

# Cooperative and Community Opportunities in Solar Energy

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This bulletin focuses on potential cooperative and community opportunities in solar energy development and use. This document is not intended to be holistic, but rather introduces some of the overall basic concepts in solar energy development and provides information on how solar energy is and may be deployed in communities in the United States. This paper consists of 4 major sections: background information, economics of solar energy, community solar solutions, and resources for additional information on solar energy.

## Introduction:

Solar Energy offers an affordable and environmentally friendly energy source to power our future. In partnership with other renewable energy sources such as wind and geothermal, our nation's energy grid is expected to rise from 19% renewable in 2019 to 38% in 2050, with solar energy accounting for almost half of all renewable energy generation in 2050.<sup>1</sup> This bulletin provides the reader with information on solar energy while outlining some of the various cooperative and small business models that can be used to adopt solar energy.

## Definitions:

**kWh:** An abbreviation for Kilowatt-hour. A unit to measure quantity of electricity. A typical American home consumes 11,000 kWh per year.<sup>2</sup>

**Solar Cell Efficiency:** The measure of the portion of sunlight energy that is converted into electricity through a solar cell.

## Part 1: Background Information

This section describes the benefits of solar power and group action, solar energy production methods, and government involvement that have all helped greater adoption of solar technology.

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<sup>1</sup> EIA <https://www.eia.gov/todayinenergy/detail.php?id=42655>

<sup>2</sup> EIA <https://www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php>

## Benefits of Solar Power

Numerous benefits of solar power have been explored and documented by researchers and developers of solar energy systems. Some of these benefits are as follows:

- Solar power is a clean and renewable energy source. Solar technology turns the abundance of light produced by the sun into energy.
- Solar energy does not require the purchase of an input commodity such as coal or oil. The price of solar is based purely on the initial infrastructure investment and minimal maintenance costs. A solar installation can function as a hedge against rising energy prices.
- Solar power creates jobs. Good, high paying American jobs are required to install and manage the solar infrastructure. As of 2019, nearly 250,000 Americans were employed in the solar industry, with almost 35,000 of those jobs in domestic manufacturing.<sup>3</sup>
- Utility scale solar generation is less expensive than all conventional electricity sources, costing as low as \$0.03/kwh (before subsidies are considered).
- Residential solar production is cost competitive with conventional utility sourced energy, even before subsidies are considered. A community solar farm can cost as little as \$0.06/kWh while residential rooftop solar is as low as \$0.15/kWh.<sup>4</sup>
- Solar energy used in conjunction with modern battery technology can save energy for nighttime use.
- Battery technology can offer a consistent supply of electricity to remote locations or locations with an unreliable connection to the electricity grid.
- An increase in solar energy adoption will increase local and national energy independence.

These benefits alone make a good case for pursuing solar energy, and in addition, there are a variety of tax credits and funding opportunities available on the federal, state, and local levels that further incentivize the adoption of solar energy.

## Benefits of Group Action

People working together to adopt solar energy can provide even further benefits beyond the general benefits listed above. Some reasons for promoting group action for solar energy projects include:

- Greater stimulation of local economies compared to conventional energy sources.
- The ability to lower energy prices through increased competition in energy markets.
- Installation and ownership costs can decline through economies of scale.
- Offers a green energy solution to renters or households that cannot install rooftop solar.

## Methods of Solar Energy Production:

There are two main methods of harnessing solar energy for electricity: *Photovoltaic Cells* (PV) and *Concentrated Solar Power* (CSP). PV is the more common method of turning the sun's energy into electricity. It is the PV solar panels you see on roofs, or in large arrays in fields. These absorb the energy contained in sunlight and transform it into usable electricity. Alternately, CSP relies on a large array of

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<sup>3</sup> Solar Industry Association. <https://www.seia.org/solar-industry-research-data>

<sup>4</sup> Lazard. October 19, 2020. <https://www.lazard.com/media/451419/lazards-levelized-cost-of-energy-version-140.pdf>

reflectors or mirrors to concentrate the sun's heat energy onto a receiver. The receiver, which often contains a steam turbine, converts the immense heat energy into electricity.

In comparing PV and CPS technology, PV has a few competitive advantages which have led to its wider adaptation. While PV systems are easily scalable, economically viable in a variety of climates, and are simple to install, CSP systems require a large amount of land in a location with an exceptionally strong amount of sunlight (such as the Mojave Desert) and are often complex to install.

