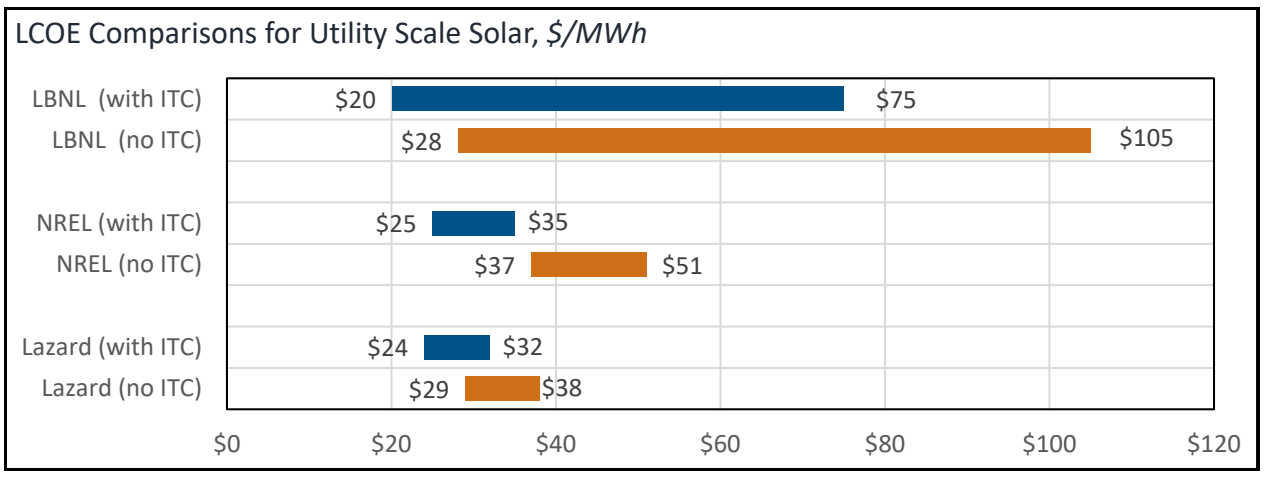
Across the major U.S. power markets, most recent PPAs for FTM solar projects are currently hovering around $25–$35/MWh from 3Q 2018 through 3Q 2020 (real 2019$) (Bolinger M. , Seel, Robson, & Warner, 2020). Capacity-weighted PPA prices declined at a 22% compound annual growth rate (CAGR) from 2014 to 2019, primarily driven by lower installed project prices, and to a lesser extent, an increasingly competitive developer landscape. The PPA prices in the chart below reflect the receipt (or anticipated receipt) of federal and state incentives, although it is not possible to determine the exact level of pass-through from the project owner to the contracted buyer.



Source: LBNL, Utility-Scale Solar Data Update: 2020 Edition (November 2020)

LCOE Trends for Utility Scale Solar

Based on research from the Lawrence Berkley National Laboratory (LBNL), the median unsubsidized LCOE among utility-scale operational solar PV projects was $40.6/MWh in 2019 (with a range from $28.1 to $104.9/MWh) and has declined at a 19% CAGR from 2014 to 2019. The median LCOE that includes the 30% federal investment tax credit (ITC), which provides a better comparison to PPA prices, was $28.8/MWh in 2019, and has declined at an 18% CAGR from 2014 to 2019. The chart below provides a comparison of prevailing LCOE ranges for FTM solar projects, as reported by prominent solar industry publications.



Sources: LBNL, Utility-Scale Solar Data Update: 2020 Edition (November 2020); NREL, U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2020 (January 2021); Lazard, Levelized Cost of Energy Analysis – Version 14.0 (October 2020)

If the co-op is procuring the solar project through a PPA, then the co-op can calculate overall potential savings by using the rate of the PPA as the cost basis. If the LCOE or PPA rate of a solar project is lower than a cooperative's power supply costs, the project should save the cooperative money, as lower-cost solar would be replacing higher cost power supply. For third-party owned (TPO) FTM solar projects, the LCOE is a primary driver of the PPA rate that the owner will require for the project to pencil out.

The LCOE of solar is widely expected to decline in the coming years, driven by expectations of declining capital costs, and to a lesser extent, increasing production efficiency. NREL forecasts the LCOE of FTM solar to decline 18% to 41% by 2025 from the 2018 base year level. The continued decline in capital costs will be essential for solar to remain competitive relative to wholesale electricity costs as the ITC gradually sunsets.

Behind-the-Meter Residential Solar

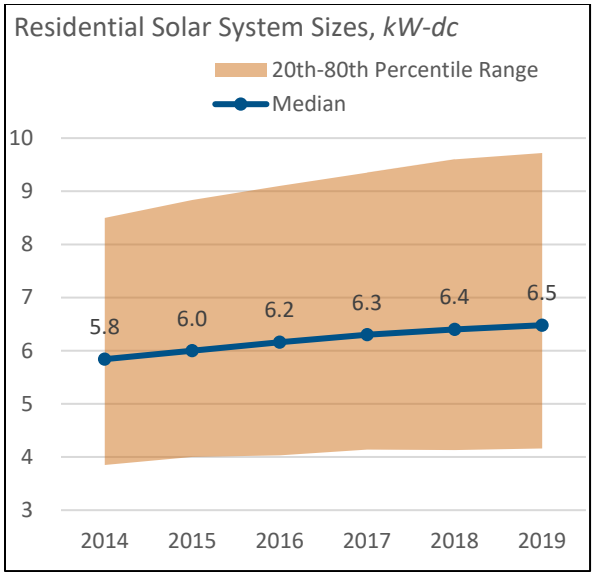
Owning solar is not only difficult for most LMI households because of high upfront costs, but also due to wide variations in solar output and solar cost treatment from the incumbent cooperative or investor-owned utility. Households have different energy usage patterns and are subject to a diverse array of tariff structures across the country. A household's overall energy usage, timing of energy usage and the peak energy usage all impact how a residential solar system would be sized and its potential value for that household. Those same characteristics also impact how monthly utility bills are calculated, and there is no standard cooperative utility tariff structure.

Residential System Sizing

Most residential solar systems are sized to match the household's electricity consumption on an annual basis, despite wide variations in seasonal solar production and in monthly household energy use. Larger solar systems drive higher upfront installation costs, of course. According to the EnergySage SolarMarketplace Intel Report[18], residential solar systems were sized to offset between 86% and 103% of the household's energy needs in the top 10 residential solar states during H2 2020[19].

Most residential rooftop solar systems are sized in a range that would supply the average household electricity consumption annually (between 10,500 kWh and 11,000 kWh).

[18] Data from EnergySage's Solar Marketplace Intel Report: H2 2019 – H12020 (October 2020), accessed from: https://www.energysage.com/data/
[19] H2 – Second half of the year under review



Source: LBNL, Distributed Solar 2020 Data Update (December 2020)

Larger Residential Solar Systems May Be Required in Cooperative Service Areas

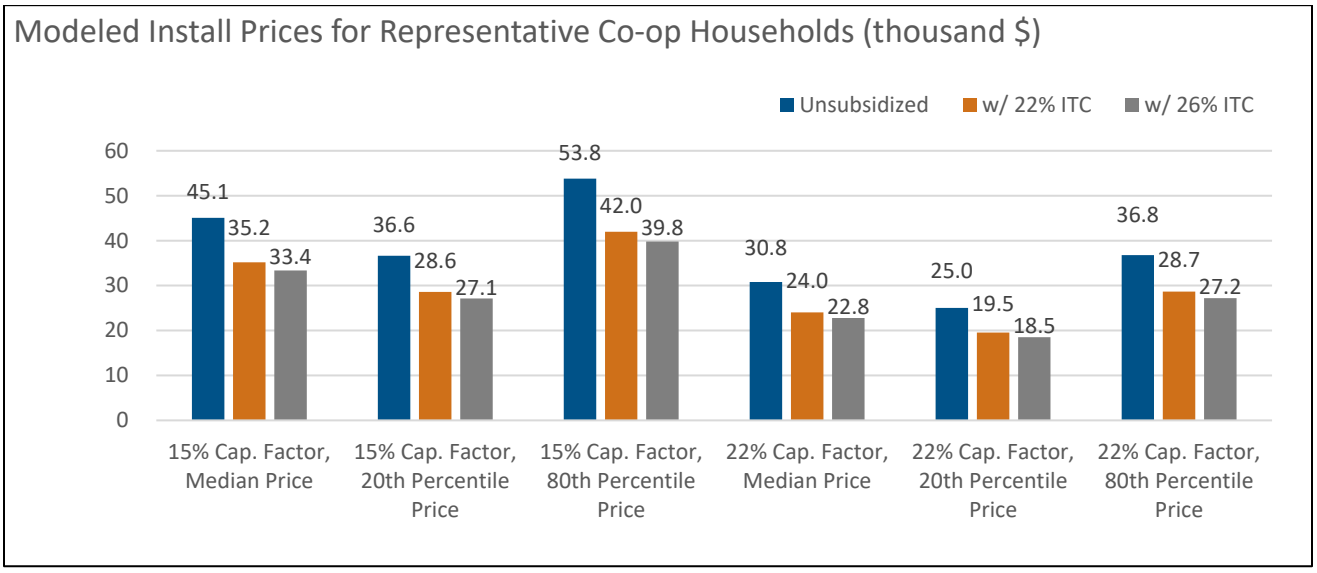
Residential households in electric cooperative service areas generally consume more energy than households in other areas of the country[20]. A few major issues driving the higher residential electricity use in co-op areas, which tend to be more rural/less urbanized, are as follows:

- The largest issue is the prevalence of single unit detached homes in rural areas rather than multi-unit buildings.
- In addition, among these single unit detached homes is a disproportionate share of relatively energy inefficient manufactured/mobile home units (14.4% in co-op areas vs. 6.1% nationwide); older homes are particularly hard to retrofit for greater efficiency.
- Finally, rural households tend to be more reliant on electricity for their primary heating fuel (a major source of residential demand), due to lack of access to piped natural gas (49% in co-op areas vs. 38% nationwide).

Thus, the typical solar installation for a cooperative household may need to be larger. National Rural Utilities Cooperative Finance Corporation's (NRUCFC) analysis shows that the average residential household in cooperative service areas consumed 13,672 kWh in 2019. Assuming a high-level (relative to residential systems) capacity factor of 22%, a residential solar system would need to be sized at 8.2 kW-dc (or 7.1 kW-ac) to produce enough energy to match the typical cooperative household. The required system size grows to 12.0 kW-dc (or 10.4 kW-ac), assuming a low-level capacity factor of 15%.

[20] In 2019, the average U.S. residential utility customer (all utility types) consumed 10,427 MWh, whereas the average residential cooperative utility customer consumed 13,672 MWh. Based on NRUCFC analysis of data sets sourced from Form EIA-861: https://www.eia.gov/electricity/data/eia860/xls/eia8602019.zip

On an unsubsidized basis, the typical cooperative household would need to spend $30,800–$45,100 currently to install a solar project large enough to support most of the household's annual electricity usage, assuming LBNL's reported 2019 median install price of $3.76/W-dc for residential solar systems.



Source: NRUCFC analysis

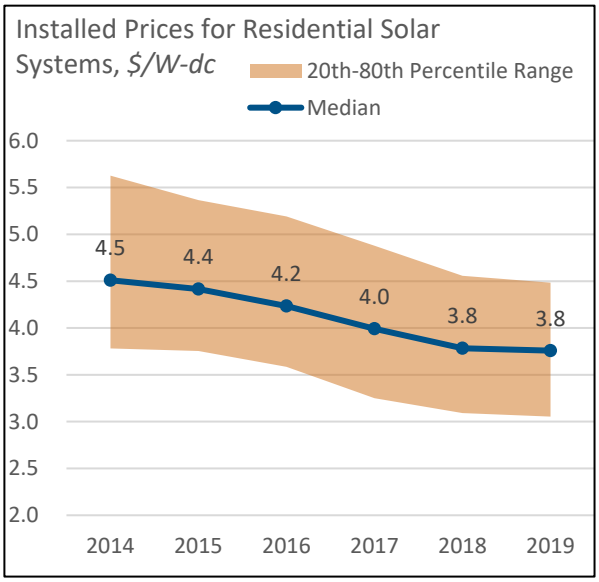
Chart notes: System sized to achieve 13,672 kWh of annual energy production to match average cooperative household annual energy consumption, with two cases for capacity factor assumption, 15% and 22% (AC basis). Inverter loading ratio assumed to be 1.15. Assumed unit prices from LBNL's median ($3.76/W-dc), 20th percentile ($3.05/W-dc) and 80th percentile ($4.48/W-dc) reported installed prices for 2019.

Costs of Residential Solar Systems

Even with dramatic cost reductions in solar power over the past decade, owning a rooftop solar system is still beyond the reach of most low-income households, due to the high upfront costs of installation and the need for good credit to qualify for financing options.

LBNL's empirical data for representative residential system sizes and install costs suggests the median residential solar system costs around $24,400 (based on a 6.5 kW-dc system size at a cost of $3.8/W-dc), and with application of the 2020–2022 level of ITC, that cost would drop to around $18,000 (26% ITC level). As the ITC is scheduled to decline, the subsidized system would cost $19,000 in 2023 (22% ITC level). Beginning in 2024, there is scheduled to be no ITC available to residential solar systems.

Representative costs (actual prices paid by the consumer) for these systems are shown below[21] at representative capacity factors[22] for residential systems (around 15% to 22% for most areas in the U.S.)[23],[24].



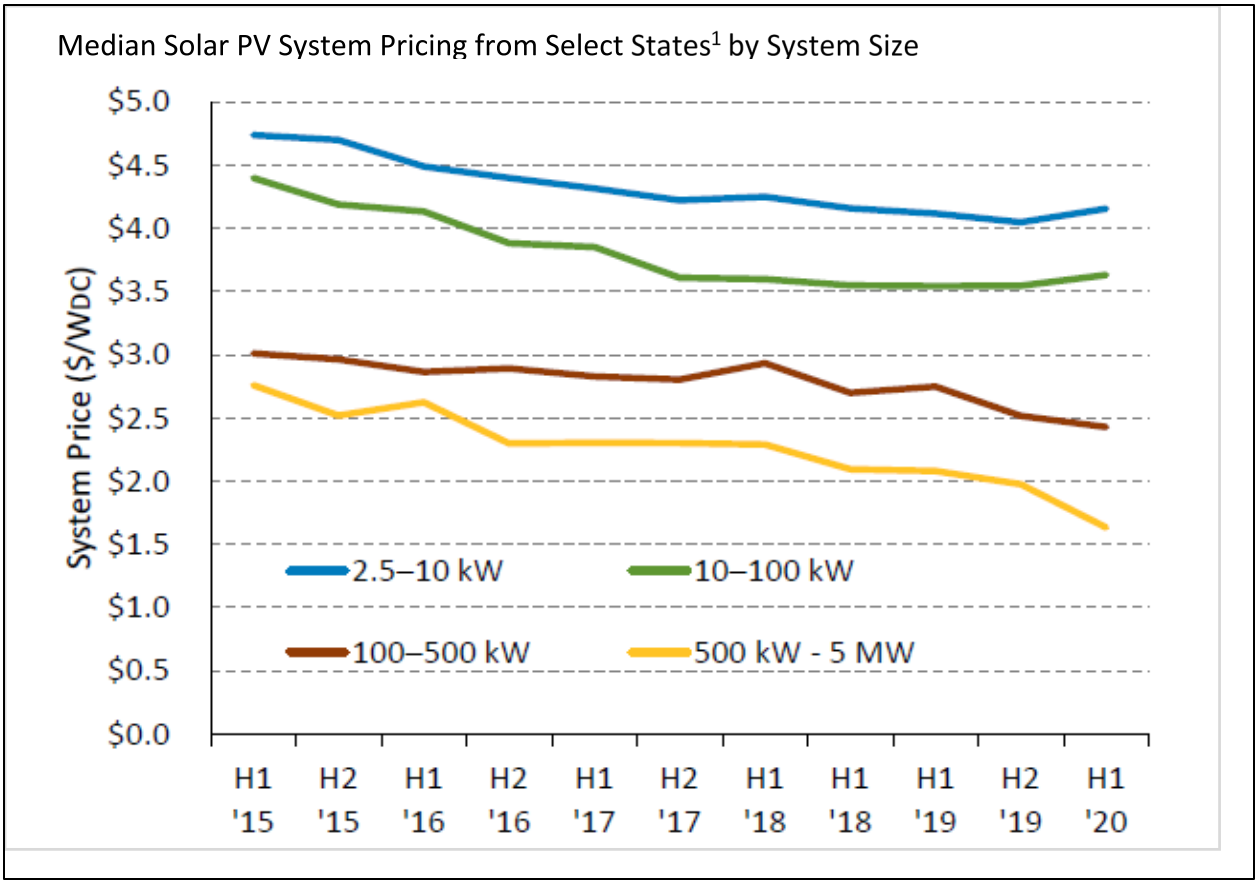
Source: LBNL, Distributed Solar 2020 Data Update (December 2020)

[21] Based on NRUCFC analysis of data sets sourced from Form EIA-861: https://www.eia.gov/electricity/data/eia860/xls/eia8602019.zip

[22] Per industry standard, capacity factors referenced in this report are reported on an AC basis and assume 8,760 hours in a year.

[23] Assuming a typical inverter loading ratio of 1.15 for residential solar systems, a system would need to be 6.2 kW-dc to produce 10,427 kWh at a capacity factor of 22%. At a 15% capacity factor, a system would need to be sized at 9.1 kW-dc to produce 10,427 kWh.

[24] Price quotes from system installers tend to be materially lower than actual prices paid by the end-customer. According to the EnergySage Solar Marketplace Intel Report: H2 2019 – H1 2020 (October 2020), the difference between installed costs nationwide and quoted prices on EnergySage has persisted for over five years. In 2019, the median installed cost of solar was 29% higher than the median quoted price on the Marketplace. Further, prices paid by the end-customer will be higher than the costs borne by the installer.



Data sample includes projects installed in Arizona, California, Connecticut, Massachusetts and New York.
Source: NREL, Q1/Q2 2020 Solar Industry Update (September 2020)

While the ITC is available to everyone, for it to be fully realized at the household level, the household must have enough tax liability. With the ACCESS assumption of average annual LMI rural household income of $52,400 (2020) and using the standard federal tax deduction, the household would have a tax liability of less than $3,000 – usually less than half of potential ITC use for the solar installation cost.

The challenge for LMI consumers to afford consumer-owned solar can be emphasized by the fact that outside of retirement accounts (which allow limited usage for other investments), the median total LMI household savings level is less than $11,000.[25]

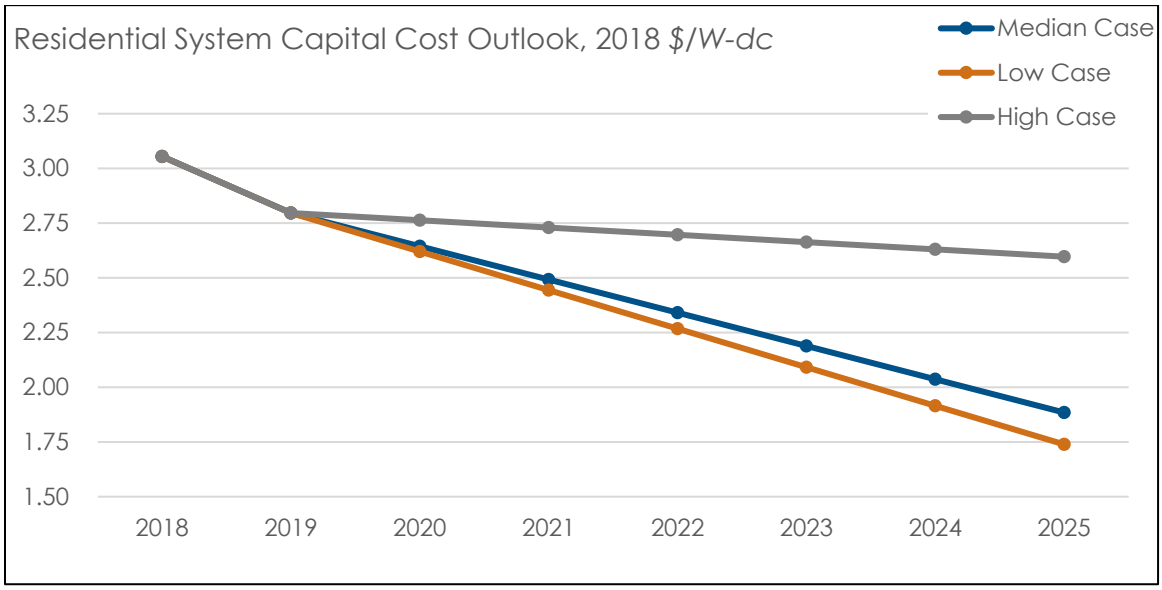
Cost Outlook

Capital costs for residential solar systems are expected to decline gradually in the coming years, but by how much is uncertain. “Soft costs” – the costs to acquire a customer, marketing expenses, developer overhead costs and permitting fees – can add up to 40% to 50% of the total cost of a residential solar

[25] Data source: https://www.depositaccounts.com/blog/average-american-savings.html

system, and these do not have the same potential for significant cost declines as compared to prices for solar hardware (modules and inverters).

Assuming the expected cost declines calculated by the national labs in the coming years are passed through to the price paid by the end customer, costs will have to come down by at least 26% to keep upfront install prices competitive to where they are in 2020 with the prevailing ITC rate. Any cost declines beyond 26% would make residential solar systems more affordable to end customers relative to 2020.



Source: NREL, 2020 Annual Technology Baseline
Note that these projections represent estimated costs from bottom-up cost modeling and market data based on ongoing research from NREL. They illustrate important trends, but do not represent actual prices paid.

Residential Solar Loans, Leases and PPAs

Households that cannot afford (or would rather not pay) the upfront cost of owning a solar system can in some cases choose to finance the system or enter into a solar lease/PPA with a TPO residential solar provider. For LMI households with credit scores (FICO) of less than 680, this may be difficult – few TPOs provide residential leases in predominantly rural states, and even few will provide a lease to low credit score households.

On average, the rates for solar leases and PPAs were 40% higher than the average residential cooperative retail rate and 38% higher than the average residential retail rate (inclusive of all utility-provider types) in 2019. However, 86% of residential solar procured from TPOs occurred in just 6 states in 2019, which typically have higher residential retail rates than average.
Without direct subsidies, it appears unlikely that TPO residential solar is a viable pathway to increasing solar energy access for LMI cooperative households, because the rates for TPO residential solar are generally not competitive with prevailing cooperative residential rates. As with consumer-owned

residential solar, unsubsidized upfront solar costs will need to be substantially lower for TPO residential solar to be affordable for LMI cooperative households.

Net Energy Metering

A factor many consider in evaluating the affordability of consumer-owned solar systems is that of net energy metering. Energy use and solar production varies across the year; Net Energy Metering (NEM) policies recognize and compensate an individual household's energy contribution to the grid, and balance that household's demand and contribution across the year. NEM rates paid to the household solar owner may be the prevailing retail rate, or the wholesale power rate, or a rate calculated and approved by the state utility commission on some other basis.

NEM policies are set at the state level and are not homogenous. Currently, many states are considering changes to NEM, rate design or solar ownership policies. NEM is a highly contentious issue due to a lack of consensus about the value that distributed solar energy provides to the grid, and it is unclear how these policies will evolve going forward.

Chapter 3: Financing Solar for Co-ops

Introduction

As the solar energy market has continued to mature, costs for technology and deployment have dropped significantly. Some cost reductions have come about due to the natural progression of efficiencies in technology production and availability.[26] However, solar costs have also fallen due to market responses to policy, programming and information sharing for solar implementation, such as what NRECA's SUNDA program helped to catalyze. Federal tax policy, most significantly the Investment Tax Credit (ITC; discussed later in this chapter), drove adoption over much of the last decade – helping to spur consistent growth to further drive technical and cost improvements in the solar industry.

Despite cost reductions for the technology overall, financing for smaller (under 5 MW), local PV systems, especially projects that are intended to serve low- and moderate-income (LMI) residential consumers, suffer from financing challenges. The legal and underwriting costs of preparing financing for any solar project are high – so investors generally would rather apply those costs to large solar projects. Small, LMI-targeted solar system financing costs remain prohibitive. For co-ops, reducing solar financing challenges is critical to delivering local renewable energy for rural communities.

The ACCESS team reviewed existing financial mechanisms and pathways that are currently used or could be used by co-ops to implement solar projects, and which have the potential to support projects for LMI consumer-members. ACCESS leader co-ops will test several forms of project financing during their pilot program phases. Some financial challenges that continue to deter solar access for the low- to moderate-income sector include:

- Financial institutions typically assess low- to moderate-income consumers as higher risk for non-payment (assuming high default rates for these customers) and may be hesitant to offer financial assistance. This can also be a factor for commercial investments that serve low- to moderate-income communities.

- Financing options often differ for commercial and residential deployment of solar energy, as is the case with the ITC.

- Financial support to cover energy costs of LMI consumers, such as the Low-Income Home Energy Assistance Program (LIHEAP) federal funding, is focused typically on paying monthly bills (i.e.: immediate short-term aid). Solar projects are designed to reduce energy costs as a longer-term solution. Making the case for the use of limited federal funds for solar installations may be challenging.

[26] Moore's Law is often cited regarding solar energy technology improvements and cost reductions. See: https://www.nature.com/news/the-chips-are-down-for-moore-s-law-1.19338

- Financing structures for community development are dynamic, and energy investments are often influenced by federal and state regulatory structures and tax policies. Cooperatives need to stay updated on policy and financing options, but often lack staffing capacity for this purpose. Some means of obtaining useful information include advisory networks, professional development within co-op staff, and the use of NRECA and state resources.

ACCESS distinguishes between Direct and Indirect financing pathways:

- **Indirect financing pathways** benefit the entire service territory or community, which may include (and benefit) LMI households.

- **Direct financing pathways** are structures that specifically serve or are targeted toward LMI communities.

Indirect Financing Pathways

The banking sector underwrites a significant share of investments in U.S. renewable development. Commonly, this investment is backed by the recurring electricity payments made by consumers to their electric providers. The solar generation assets that provide this supply are either developed by the electric supplier (a utility or electric cooperative, for example) or, increasingly, by a non-utility developer or independent power producer.

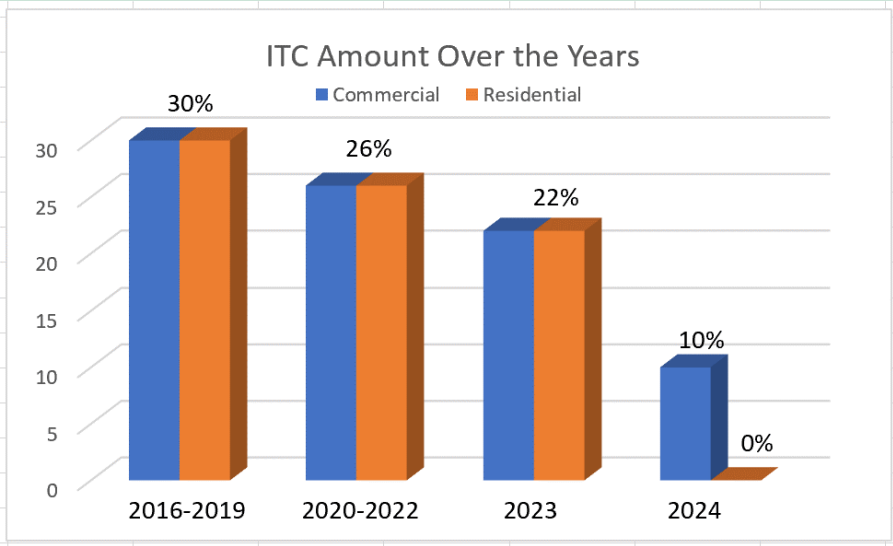
Rural LMI households served by electric cooperatives *may* benefit from this development generally, as part of the larger service territory or community that receives benefit. Hence, we designate this common form of financing an "indirect pathway."

For purposes of this discussion, we will focus on the typical instruments that are used to finance rural electric cooperative solar development or the merchant development that will benefit the electric cooperative. These instruments include: 1) Self-funding, 2) Direct electric cooperative balance sheet financing, 3) Tax-advantaged leasing, 4) Tax equity flip, 5) Third party development (Power Purchase Agreement only), 6) Community development financial institutions, 7) Green banks, and, 8) Credit enhancements such as loan guarantees and loan reserve programs,

Essential to this discussion is understanding how tax benefits have affected solar development. The Investment Tax Credit (ITC) has provided credits for solar deployment projects for both commercial and residential application, which has helped with affordability (see sidebar). It was created in 2005 to help jump-start the market, and has been overwhelmingly successful at incentivizing the deployment of both rooftop and utility-scale solar energy in the U.S. Most bank financing will take advantage of this credit.

The Investment Tax Credit (ITC) for Solar Energy

The investment tax credit (ITC), also known as the federal solar tax credit, allows the deduction of a percent of the cost of installing a solar energy system from federal taxes. The ITC applies to both residential and commercial systems, and there is no cap on its value. It began as part of the Energy Policy Act of 2005. Due to popularity, it has been extended several times. Under its most recent extension adopted in December 2020, it is set to decline to 10% for commercial projects begun in 2024 and beyond, while being phased out completely for residential installations.



However, the ITC - as a federal tax **credit** – only benefits *for-profit* entities that have sufficient tax balances they would like to offset with appropriate credits. Most *non-profit* organizations – including most rural cooperatives, and also churches, universities, municipal governments, and hospitals – cannot make use of the ITC to offset the costs of solar installations on their properties, since they do not have 'tax appetites.'

This has been a significant challenge for electric co-ops. As non-profit entities they are unable to access these tax credits directly, and instead must negotiate complicated financing agreements with for-profit, taxable entities that are able to take advantage of the tax credit, or forego ownership altogether and utilize a power purchase agreement with a third-party owner. However, co-op ownership and operations offer some advantages. Most notably for the goals of expanding solar access is that co-op consumers, through their member-ownership relationship, are partial owners of systems owned by the co-op. Because of this status, co-ops may explore all viable "self- funding" financing pathways for solar projects (see the next page for discussion on self-funding).

Developing utility-scale projects is most viable for co-ops, which can deliver community level benefits, shared across the entire co-op membership. This member aggregation offsets credit risk otherwise assumed by financial organizations.

This section will discuss the traditional sources of electric cooperative solar financing that are specifically geared toward utility-scale projects.

1. Self-Funding

There is a "self-funding" option available for cooperatives. Cooperatives with substantial balance sheet resources may find it most attractive to avoid interest payments and pay the up-front cost of solar from their own equity. Doing so may eliminate the lifetime costs of solar project financing but would require accessing and use of substantial liquid resources. The obvious benefit of this approach is that it can increase the rate of payback, as 100% of the savings and profits generated go directly to the co-op; however, it is important to maintain enough cash flow for ongoing maintenance, new projects, and unforeseen expenditures. As well, self-funding eliminates mechanisms such as power purchase agreements (PPAs) that could possibly deliver ITC benefits to the co-op and could also block the use of other favorable federal tax treatments (e.g. MACRS, described below) – making the co-op's solar project more expensive.