### Government Involvement

Interest in solar energy by governments, the private sector, and citizens have led to gradual and continuing improvements in solar technology. These include:

- 1) Market forces and government investment have resulted in a steady decline in the cost of solar. Utility-scale solar PV costs have fallen by 90 percent in over the last decade, and the downward trend is expected to continue.<sup>5</sup>
- 2) Innovation partly funded through government involvement has gradually increased efficiency of solar panels. The solar cell efficiency of commercially available solar PV panels is currently 20-23 percent. While solar PV panels that are not currently price competitive can achieve solar cell efficiency over 30 percent. The general trend toward increased efficiency of solar technology is expected to continue.
- 3) Federal and state financial incentives for solar gradually change over time as old legislation expires and new regulation is introduced. Information and resources on federal or state financial incentives are available in the "Government Incentives" section below.
- 4) Many states are gradually adopting new business and utility regulations to encourage the use of solar.

## Part 2: Economics of Solar Energy

The soaring adaptation of solar energy is changing the fundamental structure of how consumers receive and pay for electricity. While the historic method of simply receiving and paying a monthly utility bill based upon energy use will continue, solar energy adoption can take advantage of a variety of funding methods to increase local ownership of energy production.

However, the transition toward localized production of energy may require considerable investment. A solar installation large enough to meet an average home's energy needs of 10,000 kWh will cost between \$10,000 to \$20,000, before tax incentives. But a large community solar or commercial solar installation has the potential to decrease the cost of solar by up to 60 percent.<sup>6</sup>

### Financing Options

This section discusses financing options and methods for managing the value of electricity generated by solar installations. There are two basic financing options for funding a solar installation:

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<sup>5</sup> Lazard. October 19, 2020. <https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2020/>

<sup>6</sup> National Rural Energy Laboratory.

- 1) The purchase is made through a large initial cash investment can fully fund a solar array. For the years following the solar installation, the electricity generated can be used or sold without any substantial additional costs.
- 2) The purchase is made through debt financing to fund the installation of a solar array. In most circumstances, the monthly payment on the debt will be lower than the market value of the energy produced by the array providing financial feasibility.

[CoBank](#) and [The National Cooperative Bank](#) are two examples of lenders who specialize in financing activities for cooperatives.

#### Financial Management Considerations:

To recoup the costs associated with a new solar installation, there are a variety of financing methods to manage the value of electricity generated from a solar installation:

- 1) Solar Lease/Solar Subscription: In either a solar lease or a solar subscription, the energy consumer pays a set monthly fee to the entity that owns the solar panels in exchange for the energy produced by those panels. While the financier/owner of the installation benefits from stable income, the user of the electricity must pay a fixed monthly fee regardless of the amount of energy produced. For on-site solar installations, a contract may specify the leaser/subscriber may own the panels after a set period, generally around 20 years.
  - a. Subscriber Management Organization: A subscriber management organization operates as the middleman between the owner of a solar installation and the users of the electricity. These organizations often allow energy users to simply subscribe to solar through an online dashboard. [Energysage](#), [SunShare](#) and [Nelnet Energy](#) are three examples of subscriber management organizations.
- 2) Power Purchase Agreement (PPA): In contrast to the solar subscription model where financing is based on the physical solar installation, the financing for a power purchasing agreement is based on the amount of electricity generated from a solar installation. The end user of the solar energy will pay a fixed rate to the owner of the installation the amount of electricity received. While a PPA benefits the user of the electricity through maintaining a payment structure resembling paying a utility for the electricity, the owner of the solar installation will have inconsistent revenue. If the solar installation is debt financed, the owner may not receive adequate monthly income to cover debt obligations.
- 3) Renewable Energy Certificates (REC): A REC is a marketable method of trading energy produced by renewable energy. An owner of solar energy may sell the REC to an entity looking to offset the pollution caused by their conventional energy consumption. The [Environmental Protection Administration](#) offers further details on RECs, along with resources for tracking the buying and selling of clean energy.
- 4) Property Assessed Clean Energy (PACE) financing: PACE financing is a local government program where the government provides the initial financing for a private solar installation. For the years following the installation, the property owner will repay the local government for the costs of their solar installation through an additional charge on their annual property tax bill. While only select areas of the United States offer PACE financing, the DSIRE database referenced below is a valuable resource for identifying local governments that offers PACE financing.