2. Direct Electric Cooperative Balance Sheet Financing

Direct financing simply consists of a cooperative accessing loans or financing and executing the project within its corporate ownership. Although this may be a more expensive route for implementing utility-scale solar projects because no incentives or tax benefits are harnessed, it is by far the simplest and most expeditious route to implementing them. The loans (usually secured by the cooperative's existing and future pool of assets) can be obtained for terms running up to the life of the project (generally up to 25 years for solar PV), at fixed or variable interest rates, and under a variety of amortization schedules (level principal, level debt service, or customized amortization).

Loans to electric cooperatives can be accessed from multiple industry lenders, such as the U.S. Department of Agriculture (USDA)'s Rural Utility Service (RUS), the National Rural Utilities Cooperative Finance Corporation (CFC) and CoBank. These loans typically are made to the cooperative directly, although in some instances they may be made to a wholly owned cooperative subsidiary. Electric cooperatives may prefer to finance a solar project with balance sheet financing and forego the benefits of tax incentives for the following reasons:

- Funding requirements are small, and transaction costs – together with timing considerations – may outweigh the tax benefits available.
- Funding through a traditional cooperative lender offers longer-term financing to cover the estimated life of the project for up to 30–35 years. Annual cash flow requirements for a project will be lower under this scenario. As a result, the cooperative could achieve a positive cash flow earlier than from other financing alternatives.
- Amortization options could include either level debt service payment or level principal payment. Private lenders offer tailored principal amortization options, including full principal repayment at maturity.

Lenders are increasing their solar project portfolios, as technology improves, and costs continue to decline. As with all loans, interest rates can vary widely and may or may not be fixed for the life of the loan; terms and conditions of the loan may also vary widely. Before committing to a loan, it is important for the co-op Board to determine what level of risk it is willing to take on, and for the cooperative to outline a clear and feasible repayment plan to ensure project success.

3. Tax-Advantaged Leasing

Electric cooperatives can also use lease structures to access the benefits of tax incentives associated with the ITC and accelerated depreciation. Typically, lease structures deliver economics substantially like tax-equity flip financing (covered below) – subject, of course, to the return expectations prevailing in the market and the supply-demand dynamics in the tax-equity/tax investor market.

Two varieties of lease structure can be considered: a *sale leaseback* and a *pass-through lease*. Under both options, ITC benefits cannot be accessed if the property is directly owned by or leased to tax-exempt entities.

1. Sale Leaseback

In the sale leaseback structure, the project developer/cooperative sponsor (developer) builds the solar facility (using construction financing) and, upon completion of construction but before placing the project into service, sells the entire project to a tax investor (TI)/lessor who can benefit from the tax offsets and lower the overall cost of the project. Proceeds from a sale of the property are generally used to repay any obligations associated with construction of the solar facility, meaning that the developer assumes the potential upside and risk of any difference between the construction costs and the project sale price. Generally, the TI will be responsible for the operation and maintenance of the facility. The developer would negotiate a PPA with the cooperative for the sale of the energy generated by the project. The developer then uses the proceeds of the PPA to cover its operating costs and make lease payments to the TI.

2. Pass-Through Lease

In a pass-through lease structure, the roles of the lessor and lessee are reversed. In this case, the developer or taxable cooperative subsidiary (blocker) retains ownership of the assets (as lessor) and leases them to the Tax Investor (TI or lessee). The ITC benefits are passed through to the TI that claims them against taxable income. Note that the Modified Accelerated Cost Recovery System (MACRS)[27] does not pass through to the TI, but instead remains with the developer. See sidebar for explanation of MACRS.

[27] Refer to IRS Publication 946 for full rules regarding depreciation.

In this structure, the TI enters a PPA with the cooperative utility off-taker for the sale of the electricity generated. The developer does not receive a large upfront payment from the TI, as it does in the sale-leaseback structure, but rather receives lease payments over time. The developer, thus, must carry the financing costs for development and construction of the project for a longer term. The developer (i.e., the cooperative blocker corporation) is at risk for profit or loss on the project, depending on the lease payments received for it as compared to the construction and other costs.

The **Modified Accelerated Cost Recovery System** (MACRS) is an IRS income tax deduction that allows a business to depreciate, or recover the cost basis of, certain assets over time.

Under MACRS rules, a business may deduct larger depreciations of its assets during the first few years of the asset's life and relatively less later, improving cash flow. Solar property is generally depreciated over 5 to 7 years.

Unlike the previous structure, the lessor generally is responsible for the operation and maintenance of the facility. Also, the TI negotiates a PPA with the cooperative for the sale of energy generated by the project. The lessee then uses the proceeds of the PPA to make lease payments to the developer (cooperative blocker), which uses the revenue to cover its operating costs and any long-term debt obligations. As with the sale-leaseback structure, the terms of the relevant agreements would need to be drafted to avoid the PPA being treated as a lease to the cooperative utility and for the lease to be treated as a true lease under applicable IRS law.

4. Tax Equity Flip

A tax equity partnership flip allows for a tax investor to take advantage of the benefits without a long-term commitment to the project for the term of the lease or power purchase agreement. This ownership structure requires a partnership between the cooperative/blocker corporation and tax-equity investors capable of monetizing the tax incentives. The blocker entity may be a corporation or a single member LLC. A cooperative can still harness the ITC and Modified Accelerated Cost Recovery System (MACRS) without the help of third-party developers by utilizing a tax-equity flip structure. The taxable blocker corporation, wholly owned by their cooperative, is needed to meet the requirements of the tax regulations and harness the tax benefits available for the project and insulate the cooperative from various tax restrictions. In this structure, the cooperative blocker corporation

Tax Equity Flip Model

The co-op and an outside investor (the tax equity investor) would create a taxable special purpose entity (SPE) to develop, build, operate and maintain the solar facility. For example, the equity ownership could initially be 95 percent for the tax equity investor and 5 percent for the cooperative (or for-profit subsidiary). For the first years, the tax benefits and profits would flow according to this 95 percent/5 percent split. After the tax benefits have been exhausted, the structure would "flip" to 95 percent for the co-op and 5 percent for the tax equity investor. The tax equity investor would then sell his residual 5 percent share to the co-op and exit completely.

typically is given a buy-out option in the operating agreement. See Table 3-1 for details on participants in the Tax Equity Flip scenario.

Table 3-1: Participants of Solar Projects Financed with Special Purpose Entity (Tax Equity Flip)

Financial Components	Direction of Cash Flows	Major Participants
Debt	New SPE borrows money and Co-op guarantees payments	CFC, CoBank, or RUS
Equity	Flows from Tax Equity Investor	Tax Equity Investors
ITC and Accelerated Depreciation	Flows to new SPE	U.S. Treasury
Margin (or Profit)	Flows to new SPE	SPE between Tax Equity Investor and Co-op

Source: *The Changing Cost of Solar Power*, NRECA, p. 8

A tax-equity flip allows tax-exempt entities to monetize federal and state tax incentives, thus reducing overall costs. It can be the lowest-cost option, especially for larger projects (> 5 MW). Tax-equity flip financing can also be a low-cost option for smaller projects when they are aggregated/rolled together through standardized master programs — that is, when several cooperatives or smaller projects are implemented with a common tax-equity investor using standardized document sets, structures, and developers. However, it is sometimes hard to locate tax-equity investors for small projects for which transaction costs can be very high. All transactions are subject to future changes in the tax law (although retrospective applications of the change in law to transactions entered into before that change are extremely remote). Changes in tax laws that affect an investor's assumptions may trigger clauses in the transaction documents requiring "make whole" payments to be made to the investor. Such payments typically may involve not only the value of any lost tax benefits, but also the returns expected by the equity investor over the life of the project. Cooperatives should consider the terms of the transaction, negotiate adequate protections, and consider all residual risks they are assuming, if any. It is possible that some of these risks may be avoided at a cost.

5. Third Party Development — Power Purchase Agreement Only

Structuring tax equity relationships requires specific legal and financial expertise that add costs and may prevent co-ops from getting the full financial benefit of the ITC. To simplify the process of accessing the tax credits and to reduce risk, some cooperatives choose to have no ownership role with solar. Instead, they will rely on a third party to own and operate the assets, with part or all the

electricity generation sold to the electric cooperative. In fact, this "Power Purchase Agreement" (PPA) structure is the most widely used vehicle for co-ops to acquire solar generation.[28]

PPAs may be structured in various ways.[29] Typically, a solar developer would negotiate a PPA with the cooperative that would require the co-op to purchase all the power generated by the solar facility at an agreed price for an agreed time period. The solar developer would take all financial risks and enjoy all tax benefits.[30] While easier for the co-op to finance, use of a PPA and third party developer means that a co-op will not own the system, and cannot use its strengths – a skilled workforce and service delivery team, and access to low-cost financing generally – to enhance the solar asset for its members. See Table 3-2 for details on participants of a third-party developer scenario.

Table 3-2: Participants of Solar Projects Financed by 3rd Party Developer

Financial Components	Direction of Cash Flows	Major Participants
Debt	Developer borrows money and guarantees payments	Commercial banks or pension funds
Equity	Flows from Developer	Developer or Tax Equity Investors
ITC and Accelerated Depreciation	Flows to Developer	U.S. Treasury
Margin (or Profit)	Flows to Developer	3rd Party Developer

Source: The Changing Cost of Solar Power, NRECA, p. 3

Co-ops may acquire solar generation through PPAs, and then use that generation in different ways. The co-op may supply the solar power to all members of the cooperative or it may be used to facilitate subscription-based options for a specific community solar program, offered to all or to select members.

Community solar programs structured for specific members will be addressed as a separate section to follow.

Unless there is a change to the ITC and how non-taxable entities can use the credits, co-ops are likely to continue acquiring most of the solar projects they utilize via power purchase agreements

[28] See *The Changing Cost of Solar Power: Financing Options for Electric Cooperatives*, Cooperative Research Network, October 2013, for more detailed explanations of how cooperative may use different forms of PPA financing structures to support solar acquisitions. While produced in 2013, the analysis of PPA structures remains valid. Available at: https://www.cooperative.com/programs-services/bts/Documents/SUNDA/TS_Solar_Power_Financing_Oct_2013_Final.pdf

[29] For a basic explanation of a Power Purchase Agreement, see: https://www.seia.org/research-resources/solar-power-purchase-agreements

[30] To the extent these tax benefits lower the overall cost of the project, some of these savings can be passed on to the purchasing co-op indirectly through the negotiated contract terms, though of course that depends on those negotiations. Additionally, The PPA-only model can be a simple process since the purchasing utilities send out RFPs that enable the developers compete for the PPA with lower cost power.

through solar vendors rather than build, own and operate the systems themselves. NRECA is working on legislation in 2021 which would allow direct pay of tax credits to all its members, including tax-exempt electric cooperatives. The timing and outcome of such legislation is uncertain.

6. Community Development Financial Institutions (CDFIs)

A Community Development Financial Institution (CDFI) and the parallel, overlapping Community Regional Finance Institution (CRFI) are growing sources of local financing in many states.[31] These institutions are distinct from commercial banks, or from more traditional sources of electric cooperative financing. What might these institutions offer co-ops to support LMI solar projects and programs?

CDFIs were developed – separately from other banks and from USDA's Rural Utilities Service federal funding – with a specific focus: to provide low-income and low-wealth people and communities access to affordable, responsible financial products and services; to step in where mainstream commercial banks cannot or will not provide financial services. Often, CDFIs finance housing or housing-related investments to serve low-income communities. According to the Opportunity Finance Network (OFN), the national association of CDFIs with approximately 350 member institutions, CDFIs "provide fair, transparent financing and financial education to people and communities underserved by mainstream financial institutions."[32]

Targeting investments and organizations for support that can address the "gaps in employment, housing, education, health care, [and] access to banking services," CDFIs were created to address long-standing issues of disinvestment, the racial wealth gap, and persistent poverty nationwide. In support of that objective, OFN states that its member CDFIs serve borrowers who are "84 percent low-income, 60 percent people of color, 50 percent women, and 28 percent rural."[33]

Founded in 1973 with a single institution, South Shore Bank in Chicago, CDFIs were originally hyper-local, private lending institutions, and remained place based. After nearly 50 years and repeated updates to federal legislation governing and funding their services, CDFIs as institutions have evolved from small, local lending organizations to encompass community development loan funds, banks, venture capital funds, and credit unions. Except for the venture capital funds, CDFIs offer only debt financing, and since they are nonprofits, they are unable to offer tax equity funding. Cumulative CDFI financing as of 2019 totaled more than $82.7 billion. OFN calculates that its network of CDFIs have helped to generate more than 1.7 million jobs, expand, or start more than 448,000 businesses, and support the development or renovation of more than 2.1 million housing units.[34] For a list of certified CDFI funds, visit the U.S. Department of the Treasury's CDFI Fund Website.

[31] A related entity is the Community Development Credit Union (CDCU) which also presents a possible opportunity for co-ops as they explore LMI solar projects https://www.inclusiv.org/about-us/what-is-a-cdcu/
[32] See: https://ofn.org/cdfis
[33] See: https://ofn.org/OFN
[34] See: https://ofn.org/impact-performance

Leveraging CDFI Resources

CDFIs offer alternative sources of loans and underwriting, distinct from commercial banks, or from traditional cooperative financial institutions, such as CoBank and CFC. CDFIs may borrow from the USDA's Rural Utilities Service (RUS) or Rural Development program directly, then re-lend these funds for their projects – a useful option for co-ops that may not be able to apply directly to USDA funding sources themselves.

Because CDFIs mostly support local projects and businesses, and because CDFI development historically has grown from urban centers of poverty, there may not be a CDFI 'match' for every co-op. However, many CDFIs now have a national footprint and deep enough pockets, i.e. large balance sheets to explore renewable energy financing. Many CDFIs have started to focus on renewable energy project financing but generally, only a handful of CDFIs may have the necessary resources for larger utility-scale co-op solar or efficiency projects. CDFIs may also offer attractive options for co-ops, especially those co-ops that might like to offer On-bill financing (OBF) and on-bill repayment (OBR) programs, but do not have the capabilities to provide those services directly to their members. Co-ops can partner with CDFIs and attract RUS funds for their programs. Co-ops exploring funding for renewable energy projects can check the CDFI locator (members of the OFN association) for a nearby institution that may fit with the co-op's objectives for LMI energy access.

7. Green Banks

One specific parallel institution within systems of alternate finance, relative to commercial banking, is a **"Green Bank."** Green banks provide financing to generate economic activity that addresses climate change. While CDFIs focus on low-income financing, green banks focus on financing climate mitigation projects. These two distinct missions ***may*** overlap for co-ops that seek to finance affordable solar programs for their LMI member-owners.

Green banks launched as a distinct type of financial institution a decade ago. Formed as local or state institutions, many green banks provide loans to support investments in building efficiency, and now include large portfolios supporting solar, wind and other renewable energy sources; energy efficiency investments; and increasingly, electric vehicle, charging and other efforts to shift toward electrification for transit, as well as water and air projects that address local environmental challenges. Active in eight (8) states and the District of Columbia, green banks have invested more than $3 Billion to date in specific climate change projects.[35] Green banks often (but not exclusively) target loans and investments in low-income neighborhoods, addressing energy inequity and weatherization for housing. Green banks' missions are not specific to either rural or low-income populations, though their investments often take place in and benefit enterprises in electric co-op service territories. Green banks historically have received support from Federal and state funds and then leverage these public funds 3:1 or 4:1 with private investments.

[35] See: https://coalitionforgreencapital.com/our-impact/

A new effort led by the Coalition for Green Capital to create a National Green Bank, the Clean Energy & Sustainability Accelerator (Accelerator), launched in 2020 that would seek $100 billion to underwrite the accelerator, delivering financing for smaller projects that cannot secure funding from larger banks.[36] For this effort, the Green Accelerator would target 40% of capital to disadvantaged communities and would target seven sectors, including resilience and agriculture. Co-ops seeking funding for solar and energy efficiency projects may want to include the consideration of green banks as a source of project funding. Working with a CDFI or a green bank to fund partial, targeted portions of projects for co-op members, while aggregating funding from other direct and indirect funding sources, may offer a solution to improve overall project financing that co-ops can explore.

8. Credit Enhancements: Loan Guarantees and Loan Loss Reserve Programs

In addition to direct payments to support solar development for low-income communities, *credit enhancements*, a form of risk management, protect the financial exposure of a lender to losses in the case of a borrower default or delinquency. The credit enhancement can be a pool of funds, such as a portion of the total dollar amount of the outstanding loans, which is placed in a reserve and functions as insurance. One of the most common and widely used credit enhancement strategies due to its ease of implementation is the *Loan Loss Reserve*. It is the setting aside of a limited pool of funds from which the financial entity can recover a portion of their losses in the event of borrower defaults. Typically, the size of the reserves is in the range of several percent up to 10% (i.e. the loan pool coverage ratio) of the amount of capital allocated for the program.

Under loan loss reserve programs, ***public funds*** are held in reserve to cover potential losses that loan providers may incur if a customer defaults on a loan. This can mitigate perceived risk and make it easier for residents with low credit scores to obtain a loan. If a state or local government's goal is to improve the financing options available to the private sector, putting funds toward credit enhancements can be a good option, because they absorb the risk of loss for lenders.

There are numerous examples of states that have employed these credit enhancements to encourage solar development. Until 2021, the state of Massachusetts had simultaneously offered loans to moderate income customers to purchase community solar subscriptions and enabled lenders to benefit from state-funded loan loss reserve accounts to offset credit risk.[37] New York offers a similar program, providing loan loss portfolio coverage to qualified financing lenders to finance solar projects.[38] So too does Colorado, employing a ceiling cap for their loan loss reserve program equal to 15% of the amount of the loan.[39]

[36] See: ibid
[37] See NREL, Low and Moderate Income Solar Policy Basics.
[38] See NYSERDA Loan Loss Reserve Program.
[39] See Green Colorado Credit Reserve. Additionally, see other programs such as Michigan Saves https://michigansaves.org/ and Connecticut Green Bank https://www.ctgreenbank.com/

While credit enhancements cannot be specifically classified as a direct full subsidy, they are an effective tool to mitigate the risk of loan loss and, therefore, increase the pool of commercial funding.

Direct Financing Pathways

The four primary mechanisms for direct financing addressed in ACCESS's Gap analysis report include: (1) electric cooperative funding or "self-funded" LMI projects; (2) federal home energy assistance programs; (3) federal "Opportunity Zones;" and, (4) philanthropic, non-government grants.

1. Self-funded LMI Projects – Capital Credits

Background

Most rural electric cooperatives operate as 501(c)12[40] tax exempt not-for-profit organizations providing electric services to their member/owners. At the end of each year, both tax-exempt and taxable electric cooperatives calculate operating margin, which is the amount by which the cooperative's operating income exceeded its operating expenses during the year.

The excess operating margins are then allocated to each member owner based on the amount of business done with the cooperative throughout the year. Through our outreach effort, we identified a few electric cooperatives that allow all members to apply their retired capital credits toward roof-top solar installations. This section seeks to explain that process. A notable drawback of utilizing retired capital credits, according to our interviews, was that the amount of the credit typically fell far short of the funding required for the roof-top installation.

Retirement of Capital Credits

If the cooperative's board of directors determines it is financially feasible and prudent, would not adversely affect the cooperative's financial condition, and if the cooperative meets the financial requirements stated in its loan documents, then the cooperative retires the capital credits as cash or bill credits to the member owners.

Consider, for example, a cooperative that collects margins. The margins, which show up on the balance sheet as a credit to equity, are used to purchase a new asset or improve existing assets. Perhaps in twenty or thirty years, the cooperative's board approves retiring the allocated capital credits to its members. For many in the rural electric cooperative world, this represents the rotation of capital from one generation to another. For example, the members who paid for the capital investment years earlier are now receiving their retired capital credits.

[40] See: IRS Code for 501 characterization, at: https://www.irs.gov/charities-non-profits/other-tax-exempt-organizations and also, as a specific application of the 501(c)12 within a lead co-op, see: https://www.anzaelectric.org/content/501c12-information

The members are allocated a pro-rata share of the retained equity, based on how much business or patronage[41] they each conducted with the cooperative in that contemporaneous year. When the co-op's board of directors decides, if the cooperative is financially able and there would be no adverse impact to the cooperative's financial condition, to retire the capital credits, that is when the capital credit converts from an allocation to a vested interest or retirement of equity.

The use of capital credits for the purpose of funding solar PV investments on individual homes is not yet widely used and will be explored further in the ACCESS project.

Utilizing Capital Credits for LMI Solar Funding

To gain a better understanding of how a cooperative might utilize its capital credits to increase solar access for LMI members, ACCESS will investigate the following questions during pilot programs with leader co-ops. Note that there are LMI consumer-members in each of the three categories:

- *Current members:* Can the capital credits be retired early, maybe at a discount, and applied to the purchase of community or rooftop solar? Can other current commercial or industrial members assign their capital credits to these (usually) residential member purposes?

- *Former members:* If state law permits, can unclaimed capital credits be used to help LMI members purchase community or rooftop solar? Would this require explicit pre-approval from the former member? (In this case, in a member's initial membership application, or perhaps when the former member left the lines, they would have agreed to terms stating that, if they could not be reached by the cooperative after retirement, then they would allow the cooperative to use their retired capital credits for other purposes.)

- *Special Retirements*: When an individual (not entity) member of record dies, some cooperatives make a special retirement of the capital credits to the heirs or to the estate of the deceased member. Cooperatives may choose, usually if the deceased member's representative or estate agrees, to discount the capital credits to present value. Would a cooperative, if the deceased member pre-approved, allow the funds to be diverted to LMI community or rooftop solar?

Each of these might require the cooperative to investigate with legal counsel, if state electric cooperative enabling statutes or unclaimed property statutes, as well as federal cooperative tax law, permit these changes, revising their bylaws to permit these changes or simply change their capital credit forms granting permission to donate. Additionally, cooperatives might want to seek guidance from the IRS before taking some of these actions, to not jeopardize their 501c12 or cooperative tax status.

[41] **Patronage Capital** (also called margins) is the difference between the Cooperative's operating income and operating expenses for a given year.

Unclaimed Capital Credits

ACCESS participants will explore specifically whether unclaimed capital credits could be used for funding community solar projects. Without an exclusion or exception, many states' unclaimed property statutes apply to unclaimed capital credits. Some state statutes, however, allow electric cooperatives to retain unclaimed capital credits or allow bylaw provisions or board of director actions to retain unclaimed capital credit payments. Some of those states limit the permitted uses of unclaimed capital credits. Typically, in those states, unclaimed capital credits may be used for educational purposes, among other specific purposes. Even if the unclaimed credits cannot be used to fund solar projects directly, if a cooperative is able to use the unclaimed capital credits to educate LMI consumers about solar options available to them, that would be a benefit. Such education was identified by the ACCESS stakeholders as important for advancing solar in LMI communities.

Potential Concerns About Using Capital Credits for LMI

Most of the rural electric cooperatives participating in ACCESS raised concerns over directing funding specifically toward the LMI segment of their membership. Their concerns of potential improper cross-subsidization or discrimination are understandable, as questions and possible unintended consequences may result. Cooperatives need to consider where solar access falls in their priorities and how they may serve the LMI community while ensuring a precedent is not being set for unfair, unreasonable, or improper favoritism toward one member segment over another. ACCESS has noted limited exceptions or carve-outs that can be legitimately applied without improperly favoring one segment of the membership over another. Furthermore, if permitted by applicable law co-ops may choose to direct funds toward different member segments for specific purposes over specific time periods as a matter of co-op independence if by-laws and governance structures allow such decisions.

2. Federal Funding (LIHEAP and WAP)

Federal funds may offer another 'direct' funding pathway to certain co-ops, where state regulation and tax code treatment allows such use.

The Low-Income Home Energy Assistance Program (LIHEAP) is a U.S. federal government-funded program enacted in 1981 that aims to help low-income households with their energy needs. States, tribes, and territories receive LIHEAP funds as block grants, which gives these entities flexibility in using the funds and in determining which households are eligible for funding assistance, while staying within established federal guidelines. LIHEAP funds can be used for managing costs related to home energy bills (heating and cooling), energy crises, weatherization assistance and minor home energy repairs. In addition to helping to pay an eligible household's monthly home energy bill in high energy use months (winter or summer, as designated by the local agency), LIHEAP funds can

be used for energy crises, weatherization assistance and Assurance 16 programs provided for in section 2605(b)(16) of the LIHEAP statute.[42]

Currently, most grantees of LIHEAP funds use the program to support heating and cooling programs for consumers in need. Very few states, in fact, have opted to include use of these energy safety net funding sources for solar accessibility. The most obvious reason that state programs have not systematically integrated payments toward solar or other renewables into federal programs, such as LIHEAP and WAP, is that the need for straightforward bill relief for low-income households chronically outstrips available funding. As well, the cost of solar technologies seemed too high until recently, though advocates have argued that using assistance funds for solar investments over time would reduce or eliminate annual support payments – a short-term temporary relief versus long-term solution argument. Nevertheless, there are several reasons that ACCESS remains hopeful that these programs will ultimately prove beneficial for directly bridging the gap for solar development in LMI communities.

First, while the LIHEAP statute does not expressly call out renewable energy and solar PV as a possible use for LIHEAP funds, supplemental LIHEAP funding is available for current grantees to *"receive competitive grants to implement **innovative** plans to help LIHEAP eligible households reduce their home energy vulnerability."* Current LIHEAP grantees would pursue this additional funding through the HHS REACH[43] program. This supplemental funding may present an opportunity for co-ops to extend benefits to their LMI members.

LIHEAP is managed by the U.S. Department of Health and Human Services (HHS), while another energy assistance program for low-income consumers, the Weatherization Assistance Program (WAP),[44] is managed by the U.S. Department of Energy (DOE). The LIHEAP statute section referenced here gives grantees the flexibility to use LIHEAP funds for weatherization projects and to choose whether HHS, DOE or a combination of both agencies' rules will be used to administer the projects. This gives grantees the opportunity to think strategically as to which weatherization projects to undertake for their communities to make the most of the opportunity.

Section 2605(b)(16), known as *Assurance 16 (*also referred to as Energy Assistance Program Weather Transfer or "EAP-WX Transfer"), allows grantees to use LIHEAP funds to provide services that help households reduce their energy needs and by doing so, reduce their need for assistance.[45] Assurance 16 is already commonly used for weatherization funding. An example of its use for solar can be found in California, where 14,000 rooftop Solar systems were installed in 2009 using this funding mechanism.[46] California has elected to dedicate up to 15% of its LIHEAP Block

[42] Assurance 16 programs are energy education programs to encourage and empower households to reduce their energy use. Assurance 16 support is capped at 5% of the total LIHEAP grant funds available to each grantee. Average benefit varies by program type and by region across the U.S.
[43] Residential Energy Assistance Challenge Program (REACH): The law allows HHS to award supplemental LIHEAP funding for current grantees to receive competitive grants to implement innovative plans to help LIHEAP eligible households reduce their home energy vulnerability. https://www.acf.hhs.gov/ocs/resource/liheap-fact-sheet-0
[44] https://www.energy.gov/eere/wap/weatherization-assistance-program
[45] https://liheapch.acf.hhs.gov/pubs/LCIssueBriefs/solar/renewable.pdf
[46] The policy position within that state was to take a carve-out of the carve-out, if you will.

Grant toward strategic initiatives, and with the governor's approval, this carve out can be raised to 20% of the program's funds. See the sidebar for examples of how states are using funding though Assurance 16 to help consumers in need.

How States are Using LIHEAP Assurance 16 to Assist Consumers

The following are some ways that states are using funding available through Assurance 16 to assist consumers in need:

- Needs Assessments – to determine the needs of key groups such as the elderly, those disabled, and small children,
- Providing energy and financial counseling,
- Conducting referrals to other coordinated services,
- Coordinating assistance with energy suppliers – aimed at reducing disconnections and shut-offs,
- Producing and/or ordering energy conservation materials to give out during outreach, public hearings, client intake, etc.,
- Presenting educational programs on fuel usage, meter reading, household budgeting.

For more information: https://liheapch.acf.hhs.gov/tables/A16.htm#:~:text=Assurance%2016%20activities%20are%20services,higher%20degree%20of%20self%2Dsufficiency.

For more information on the potential use of LIHEAP for solar projects, see our related ACCESS advisory: *Research on Using Low Income Home Energy Assistance Program (LIHEAP) Funds to Achieve Solar Affordability for Co-op Communities in Need.*

Perspectives on the Use of LIHEAP or WAP Funding for Renewable Energy

Co-ops and policymakers at federal, state, and local levels hold differing opinions on the idea of leveraging existing federal assistance programs for renewable energy projects. Because available federal funds are chronically limited relative to the documented needs of the population, proponents of the status quo prefer that these funds be used only for the purpose of direct assistance for LMI households – i.e., to help households cover direct costs related to home-energy bills. On the other hand, proponents of exploring "innovative" uses for assistance programs advocate that integrating solar energy into these programs could provide enduring reductions in LMI households' energy spending and reduce overall demand for energy assistance.

It remains difficult to justify diverting the limited federal funds from either LIHEAP or WAP away from maintaining immediate short-term energy access and toward a longer-term strategy of lowering

costs. At the administrative level, there is also a fundamental lack of understanding in how to create an equitable program at the state level that achieves the dual aim of LIHEAP and WAP while addressing solar accessibility. DOE and HHS have taken steps to provide such guidance. A few states that have successfully integrated solar with energy assistance funds include California, Colorado, Minnesota, Vermont and Oregon, and additional states are making progress. Since there is not yet a set standard approach, proponents for innovative funding applications will need to continue exploring pathways and projects that demonstrate long-term benefit to all parties.

ACCESS will conduct additional research to further understand how various states have utilized federal funding to lower the energy cost burden through solar development. The lessons learned and resulting resources will be shared publicly with the aim that a greater number of states (and by extension, rural electric cooperatives) can benefit.

At this point, there are initial findings in this gap analysis that reinforce why LIHEAP and WAP may prove critical for bridging the financing gap for solar access to the LMI community. We have outlined these findings as well as some of the related challenges below:

- ***Qualifying the "Target LMI Community" and connecting with that target community.***

  Although both LIHEAP and WAP are national or federal programs, both are administered at the state level with quite a bit of autonomy. As such, it is important to note that the programs can vary greatly state by state. Yet, all the state programs share the requirement that program administrators define eligibility and identify low-income Americans who are eligible for federal energy support – usually by requiring proof of total annual household income. This identification is critical, as it provides a clear definition of the LMI target community and is a well-established conduit for connecting to that community. That said, some states use their own defined method of income verification, so those that qualify as "LMI" may differ state by state. Nonetheless, having a defined category for low- to moderate-income consumers is essential for developing programs to meet their needs.

  Despite being issued by two different federal agencies, both LIHEAP and WAP are implemented by the same local administrative groups, commonly called Community Action Agencies (CAA) or Community Action Program (CAP) agencies. CAPs have been in place for over 50 years, so they are established within the minds of the LMI community. Each state receives a block of funding, and then the local CAP organizations are charged with administering the funding at the local level. It has been estimated that these important go-betweens deliver more than 90% of federal block grant resources to local communities. Each of these CAPs has a certain level of autonomy, and typically, different departments or staff within the CAPs organizations handle LIHEAP and WAP, so there may not be tight coordination of the funding available through the two different programs.

- ***Customer "acquisition" costs are high for community solar programs***.

The costs of identifying qualifying consumers, educating them on the opportunities of energy options, and signing them up for programs are often barriers to implementation. Most solar developers have little experience with identifying LMI families. Moreover, a significant portion of community solar project costs are associated with building community "awareness" and signing on new customers. Co-ops and ACCESS stakeholder representatives confirmed the importance of collaborating with local agencies (housing authorities and CAPs) to properly identify and communicate with LMI households in their service territories. Upfront cost of customer acquisition for community solar programs can be substantially reduced through such coordination.