#### Government Programs:

Tax incentives and other government initiatives are available to further reduce the costs associated with installing solar energy systems. Local utilities, state and local governments and solar installers are often

a valuable resource to understand local solar financing incentives. The Small Business Administration maintains a [list](#) of state and local energy efficiency programs, many of whom, offer financial incentives. The [Database of State Incentives for Renewables and Efficiency \(DSIRE\)](#) provides comprehensive information on federal, state and local financial programs to support the adaptation of renewable energy. Included in the DSIRE Database are a few notable federal programs which support the adaptation of Solar Technology:

The USDA offers a variety of loan and grant programs which can aid in our nations transition toward renewable future:

- 1) USDA Rural Developments' [Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Guaranteed Loans & Grants](#): provides guaranteed loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements.
- 2) USDA Rural Developments' [Rural Energy for America Program Energy Audit & Renewable Energy Development Assistance Grants](#): assists rural small businesses, agricultural producers, and electric cooperatives by conducting and promoting energy audits and providing Renewable Energy Development Assistance (REDA).
- 3) USDA Rural Development' [Business & Industry Guaranteed Loan Program \(B&I\)](#): offers loan guarantees to lenders providing credit enhancement and risk mitigation for loans to rural businesses.
- 4) USDA's Rural Utilities Services' [High Energy Cost Grants](#): Assists energy providers and other eligible entities in lowering energy costs for families and individuals in areas with extremely high per-household energy costs.
- 5) USDA's Rural Utility Services' [Electric Programs](#): Offers loans and loan guarantees to finance the construction of electric facilities, including system improvements and replacement required to furnish and improve electric service in rural areas.

Congress has passed a couple of key federal tax incentives to support the adaptation of solar energy:

- 1) [The Federal Business Energy Investment Tax Credit](#) provides a tax credit for commercial solar installations based upon the year construction begins. As of February 2021, legislation allows for a 26 percent tax credit through 12/31/23, a 22 percent tax credit through 12/31/25, and a 10 percent tax credit for solar installations commencing in 2026 or beyond.
- 2) [The Residential Renewable Energy Tax Credit](#) provides a tax credit for residential solar installations based upon when a new solar installation is "placed in service". As of February 2021, current legislation allows for a 26 percent tax credit for systems placed in service before 01/01/23, and a 22 percent for installations placed in service before 01/01/2024.

### Managing the Inconsistency of Supply

Since sunshine is not available 24 hours a day, the sun is unable to directly power all energy needs. Large scale battery installations are being used as a method to store solar energy for future use. Solar systems working with a battery installation and smart technology can store solar energy for later use. In areas that may suffer from frequent power outages, a home solar array in conjunction with a home battery can provide power during the outage.

Most on-site solar installations connected with the energy grid use a system known as "net metering" to account for the value of excess energy while ensuring a consistent supply of energy. At the end of a billing period, a utility provider will credit the excess energy produced against the energy supplied by

their grid. When solar energy production is low, the solar owner(s) may buy energy from the grid. In a process known as a “net metering”, the flow of energy into and out from the grid will be balanced out on your monthly utility statement. The [National Conference of State Legislatures](#) offers a list of net metering policies by state.

## Part 3: Community Solar Solutions

A community solar farm can offer solar to individuals that may not be able to install conventional household solar and/or cannot afford the cost of installing an individual system. The community solar model may be an option to offer conventional homeowners, housing cooperatives, renters, condo owners, and others an opportunity to gain solar energy. However, since models of community solar are dependent upon local laws, regulations, and incentives, it is important to consider the local solar environment when exploring opportunities in community solar.

**Cooperative Models:** In some cases, community solar may be achieved through the development of cooperatives. This section explores some cooperative models, all structured to lower the cost of electricity and providing access to solar power to interested individuals

**Purchasing Model:** When multiple households of a community would like to “go solar”, one option would be for them to form a solar purchasing cooperative that will bulk buy the household solar installations. This type of cooperative would pool-purchase the installations at a lower cost given increased purchasing power and the individual household members would purchase their individual installation from the cooperative. These members would thus, benefit from lower installation costs and from lower electricity prices. Some examples of this model can be found at the Website: [Solar United Neighborhoods](#), a resource platform for those interested in cooperative solar opportunities.

**Dividend Model:** Under a dividend model, community members unite to raise funds, install, and own a cooperative solar installation. Upon completion of the installation, the cooperative members receive a re-occurring dividend payment for the electricity produced by their proportional share of the solar installation. While individual homes may not receive the clean power, the cooperative contributes to a more renewable future. [People Power Solar](#) is a Californian organization working to expand access to solar energy through the dividend model of solar cooperatives.

**Standard Model:** People interested in solar energy have the option of forming a cooperative that would both own the solar panels and use the electricity generated from the installation. To account for the energy distributed among cooperative members, a variety of energy or financial instruments can be utilized, including net metering, purchase power agreements, renewable energy certificates or solar subscriptions.