Cooperatives have strong, long-standing relationships with their members, and have become a trusted resource for energy information. This makes the involvement by cooperatives in coordination with local agencies a significant benefit for the success of reaching the LMI community and effectively communicating solar options. An example can be found in Colorado[47] (see sidebar).

Example of Coordinated Efforts to Reduce Acquisition Costs

Colorado was the first state to mandate a low-income residential carve-out for community solar projects in 2015. The Colorado Energy Office and Energy Outreach Colorado (EOC) (partners in the U.S. Department of Energy "Clean Energy for Low Income Communities Accelerator" program) leveraged the network of income-qualified and previously weatherized households to link them to community solar subscriptions. Subscribers in the new community solar model for the state are households served by energy assistance and weatherization agencies. Community Energy, Inc., another non-profit group, worked with Xcel Energy to develop the community solar garden under this program, which was delivered and tested by seven Colorado co-ops and one muni utility. LMI Community Garden services continue today.

ACCESS co-ops and stakeholders affirmed the importance of incorporating federal program coordination as a means of direct financing AND a means to identify LMI eligible members and better communicate with that community. As noted earlier, federal funding used to build awareness of energy subsidies can also be used to communicate solar program availability and lower costs. Up to 15% of most state's overall LIHEAP block grant is intended to inform the public about the program, via Assurance 16 provisions. Most recently, funding to build awareness has also been used as an additional outreach mechanism to make eligible families aware of solar options.

[47] See: Insights from the Colorado Energy Office Low-Income Community Solar Demonstration Pilot Project, December 2017, available at: https://www.colorado.gov/pacific/sites/default/files/Insights%20from%20the%20CEO%20Low-Income%20Community%20Solar%20Demonstration%20Project.pdf

- ***LIHEAP focus on "Self-Sufficiency through Assurance 16."***

  One of the more promising aspects of the LIHEAP program is that a portion of the funding is intended to be used toward household "self-sufficiency" — this appears to be the forcing mechanism that will enable states to allocate funding for LMI-targeted social development. As previously indicated, LIHEAP's Assurance 16 has been regularly used for weatherization, and more recently for roof-top solar, under the goal of assisting consumers to become 'self-sufficient' and no longer need assistance for energy costs.

  The amount of LIHEAP funds available for such investments depends on annual energy assistance needs. From our initial review, it seems that energy assistance needs fluctuate every year based on weather. Milder weather might trigger a decreased demand for direct aid and allow a greater allocation toward lowering long-term costs, through efforts such as solar investment, as a means of achieving self-sufficiency. More broadly, lower-than-normal heating degree days (for those states that apply the funding toward space heating support) or cooling degree days (for states that apply funding toward air-conditioning support) might result in available LIHEAP funding, with greater funding available for solar development.

  Further research is needed to understand which states are optimally using LIHEAP and how, and what options are available so that the purpose of LIHEAP (emergency energy bill funding for LMI households) remains intact.

- ***Additional obstacles and challenges for utilizing federal home energy assistance programs for solar development.***

  - Many LMI consumers rent their homes and may only live in that property for a relatively short time, as compared to owner-occupied homes. This presents several challenges to utilizing federal home energy assistance programs – both LIHEAP and WAP – for solar development, given that it is a relatively long-term investment. Tying solar improvements to a meter rather than an individual offers one solution for use of LIHEAP, while ownership of the property is required for utilizing WAP funds for solar. ACCESS will explore further pathways for both these federal energy funding programs.

  - LMI communities often lack "agency" or a sense of control in electing what type of energy they would like to utilize. So, the idea of "opting in" to a solar program is novel and, therefore, can raise barriers for either roof-top or community solar programs. By extension, working through a well-established, locally recognized administrator who is already charged with providing energy bill payment support can be enabling.

  - Given that LMI households might not occupy the same address for an extended period, providing access through a monthly 'subscription' at the electric cooperative level might prove the most accessible route for addressing solar access. This dovetails into a second consideration for use of LIHEAP funding for solar, namely, timing. LIHEAP funding

requires the household to verify its eligibility *annually*. Again, matching solar services to a similar timeframe (through monthly or annual community solar subscriptions, for example) may be more effective than installing rooftop solar systems on a dwelling that may serve multiple families over the years. This is a real hurdle for financing.

One State's Perspective on Using Federal Funds for Low-Income Solar Programs

The following are comments and insights provided by Ryan Harry, Colorado Energy Office

- *If you're a state that just has DOE funding [through the Solar Energy Technologies Office, or other Energy Efficiency & Renewable Energy Administration programs], and maybe some LIHEAP funding, I would recommend #1- use some of the DOE support to leverage additional funding (can tap funds to hire someone to write grants to leverage capital). Also tap DOE funds for Training and Technical Assistance efforts. And speak with your LIHEAP office to negotiate some money for solar activities.*
- *If a state includes weatherization or solar in its state energy plan, there is much more flexibility in allocating funds to different mitigations. Up to 15% of entire LIHEAP block grant can be used in more innovative fashion – energy assistance to weatherization transfer. In that carve out, much more solar can be installed.*
- *Within LIHEAP, Assurance 16 provides funds for service providers to support outreach to their clients. Intended by authorizing legislation to reduce dependence on energy assistance, these funds can be leveraged for solar programs.*

3. Opportunity Zones

Under the Opportunity Zones program, investors get tax credits for investing in low-income areas. On the surface, this program would appear to be a good resource for directing funding toward the LMI community for solar access. However, there is very little evidence of material development in this space.

The largest obstacle for the Opportunity Zone program to become a functional pathway for LMI solar development is the fact that very few funds envisioned using the program for renewable development in these communities.

According to Green Tech Media, a database held by the National Council of State Housing Agencies (NCSHA) listed only 11 funds focused on renewable energy.[48] Further, the largest of these funds that had any meaningful focus on renewable energy, planned to diversify the $500 million raised toward other investment segments, such as housing, commercial real estate, community revitalization, and economic, hospitality and mixed-use development projects. Indeed, our analysis suggests that only one project, the Oregon-based Obsidian Opportunity Fund, appears to have a primary focus on renewables. Yet, that project is currently held up by the local land use board, so it is difficult to assess whether the project, with a completion date still 3 years away, will be successful in providing LMI solar access.

How Opportunity Zones Came to Be

The Opportunity Zones program was created as a part of Tax Cuts and Jobs Act of 2017. Like the investment tax credit ("ITC") and production tax credit ("PTC"), the concept of was born out of federal tax policies designed to tilt the flow of funds toward investments deemed to be in the interest of the greater common good. However, unlike the ITC and PTC, the underlying tax incentives were not designed with renewable project development in mind.

The fundamental tax incentive associated with Opportunity Zones is deferment, or forgiveness, of capital gains tax with respect to a qualifying investment. The program allows equity investors to defer taxes on gains put into Qualified Opportunity Funds (QOFs), the investment vehicles used to invest in the zones, until December 2026. If investors hold their investments for five to seven years, they can increase their basis on the investment by 10 and 15 percent, cutting tax by an equal amount. If they hold the investments for at least a decade, any extra gain on the investment is not subject to federal tax.

4. Catalytic Financing from Grants and Philanthropic Support

Catalytic financing leverages seed funding from external sources (such as philanthropic partnerships) to kick programs off and achieve the necessary scale for continued operation. Philanthropic support for LMI projects would be of assistance to cooperatives in meeting their goals and, in fact, the ACCESS "leader" co-ops have developed partnerships with some donor agencies to move their projects forward. To fund its "SolarShare" project, a hybrid project to provide solar and energy efficiency benefits to its members, Roanoke Electric Cooperative (Roanoke) in North Carolina sought and received support from philanthropic organizations, so that its LMI members could receive a low or no cost subscription to solar panels with an immediate credit on their electric bills. Furthermore, Roanoke plans to leverage those same credits available to the LMI members to offset investment needed to address health and safety concerns that prevent their members from fully participating in their Upgrade to $ave energy efficiency program.[49] Still,

[48] https://www.greentechmedia.com/articles/read/sluggish-uptake-from-renewables-sector-as-clock-ticks-on-opportunity-zones (As of April 2019)

[49] See Roanoke's case study: "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

the general consensus is that grant funding would be a short-term solution, and such programs need to be sustainable without philanthropic support or else they are not scalable.

Next Steps

Through our ACCESS Gap Analysis, we have explored current financial mechanisms that are or could be used by cooperatives to advance solar accessibility for LMI communities. While costs for solar energy deployment have come down over recent years, smaller (under 5MW), local PV systems continue to be costly to finance. Furthermore, while there are a variety of financing options available to the industry, many have not been positioned for solar projects serving the LMI community.
As part of its work going forward, the ACCESS team will continue to work with its stakeholders to investigate:

- Expansion of opportunities to work with local financial institutions,
- Impacts from potential policy changes to the Investment Tax Credit that may make it, or other federal tax benefits, more directly accessible to co-ops and other public utilities/non-profits,
- Leveraging DOE funds, to include training and technical assistance programs,
- Integrating weatherization and renewable energy/solar into state energy plans,
- LIHEAP innovations,
- Philanthropic partnerships, and
- A framework for helping co-ops develop the business case for LMI Solar/LMI Energy Access initiatives.

Chapter 4: Exploring Ways to Engage LMI Consumers in Solar Programs

Introduction

As reviewed in earlier chapters of this Gap Analysis, electric cooperatives have substantial experience with solar installations, and the continual improvements in solar and energy storage technologies are reducing costs and supporting further deployments. Financing challenges exist, but there are some viable options for cooperatives today and the potential for additional pathways in the future. However, a main challenge to implementing solar programs for communities in need is designing programs that help gain the attention and engagement of the low- to moderate-income (LMI) consumers.

Program observations and suggested frameworks presented in this chapter are focused on member engagement – especially for innovative services to low-income households. Member engagement can take many forms, and several examples are presented herein. The ACCESS leader co-op pilot programs will test and explore additional ways to successfully engage consumers in solar programs for the LMI community.

One cooperative's perspective shared during the ACCESS stakeholder meeting:

"As we give members more opportunities to understand their usage and options, they are more willing to engage with us on developing new solutions"

Luis Reyes, Jr.
CEO and General Manager
Kit Carson

ACCESS Leader Co-op Pilot Projects

ACCESS leader co-ops will pilot some promising solutions to current program challenges during ACCESS project years #2 and #3. Specific program barriers to be tested and evaluated are identified in Figure 1:

Figure 1: ACCESS Leader Co-op Work Plans - Alignment with Program Barriers to be Reviewed

Leader Co-op Size of co-op/ # of meters/# LMI members to benefit	Deployment plan (anticipated)	Finance Elements to Pilot/Evaluate	Program Elements to Pilot/Evaluate
Budget Year 1			
Roanoke Electric Cooperative (NC) 14,284 members *~750 LMI participants*	4 to 8 arrays of 250 kW each with storage	• Catalytic Finance • PAYS for Solar – bundled EE and solar service financial terms • Federal funds for LMI solar (WAP)	• Solar PAYS structured on-bill tariff • Hybridization of solar and energy efficiency • Local agency partnership for service delivery • Philanthropic partnerships
Anza Electric Cooperative (CA) 5,100 members *~ 250 LMI participants*	2MW already deployed, Adding 2.4 MW (2 projects; 1 MW and 1.4 MW) + 2 MW/4 MWh battery deployment	• Rate programs (internal IRR) • Battery enabled energy arbitrage pricing	• Special Rate Program • Integration of new technology
Orcas Power & Light Cooperative (WA) 15,198 members *~ 400 LMI participants*	Solar + storage between 500kW & 3MW	• Private Finance (CRFIs/CDFIs) – mixed funding streams • Financial impacts for island-based system and transmission upgrade deferral	• Partnership with local institutions and non-profits for service delivery • >50% LMI community solar
Oklahoma Electric Cooperative (OK) 57,800 members *NA – public benefits*	New 2MW solar addition Benefits Norman Public Schools (50% LI students)	• Mixed funding streams • CDFI for project finance	• Behind-the-Meter systems to serve local school (partnership)
Budget Year 2			
BARC Electric Cooperative (VA) 10,295 members *~600 LMI participants in rural Appalachia*	2.5MW with potential for battery storage; 1.25MW to LMI community solar	• Split revenue streams • Community Solar	• Special Rate Program: Solar-based LMI retail tariff for Community Solar combined with savings from peak demand reductions

Kit Carson Electric Cooperative 28,984 members *115 (Picuris Pueblo)* *Up to 8,000 members (generally)*	22MW of PV and 15 MW of battery storage already deployed Add'l 1.5MW + storage specific to Picuris Pueblo in consideration	• Leveraging Opportunity Zone Incentives • Financing with sovereign nation (CDFI, Federal and Tribal funding sources)	• Unique LMI rate design • Microgrid w/ battery • Service delivery of distinct LMI population within a member base (partner with Tribal program branding and comm solar subscriber sign-ups)
Ouachita (AR) *Up to 7,000 members (generally)* *~3,930 members are in poverty (21.4%)* *~66 LMI participants to start*	1 array of 600KW – 1MW of PV	• Reduce the cost per watt for LMI members and extend the time for financing to eliminate the co-payment on the members' end. • Possible leverage state LIHEAP funds to support LMI participation	• Member participation via net metering • Design a program that extends its PAYS program to solar programs and include more LMI participants

As it is not possible for the ACCESS project to test *every* program design or delivery barrier, even with the extensive coordination between leader co-ops in pilot design structures, program element observations are listed within each section below that warrant further research and pilot testing throughout the U.S. utility system.

Design vs. Delivery Challenges

In the same way that ACCESS has characterized financing pathways as "Direct" and "Indirect," we categorize program challenges as ***Design*** (including innovative technologies and use of "ambassadors" within the community) and ***Delivery*** (collaboration with community partner organizations, subscription prices and processes, and logistics). For example:

- How can cooperatives avoid cross-subsidy and/or perceptions of cross-subsidy when creating payment plans for programs that target low-income members? (*Design*)
- How is the program communicated to members in a way they can understand? (*Delivery*)

Core Program Design Elements

The way that solar programs for low-income households are designed, including program simplicity, communications, ease of registration, payment structures, and customer education regarding energy use, all impact the number of LMI households who participate in solar access programs, the extent of their participation, and whether their needs are satisfied.

This chapter focuses on program designs and delivery mechanisms proposed for the ACCESS projects through a discussion of six core program design elements:

- **Integration of New Technologies:** Including such measures as storage for increased technical and financial health.
- **Special Rate Programs:** Exploring offerings that encourage members/subscribers to shift load to coincide with solar generation via compensation rates for avoided costs, demand response, peak-shaving, backup, etc.
- **LMI Community Solar:** Including such strategies as voluntary cross-subsidization for LMI by other customer segments, whereby individual members, groups of members, or organizations sponsor LMI solar subscriptions.
- **The PAYS® (Pay As You Save®) Model or On-Bill Financing:** Adapting the effective on-bill tariff financing model now used for energy efficiency financing and service delivery to include solar power.
- **Behind-the-Meter Services:** Exploring offerings such as rooftop solar offered directly from the co-op/utility or in partnership with a third-party installer and/or dedicated systems for local schools, government and/or non-profits.
- **Hybridization of Energy Efficiency and Solar Programs:** Including potentially leveraging funding from federal energy programs, such as LIHEAP or Weatherization Assistance Programs (WAP) and applying funds toward LMI solar access.

United Power, an electric cooperative in Colorado, was a leader in developing one of the first community solar projects in the country. United is now piloting an innovative "community battery" program that allows members to purchase a share of the battery system's output to directly reduce demand charges on their monthly electric bills. This program does not currently have an LMI component.

To help ACCESS meet its goals and address challenges connected to program designs, and to indicate how program changes may provide greater reductions in energy burden and increase solar access for the largest number of LMI members, ACCESS partners analyzed these six design elements (and detailed designs within each element category) during a series of stakeholder group meetings in the fall of 2020. Participating stakeholders explored solutions and provided in-depth analysis and discussion of challenges and gaps in various program design approaches. The following sections provide a summary of the discussions and feedback specific to each solar or community solar program design element, including applicable challenges and observations of possible mitigation actions.

Integration of New Technologies

The ACCESS leader co-ops discussed their approaches for integrating new technologies, which have predominately focused on adding battery energy storage systems (BESS) for projects at both distribution and transmission levels. The aim of the ACCESS project regarding energy storage integration is to

introduce and explore **additional value streams** that may have technical, financial, and programmatic benefits for the co-ops, including direct applications for LMI members. While co-ops are increasingly leading in adopting energy storage integration within their systems through innovative approaches,[50] programmatic applications are still novel.

Holy Cross Energy has an affordable housing development project that includes a battery. Read about it on NREL's website.

Pacific Northwest National Laboratory (PNNL), the technical partner on the ACCESS project, is studying the leader co-ops' projects to understand if and how their solar PV assets can be utilized to achieve additional benefits.[51] Smart inverters in solar PVs can be employed to provide various ancillary services to the co-op distribution grids that, if properly monetized, could capture additional benefits for the co-ops from the PV installations. Additional benefits from solar PVs include energy arbitrage, distribution upgrade deferral, outage mitigation, demand response, power factor penalty reduction or avoidance, etc. Information from PNNL's evaluation will be provided to NRECA co-op members at the conclusion of the research.

To support this work, the ACCESS team held a technical session at the stakeholder meeting where PNNL engaged the stakeholders in a facilitated discussion about the opportunities that might exist to support rural utilities on this issue. During the session, the ACCESS team worked with the group to review the concept, discuss the feasibility of valuating smart inverter benefits, and how potential field validations of the concept could be accomplished. Stakeholders offered the following feedback:

- Investors know about some solar value streams; understanding new value streams is helpful and this ACCESS work will help towards that understanding.
- Financial analysis is critical, especially as costs for battery storage is falling in price like how solar PV prices dropped in recent years.

ACCESS Leader Co-ops' Approaches to Integration of Energy Storage

The following provides a brief overview of the approaches to energy storage by the leader co-ops participating in the ACCESS project.

- **Orcas Power & Light Cooperative (OPALCO)**

  OPALCO, which serves twenty (20) of the San Juan Islands in Washington state, has already installed one microgrid system on Decatur Island with solar plus storage to serve its members. This project offers cost savings and benefits through:

[50] https://www.cooperative.com/remagazine/articles/Pages/electric-co-op-battery-energy-storage-breakthrough.aspx
[51] https://www.cooperative.com/programs-services/bts/access/Pages/ACCESS-PNNL-Research.aspx and https://www.cooperative.com/programs-services/bts/access/Pages/ACCESS-PNNL-Report-on-Solar-Project-Valuation.aspx

- load shaping and demand charge reduction
- transmission charge reduction, submarine cable replacement deferral,
- energy cost reduction,
- voltage regulation and outage mitigation,
- demonstration of islanding,
- Volt-VAR control and other advanced control methods, and
- integration of renewables onto the grid (to help reduce intermittency of community solar array).

This next phase of OPALCO's microgrid initiative is a solar plus storage installation on San Juan Island with 1 MW of solar (with room for future expansion of up to 5+ MW), and a 1 MW, 4MWh battery system as part of an overall innovative approach that OPALCO is using with its microgrid to show the benefits of renewables on the grid, benefits of storage on load shaping, capital deferral and outage mitigation, existence of locational benefits, and to extend the benefits of renewable energy to their LMI members. The co-op plans to continue adding microgrid projects to the islands in its service territory.

- **Roanoke Electric Cooperative (Roanoke)**

  Roanoke is working with its generation and transmission (G&T) cooperative, North Carolina Electric Membership Corporation (NCEMC) to install 4 solar arrays of 250kW each with battery storage (1MWh) designed to discharge over 2 hours each day. The new installations will be connected to the feeders (siting nearer to load centers) and not to the substation, which allows Roanoke to reduce line loss by not carrying power over very long stretches of lines from the substation. Roanoke has 12 substations and over 40 feeders across its service territory. Additionally, by siting with feeders, Roanoke can demonstrate the viability of this mode of interconnection and will allow for greater flexibility to install additional capacity.

- **Anza Electric Cooperative (Anza)**

  Anza is also working with its generation and transmission cooperative, Arizona Generation & Transmission Cooperatives. Anza's projects will total 2.4 MW of solar PV and 2MW/4MWh battery deployment. The battery system will be capable of supplying a grid voltage. Additionally, all the deployed solar will be able to synchronize with the battery system to leverage the PV generation to theoretically provide islanded power. Anza's first battery deployment helped the cooperative learn how to operate in island mode and understand peak shaving capabilities.

- **Kit Carson Electric Cooperative (KCEC)**

  KCEC is planning a 1.5 to 2 MW solar plus storage project to serve the Picuris Pueblo tribal community, one of the Native American Tribes within its service area. Current questions are whether

to expand and incorporate microgrid capabilities for an existing deployment or deploy on a new site. KCEC has an existing solar project with the Pueblo.

Observations: Exploring New Technology Integration Pathways

ACCESS partners may explore additional technology pathways with future awards and funding; for now, distinct technology areas offer new and encouraging value streams that ACCESS includes in this chapter for consideration and guidance.

The following areas will be tested during ACCESS:

- Battery storage paired with solar generation for financial arbitrage (co-op as Qualifying Facility (QF)).
- Battery storage enabling peak shaving with savings from avoiding higher cost marginal energy purchases split between the distribution and G&T cooperatives; the distribution co-op delivers savings to its LMI members.
- New PV values (EV charging station, peak shaving, load shifting, black start and resilience enabled by solar, with and without storage).

Areas for potential future analysis could include:

- Available values of distribution sited energy storage for LMI or underserved customers for consideration in programmatic applications, such as resiliency or other locational benefit.
- Available value of transmission/G&T sited energy storage and opportunities for programmatic applications.
- The range of storage benefits; prioritizing to help inform co-op decision-making on potential programmatic applications for storage in ACCESS projects.

LMI Community Solar with Special Rate Programs

Community Solar Efforts

Community solar is a flexible program model that allows for a variety of delivery models for LMI customers. Co-ops are leaders in developing community solar models for their LMI members. As highlighted in Chapter 3 of this Gap Analysis, Colorado's Low-income Community Solar Demonstration Project included seven electric cooperatives, who partnered with the Colorado Energy Office to develop community solar projects that reduced energy burden for low-income members[52]. Other states have since developed similar initiatives that have included co-op participation, including the California Department of Community Services and Development's Low-Income Weatherization

[52] https://www.colorado.gov/pacific/sites/default/files/Insights%20from%20the%20CEO%20Low-Income%20Community%20Solar%20Demonstration%20Project.pdf

Program (LIWP) Community Solar Pilot.[53] These initiatives have had a predominant focus on reducing energy burden through access to solar, in combination with other low-income energy services such as weatherization. They have also generally offered state grant funds for participating co-ops.

Example of an LMI Community Solar Approach

Eric Blank, co-founder of utility and community solar developer, Community Energy, offered his perspective as a utility scale solar developer. Community Energy is one of the industry groups that attended the ACCESS stakeholder meeting.

Community Energy has 12 MW AC of projects in Colorado, roughly half in rural San Luis Valley. State requirements required Community Energy to sign up about 1 MW of LMI customers, which was a challenge in rural areas. Community Energy leveraged a partnership with a community action agency, Energy Outreach Colorado (EOC) to identify customers. EOC helped to ultimately sign up 500-600 LMI customers, a value of $200,000 per year to those LMI customers, or $2 million over 10 years. Community Energy offered EOC a payment per customer signed up. Community Energy was able to aggregate revenue from conventional residential and commercial subscribers, as well as available renewable energy credits (RECs) and tax benefits to then offer free subscriptions to its projects' low-income customers. Partnerships with direct service organizations, such as community action agencies and housing authorities, have been the key to Community Energy's success.

Observations: Long-term Partnerships in Community Solar

ACCESS includes these observations for consideration and guidance.

- Community solar can often be lower cost power than from the typical power supply. If a co-op is diverting the financial benefits from its solar generation and allocating these to LMI members, it may be changing the balance of equity in cost savings away from the overall membership.
- States are interested in supporting models like community solar, both through grants and programmatically.
- State regulation is a key consideration for approaches involving subsidizing LMI customers. Many states allow cross-subsidization (e.g., CO and CA), which allow for more favorable LMI community solar virtual net energy metering (VNEM) or crediting programs. Other states do not

[53] https://www.csd.ca.gov/Pages/Community-Solar-Pilot.aspx

(e.g., VA and NM) and are much more constrained on how benefits can be delivered. This topic should be discussed as a separate category.

- Ensuring that it is clear to members who are receiving savings from community solar on their utility bills that the savings are from their co-op/utility. Engagement and communication to provide dashboards or member education to "see" their solar benefit is helpful.

The following areas will be tested during ACCESS:

- Anza Electric Cooperative is leveraging a community solar approach with its program and plans to offer a virtual net metering model to deliver benefits for LMI members. The co-op is utilizing state grant funding through California's LIWP program to support its delivery model[54].
- Oklahoma Electric Cooperative (OEC) is partnering with the public-school system in Norman, OK to develop solar education and offset electricity use in the schools to benefit the entire community.
- Kit Carson Electric Cooperative (KCEC) is partnering with the Picuris Pueblo tribal community to target solar energy support for Tribal households, using rate, connections, and community liaisons to increase solar adoption.
- Engagement and communication to provide ways for consumer members to "see" their solar benefits is planned for all leader co-op pilot programs.

Areas for potential future analysis could include:

- ACCESS partners may explore additional partnership pathways with future awards and funding
- Additional analysis of state funding sources for community solar would be helpful for co-op reference.

Observations for Piloting Special Rate Designs to Increase LMI Solar Access

To support their community solar efforts, ACCESS leader co-ops are exploring how rate design – a program structure – can help increase solar adoption for LMI households as a complementary boost to financing solutions. Testing or piloting various frameworks for Time of Use (TOU) rates could help drive member and system benefits.

TOU rates may not necessarily need to be based on or connected with community solar; a conventional TOU may be more appropriate.

[54] https://www.csd.ca.gov/Pages/Community-Solar-Pilot.aspx

As noted earlier, there are different views about cross-subsidization for segments of consumers served by utilities. It will be important to change perceptions among co-op members regarding "special" rates for LMI members. Investments in upgraded service and home efficiency improvements pay dividends for the entire community. Engagement should emphasize positive, empowered interactions between LMI members and their co-op.

ACCESS industry stakeholders offered the following feedback:

- "TOU may not be best proxy to value capture ... a better proxy to highest value capture is demand peak use, which does not always occur at same time of day."
- "A TOU tariff will help, but a behavioral component is important to consider as well,"
- "A demand reduction rate could also be explored to meet this goal."
- "A critical peak period could also be integrated, very few hours but a much higher price to the TOU structure." Fort Collins Municipal Utility's rate design was offered as an example.[55]
- "Ontario [Canada] (entire province) has everyone on TOU, nearly 5% of population receives solar, however the province suspended TOU due to pandemic."

One Stakeholder's Perspective on Changing the View of Assistance Programs

"Perhaps we should invest in shifting public thinking about EE/RE/DR programs to see it as an investment in *energy infrastructure* rather than a charitable act to an individual. This is where the opposition to these programs rests, this notion of 'taking money from me to help someone else that maybe I don't think deserves help.'

"Inefficient and unhealthy homes/buildings are a drain on utilities and community resources as much as they are the occupants. Working across the southeast, we see a lot of substandard housing in low-income communities. With the maturation of grid interactive devices and controls, and the rapid decline in costs for on-site generation and battery storage, buildings are no longer the end of the line for electrons, but a two way street where enhanced interactivity can turn housing into grid scale generation, storage, and load shaping assets.

"We have an opportunity to change our perspective of weatherization programs as an act of charity and recognize housing retrofits as an investment in energy infrastructure and community resiliency, rather than as a charitable act to an individual. Remove the social and political issues and focus on the role of buildings as a grid resource."

Wesley Holmes
Southeast Energy Efficiency Alliance,
ACCESS Stakeholder Advisor

ACCESS Leader Co-ops' Approaches to Special Rate Programs

- **BARC Electric Cooperative (BARC)**

  BARC is exploring new approaches to expand its existing community solar offering. It is developing a 2.5 MW solar project, with half of the project dedicated to expanding BARC's community solar program, and the other half dedicated to a "shared savings" arrangement with BARC's generation and transmission cooperative (G&T), Old Dominion Electric Cooperative (ODEC). The solar array

[55] https://www.fcgov.com/utilities/residential/rates/electric

is designed to enable potential future pairing with battery storage. The "shared savings" is realized by both ODEC and BARC in the form of peak demand reductions, and the two organizations will share these savings equally. BARC will use all or a portion of the savings for LMI subscribers through an innovative solar-based retail tariff. The rate structure will need to be accepted/approved by BARC's PUC.

- **Anza Electric Corporative (Anza)**

  Anza is analyzing a TOU tariff for its community solar project, which uses a 1.4 MW solar array, to further address peaks and shift demand and to enhance microgrid capabilities. As a result of its single radial feed system, Anza is currently import constrained, with summer peak predictable in a late evening window.

- **Kit Carson Electric Cooperative (KCEC)**

  KCEC is creating a model that will reduce energy bills for all members utilizing a lower blended cost of power. KCEC is in the process of building a specific rate for LMI and tribal members. This rate is intended not just to lower energy costs but to also help provide renewable energy for every member.

ACCESS co-ops will test some rate designs to measure adoption rates among members. The following will be tested during ACCESS:

- Time of Use rates for solar program participants coupled with an education campaign on load shifting, incenting solar use during peak generation.
- Time of Use rates - incentive levels for encouraging load leveling, load shifting among solar program participants - what incentives at what levels drive desired behaviors?
- How can rates be structured to comply with public utility commission restrictions on cross-subsidy?

Areas for potential future analysis could include:

- Explore potential benefits for integrating TOU rates into specific programs like community solar.
- Consumer perceptions and sensitivities about "special" rates for LMI consumers, and ways to mitigate negative perceptions.

The PAYS® (Pay As You Save®) Model or On-Bill Financing

On-bill financing (OBF), which includes on-bill loans and on-bill tariffs,[56] removes the upfront costs of energy efficiency measures for the residential member. Through OBF, the co-op or lending partner pays the full cost of the measures upfront, and then structures repayment through the monthly utility bill – with payments guaranteed to be lower (due to efficiency savings) than pre-weatherization bills. Co-op's existing OBF programs include weatherization, energy efficient appliances, beneficial electrification,[57] and rooftop solar.[58] In many OBF programs, co-ops conduct on-site energy audits to determine which measures are likely to be cost effective. Members pay monthly installments on their bills until the co-op or lender recuperates their cost. At the end of the term, the member owns the new equipment.