**Solar Power via Utility Cooperatives:** Forty-two million Americans receive their electricity through an electric cooperative. As customer-owned entities, these cooperatives serve the needs and wishes of their customers. As a result, 227 utility

cooperatives in 33 states offer a form of community solar. Models of utility-scale community solar vary considerably and the best source for information on local options for utility solar is your utility provider itself.<sup>7</sup>

**Non-profit Community Solar Model:** Non-profits can form to raise funds for the purchase of a community solar installation. The solar installation benefits the community, while the financiers of the installation do not receive any profit. As an example, a non-profit purchasing organization may form to fund a solar installation for a public school. Upon completion of the installation, the school and community will benefit from clean energy and a lower electric bill. Unfortunately, non-profit entities are generally not able to take advantage of federal and state tax credits.

**For-Profit Community Solar Business Models:** Small businesses around the nation have been implementing innovative business models to transition the Nation toward a greener future.

Special Purpose Entities: In this model, a legal entity is created to directly own and manage a solar installation. The entity can be an independent organization or owned by a parent organization. The most common business structure of a solar special purpose entity is an LLC; though public benefit corporations, partnerships or other business structures are also used. A community solar special purpose entity can take advantage of a subscriber management organization, purchase power agreement, solar leases, or renewable energy certificates.

Developer Model: A solar developer holistically installs, owns, and manages a solar installation. The developer is responsible for acquiring the land, adhering to necessary regulations, and working with local utilities. The developer model often takes advantage of a subscriber management organization, though power purchase agreements, solar leases and renewable energy credits may also be used.

**Utility Model:** Utilities operate similarly to a solar developer model. In fact, some utilities may purchase solar directly from a solar developer. The community solar model for utility companies will generally be structured through a power purchase agreement or a solar lease. A key benefit of the utility model community solar is the ability for your solar energy bill and utility bill to be combined into one place.

### Small Business and Cooperative Installers

Small businesses have formed to install solar for homeowners, electric utilities, and everything in between. In order to compete against the larger solar installers, [Amicus Solar](#) formed to unite the purchasing power of small solar installers. Although its members include both small corporate installers and cooperative installers, Amicus itself is a member-owned cooperative helping small businesses to thrive in a competitive marketplace.

Cooperative Installers: Cooperative installers, such as [Evergreen Energy Solutions](#) in Cleveland, Ohio, is a worker-owned cooperative that installs community solar farms, private solar, and corporate solar systems. Among the benefits of a solar installation cooperative over a traditional corporate installer include: (a) worker-owners have increased control over their compensation

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<sup>7</sup> National Rural Electric Cooperative Association. <https://www.electric.coop/wp-content/Renewables/community-solar.html>



and (b) worker-owners have a greater incentive for efficient and quality work compared to a employees that don't share ownership of the businesses.

In summary, the increasing adaptation of solar energy is fueling a localization of energy production. This changing dynamic of utility grids has resulted in a variety of new community models of energy production. Different models of community solar being employed or developed help expand the opportunities for greater solar energy use for those who may not be able to install conventional rooftop solar. Other small businesses can also form to install and manage community or other large solar arrays. Solar energy development and use offers many opportunities for new jobs and economic growth while lowering energy costs and benefiting the environment.

## Part 4: Resources for Additional Solar Energy Information

This section provides some of the resources described in the text and some additional information about solar energy, including government programs, for those interested in exploring and learning more.

USDA Rural Development

[Rural Development Energy Programs](#)

Rural Business-Cooperative Services: [REAP Renewable Energy Systems Loans and Grants](#)

Rural Business-Cooperative Services: [REAP Renewable Energy Audit & Development Assistance Grants](#)

Rural Utilities Service, [High Energy Cost Grants](#), [Electric Programs](#)

Database of State Incentives for Renewables and Efficiency (DSIRE)

[DSIRE](#)

National Renewable Energy Laboratory:

[Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation \(2015\)](#)

[A guide to Community Solar \(2010\)](#)

US Department of Energy: Office of Energy Efficiency & Renewable Energy

[Solar Energy Technologies Office](#)

[Community and Shared Solar](#)

[Solar Powering America Program](#)

[Homeowner's Guide to Going Solar](#)



Environmental Protection Agency:

[Community Solar: An Opportunity to Enhance Sustainable Development on Landfills and Other Contaminated Sites.](#)

Co-op Power

[Offers Community Solar, Solar Subscriptions, Solar Power Purchasing Agreements and more in Massachusetts and New York.](#)

Amicus Solar Cooperative

[A Network of Solar Installers](#)

Energy Sage

[Offers a lot of Resources on Solar and Community Solar](#)

NRECA (National Rural Electric Cooperative Association)

Outlines Electric Cooperatives involved in [Community Solar Across the Country](#)