OBF loan installments are calculated in the same way as typical loans – principal, interest, and term. Tariffs are calculated similarly, but co-ops may cap the monthly tariff (and, therefore, total amount financed) to ensure the new bill is less than the old bill would have been. By leveraging U.S. Department of Agriculture's Rural Utilities (RUS) programs such as Energy Efficiency and Conservation Loan Program (EECLP) and the Rural Energy Saving Program (RESP), co-ops typically offer below-market interest rates. Tariff programs, such as Ouachita Electric Cooperative's HELP PAYS and Roanoke Electric Cooperative's Upgrade to $ave, are often Pay As You Save® (PAYS®) programs, a system created by the Energy Efficiency Institute, Inc. (EEI) that ensures program participants receive energy cost savings on their bills each month while still paying their monthly tariff.[59]

On-bill tariff programs that bundle the cost of energy efficiency upgrades with the addition of solar generation present an interesting model. Solar PAYS programs could be income-agnostic and affordable to any co-op member.[60]

ACCESS Leader Co-ops' Approaches to PAYS

- **Roanoke Electric Cooperative (Roanoke)**

  Philanthropic Partnership: Roanoke is working to integrate community solar into its PAYS on bill tariff program, Upgrade 2 $ave. A detailed case study on Roanoke's approach was developed by the ACCESS team.[61] About 40% of participants who apply for Upgrade 2 $ave are not eligible due to

[56] With on-bill loans, a debt amount is associated with the member or meter, depending on the program's structure. With on-bill tariffs, there is no debt or loan payment. Instead, a monthly tariff is associated with the meter. See: https://www.eesi.org/obf/coops/faq

[57] Beneficial electrification refers to replacing direct fossil fuel end uses (e.g., water heaters, furnaces, cars) with electric versions to reduce emissions and lower costs. For more information, see: https://be-league.com/
Program example: Orcas Power and Light Cooperative's Switch It Up! program

[58] Program example: Mountain Parks Electric, Inc. Electrify Everything program

[59] For more information, see: https://www.eeivt.com/

[60] See: *Applying the PAYS System to On-Site Solar to Expand Access for All*, available at: https://groundswell-web-assets.s3.amazonaws.com/lift-solar/Pays+Solar+study+2.pdf

[61] https://www.cooperative.com/programs-services/bts/access/Pages/default.aspx

need for urgent health and safety repairs (such as roofs in various stages of disrepair) on their homes that must be done before the weatherization and solar measures could be applied. This led to a push at Roanoke to find innovative ways to solve the participation problem and ensure that many of its members were not being left out of the program. Roanoke decided to seek philanthropic support for LMI participation so that the members can receive a low- or no-cost subscription with an immediate credit and leverage those same credits to offset investment needed to address the health and safety repairs that prevent the members from fully participating in the Upgrade to $ave program. Roanoke has raised approximately $500,000 in philanthropic grants to date towards a goal of $1.7 million to offset the cost of LMI participation in the community solar program.[62]

Additional Partnership Opportunities: Roanoke is also exploring relationships with its local Community Action Program (CAP) agencies and state Department of Environmental Quality (which oversees LIHEAP) to identify additional partnership opportunities and sources of funding to align within its program.

- **Ouachita Electric Co-op (Ouachita)**

  Ouachita EC is also looking to expand its program to include solar as part of the ACCESS project. One challenge is that Arkansas's net metering laws prohibit Ouachita EC from owning more than 1 MW of solar, and the co-op currently already owns 1 MW. The co-op will work with Today's Power, Inc. (TPI), a subsidiary of its Generation & Transmission (G&T) cooperative, Arkansas Electric Cooperative Association who will own the system. Members will participate via virtual net metering. A goal of this project is to reduce the cost per watt for LMI members and extend the time for financing to eliminate the co-payment on the members' end.

The following will be tested during ACCESS:

- PAYS for solar as described above is in the testing phase at Roanoke and Ouachita.
- Roanoke's model encourages co-ops to identify their most appropriate members for innovative support through on-bill or other services – not just targeting the largest number of customers who could be signed-up. For Roanoke, identifying and serving the 40% of its members left "hanging" and not able to access the Upgrade to $ave program proved critical to attracting philanthropic support. It can now target programs to reach all eligible customers sustainably.[63]

Areas for potential future analysis could include:

- PAYS is working well in an *energy efficiency* approach, but additional analysis of *solar integration* and value proposition is needed, including the approach that can be both onsite and

[62] Roanoke expects the $1.7 million to help 750 members with an initial pilot goal of 75 members.

[63] See NRECA Case Study of Roanoke programs: https://www.cooperative.com/programs-services/bts/access/Pages/default.aspx

offsite/community solar. [This analysis is underway outside of the ACCESS project and will be reported to ACCESS partners as results are available.]

- Roanoke's approach presents an opportunity to change the view from "subsidizing" and "charity" in serving LMI members to "self-interest" in community, health and safety, grid resiliency, etc., and "investment" in LMI homes.
- Flattening the load curve is another consideration of the PAYS approach. Co-ops can look at the operational savings as another source of funds toward benefiting our LMI member-owners.

Behind-the-Meter Services

Behind-the-meter (BTM) services (as referenced in previous chapters) remain an important programmatic opportunity. Various co-ops are interested in exploring additional BTM services for their program approaches. Concepts remain in the early stages and will continue to be explored as the ACCESS project moves forward. Some of the approaches in consideration include dedicated systems for local schools, government, and/or non-profits.

ACCESS Leader Co-ops' Approaches to Behind-the-Meter Services

- **Oklahoma Electric Cooperative (OEC)**

  OEC, a distribution co-op serving the cities of Norman, Moore and parts of Oklahoma City, is developing a utility-scale 2 MW solar project as part of a Solar Park and Learning Center in Norman, OK. The project is developed in coordination with Norman Public Schools (NPS), with the entire project sited on land leased from NPS. OEC aims to provide lease revenue to the NPS and potentially transfer renewable energy credits (RECs) to the local public school where 50% of the students receive free or subsidized school lunches.

- **Anza Electric (Anza)** and **Kit Carson Electric Cooperative (KCEC)**

  Both Anza and KCEC are working with tribal communities to deploy systems on tribal lands and dedicated, wholly or in part, to tribal needs.

Areas for potential future analysis could include:

- Beyond the ACCESS field test projects, there is interest in residential BTM. The defined ACCESS projects may provide insights to support additional work in this area. The ACCESS team will also incorporate insights from any Affiliate co-ops pursuing BTM programs.

Hybridization of Energy Efficiency & Solar Programs

ACCESS leader co-ops are exploring various approaches to hybridization of energy efficiency and solar. Deeper understanding and analysis of state energy burden characteristics would be beneficial to informing co-op decision-making around integrating EE and solar. This program element received robust feedback from ACCESS stakeholders. The interest around this approach presents co-ops with a range of opportunities and challenges for consideration.

A key observation from co-ops' experience and stakeholder feedback is that **identifying those members who need these services most and then engaging and signing up the members for services can be expensive and beyond the capacities of most co-op staff on their own**.
Reaching out to local partners for outreach help and funds is critical to success. Hybridization of energy efficiency and solar presents opportunities to leverage existing programs, utilizing the relationships and capacity of local efficiency implementation partners to reduce costs and increase impact of solar programs. For an example of a hybrid program, see the Colorado Energy Office's program in the sidebar and footnote below.[64]

Example of a Hybrid Program

The Colorado Energy office (CEO) went into solar about 5 years ago because of reliance on natural gas (primarily) for home heating. LMI clients saved on average $330/year with EE measures, but with 3.5 kW solar array through CEO's low-income solar program, these consumers save an additional $400-$550 per year on rooftop solar. This approach has a big impact in Colorado. Colorado did not directly apply WAP funds because of DOE restrictions but used severance tax at rate-based rebates from the participating Investor Owned Utility, Xcel Energy.

Stakeholders offered the following specific feedback:

- "Use federal/state funding available to mitigate costs of identifying eligible consumers and support outreach/education."
- "Solar and other programs can leverage existing outreach methods (bill inserts) to get information to consumers."
- "Leave the identifying of eligibility to those already doing it for other purposes or in that function already (to mitigate costs, protect privacy, etc.) – use Assurance 16"[65] *(see Chapter 3 of this Gap Analysis for additional details*).
- "Solar presents a strong opportunity to complement energy efficiency measures to reduce electric energy burden."
- "Direct collaboration with community action agencies is recommended to leverage synergies in program delivery and resources."

[64] https://energyoffice.colorado.gov/weatherization-assistance/low-income-solar
[65] Section 2605(b)(16), also known as Assurance 16, allows grantees to use LIHEAP funds to provide services that help households reduce their energy needs and by doing so, reduce their need for assistance. https://liheapch.acf.hhs.gov/pubs/LCIssueBriefs/solar/renewable.pdf

While the use of existing funds for energy efficiency (such as LIHEAP) is possible in some states and co-op service territories and is an allowable measure under federal programs,[66] significant barriers may exist to this approach which can vary greatly by state. These barriers include:

- Lack of state approval/direction for these funds.
- Importance of preserving these funds for existing services and investing resources in energy efficiency programs, which are often under-resourced, first.
- Complexities due to the different regulations and policies from state to state, which further complicates funding and accessibility.

LIHEAP has essentially three funds at the state level: 1) Bill assistance is the lion's share of this fund, 2) EAP-WX (energy assistance to weatherization) transfer, and 3) Assurance 16 - outreach and customer identification.[67] Bill assistance is off-limits to solar. The other two subsets provide some opportunity for solar investments and delivery depending on state innovation.

For further related reading, the ACCESS team has authored a detailed case study regarding the use of LIHEAP funds for solar, which captures additional lessons learned and leading practices to date.[68]

ACCESS Leader Co-ops' Approaches to Hybridization of Energy Efficiency and Solar Programs:

- Co-ops including Roanoke, Anza, and OPALCO are exploring hybridization of energy efficiency and solar programs.

The following will be tested during ACCESS:

- Various approaches to hybrid programs: Nearly all ACCESS leader co-ops are planning to pilot hybridization models.
- Cost-benefit analysis to help expand state regulatory interpretation in a helpful way for co-op adoption.
- Analysis of DOE rules for leveraging solar through federally funded programs to identify potential for changes/flexibility.
- Exploration of other federal funds that may present more viable avenues for solar than LIHEAP and WAP energy efficiency funds.

Areas for potential future analysis could include:

[66] As of 2005, solar is an approved measure in the WAP program – avg cap of $3,500 per family.
[67] See LIHEAP and Assurance 16 in Chapter 3: Finance
[68] See NRECA LIHEAP Case Study: https://www.cooperative.com/programs-services/bts/access/Pages/default.aspx

- In addition to energy efficiency, there are also opportunities to hybridize solar offerings with beneficial electrification (such as fuel switching from propane to heat pumps) and broadband. Members receiving services in these areas may also benefit from LMI solar.

Chapter 5: Initial Insights and Next Steps – Prioritizing and Addressing Gaps and Challenges

With guidance from co-ops and insights from ACCESS stakeholders, our Gap Analysis has identified promising practices for providing affordable solar options that could be adopted broadly, either as they are or with small revisions. These "potential, scalable success pathways" provide an action plan for ACCESS to explore with our cooperative partners and stakeholders over the next two years.

We have also identified solar energy financing and program structures that do not seem to work as well for rural populations. This could be because the structures are not relevant for co-ops' LMI projects or due to unintended limitations in federal and/or state policies, coverage, or coordination. Additionally, the programs themselves may also lack specific components that could increase and accelerate participation from low and moderate income (LMI) rural households.

Initial Findings

Some initial findings from our Gap Analysis research include:

- Co-ops continue to progress in including solar options in their power supply mix for members, and they are interested in finding ways to extend options to the low- to moderate-income communities.
- Some financing options exist for cooperatives to pursue ownership of solar projects, including low-cost capital options with traditional financing partners.
- Accessing tax incentives, such as the Investment Tax Credit (ITC), is difficult for federally tax-exempt co-ops.
- The typical high risk assumed by financial organizations for low-income communities can be a barrier to receiving financing for solar projects for communities in need.
- Reaching and educating members of the LMI community can be challenging.
- LMI consumers often are not used to having energy options due to transient housing situations and split incentives related to rental housing (e.g. those who rent their housing may not pay their own electric bills/utilities, as it is included in the monthly rent).
- Co-ops have existing programs serving the LMI communities, such as weatherization projects, which may be "piggybacked" or replicated for solar options.
- Federal support programs traditionally focus on short-term, immediate energy cost relief, where solar investment would be long-term – which would pose a paradigm shift.
- Solar projects may be able to receive funding through some federal funding that is currently serving energy cost relief efforts, such as weatherization programs, under a category of "innovation."

Exploring Program Designs

To test a variety of program approaches, the ACCESS team is working with our team of leader co-ops on their solar projects (both existing and planned). While these ACCESS projects are each different from one another and tailored to the co-ops' local needs, they face some common challenges. The ACCESS leader co-ops are committed to LMI solar and reducing their LMI members' energy burden as part of their missions to provide safe, reliable, and affordable energy. Through their involvement, our team will be able to explore the opportunities and challenges of diverse program structures and gain valued lessons learned.

Following individual and group sessions with each of the leader co-ops as well as the four stakeholder group workshops, the co-ops prioritized program design elements considered to be critical or important to their current initiatives. In response, the ACCESS team and select stakeholder representatives will form working groups around the following program design elements:

- **Ownership.** When can energy burden be best addressed through direct, member ownership of solar? Through co-op ownership? Through co-op procurement?
- **Rate structures.** Including Time Of Use (TOU), and innovative tariff designs.
- **Low-interest loans.** Via CDFIs and/or Green Banks.
- **Philanthropy.** What are the opportunities for philanthropic efforts to advance solar deployment for LMI? What level of philanthropic support is optimal, and for what duration?
- **Cross-subsidy.** How can co-ops best support members with high energy burdens without cross-subsidy or violation of regulatory rules?
- **LMI Engagement.** How should co-ops identify and engage LMI members without stigmatizing them? Where and how can strategic partnerships with agencies such as Community Action Partnerships simplify the process and create synergies? What should the customer experience look like from LMI members' perspective?

Exploring Policy Issues

Beyond evaluating the program designs of the ACCESS leader co-ops' projects, the team and industry stakeholders also identified several policy goals for consideration. While the interest in these varied amongst the participating co-ops for their own projects, they rated these as Useful, Important or Critical for the broader co-op community.[1]

The following is a sampling of the responses:

Consideration for Importance	Number of respondents rating the issue as "Useful, Important, or Critical" (out of 35)
Policy: Extend USDA programs to LMI energy offerings	29 (83%)
Policy: Add weatherization and solar into state energy plans	21 (60%)
Policy: Corporate RECs for sponsoring LMI energy projects/participation	26 (74%)

The team will add working groups in late FY2021 for topics including:

- Leveraging state and federal funds, training, and technical assistance.
- Extending USDA programs to LMI energy offerings.
- Adding weatherization and solar into state energy plans.
- Corporate Renewable Energy Credits (RECs) for sponsoring LMI energy projects/participation.
- Loan reserve funds.
- Monitoring changes to the ITC.

Considering the Bigger Picture

Through the discussions and prioritization of these specific issues, the group also defined a larger context within which these challenges should be addressed. First, LMI solar as an independent activity will have limited benefits and cost savings. However, LMI members are often those who would most benefit from energy efficiency, urgent home repairs, beneficial electrification, and broadband programs, as well. Leveraging existing programs and strengthening strategic partnerships to combine or hybridize programs has the potential to maximize benefits to LMI members (without stigmatizing), to the cooperative (technical, financial, and operational benefits), and to the local community. There is a need to reframe programs designed to reduce LMI energy burden as "investments in energy infrastructure" – efficient housing with solar and storage is a grid investment with community development benefits.

To support this discussion and framing, ACCESS engaged Pacific Northwest National Laboratory (PNNL) to identify "value stream" opportunities across several measures to better

understand the potential impact of distributed energy resource (DER) investments. A Valuation Report by PNNL was recently issued through our ACCESS Project, as an initial step in this research area.

Next Steps and Reporting

In the coming year, the ACCESS team will move forward with its planned co-op field tests, support the field tests through working groups focused on the identified gaps and challenges, measure progress in accordance with the defined metrics, and share lessons learned along the way. Based on this research, ACCESS will provide recommendations aimed at improving solar energy access for LMI rural populations, including providing information on potential program, financing, and policy solutions.

Recommendations will focus on helping to close the gaps in solar availability, considering:

- How can rural LMI households gain greater access to solar resources ***now and in the near future***?
- How can the research and pilot test projects proposed by ACCESS over the next two years become a catalyst for more effective solar services for rural low-income households, reducing both energy costs and energy burden?
- What is the business case, beyond assistance, for making LMI energy access investments? How do these efforts benefit the member, the co-op, the community, the local economy, the distribution system, the transmission system, and/or resiliency?

Chapter 6: Resources

This chapter of the ACCESS Gap Analysis provides a listing of resources cooperatives may find helpful. Some we have used for our Gap Analysis.

This list is not intended to be exhaustive, and we encourage cooperatives to consider all available resources for their decision-making around solar programs. In addition, as we have noted throughout this Gap Analysis, the solar market is changing rapidly in availability of technology, costs, and related policies. Cooperatives should seek the most current information for their specific area and objectives when considering solar program options.

Financial and Loan Information

In addition to banks and financial firms, cooperatives may have access to funds through various federal and state sources. Federal sources include, but are not limited to:

USDA Rural Economic Development Loans and Grants Program: Source of zero-interest loans to local utilities, for projects that will create and retain employment in rural areas: https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program

USDA Rural Energy Savings Program: Source of loans to cooperatives and other entities to support energy efficiency improvements. RESP loans may support energy efficiency, renewable energy, energy storage or energy conservation measures and related services, improvements, financing, or relending: https://www.rd.usda.gov/programs-services/rural-energy-savings-program

Low-Income Home Energy Assistance Program (LIHEAP): Federal funds allocated by the U.S. Department of Health and Human Services to state agencies, for distribution through local Community Action Agencies.

- For information and program descriptions, see: https://www.benefits.gov/benefit/623
- For LIHEAP information from your state, see: https://www.acf.hhs.gov/ocs/map

Weatherization Assistance Program (WAP): Federal funds and programming supported by the U.S. Department of Energy, targeted to reduce energy costs for low-income households by increasing the energy efficiency of their homes, while ensuring their health and safety.

- For information and program descriptions, see: https://www.energy.gov/eere/wap/weatherization-assistance-program
- To direct cooperative members to the WAP application and information center in your local area, refer to this site: https://www.energy.gov/eere/wap/how-apply-weatherization-assistance#states
- To find the appropriate WAP office for your cooperative service territory, refer to the MAP and click on your state.

An additional resource on funding options is **NRECA's "SUNDA" Project Guide:** *Member Financing for Energy Efficiency and Solar: A Guide for Cooperatives,* 2017: https://www.cooperative.com/programs-services/bts/documents/sunda/final_member_financing_guide_2-27-17.pdf

General, Comprehensive Resources for Low-Income Solar Energy Delivery

U.S. Department of Energy (web sites with resources):
Low-Income Energy Affordability Data (LEAD) Tool: to calculate energy burden. Encompasses housing, energy, and other residential cost factors. https://www.energy.gov/eere/slsc/maps/lead-tool

Low-Income Community Energy Solutions: https://www.energy.gov/eere/slsc/low-income-community-energy-solutions

National Community Solar Partnership (NCSP): Free network of community solar programs: utilities, state and local governments, non-profit, academic and solar developers. Shared networks with supported communications. https://www.energy.gov/eere/solar/national-community-solar-partnership

DOE Solar Energy Technologies Office (SETO):

- *How Does Solar Work? https://www.energy.gov/eere/solar/how-does-solar-work*
- *Unlocking Solar for Low and Moderate Income Residents*, National Renewable Energy Laboratory, January 2018: https://www.nrel.gov/solar/low-moderate-income-financing-matrix.html
- Additional resources and tools are available through NREL's Solar Research division: https://www.nrel.gov/solar/market-research-analysis.html
  - Solar Soft Cost Analyses: https://www.nrel.gov/solar/solar-cost-analysis.html
  - Flexible Financial Credit Agreements for Solar Adoption: https://www.nrel.gov/solar/flexible-financial-credit-agreements.html
  - Tools:
    - ReOpt (for system modeling): https://reopt.nrel.gov/
    - System Advisor Model (SAM): for estimating solar system models, sizes, capacities and financing: https://sam.nrel.gov/about-sam.html

Other Comprehensive Community Solar Publications and Resources

Low-Income Solar Policy Guide (website with comprehensive tools): https://www.lowincomesolar.org

General Publication: *Low-Income Solar Policy Guide*, Available from: https://www.lowincomesolar.org/wp-content/uploads/2016/03/Low-Income-Solar-Policy-Guide_3.11.16.pdf

Utility-specific publication: *Low-Income Solar Policy Guide: Principles and Recommendations for Utility Participation in Solar Programs for Low-Income Customers*. GRID Alternatives, Vote Solar and Environmental Law & Policy Institute. January 2020. Excellent comprehensive resource for utility managers. Available from: https://www.lowincomesolar.org/wp-content/uploads/2020/01/Utility-LMI-Solar-paper.pdf

Community Solar Opportunities for Low to Moderate Income Households in the Southeast, NC Clean Energy Technology Center, Anne Tazewell; Shrestha, Achyut. March 2018: https://nccleantech.ncsu.edu/wp-content/uploads/2018/05/Community-Solar-LMI-Report-3_27_18.pdf

The Ultimate Guide to Community Solar, Solstice Project, August 2020. Also available as a pdf download document: https://solstice.us/solstice-blog/ultimate-guide-community-solar/

Community Solar Policy Decision Matrix: Guidance for Designing Community Solar Programs, Coalition for Community Solar Access, March 2019: http://www.communitysolaraccess.org/wp-content/uploads/2019/04/2019CommunitySolarPolicyMatrix-2.pdf

Comprehensive Building Blocks for a Regenerative & Just 100% Policy, The 100% Network, January 2021: https://www.climateadvocacylab.org/system/files/100-network_comprehensive-building-blocks-for-a-just-regenerative-100-policy-2020.pdf

The Opportunity Zone Incentive Isn't Living Up to Its Equitable Development Goals. Here Are Four Ways to Improve It, Brett Theodos, Jorge Gonzále, Brady Meixell; Urban Institute blogpost, June 17, 2020, Available from: *https://www.urban.org/urban-wire/opportunity-zone-incentive-isnt-living-its-equitable-development-goals-here-are-four-ways-improve-it*

Content Related to NRECA's ACCESS Project

Advancing Energy Access For All

- **Website**
- **Case Study Series**
  - *Cobb Electric Membership Cooperative:* Innovative "Smart Choice" rate designs and a suite of member programs to reduce energy burden. Eric Cody, October 2019. https://www.cooperative.com/programs-services/bts/energy-access/Documents/Secure/Advisory-Advancing-Energy-Access-for-All-case-study-Cobb-EMC-Oct-2019.pdf
  - *Bringing the Benefits of Solar to Low-Income Households: The Case of Cherryland Electric Cooperative*, Eric Cody, June 2019: https://www.cooperative.com/programs-services/bts/energy-access/Documents/Advisory-Advancing-Energy-Access-for-All-Case-Study-Cherryland-June-2019.pdf
  - *Consolidated Cooperative: A Community Assistance Program that Responds to Critical Needs*, Eric Cody, August 2019: https://www.cooperative.com/programs-services/bts/Documents/Secure/Advisories/Advisory-Advancing-Energy-Access-for-All-Case-Study-Consolidated-Cooperative-August-2019.pdf
  - *North Dakota Association of Rural Electric Cooperatives*, December 2019: https://www.cooperative.com/programs-services/bts/energy-access/Documents/Advisory-Advancing-Energy-Access-Case-Study-NDAREC-Dec-2019.pdf
  - *Mid-Carolina Electric Cooperative's Residential Demand Rate*, Eric Cody, February 2020: https://www.cooperative.com/programs-services/bts/energy-access/Documents/Secure/Advisory-Advancing-Energy-Access-MCEC-Case-Study-Feb-2020.pdf
  - *Making Energy Retrofits Affordable with Tariff-based Financing: The Case of Ouachita Electric Cooperative*, Eric Cody, July 2019: https://www.cooperative.com/programs-services/bts/Documents/Secure/Advisories/Advisory-Advancing-Energy-Access-for-All-Case-Study-Ouachita-July-2019.pdf
  - Source of Ouachita data for this report: Ouachita Electric Cooperative and EEtility, "Opening Opportunities with Inclusive Financing for Energy Efficiency: Report on the first year of the HELP PAYS® Program at Ouachita Electric," June 2017. https://www.oecc.com/pdfs/HELP_PAYS_Report_2016-Ouachita_Electric_20170612V1.pdf

Additional Resources

- **Website** – *Visit this website often for updates on ACCESS*

- **NRECA Advisory: ACCESS Project -** *Opportunity for Cooperatives to Participate in DOE Research Project "ACCESS" To Expand Solar Energy Affordability*, July 2020: https://www.cooperative.com/programs-services/bts/Documents/Advisories/Advisory-Solar-ACCESS-Project-Cooperatives-Recruitment-July-2020.pdf

- **NRECA Advisory: NRECA and PNNL Research Additional Benefits from Solar PV and Energy Storage -** *Achieving Cooperative Community Equitable Solar Sources (ACCESS): Research on Potential Additional Benefits from Solar PV and Energy Storage to the Distribution Grid*, October 2020: https://www.cooperative.com/programs-services/bts/Documents/Advisories/Advisory-ACCESS-PNNL-Distribution-Grid-Services-Oct-2020.pdf

- **NRECA Advisory: ACCESS Project Explores Use of Federal Assistance Funds to Provide Affordable Solar Energy for Low-Income Households -** *Achieving Cooperative Community Equitable Solar Sources (ACCESS): Research on Using Low Income Home Energy Assistance Program (LIHEAP) Funds to Achieve Solar Affordability for Co-op Communities in Need*, October 2020: https://www.cooperative.com/programs-services/bts/Documents/Advisories/Advisory-ACCESS-Research-of-LIHEAP-Overview-Oct-2020.pdf

- **PNNL Report on the Valuation of DER Resources to Demonstrate the Range of Potential Benefits**: *Achieving Cooperative Community Equitable Solar Sources (ACCESS) Valuation Report: A Guide for Electric Co-ops,* NRECA/BTS in collaboration with Pacific Northwest National Laboratory. Kendall Mongird Jan Alam Abhishek Somani; PNNL, February 2021: https://www.cooperative.com/programs-services/bts/Documents/Reports/ACCESS-Report-PNNL-Valuation-of-Solar-February-2021.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
    - Report 1: *How Cooperatives Are Supporting Their Members In Need - Programs, Rates and Partnerships for Low- to Moderate-Income Members*
    - Report 2: *How Existing Co-op Program and Financing Mechanisms Support Solar Access for Low- to Moderate-Income Members*
    - Report 3: *Electric Cooperative Solar Market Analysis and Trends*

- **Case Studies**

  - **Case Study: Anza Electric Cooperative** October 2020: 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

  - **Case Study: Roanoke Electric Cooperative**, October 2020: 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

- *Public Utilities Fortnightly,* March 2021. Ifebigh, Adaora. *"*Small Co-op Tackles Big Issue – Solar Access for Low-Income Households: Roanoke's SolarShare Program*."* https://www.fortnightly.com/fortnightly/2021/03/small-co-op-tackles-big-issue-solar-access-low-income-households

  - *Roanoke's SolarShare program also featured at:* https://cbey.yale.edu/sites/default/files/2019-08/Roanoke%20Upgrade%20to%20Save.pdf

- *"*'Essential Services': Co-op programs are tailor-made to help low- and moderate-income members*", RE Magazine*, Adaora Ifebigh, Deb Roepke, May 2019: https://www.cooperative.com/remagazine/articles/Pages/essential-services-help-low-moderate-income-members.aspx

Appendix: Metrics to Measure ACCESS Pilot Programming

ACCESS will measure success of its solar programs by utilizing the following metrics:

Participation			
Indicator	**Metric**	**Definition**	**Purpose**
Total Participation (# Households)	Number of households served	Sum of the total households participating in the solar program.	- Quantify the number of members who benefit
Participation by Income Level (%)	Percentage of Total Participation made of low and moderate income households	Of the Total Participation, the percentage of households that have been identified as LMI.	- Quantify the number of low and moderate income members who benefit
LMI Participation (%)	Percentage of identified low and moderate income households served	Of the total number of identified LMI households served by the utility, the percentage participating in the solar program.	- Verify access to low and moderate income communities
Housing Type Participation (%)	Percent participation by housing type (single family vs multifamily	Of the Total Participation, the percentages of households that are in single-family and in multifamily homes.	- Verify access to low and moderate income communities
Number of Homes with Health and Safety Issues (# Households) (rooftop solar only)	Number of homes not served due to health and safety issues.	Number of program applicant households who were not able to participate in the program due to health and safety issues at their residence (applicable to rooftop solar programs only).	- Verify access to low and moderate income communities
Percentage of Homes with Health and Safety Issues (%) (rooftop solar only)	Percentage of total homes surveyed that could not be served due to health and safety issues.	Percentage of total program applicant households who were not able to participate in the program due to health and safety issues at their residence (applicable to rooftop solar programs only).	- Verify access to low and moderate income communities

Number of Health and Safety Issues Abated (# Households) (rooftop solar only)**	Number of Homes with Health and Safety Issues that were abated.	Number of program applicant households where the cooperative was able to make health and safety improvements to participate in the program (applicable to rooftop solar programs only).	- Verify access to low and moderate income communities
Savings			
Indicator	**Metric**	**Definition**	**Purpose**
Dollar Savings ($USD)	Aggregate cost savings for participants	Sum of the total difference between the annual baseline cost of electricity for participating customers and the annual cost of electricity resulting from the solar program.	- Measure energy savings for participants
Average Cost Reduction (%)	Average cost savings for participants	Average of the percentage difference between the baseline cost per kWh of electricity for participating customers and the resulting cost per kWh of electricity resulting from the solar program.	- Measure energy savings for participants
LMI Percentage Savings (%)	Percentage of the cost savings delivered to participating low and moderate income households	Percentage of the total Dollar Savings that were provided to LMI households.	- Quantify cost savings toward LMI participants.
Cost Reduction (%)	Percentage reduction in energy burden for participating low and moderate income households	Percentage difference between the baseline energy burden (percentage of annual income spent on annual electricity bills) and the energy burden resulting from the solar program for LMI households.	- Measure energy savings for participants
Financing			
Indicator	**Metric**	**Definition**	**Purpose**
Total Program Funding ($ USD)	Total funding leveraged as a part of solar program.	Total funds leveraged in the design, construction, and implementation of the solar program.	- Quantify the total funds invested to deliver solar program benefits

Total Program Investment Financing ($ USD)	Total amount of investment financed, e.g. through the housing tax credit projects, on-bill programs, etc.	Total costs paid for through financing, including both tax credit partnerships or ratepayer financings options, for the solar program.	- Quantify the total amount of financing required to deliver solar program benefits
Expenses for on-going operations ($ USD)	Annual cost to manage the program	Estimated annual operations costs to the cooperative following program go-live.	- Quantify the total amount of financing required to deliver solar program benefits
Cost per LMI member of program ($ USD)	Total cost of the program divided by the number of low and moderate income households	Total Program Funding and Investment Financing combined, divided by the number of LMI households for the project.	- Quantify the total amount of financing required to deliver solar program benefits - Verify access to low and moderate income communities

*LMI = Low and Moderate Income. For the purposes the ACCESS project, a single, national average income calculation will guide how populations we discuss are characterized as Low and Moderate Income using the annual household income figures provided by the Department of Housing and Urban Development. While NRECA calculates that rural households nearly always earn less (~12% less annual median household income) than urban households, and rural states have lower Average Median Incomes across the board compared to more urban states, this comparison is valid for purposes of ACCESS measurement and program recommendations. See: https://www.huduser.gov/portal/datasets/il.html

** Health impacts from solar installation will be evaluated during 2021 to assure that cooperatives are able to accurately capture this metric during ACCESS piloting phases.